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(54) Title: NUCLEIC ACID MOLECULES AND USES THEREOF

(57) Abstract: The present invention is directed to an artificial nucleic acid and to polypeptides suitable for use in treatment or prophylaxis of an infection with Norovirus or a disorder related to such an infection. In particular, the present invention concerns a Norovirus vaccine. The present invention is directed to an artificial nucleic acid, polypeptides, compositions and vaccines comprising the artificial nucleic acid or the polypeptides. The invention further concerns a method of treating or preventing a disorder or a disease, first and second medical uses of the artificial nucleic acid, polypeptides, compositions and vaccines. Further, the invention is directed to a kit, particularly to a kit of parts, comprising the artificial nucleic acid, polypeptides, compositions and vaccines.

Nucleic acid molecules and uses thereof

Introduction:

The present invention is directed to an artificial nucleic acid and to polypeptides suitable for use in treatment or prophylaxis of an infection with Norovirus or a disorder related to such an infection. In particular, the present invention concerns a Norovirus vaccine. The present invention is directed to an artificial nucleic acid, polypeptides, compositions and vaccines comprising the artificial nucleic acid or the polypeptides. The invention further concerns a method of treating or preventing a disorder or a disease, first and second medical uses of the artificial nucleic acid, polypeptides, compositions and vaccines. Further, the invention is directed to a kit, particularly to a kit of parts, comprising the artificial nucleic acid, polypeptides, compositions and vaccines.

Noroviruses (also known as Norwalk-like viruses or Norwalk viruses) are positive sense, single-stranded RNA Caliciviruses (Sarvestani, Soroush I , et al. "Norovirus Infection: Replication, Manipulation of Host, and Interaction with the Host Immune Response." Journal of Interferon & Cytokine Research 36.4 (2016):215-225), containing a non-segmented RNA genome. The virus genome is organized in three open reading frames, of which the 5' proximal ORF1 encodes a large polyprotein that is cleaved into non-structural proteins; the minor capsid protein VP2 is encoded by ORF3 and the major capsid protein VP1 is encoded by ORF2 (Karst et al.. Cell Host Microbe 17; 15(6):668-680, 2014; Robilotti E, Deresinski S, Pinsky BA. 2015. Norovirus. Clin Microbiol Rev 28:134-164).

Noroviruses are classified into five genogroups (GI - GV), and are further subdivided into genotypes based on the capsid sequence (Zheng, Du-Ping, et al. "Norovirus classification and proposed strain nomenclature." Virology 346.2 (2006):312-323; Kroneman, A., et al. "An automated genotyping tool for enteroviruses and noroviruses." Journal of Clinical Virology 51.2 (2011):121-125). Mostly viruses of genogroups I, II are known to infect humans (Ramani, Sasirekha, Robert L. Atmar, and Mary K. Estes. "Epidemiology of human noroviruses and updates on vaccine development", Current opinion in gastroenterology 30.1 (2014):25), Norwalk viruses (NV) genotype GI.1 was the first isolated Norovirus, however genotype GII.4 Noroviruses are currently the most frequently detected in humans (Glass, Roger I., Umesh D. Parashar, and Mary K. Estes. "Norovirus gastroenteritis." New England Journal of Medicine 361.18 (2009):1776-1785).

Infections with Noroviruses are generally self-limiting in healthy adults, displaying typical symptoms including non-bloody diarrhea, vomiting, nausea and abdominal cramps. However, in individuals with weakened immune system, including young children and elderly, infection can be severe and even fatal (Glass, Roger I., Umesh D. Parashar, and Mary K. Estes. "Norovirus

gastrDEnteritis." NEW England Journal of MBdicine 361.18 (20D9):I77G-I785). Nongastrointestinal- related illness, including neuradevelopmental disorders have also been reported after Norovirus infection. (Sarvestani, Soroush I , et al. "Norovirus Infection: Replication, Manipulation of Host, and Interaction with the Host Immune Response." Journal of Interferon 5 Cytokine Research 36.4 (20l6):2l5-225).

Due to the low infectious dose, resistance to many common sterilization procedures, and ease of transmission, epidemic outbreaks are common and difficult to control (Glass, Roger I„ Umesh D. Parashar, and Mary K. Estes. "Norovirus gastroenteritis." New England Journal of Medicine 361.18 (20D9):I77G-I785: Hutson et al., 2DD4). NoV has been shown to be the cause of the majority of nonbacterial gastroenteritis epidemics, resulting iΠ a huge economic burden. In the US, the cost of NoV-associated hospitalizations has been estimated at approximately $500 million, while foodborne NoV **cost** due to healthcare and **lost** productivity has been estimated at $2 billion (Batz, Michael B., Sandra Hoffmann, and J. Glenn Morris Jr. "Ranking the diseasB burden of 14 pathogens in food sources in the United States using attribution data from outbreak investigations and expert **elicitatiDfi."** Journal of Food Protection 75.7 (20I2):I278-I2FJI). The rapid evolution of Norovirus genotypes through antigenic drift and changing glycan specificities still provide challenges in the development of potent vaccines (Ramani, Sasirekha, Robert L. Atmar, and Mary K. Estes. "Epidemiology of human noroviruses and opdates on vaccine development." Current opinion in gastroentErology 3D.I (2DI4):25).

At present, there is no specific treatment of Norovirus infections. Therapy is limited to curing the symptoms caused by the infection. In addition, there is currently no vaccine available against Norovirus infections. There is therefore a strong need foΓ a vaccine against Norovirus infection.

The underlying objEct of the present invention is therefore to provide a Norovirus vaccine. It is a further preferred object of the invention to provide a Norovirus vaccine, which may be produced at an industrial scale. A further object of the present invention is the provision of a storage-stable Norovirus vaccine. Further object of the underlying invention is to provide mRNA sequences coding for antigenic peptides or proteins derived from a protein of a Norovirus or a fragment or variant thereof for the use as a vaccine for prophylaxis or treatment of Norovirus infections. Furthermore, it is the object of the present invention to provide an effective Norovirus vaccine which can be stored without cold chain and which enables rapid and scalable vaccine production.

The object underlying the present invention is solved by the claimed subject-matter. Particularly, the objects underlying the present invention are solved according to a first **aspect** by an inventive by providing an artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, aod/or a fragment or variant thereof.

Definitions:

For the sake of clarity and readability the following definitions are provided. Any technical feature mentioned for these definitions may be read on each and every embodiment of the invention. Additional definitions and explanations may be specifically provided in the context of these embodiments.

Adaptive immune response: The adaptive immune response is typically understood to be an antigen-specific response of the immune system. Antigen specificity allows for the generation of responses that are tailored to specific pathogens or pathogen-infected cells. The ability to mount these tailored responses is usually maintained in the body by "memory cells". Should a pathogen infect the body more than once, these specific memory cells are used to quickly eliminate it. In this context, the first step of an adaptive immune response is the activation of naive antigen-specific T cells or different immune cells able to induce an antigen-specific immune response by antigen-presenting cells. This occurs in the lymphoid tissues and organs through which naive T cells are constantly passing. The three cell types that may serve as antigen-presenting cells are dendritic cells, macrophages, and B cells. Each of these cells has a distinct function in eliciting immune responses. Dendritic cells may take up antigens by phagocytosis and macropinocytosis and may become stimulated by contact with e.g. a foreign antigen to migrate to the local lymphoid tissue, where they differentiate into mature dendritic cells. Macrophages ingest particulate antigens such as bacteria and are induced by infectious agents or other appropriate stimuli to express MHC molecules. The unique ability of B cells to bind and internalize soluble protein antigens via their receptors may also be important to induce T cells. MHC-molecules are, typically, responsible for presentation of an antigen to T-cells. Therein, presenting the antigen on MHC molecules leads to activation of T cells which induces their proliferation and differentiation into armed effector T cells. The most important function of effector T cells is the killing of infected cells by CD8+ cytotoxic T cells and the activation of macrophages by Thl cells which together make up cell-mediated immunity, and the activation of B cells by both ThZ and Thl cells to produce different classes of antibody, thus driving the humoral immune response. T cells recognize an antigen by their T cell receptors which do not recognize and bind the antigen directly, but instead recognize short peptide fragments e.g. of pathogen-derived protein antigens, e.g. so-called epitopes, which are bound to MHC molecules on the surfaces of other cells.

Adaptive immune system: The adaptive immune system is essentially dedicated to eliminate or prevent pathogenic growth. It typically regulates the adaptive immune response by providing the vertebrate immune system with the ability to recognize and remember specific pathogens (to generate immunity), and to mount stronger attacks each time the pathogen is encountered. The system is highly adaptable because of somatic hypermutation (a process of accelerated somatic mutations), and V(D)J recombination (an irreversible genetic recombination of antigen receptor gene segments). This mechanism allows a small number of genes to generate a vast number of different antigen receptors, which are then uniquely expressed on each individual lymphocyte. Because the gene rearrangement leads to an irreversible change in the DNA of each cell, all of the progeny (offspring) of such a cell will then inherit genes encoding the same receptor specificity, including the Memory B cells and Memory T cells that are the keys to long-lived specific immunity.

Adjuvant/ adjuvant component: An adjuvant or an adjuvant component in the broadest sense is typically a pharmacological and/or immunological agent that may modify, e.g. enhance, the effect of other agents, such as a drug or vaccine. It is to be interpreted in a broad sense and refers to a broad spectrum of substances. Typically, these substances are able to increase the immunogenic^ of antigens. For example, adjuvants may be recognized by the innate immune systems and, e.g., may elicit an innate immune response. "Adjuvants" typically do not elicit an adaptive immune response. Insofar, "adjuvants" do not qualify as antigens. Their mode of action is distinct from the effects triggered by antigens resulting in an adaptive immune response.

Antigen: In the context of the present invention "antigen" refers typically to a substance which may be recognized by the immune system, preferably by the adaptive immune system, and is capable of triggering an antigen-specific immune response, e.g. by formation of antibodies and/or antigen-specific T cells as part of an adaptive immune response. Typically, an antigen may be or may comprise a peptide or protein which may be presented by the MHC to T-cells. In the sense of the present invention an antigen may be the product of translation of a provided nucleic acid molecule, preferably an mRNA as defined herein. In this context, also fragments, variants and derivatives of peptides and proteins comprising at least one epitope are understood as antigens. In the context of the present invention, tumour antigens and pathogenic antigens as defined herein are particularly preferred.

Artificial nucleic acid molecule: An "artificial nucleic acid molecule" or "artificial nucleic acid" may typically be understood to be a nucleic acid molecule, e.g. a DNA or an RNA that does not occur naturally. In other words, an artificial nucleic acid molecule may be understood as a non-natural nucleic acid molecule. Such nucleic acid molecule may be non-natural due to its individual sequence (which does not occur naturally) and/or due to other modifications, e.g. structural modifications of nucleotides which do not occur naturally. An artificial nucleic acid molecule may be a DNA molecule, an RNA molecule or a hybrid-molecule comprising DNA and RNA portions. Typically, artificial nucleic acid molecules may be designed and/or generated by genetic engineering methods to correspond to a desired artificial sequence of nucleotides (heterologous sequence). In this context an artificial sequence is usually a sequence that may not occur naturally, i.e. it differs from the wild type sequence by at least one nucleotide. The term "wild type" may be understood as a sequence occurring in nature. Further, the term "artificial nucleic acid molecule" is not restricted to mean "one single molecule" but is, typically, understood to comprise an ensemble of identical molecules. Accordingly, it may relate to a plurality of identical molecules contained in an aliquot.

Bicistronic nucleic acid or RNA and multicistronic nucleic acid or RNA: A bicistronic or multicistronic nucleic acid or RNA is typically a nucleic acid or an RNA, preferably an mRNA, that typically may have two (bicistronic) or more (multicistronic) coding regions. A coding region in this context is a sequence of codons that is translatable into a peptide or protein.

Carrier/polymeric carrier: A carrier in the context of the invention may typically be a compound that facilitates transport and/or complexation of another compound (cargo). A polymeric carrier is typically a carrier that is formed of a polymer. A carrier may be associated to its cargo by covalent or non-covalent interaction. A carrier may transport nucleic acids, e.g. RNA or DNA, to the target cells. The carrier may - for some embodiments - be a cationic component.

Complexation and Formulation: According to a preferred embodiment, the at least one mRNA of the inventive composition may be complexed with lipids to form one or more liposomes, lipoplexes, or lipid nanoparticles. Therefore, in one embodiment, the inventive composition comprises liposomes, lipoplexes, and/or lipid nanoparticles comprising the at least one mRNA.

Lipid-based formulations have been increasingly recognized as one of the most promising delivery systems for RNA due to their biocompatibility and their ease of large-scale production. Cationic lipids have been widely studied as synthetic materials for delivery of RNA. After mixing together, nucleic acids are condensed by cationic lipids to form lipid/ nucleic acid complexes known as lipoplexes. These lipid complexes are able to protect genetic material from the action of nucleases and deliver it into cells by interacting with the negatively charged cell membrane. Lipoplexes can be prepared by directly mixing positively charged lipids at physiological pH with negatively charged nucleic acids. Conventional liposomes consist of a lipid bilayer that can be composed of cationic, anionic, or neutral (phospho)lipids and cholesterol, which encloses an aqueous core. Both the lipid bilayer and the aqueous space can incorporate hydrophobic or hydrophilic compounds, respectively. Liposome characteristics and behaviour in vivo can be modified by addition of a hydrophilic polymer coating, e.g. polyethylene glycol (PEG), to the liposome surface to confer steric stabilization. Furthermore, liposomes can be used for specific targeting by attaching ligands (e.g., antibodies, peptides, and carbohydrates) to its surface or to the terminal end of the attached PEG chains (Front Pharmacol. 2DI5 Dec l;B:28B).Liposomes are colloidal lipid-based and surfactant-based delivery systems composed of a phospholipid bilayer surrounding an aqueous compartment. They may present as spherical vesicles and can range in size from 20 nm to a few microns. Cationic lipid-based liposomes are able to complex with negatively charged nucleic acids via electrostatic interactions, resulting in complexes that offer biocompatibility, low toxicity, and the possibility of the large-scale production required for in vivo clinical applications. Liposomes can fose with the plasma membrane for uptake; once inside the cell, the liposomes are processed via the endocytic pathway and the genetic material is then released from the endnsome/carrier into the cytoplasm. Liposomes have long been perceived as drug delivery vehicles because of their superior biocompatibility, given that liposomes are basically analogs of biological membranes, and can be prepared from both natural and synthetic phospholipids (Int J Nanomedicine. 2014; 3:1833-1843).

Cationic liposomes have been traditionally the most commonly used non-viral delivery systems for oligonucleotides, including plasmid DNA, antisense oligos, and siRNA/small hairpin RNA-shRNA). Cationic lipids, such as DDTAP, (l,2-dioleoyl-3-trimethylammonium-propane) and DOTMA (N-[l-(2,3-dmleoyloxy)propyl]-N,N,N-trimethyl-ammonium methyl sulfate) can form complexes or lipoplexes with negatively charged nucleic acids to form nanoparticles by electrostatic interactioo, providing high in vitro transfection efficiency . Furthermore, neutral lipid-based nanoliposomes for RNA delivery as e.g. neutral 1,2-diolBoyl-sn-glycero-3-phosphatidylchaline (DOPC)-based nanoliposomes were developed. (Adv Drug Deliv Rev. 2DI4 Feb; 66:110-116).

Therefore, in one embodiment the at least one mRNA of the inventive compositioo is complexed with cationic lipids and/or neutral lipids and thereby forms liposomes, lipid nanoparticles, lipoplexes or neutral lipid-based nanoliposomes.

Cationic campanent or catipnic compound: The term "cationic component" or "cationic compound" typically refers to a charged molecule, which is positively charged (cation) at a pH value typically from 1 to 3, preferably at a pH value of or below 9 (e.g. from 5 to 9), of or below 8 (e.g. from 5 to 8), of or below 7 (e.g. from 5 to 7), most preferably at a physiological pH, e.g. from 7.3 to 7.4. Accordingly, a cationic component may be any positively charged compound or polymer, preferably a cationic peptide or protein which is positively charged under physiological conditions, particularly under physiological conditions in vivo. Further accordingly, a cationic peptide, protein, polysaccharide, lipid or polymer according to the present invention is positively charged under physiological conditions, particularly under physiological salt conditions of the cell in vivo. A "cationic peptide or protein" may contain at least one positively charged amino acid, or more than one positively charged amino acid, e.g. selected from Arg, His, Lys or Orn. Accordingly, "polycationic" components or compounds are also within the scope exhibiting more than one positive charge under the conditions given.

5'-cap: A 5'-cap is an entity, typically a modified nucleotide entity, which generally "caps" the 5'-end of a mature mRNA. A 5'-cap may typically be formed by a modified nucleotide, particularly by a derivative of a guanine nucleotide. Preferably, the 5'-cap is linked to the 5'-terminus via a 5'-5'-triphosphate linkage. A 5'-cap may be methylated, e.g. m7GpppN, wherein N is the terminal 5' nucleotide of the nucleic acid carrying the 5'-cap, typically the 5'-end of an RNA. Further examples of 5'cap structures include glyceryl, inverted deoxy abasic residue (moiety), 4',5' methylene nucleotide, l-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide, 1,5-anhydrohexitol nucleotide, L-nucleotides, alpha-nucleotide, modified base nucleotide, threo-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide. 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-inverted nucleotide moiety, 3'-2'-inverted abasic moiety, 1,4-butanediol phosphate. 3'-phosphoramidate, hexylphosphate. aminohexyl phosphate, 3'-phosphate, 3'phosphorothioate, phosphorodithioatE, or bridging or π∏π-bridging methylpfiDsphonate moiety.

Cap analogue: A cap analogue refers to a non-polymerizable di-nucleotide that has cap functionality in that it facilitates translation or localization, and/or prevents degradation of a nucleic acid molecule, particularly of an RNA molecule, when incorporated at the 5' end of the nucleic acid molecule. Non-polymerizable means that the cap analogue will be incorporated only at the 5'-terminus because it does not have a 5' triphosphate and therefore cannot be extended in the 3' direction by a template-dependent polymerase, particularly, by template-dependent RNA polymerase.

Cap analogues include, but are not limited to, a chemical structure selected from the group consisting of m7GpppG, m7GpppA, m7GpppC; unmethylated cap analogues (e.g., GpppG); dimethylated cap analogue (e.g., m2.7GpppG), trimethylated cap analogue (e.g., m2,2,7GpppG), dimethylated symmetrical cap analogues (e.g., m7Gpppm7G), or anti reverse cap analogues (e.g., ARCA; m7,2'0meGpppG. m7,2'dGpppG, m7,3'0meGpppG, m7.3'dGpppG and their tetraphosphate derivatives) (Stepinski et al„ 2DDI. RNA 7(ID):l48G-95).

Further cap analogues have been described previously (US 7,074.596, WO 20D8/0I6473. WD 2008/157688. WO 2009/149253. WO 2011/015347, and WO 2013/059475). The synthesis of N7-(4-chlorophenoxyethyl) substituted dinucleotide cap analogues has been described recently (K□r'e et al. (2013) Bioorg. Med. Chem. 2l(l5):4570-4).

5'-cap-Structure: A 5'-cap is typicallya a modified nucleotide (cap analogue), particularly a guanine nucleotide, added to the 5' end of a nucleic acid molecule, particularly of an RNA molecule, e.g. an mRNA molecule. Preferably, the 5'- cap is added using a 5'-5'-triphosphate linkage (also named m7GpppN). Further examples of 5'- cap structures include glyceryl, inverted de□xy abasic residue (moiety), 4',5' methylene nucleotide, l-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide. 1,5-anhydrohexitol nucleotide, L-nucleotides, alpha-nucleatide, modified base nucleotide, thren-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide, 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-inverted nucleotide moiety, 3'-2'-inverted abasic moiety, 1,4-butanediol phosphate, 3'-phasphoramidate, hexylphosphate, aminohexyl phosphate, 3'-phasphate, 3'phosphorothioate, phosph□r□dithi□ate, or bridging or non-bridging methylphosphonate moiety. These modified 5'-cap structures may be used in the context of the present invention to modify the mRNA sequence of the inventive composition. Further modified 5'-cap structures which may be used in the context of the present invention are cap I (additional methylation of the ribose of the adjacent nucleotide of m7GpppN), cap2 (additional methylation of the ribose of the 2nd nucleotide downstream of the m7GpppN), cap3 (additional methylation of the ribose of the 3rd nucleotide downstream of the m7GpppN), cap4 (additional methylation of the ribose of the 4th nucleotide downstream of the m7GpppN), ARCA (anti-reverse cap analogue), modified ARCA (e.g. phosphothioate modified ARCA), inosine, Nl-methyl-guanosine, 2'-fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine, LNA-guanosine, and 2-azido-guanosine.

In the context of the present invention, a 5' cap structure (capO or capl) may also be formed in chemical RNA synthesis or RNA in vitro transcription (co-transcriptional capping) using cap analogues, or a cap structure may be formed in vitro using capping enzymes (e.g., commercially available capping kits). A cap structure (e.g., capO or capl) may also be formed in vitro using immobilized capping enzymes, e.g. in a capping reactor as described in W0 2016/193226.

Ghemical synthesis of nucleic acids: Chemical synthesis of relatively short fragments of oligonucleotides with defined chemical structure provides a rapid and inexpensive access to custom-made oligonucleotides of any desired sequence. Whereas enzymes synthesize DNA and RNA only in the 5' to 3' direction, chemical oligonucleotide synthesis does not have this limitation, although it is most often carried out in the opposite, i.e. the 3' to 5' direction. Currently, the process is implemented as solid-phase synthesis using the phosphoramidite methnd and phosphoramidite building blocks derived from protected nucleosides (A, C, G, and U), or chemically modified nucleosides.

To obtain the desired oligonucleotide, the building blocks are sequentially coupled to the growing oligonucleotide chain on a solid phase in the order required by the sequence of the product in a fully automated process. Upon the completion of the chain assembly, the product is released from the solid phase to the solution, deprotected, and collected. The occurrence of side reactions sets practical limits for the length of synthetic oligonucleotides (up to about 20□ nucleotide residues), because the

number of errnrs increases with the length of the oligonucleotide being synthesized. Products are often isolated by HPLC to obtain the desired oligonucleotides in high purity.

Chemically synthesized oligonucleotides find a variety of applications iΠ molecular biology and medicine. They are most commonly used as antisense oligonucleotides, small interfering RNA, primers fΟr DNA sequencing and amplification, probes for detecting complementary DNA or RNA via molecular hybridization, tools for the targeted introduction of mutations and restriction sites, and for the synthesis of artificial genes. Moreover, long-chain DNA molecules and long-chain RNA molecules may be chemically synthetized and used in the context of the present invention.

Cellular immunity/cellular immune response: Cellular immunity relates typically to the activation of macrophages, natural killer cells (NK). antigen-specific cytotoxic T-lymphncytes, and the release of various cytokines in response to an antigen. In more general terms, cellular immunity is not based on antibodies, but on the activation of cells of the immune system. Typically, a cellular immune response may be characterized e.g. by activating antigen-specific cytotoxic T-lymphocytes that are able to induce apoptosis in cells, e.g. specific immune cells like dendritic cells or other cells, displaying epitopes of foreign antigens on their surface. Such cells may be virus-infected or infected with intracellular bacteria, or cancer cells displaying tumor antigens. Further characteristics may be activation of macrophages and natural killer cells, enabling them to destroy pathogens and stimulation of cells to secrete a variety of cytokines that influence the function of other cells involved in adaptive immune responses and innate immune responses.

Cloning site: A cloning site is typically understood to be a segment of a nucleic acid molecule, which is suitable for insertion of a nucleic acid sequence, e.g., a nucleic acid sequence comprising a coding region. Insertion may be performed by any molecular biological method known to the one skilled in the art, e.g. by restriction and ligation. A cloning site typically comprises **Οne** or more restriction enzyme recognition sites (restriction sites). These **Dne** or more restrictions sites may be recognized by restriction enzymes which cleave the DNA at these sites. A cloning site which comprises more than one restriction site may also be termed a multiple cloning site (MCS) or a polylinker.

Coding region, coding sequence: A coding region, in the context of the invention, is typically a sequence of several nucleotide triplets, which may be translated into a peptide or protein. A coding region preferably contains a start codon, i.e. a combination of three subsequent nucleotides coding usually for the amino acid methionine (ATG), at its 5'-end and a subsequent region which usually exhibits a length which is a multiple of 3 nucleotides. A coding region is preferably terminated by a stop-codon (e.g., TAA, TAG, TGA). Typically, this is the only stop-codon of the coding region. Thus, a coding region in the context of the present invention is preferably a nucleotide sequence, consisting of a number of nucleotides that may be divided by three, which starts with a start codon (e.g. ATG) and which preferably terminates with a stop codon (e.g., TAA, TGA, or TAG). The coding region may be isolated or it may be incorporated in a longer nucleic acid sequence, for example in a vector or an mRNA. In the context of the present invention, a coding region may also be termed "protein coding region", "coding sequence", "CDS", "open reading frame" or "DRF".

Derived from: The phrase "derived from" as used throughout the present specification in the context of a nucleic acid, i.e. for a nucleic acid "derived from" (another) nucleic acid, means that the nucleic acid, which is derived from (another) nucleic acid, shares at least 50%, preferably at least 60%, preferably at least 70%, more preferably at least 75%, more preferably at least 80%, more preferably at least 85%, even more preferably at least 90%, even more preferably at least 95%, and particularly preferably at least 98% sequence identity with the nucleic acid from which it is derived. In one embodiment, "derived from" means having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%. 57%, 58%, 58%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%. 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequences as represented by SEQ ID NOs: 1-39690. 39713-39746. The skilled person is aware that sequence identity is typically calculated for the same types of nucleic acids, i.e. for DNA sequences or for RNA sequences. Thus, it is understood, if a DNA is "derived from" an RNA or if an RNA is "derived from" a DNA. in a first step the RNA sequence is converted into the corresponding DNA sequence (in particular by replacing the uracils (U) by thymidines (T) throughout the sequence) or, vice versa, the DNA sequence is converted into the corresponding RNA sequence (in particular by replacing the thymidines (T) by uracils (U) throughout the sequence). Thereafter, the sequence identity of the DNA sequences or the sequence identity of the RNA sequences is determined. Preferably, a nucleic acid "derived from" a nucleic acid also refers to nucleic acid, which is modified in comparison to the nucleic acid from which it is derived, e.g. in order to increase RNA stability even further and/or to prolong and/or increase protein production. It goes without saying that such modifications are preferred, which do not impair RNA stability, e.g. in comparison to the nucleic acid from which it is derived.

Different Noro virus: The term "different Noro virus" in the context of the invention has to be understood as the difference between at least two respective Noroviruses, wherein the difference is manifested on the RNA genome of the respective different virus. In the broadest sense, "different Norovirus" has to be understood as genetically "different Norovirus". Particularly, said (genetically) different Noroviruses express at least one different protein or peptide, wherein the at least one different protein or peptide preferably differs in at least one amino acid.

Same Norovirus: In the broadest sense, "same Norovirus" has to be understood as genetically the same. Particularly, said (genetically) same virus expresses the same proteins or peptides (e.g., at least one structural and/or non-structural protein), wherein all proteins or peptides have the same amino acid sequence.

DNA: DNA is the usual abbreviation for deoxyribonucleic acid. It is a nucleic acid molecule, i.e. a polymer consisting of nucleotides. These nucleotides are usually deoxy-adenosine-monophosphate, deoxy-thymidine-monophosphate, deoxy-guanasine-monaphasphate and deoxy-cytidine-monophosphate monomers which are - by themselves - composed of a sugar moiety (deoxyribose), a base moiety and a phosphate moiety, and polymerize by a characteristic backbone structure. The backbone structure is, typically, formed by phosphodiester bonds between the sugar moiety of the nucleotide, i.e. deoxyribose, of a first and a phosphate moiety of a second, adjacent monomer. The specific order of the monomers, i.e. the order of the bases linked to the sugar/phosphate-backbone, is called the ONA sequence. DNA may be single stranded or double stranded. In the double

stranded farm, the nucleotides of the first strand typically hybridize with the nucleotides of the second strand, e.g. by A/T-base-pairing and G/C-base-pairing.

Mono-, bi- and multieistronic and multi-antigen nucleic acids: A monocistronic nucleic acid may typically be a DNA or RNA, particularly aΠ mRNA that comprises only one coding sequences. A coding sequence in this context is a sequence of several nucleotide triplets (codons) that can be translated into a peptide or protein

According to a further embodiment the coding region of the at least one mRNA of the composition may encode at least two, three, four, five, six. seven, eight and more antigens (or fragments and derivatives thereof) linked with or without an amino acid linker sequence, wherein said linker sequence can comprise rigid linkers, flexible linkers, cleavable linkers (e.g., self-cleaving peptides) or a combination thereaf. Therein, the antigens may be identical or different or a combination thereof. According to the present invention, specific antigen and/or epitope combinations according to the paragraph "specific antigen combinations" disclosed above are particularly envisioned. Particular antigen/epitope combinations can be encoded by said mRNA encoding at least two antigens as explained abovE (herein referred to as "multi-antigen-constructs/mRNA").

According to a further embodiment the composition of the present invention, may comprise a mixture of at least one monocistronic mRNA, as defined above, and/ Or at least oΠe bicistronic mRNA as defined above, and/ Or at least one multieistronic mRNA, as defined above, and/ Or at least one multi-antigen-constructs as defined above, and any combinations thereof. According to the present invention, specific antigen combinations according to the paragraph "specific antigen combinations" disclosed above are particularly envisioned and may be generated using a combination of mono-, bi-, multieistronic mRNA and multi-antigen-constructs.

According to certain embodiments of the present invention, the mRNA sequence is mono-, bi-, or multieistronic, preferably as defined herein. The coding sequences in a bi- or multieistronic mRNA preferably encode distinct peptides or proteins as defined herein or a fragment or variant thereof. Preferably, the coding sequences encoding two or more peptides oΠ proteins may be separated in the bi- or multieistronic mRNA by at least one IRES (internal ribosomal entry site) sequence, as defined below. Thus, the term "encoding two or more peptides or proteins" may mean, without being limited thereto, that the bi- or even multieistronic mRNA, may encode e.g. at least two, three, four, five, six or more (preferably different) peptides or proteins or their fragments or variants within the definitions provided herein. More preferably, without being limited thereto, the bi- or even multieistronic mRNA. may encode, for example, at least two, three, four, five, six or more (preferably different) peptides or proteins as defined herein oΠ their fragments or variants as defined herein. In this context, a so-called IRES (internal ribosomal entry site) sequence as defined above can function as a sole ribosome binding site, but it can also serve to provide a bi- or even multieistronic mRNA as defined above, which encodes several peptides or proteins which are to be translated by the ribosomes independently of one another. Examples of IRES sequences, which can be used according to the invention, are those from picornavirusBS (e.g. FMDV), pestiviruses (CFFV), poxviruses (PV). encephalomyocarditis viruses (ECMV), foot and mouth disease viruses (FMDV), hepatitis C

viruses (HCV), classical swine fever viruses (CSFV), mouse leukoma virus (MLV), simian immunodeficiency viruses (SIV) or cricket paralysis viruses (CrPV).

According to a further embodiment the at least one coding region of the mRNA sequence according to the invention may encode at least two, three, four, five, six, seven, eight and more peptides or proteins (or fragments and derivatives thereof) as defined herein linked with or without an amino acid linker sequence, wherein said linker sequence can comprise rigid linkers, flexible linkers, cleavable linkers (e.g., self-cleaving peptides) or a combination thereof. Therein, the peptides or proteins may be identical or different or a combination thereof. Particular peptide or protein combinations can be encoded by said mRNA encoding at least two peptides or proteins as explained herein (also referred to herein as "multi-antigen-constructs/mRNA").

Epitope: (also called "antigen determinant") can be distinguished in T cell epitopes and B cell epitopes. T cell epitopes or parts of the proteins in the context of the present invention may comprise fragments preferably having a length of about 6 to about 20 or even more amino acids, e.g. fragments as processed and presented by MHC class I molecules, preferably having a length of about 8 to about 10 amino acids, e.g. 8, 9, or 10, (or even 11, or 12 amino acids), or fragments as processed and presented by MHC class II molecules, preferably having a length of about 13 or more amino acids, e.g. 13, 14, 15, 16, 17, 18, 19, 20 or even more amino acids, wherein these fragments may be selected from any part of the amino acid sequence. These fragments are typically recognized by T cells in form of a complex consisting of the peptide fragment and an MHC molecule, i.e. the fragments are typically not recognized in their native form. B cell epitopes are typically fragments located on the outer surface of (native) protein or peptide antigens as defined herein, preferably having 5 to 15 amino acids, more preferably having 5 to 12 amino acids, even more preferably having 6 to 9 amino acids, which may be recognized by antibodies, i.e. in their native form. Such epitopes of proteins or peptides may furthermore be selected from any of the herein mentioned variants of such proteins or peptides. In this context antigenic determinants can be conformational or discontinuous epitopes which are composed of segments of the proteins or peptides as defined herein that are discontinuous in the amino acid sequence of the proteins or peptides as defined herein but are brought together in the three-dimensional structure or continuous or linear epitopes which are composed of a single polypeptide chain.

Fragment of a sequence: A fragment of a sequence may typically be a shorter portion of a full-length sequence of e.g. a nucleic acid molecule or an amino acid sequence. Accordingly, a fragment, typically, consists of a sequence that is identical to the corresponding stretch within the full-length sequence. A preferred fragment of a sequence in the context of the present invention, consists of a continuous stretch of entities, such as nucleotides or amino acids corresponding to a continuous stretch of entities in the molecule the fragment is derived from, which represents at least 5%, 10%, 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, and most preferably at least 80% of the total (i.e. full-length) molecule from which the fragment is derived.

G/C modified: A G/C-modified nucleic acid may typically be a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, based on a modified wild type sequence comprising a preferably increased number of guanosine and/or cytosine

nucleotides as compared to the wild type sequence. Such an increased number may be generated by substitution of cndons containing adenosine or thymidine nucleotides by cndons containing guanosine or cytosine nucleotides. If the enriched G/C content occurs in a coding region of DNA or RNA. it makes use of the degeneracy of the genetic code. Accordingly, the codon substitutions preferably do not alter the encoded amino acid residues, but exclusively increase the G/C content of the nucleic acid molecule.

Gene therapy: Gene therapy may typically be understood to mean a treatment of a patient's body or isolated Elements of a patient's body, for example isolated tissues/cells, by nucleic acids encoding a peptide or protein. It typically may comprise at least one of the steps of a) administration of a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, directly to the patient - by whatever administration route - or in vitro to isolated cells/tissues of the patient, which results in transfectian of the patient's cells either in vivo/ ex vivo or in vitro; b) transcription and/ or translation of the introduced nucleic acid molecule; and optionally c) re-administration of isolated, transfected cells to the patient, if the nucleic acid has not been administered directly to the patient.

Genetic vaccination: Genetic vaccination may typically be understood to be vaccination by administration of a nucleic acid molecule encoding an antigen or an immunngen or fragments thereof. The nucleic acid molecule may be administered to a subject's body or to isolated cells of a subject. Upon transfection of certain cells of the body or upon transfection of the isolated cells, the antigen or immunogen may be expressed by those cells and subsequently presented to the immune system, eliciting an adaptive, i.e. antigen-specific immune response. Accordingly, genetic vaccination typically comprises at least one of the steps of a) administration of a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, to a subject, preferably a patient, or to isolated cells of a subject, preferably a patient, which usually results in transfection of the subject's cells either in vivo or in vitro; b) transcription and/or translation of the introduced nucleic acid molecule; and optionally c) re-administration of isolated, transfected cells to the subject, preferably the patient, if the nucleic acid has not been administered directly to the patient.

Genotype, genotype of a virus: The terms "genotype" or "genotype of a virus" have to be understood as the genetic constitution of an individual or a group or class of organisms having the same genetically consistent structure. Genotyping means determining differences in the genetic of an individual. In the context of the invention, Norovirus genotype has to be understood as a Noro virus having the same genetically consistent structure.

Heterologous sequence: Two sequences are typically understood to be "heterologous" if they are not derivable from the same gene or in the same allele. I.e., although heterologous sequences may be derivable from the same organism, they naturally (in nature) do not occur in the same nucleic acid molecule, such as in the same mRNA.

Homolog of a nucleic acid sequence: The term "homolog" of a nucleic acid sequence refers to sequences of other species than the particular sequence. It is particularly preferred that the nucleic acid sequence is of human origin and therefore it is preferred that the homolog is a homolog of a human nucleic acid sequence.

Humoral immunity/humoral immune response: Humoral immunity refers typically to antibody production and optionally to accessory processes accompanying antibody production. A humoral immune respanse may be typically characterized, e.g., by Th2 activation and cytokine production, germinal center formation and isotype switching, affinity maturation and memory cell generation. Humoral immunity also typically may refer to the effector functions of antibodies, which include pathogen and toxin neutralization, classical complement activation, and opsonin promotion of phagocytosis and pathogen elimination.

Immunngen: In the context of the present invention an immunogen may be typically understood to be a compound that is able to stimulate an immune respanse. Preferably, an immunogen is a peptide, polypeptide, or protein. In a particularly preferred embodiment, an immunogen in the sense of the present invention is the product of translation of a provided nucleic acid molecule, preferably an artificial nucleic acid molecule as defined herein. Typically, an immunogen elicits at least an adaptive immune response.

Immunostimulatory composition: In the context of the invention, an immunostimulatory composition may be typically understood to be a composition containing at least one component which is able to induce an immune response or from which a component which is able to induce an immune response is derivable. Such immune response may be preferably an innate immune response or a combination of an adaptive and an innate immune response. Preferably, an immunostimulatory composition in the context of the invention contains at least one artificial nucleic acid molecule, more preferably an RNA, for example an mRNA molecule. The immunostimulatory component, such as the mRNA may be complexed with a suitable carrier. Thus, the immunostimulatory composition may comprise an mRNA/carrier-camplex. Furthermore, the immunostimulatory composition may comprise an adjuvant and/or a suitable vehicle for the immunostimulatory component, such as the mRNA.

Immune response: An immune response may typically be a specific reaction of the adaptive immune system to a particular antigen (so called specific or adaptive immune response) or an unspecific reaction of the innate immune system (so called unspecific or innate immune response), or a combination thereof.

Immune system: The immune system may protect organisms from infection. If a pathogen succeeds in passing a physical barrier of an organism and enters this organism, the innate immune system provides an immediate, but non-specific response. If pathogens evade this innate response, vertebrates possess a second layer of protection, the adaptive immune system. Here, the immune system adapts its response during an infection to improve its recognition of the pathogen. This improved response is then retained after the pathogen has been eliminated, in the form of an immunological memory, and allows the adaptive immune system to mount faster and stronger attacks each time this pathogen is encountered. According to this, the immune system

comprises the innate and the adaptive immune system. Each of these two parts typically contains so called humoral and cellular components.

Immunostimulatory RNA: An immunostimulatory RNA (isRNA) in the context of the invention may typically be an RNA that is able to induce an innate immune response. It usually does not have a coding region and thus does not provide a peptide-antigen or immunogen but elicits an immune response e.g. by binding to a specific kind of Toll-like-receptor (TLR) or other suitable receptors. However, of course also mRNAs having a coding region and coding for a peptide/protein may induce an innate immune response and, thus, may be immunostimulatory RNAs.

Innate immune system: The innate immune system, also known as non-specific (or unspecific) immune system, typically comprises the cells and mechanisms that defend the host from infection by other organisms in a non-specific manner. This means that the cells of the innate system may recognize and respond to pathogens in a generic way, but unlike the adaptive immune system, it does not confer long-lasting or protective immunity to the host. The innate immune system may be. e.g., activated by ligands of Toll-like receptors (TLRs) or other auxiliary substances such as lipopnlysaccharides, TNF-alpha, C04D ligand, or cytokines, monokines, lymphokines. interleukins or chemokines, IL-I. IL-2, IL-3, IL-4, IL-5, IL-G. IL-7, IL-8, IL-B, IL-ID, IL-II. IL-IZ. IL-I3, IL-I4. IL-I5, IL-16, IL-I7, IL-IB. IL-I9. IL-2D, IL-2I, IL-22. IL-23. IL-24, IL-25, IL-2B, IL-27. IL-28, IL-29, IL-3D, IL-3I, IL-32, IL-33. IFN-alpha, IFN-beta, IFN-gamma, GM-CSF, G-CSF. M-CSF, LT-beta, TNF-alpha, growth factors, and hGH, a ligand of human Toll-like receptor TLRI, TLR2, TLR3, TLR4, TLR5, TLRG, TLR7, TLR8, TLR9, TLRID, a ligand of murine Toll-like receptor TLRI, TLR2, TLR3, TLR4, TLR5, TLRG, TLR7, TLRS, TLRG, TLRID, TIM TLRI2 or TLRI3, a ligand of a NOD-like receptor, a ligand of a RIG-I like receptor, an immunostimulatory nucleic acid, an immunostimulatory RNA (isRNA), a CpG-DNA, an antibacterial agent, or an anti-viral agent. The pharmaceutical composition according to the present invention may comprise one or more such substances. Typically, a response of the innate immune system includes recruiting immune cells to sites of infection, through the production of chemical factors, including specialized chemical mediators, called cytokines; activation of the complement cascade; identification and removal of foreign substances present in organs, tissues, the blood and lymph, by specialized white blood cells; activation of the adaptive immune system; and/or acting as a physical and chemical barrier to infectious agents.

Jet injection: The term "jet injection", as used herein, refers to a needle-free injection method, wherein a fluid containing at least one inventive nucleic acid seguence (e.g., RNA, DNA, mRNA) and, optionally, further suitable excipients is forced through an orifice, thus generating an ultra-fine liquid stream of high pressure that is capable of penetrating mammaliao skin and, depending on the injection settings, subcutaneous tissue or muscle tissue. In principle, the liquid stream forms a hole in the skin, through which the liquid stream is pushed into the target tissue. Preferably, jet injection is used for intradermal, subcutaneous or intramuscular injection of the mRNA sequence according to the invention. In a preferred embodiment, jet injection is used for intramuscular injection of the mRNA sequence according to the invention. In a further preferred embodiment, jet injection is used for intradermal injection of the mRNA sequence according to the invention.

Monovalent/monovalent vaccine: A monovalent vaccine, also called univalent vaccine, is designed against a single antigen for a single organism. The term "monovalent vaccine" includes the immunization against a single valence. In the context of the invention, a monovalent Norovirus vaccine would comprise a vaccine comprising an artificial nucleic acid encoding one single antigenic peptide or protein derived from one specific Norovirus strain.

Nucleic acid molecule: A nucleic acid molecule, an artificial nucleic acid, or nucleic acid is a molecule comprising, preferably consisting of nucleic acid components. The terms nucleic acid molecule, artificial nucleic acid, or nucleic acid preferably refer to DNA or RNA molecules and vice versa. It is preferably used synonymous with the term "palynucleotide". Preferably, a nucleic acid molecule is a polymer comprising or consisting of nucleotide monomers, which are covalently linked to each other by phosphodiester-bonds of a sugar/phosphate-backbone. The terms "nucleic acid molecule", "artificial nucleic acid" or "nucleic acid" also encompasses modified nucleic acid molecules, such as base-modified, sugar-modified or backbone-modified etc. It encompasses any type of DNA or RNA molecules.

Nucleic acid sequence/amino acid: The sequence of a nucleic acid molecule is typically understood to be the particular and individual order, i.e. the succession of its nucleotides. The sequence of a protein or peptide is typically understood to be **the** order, i.e. the succession of its amino acids.

Peptide: A peptide or polypeptide is typically a polymer of amino acid monomers, linked by peptide bonds. It typically contains less than 50 monomer units. Nevertheless, the term peptide is not a disclaimer for molecules having more than 50 monomer units. Long peptides are also called polypeptides, typically having between 50 and 600 monomeric units. The term "polypeptide" as used herein, however, is typically not limited by the length of the molecule it refers to. In the context of the present invention, the term "polypeptide" may also be used with respect to peptides comprising less than 50 (e.g. 10) amino acids or peptides comprising even more than 600 amino acids. Also, the terms "polypeptide", "peptide", and "protein" are used interchangeably herein to refer to polymers of amino acids of any length.

Pharmaceutically effective amount: A pharmaceutically effective amount in the context of the invention is typically understood to be an amount that is sufficient to induce a pharmaceutical effect, such as an immune response, altering a pathological level of an expressed peptide or protein, or substituting a lacking gene product, e.g., in case of a pathological situation.

Protein: A protein typically comprises one or more peptides or polypeptides. A protein is typically folded into 3-dimensional form, which may be required for the protein to exert its biological function.

Poly(A) sequence: A poly(A) sequence, also called poly(A) tail or 3'-poly(A) tail, is typically understood to be a sequence of adenosine nucleotides, e.g., of up to about 400 adenosine nucleotides, e.g. from about 20 to about 400, preferably from about 50 to about 400, more preferably from about 50 to about 300, even more preferably from about 50 to about 250, most preferably from about 60 to about 250 adenosine nucleotides. A poly(A) sequence is typically located at the 3'-end of an mRNA. In the context

of the present invention, a poly(A) sequence may be located within an mRNA or any other nucleic acid molecule, such as, e.g., in a vector, for example, in a vector serving as template for the generation of an RNA, preferably an mRNA, e.g., by transcription of the vector. Moreover, poly(A) sequences, or poly(A) tails may be generated in vitro by enzymatic polyadenylation of the RNA, e.g. using Pnly(A)polymerases (PAP) derived from E.coli or yeast. In addition, polyadenylation of RNA can be achieved by using immobilized PAP eozymes e.g. in a polyadenylation reactor (WD 2DIB/I7427I).

Poly(C) sequence: A poly(C) sequence is typically a long sequence of cytosine nucleotides, typically about ID to about 2D0 cytosine nucleotides, preferably about ID to about I00 cytosine nucleotides, more preferably about ID to about 7D cytosine nucleotides or even more, preferably about 2D to about 50, or even about 2D to about 3D cytosine nucleotides. A poly(C) sequence may preferably be located 3' of the coding sequence comprised by a nucleic acid.

Polyadenylation: Polyadenylation is typically understood to be the addition of a poly(A) sequence to a nucleic acid molecule, such as an RNA molecule, e.g. to a premature mRNA. Polyadenylation may be induced by a so called polyadenylation signal. This signal is preferably located within a stretch of nucleotides at the 3'-end of a nucleic acid molecule, such as an RNA molecule, to be polyadenylated. A polyadenylation signal typically comprises a hexamer consisting of adenine and uracil/thymine nucleotides, preferably the hexamer sequence AAUAAA. Other sequences, preferably hexamer sequences, are **alsD** conceivable. Polyadenylation typically occurs during processing of a pre-mRNA (also called premature-mRNA). Typically, RNA maturation (from pre-mRNA to mature mRNA) comprises the step of polyadenylation.

Polyvalent/polyvalent vaccine: A polyvalent vaccine, called also multivalent vaccine, containing antigens from more than one strain of a virus, or different antigens of the same virus, or any combination thereof. The term "polyvalent vaccine" describes that this vaccine has more than one valence. In the context of the invention, a polyvalent Norovirus vaccine would comprise a vaccine camprising an artificial nucleic acid encoding antigenic peptides or proteins derived from several different Norovirus strains or comprising artificial nucleic acid encoding different antigens from the same Norovirus strain, or a combination thereof. In preferred embodiment, a polyvalent Norovirus vaccine comprises 2, 3, 4, 5, 6, 7, 8, 9, ID, II, I2, 13, 14, 15, IB, I7, 18, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 2D, 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50, 51, 52, 53, 54, 55, 5B, 57, 58, 59, BO, Bl, B2, B3, B4, B5, BB, B7, B8, B9, 70, 71, 72, 73, 74, 75, 7B, 77, 78, 79, 80, 81, 82, 83, 84. 85, 8B, 87, 88, 89, 90, 91, 92, 93, 94, 95, 9B, 97, 98, 99, 10D or even more different artificial nucleic acids each encoding at least one different antigenic peptide or protein. Methods to produce polyvalent mRNA vaccines are disclosed in the PCT application PCT/EP20IB/082487.

Restriction site: A restriction site, also termed restriction enzyme recognition site, is a nucleotide sequence recognized by a restriction enzyme. A restriction site is typically a short, preferably palindromic nucleotide sequence, e.g. a sequence comprising 4 to 8 nucleotides. A restriction site is preferably specifically recognized by a restriction enzyme. The restriction enzyme typically cleaves a nucleotide sequence comprising a restriction site at this site. In a double-stranded nucleotide sequence, such as a double-stranded DNA sequence, the restrictioo enzyme typically cuts both strands of the nucleotide sequence.

RNA, mRNA: RNA is the usual abbreviation for ribonucleic-acid. It is a nucleic acid molecule, i.e. a polymer consisting of nucleotides. These nucleotides are usually adenosine-monophosphate, uridine-monophosphate, guanosine-monophosphate and cytidine-monophosphate monomers which are connected to each other along a so-called backbone. The backbone is formed by phosphodiester bonds between the sugar, i.e. ribose, of a first and a phosphate moiety of a second, adjacent monomer. The specific succession of the monomers is called the RNA-sequence. Usually RNA may be obtainable by transcription of a DNA-sequence, e.g., inside a cell. In eukaryotic cells, transcription is typically performed inside the nucleus or the mitochondria. Typically, transcription of DNA usually results in the so-called premature RNA which has to be processed into so-called messenger-RNA, usually abbreviated as mRNA. Processing of the premature RNA, e.g. in eukaryotic organisms, comprises a variety of different posttranscriptional-modifications such as splicing. 5'-capping, polyadenylation, export from the nucleus or the mitochondria and the like. The sum of these processes is also called maturation of RNA. The mature messenger RNA usually provides the nucleotide sequence that may be translated into an amino-acid sequence of a particular peptide or protein. Typically, a mature mRNA comprises a 5'-cap, a 5'-UTR, a coding region, a 3'-UTR and a poly(A) sequence. Aside from messenger RNA, several non-coding types of RNA exist which may be involved in regulation of transcription and/or translation.

Stabilized nucleic acid, preferably mRNA: A stabilized nucleic acid, preferably mRNA typically, exhibits a modification increasing resistance to in vivo degradation (e.g. degradation by an exo- or endo-nuclease) and/or ex vivo degradation (e.g. by the manufacturing process prior to vaccine administration, e.g. in the course of the preparation of the vaccine solution to be administered). Stabilization of RNA can, e.g., be achieved by providing a 5'-cap-Structure, a Poly-A-Tail, or any other UTR-modification. It can also be achieved by chemical modification or modification of the G/C content of the nucleic acid or other types of sequence optimization. Various other methods are known in the art and conceivable in the context of the invention.

Sequence identity: Two or more sequences are identical if they exhibit the same length and order of nucleotides or amino acids. The percentage of identity typically describes the extent, to which two sequences are identical, i.e. it typically describes the percentage of nucleotides that correspond in their sequence position with identical nucleotides of a reference sequence. In order to determine the degree of identity, the sequences to be compared are considered to exhibit the same length, i.e. the length of the longest sequence of the sequences to be compared. This means that a first sequence consisting of 8 nucleotides is 80% identical to a second sequence consisting of ID oucleotides comprising the first sequence. Hence, in the context of the present invention, identity of sequences preferably relates to the percentage of nucleotides of a seqoence which have the same position in two or more sequences having the same length. Therefore, e.g. a position of a first sequence may be compared with the corresponding position of the second sequence. If a position in the first sequence is occupied by the same component (residue) as is the case at a position in the second sequence, the two sequences are identical at this position. If this is not the case, the sequences differ at this position. If insertions occur in the second sequence in comparison to the first sequence, gaps can be inserted into the first sequence to allow a further alignment. If deletions occur io the second sequence in comparison to the first sequence, gaps can be inserted into the second sequence to allow a further alignment. The percentage to which two seqoences are identical is then a function of the number of identical positions divided by the total number of positions including those positions which are only occupied in Doe sequence. The percentage to which two sequences are identical can be determined using

a mathematical algorithm. A preferred, but not limiting, example of a mathematical algorithm which can be used is the algorithm of Karlin et al. (1993), PNAS USA, 90:5873-5877 or Altschul et al. (1997), Nucleic Acids Res., 25:3399-3402. Such an algorithm is integrated in the BLAST program. Sequences which are identical to the sequences of the present invention to a certain extent can be identified by this program.

Serotype, serotype of a virus: A serotype or a serotype of a virus is a group of viruses classified together based on their antigens on the surface of the virus, allowing the epidemiologic classification of organisms to the sub-species level.

Strain, strain of a virus: A strain or a strain of a virus is a group of viruses that are genetically distinct from other groups of the same species. The strain that is defined by a genetic variant is also defined as a "subtype".

Transfectian: The term "transfection" refers to the introduction of nucleic acid molecules, such as DNA or RNA (e.g. mRNA) molecules, into cells, preferably into eukaryotic cells. In the context of the present invention, the term "transfection" encompasses any method known to the skilled person for introducing nucleic acid molecules into cells, preferably into eukaryotic cells, such as into mammalian cells. Such methods encompass, for example, electroporation, lipofection, e.g. based on cationic lipids and/or liposomes, calcium phosphate precipitation, nanoparticle based transfection, virus based transfection, or transfection based on cationic polymers, such as DEAE-dextran or polyethylenimine etc. Preferably, the introduction of the nucleic acid, preferably the mRNA is non-viral.

Vaccine: A vaccine is typically understood tn be a prophylactic or therapeutic material providing at least one antigen, preferably an immunogen. The antigen or immunogen may be derived from any material that is suitable for vaccination. For example, the antigen or immunogen may be derived from a pathogen, such as from bacteria or virus particles etc., or from a tumor or cancerous tissue. The antigen or immunogen stimulates the body's adaptive immune system to provide an adaptive immune response.

Vector: The term "vector" refers to a nucleic acid molecule, preferably to an artificial nucleic acid molecule. A vector in the context of the present invention is suitable for incorporating or harboring a desired nucleic acid sequence, such as a nucleic acid sequence comprising a coding region. Such vectors may be storage vectors, expression vectors, cloning vectors, transfer vectors etc. A storage vector is a vector which allows the convenient storage of a nucleic acid molecule, for example, of an mRNA molecule. Thus, the vector may comprise a sequence corresponding, e.g., to a desired mRNA sequence or a part thereof, such as a sequence corresponding to the coding region and the 3'-UTR and/or the 5'-UTR of an mRNA. An expression vector may be used for production of expression products such as RNA, e.g. mRNA, or peptides, polypeptides or proteins. For example, an expression vector may comprise sequences needed for transcription of a sequence stretch of the vector, such as a promoter sequence, e.g. an RNA polymerase promoter sequence. A cloning vector is typically a vector that contains a cloning site, which may be used to incorporate nucleic acid sequences into the vector. A cloning vector may be, e.g., a plasmid vector or a bacteriophage vector. A transfer vector may be a vector which is suitable for transferring nucleic acid molecules into cells or organisms, for example,

viral vectors. A vector in the context of the present invention may be, e.g., an RNA vector or a ONA vector. Preferably, a vector is a DNA molecule. Preferably, a vector in the sense of the present application comprises a cloning site, a selection marker, such as an antibiotic resistance factor, and a sequence suitable for multiplication of the vector, such as an origin of replication. Preferably, a vector in the context of the present application is a plasmid vector.

RNA in vitro transcription: The terms "RNA in vitro transcription" or "in vitro transcription" relate to a process wherein RNA is synthesized in a cell-free system (in vitro). DNA, particularly plasmid DNA, is used as template for the generation of RNA transcripts. RNA may be obtained by DNA-depeodent in vitro transcription of an appropriate DNA template, which according to the present invention is preferably a linearized plasmid DNA template. The promoter for controlling in vitro transcription can be any promoter for any DNA-dependent RNA polymerase. Particular examples of DNA-dependent RNA polymerases are the T7, T3, and SPG RNA polymerases. A DNA template for in vitro RNA transcription may be obtained by cloning of a nucleic acid, in particular cDNA corresponding to the respective RNA to be iñ vitro transcribed, and introducing it into an appropriate vector for in vitro transcription, for example into plasmid DNA. In a preferred embodiment of the present invention the DNA template is linearized with a suitable restriction enzyme, before it is transcribed in vitro. The cDNA may be obtained by reverse transcription of mRNA or chemical synthesis. Moreover, the DNA template for in vitro RNA synthesis may also be obtained by gene synthesis.

Methods for in vitro transcription are known in the art (see, e.g., Geall et al. (20I3) Semin. Immunol. 25(2):I52-I59; Brunelle et al. (2DI3) Methods Enzymol. 530:I0I-I4). Reagents used in said method typically include:

1) a linearized DNA template with a promoter sequence that has a high binding affinity for its respective RNA polymerase such as bacteriophage-encoded RNA polymerases;
2) ribonucleoside triphosphates (NTPs) for the four bases (adenine, cytosine, guanine and uracil):
3) optionally a cap analogue as defined above (e.g. m7G(5')ppp(5')G (m7G)). optionally, fraction of NTPs optimized to the RNA sequence (according to WD/2DI5/I88933);
4) a DNA-dependent RNA polymerase capable of binding to the promoter sequence within the linearized DNA template (e.g. T7, T3 or SPG RNA polymerase);
5) optionally a ribonuclease (RNase) inhibitor to inactivate any contaminating RNase;
G) optionally a pyrophosphatase to degrade pyrophosphate, which may inhibit transcription;
7) MgCI2, which supplies Mg2+ ions as a co-factor for the polymerase;
8) a buffer to maintain a suitable pH value, which cañ also contain antioxidants (e.g. DTT), and/or polyamines such as spermidine at optimal concentrations.

Vehicle: A vehicle is typically understood to be a material that is suitable for storing, transporting, and/or administering a compound, such as a pharmaceutically active compound. For example, it may be a physiologically acceptable liquid which is suitable for storing, transporting, and/or administering a pharmaceutically active compound.

Different species/species: The term "species" defines a monophyletic group of viruses whose properties can be distinguished from those of other species by multiple criteria (Adams et al., 2DI3, Arch Virol I58: 2633- 9). The reference to a "different" or

"2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, IB, 2B, 21, 22, 23, 24, 25, 2B, 27, 28, 23, 3D. 31, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4B, 47, 48, 49. 5D, 51. 52, 53, 54, 55, 5B, 57, 58, 5B, BD, BI, B2, B3, B4, B5, BB, B7, B8, B9, 7D, 71, 72, 73, 74, 75, 7B. 77, 78, 79, 8D, 81, 82, 83, 84, 85, 8B, 87, 88, 89, 9D, 91, 92, 93, 94, 95, 9B, 97, 98, 99, IDD or more different" GI, Gil, Gill, GIV or GV, Gl.I or GII.4 Nnrovirus or Noroviruses as used in the present invention means that a Norovirus from another species, strain or serotype is used or that the properties of the Noroviruses which are used or utilized can be distinguished from those of the other Norovirus by multiple criteria.

^'-untranslated region (3'-DTR): Generally, the term "3'-DTR" refers to a part of the artificial nucleic acid molecule, which is located 3' (i.e. "downstream") of a coding region and which is not translated into protein. Typically, a 3'-UTR is the part of an mRNA which is located between the protein coding region (coding region or coding sequence (CDS)) and the poly(A) sequence of the mRNA. In the context of the invention, the term 3'-DTR may also comprise elements, which are not encoded in the template, from which an RNA is transcribed, but which are added after transcription during maturation, e.g. a poly(A) sequence. A 3'-UTR of the mRNA is not translated into an amino acid sequence. The 3'-UTR sequence is generally encoded by the gene which is transcribed into the respective mRNA during the gene expression process. The genomic sequence is first transcribed into pre-mature mRNA, which comprises optional introns. The pre-mature mRNA is then further processed into mature mRNA in a maturation process. This maturation process comprises the steps of 5'capping, splicing the pre-mature mRNA to excize optional introns and modifications of the 3'-end, such as polyadenylation of the 3'-end of the pre-mature mRNA and optional endo-/ or exonuclease cleavages etc. In the context of the present invention, a 3'-DTR corresponds to the sequence of a mature mRNA which is located between the stop codon of the protein coding region, preferably immediately 3' to the stop codon of the protein coding region, and the poly(A) sequence of the mRNA. The term "corresponds to" means that the 3'-DTR sequence may be an RNA sequence, such as in the mRNA sequence used for defining the 3'-DTR sequence, or a DNA sequence which corresponds to such RNA sequence. In the context of the present invention, the term "a 3'-DTR of a gene", is the sequence which corresponds to the 3'-DTR of the mature mRNA derived from this gene, i.e. the mRNA obtained by transcription of the gene and maturation of the pre-mature mRNA. The term "3'-DTR of a gene" encompasses the DNA sequence and the RNA sequence (both sense and antisense strand and both mature and immature) of the 3'-UTR. Preferably, the 3'-UTRs have a length of more than 2D, 3D, 40 or 50 nucleotides.

5'-untranslated region (5'-UTR): Generally, the term "5'-UTR" refers to a part of the artificial nucleic acid molecule, which is located 5' (i.e. "upstream") of a coding region and which is not translated into protein. A 5'-DTR is typically understood to be a particular section of messenger RNA (mRNA), which is located 5' of the coding region of the mRNA. Typically, the 5'-UTR starts with the transcriptional start site and ends one nucleotide before the start codon of the coding region. Preferably, the 5'-UTRs have a length of more than 2D, 3D, 40 or 50 nucleotides. The 5'-UTR may comprise elements for controlling gene expression, also called regulatory elements. Such regulatory elements may be, for example, ribosomal binding sites. The 5'-UTR may be post transcriptionally modified, for example by addition of a 5'-CAP. A 5'-DTR of the mRNA is not translated into an amino acid sequence. The 5'-DTR sequence is generally encoded by the gene which is transcribed into the respective mRNA during the gene expression process. The genomic sequence is first transcribed into pre-mature mRNA, which comprises optional introns. The

pre-mature mRNA is then further processed into mature mRNA iΠ a maturation process. This maturation process comprises the steps of 5'capping, splicing the pre-mature mRNA to excize optional intrnns and modifications of the 3'-eΠd. such as polyadenylation of the S'-end of the pre-mature mRNA and optional endo-/ or exonuclease cleavages etc.. In the context of the present invention, a 5'-UTR corresponds to the sequence of a mature mRNA which is located between the start codΩΠ and, for example, the 5'-cap. Preferably, the 5'-UTR corresponds to the sequence which extends from a nucleotide located 3' to the 5'-cap, more preferably from the nucleotide located immediately 3' to the 5'-eap, to a nucleotide located 5' tn the start codon of the protein coding region, preferably to the nucleotide located immediately 5' to the start codon of the protein coding region. The nucleotide located immediately 3' to the 5'-cap of a mature mRNA typically corresponds to the transcriptional start site. The term "corresponds to" means that the 5'-UTR sequence may be an RNA sequence, such as in the mRNA sequence used for defining the 5'-UTR sequence, or a DNA sequence which corresponds to such RNA sequence. In the context of the present invention, the term "a 5'-UTR of a gene" is the sequence which corresponds to the 5'-DTR of the mature mRNA derived from this gene, i.e. the mRNA obtained by transcription of the gene and maturation of the pre-mature mRNA. The term "5'-UTR of a gene" encompasses the DNA sequence and the RNA sequence (both sense and antisense strand and both mature and immature) of the 5'-UTR.

5'-Terminal Oligapyrimidine Tract (TDP): The 5'-terminal oligopyrimidine tract (TDP) is typically a stretch of pyrimidine nucleotides located in the 5'-terminal region of a nucleic acid molecule, such as the 5'-terminal region of certain mRNA molecules or the 5'-terminal region of a functional entity, e.g. the transcribed region, of certain genes. The sequence starts with a cytidine, which usually corresponds to the transcriptional start site, and is followed by a stretch of usually about 3 to 3D pyrimidine nucleotides. For example, the TDP may comprise 3, 4, 5, 6, 7, 8, B, ID, II, I2, 13, 14, I5, IB, I7, IS, IB, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30 or even more nucleotides. The pyrimidine stretch and thus the 5' TOP ends one nucleotide 5' to the first purine nucleotide located downstream of the TDP. Messenger RNA that contains a 5'-terminal oligopyrimidine tract is often referred to as TDP mRNA. Accordingly, genes that provide such messenger RNAs are referred tn as TOP genes. TOP sequences have, for example, been found in genes and mRNAs encoding peptide elongation factors and ribosomal proteins.

TOP motif: In the context of the present invention, a TOP motif is a nucleic acid sequence which corresponds to a 5'TOP as defined above. Thus, a TDP motif in the context of the present invention is preferably a stretch of pyrimidine nucleotides having a length of 3-30 nucleotides. Preferably, the TOP-motif consists of at least 3 pyrimidine nucleotides, preferably at least 4 pyrimidine nucleotides, preferably at least 5 pyrimidine nucleotides, more preferably at least G nucleotides, more preferably at least 7 nucleotides, most preferably at least 8 pyrimidine nucleotides, wherein the stretch of pyrimidine nucleotides preferably starts at its 5'-end with a cytosine nucleotide. In TOP genes and TOP mRNAs, the TOP-motif preferably starts at its S'-end with the transcriptional start site and ends one nucleotide 5' to the first purin residue in said gene or mRNA. A TOP motif in the sense of the present invention is preferably located at the 5'-end of a sequence which represents a 5'-UTR or at the 5'-end of a sequence which codes for a 5'-DTR. Thus, preferably, a stretch of 3 or more pyrimidine nucleotides is called "TDP motif" in the sense of the present invention if this stretch is located at the 5'-end of a respective sequence, such as the artificial nucleic acid molecule, the 5'-0TR element of the artificial nucleic acid molecule, or the nucleic acid sequence which is derived from the 5'-0TR of a TOP

gene as described herein. In other words, a stretch of 3 or more pyrimidine nucleotides, which is not located at the 5'-end of a 5'-UTR or a 5'-UTR element but anywhere within a 5'-UTR or a 5'-UTR element, is preferably not referred to as "TDP motif".

TDP gene: TDP genes are typically characterised by the presence of a 5'-terminal oligopyrimidine tract. Furthermore, most TOP genes are characterized by a growth-associated translational regulation. However, also TOP genes with a tissue specific translational regulation are known. As defined above, the 5'-0TR of a TOP gene corresponds to the sequence of a 5'-DTR of a mature mRNA derived from a TDP gene, which preferably extends from the nucleotide located 3' to the 5'-cap to the nucleotide located 5' to the start codon. A 5'-UTR of a TOP gene typically does not comprise any start codons, preferably no upstream AUGs (uAUGs) or upstream coding regions (uDRFs). Therein, upstream AUGs and upstream coding regions are typically understood to be AOGs and coding regions that occur 5' of the start codon (AOG) of the coding region that should be translated. The 5'-UTRs of TDP genes are generally rather short. The lengths of 5'-DTRs of TOP genes may vary between ZD nucleotides up to 5DD nucleotides, and are typically less than about 2D0 nucleotides, preferably less than about I5D nucleotides, more preferably less than about 100 nucleotides. Exemplary 5'-0TRs of TDP genes in the sense of the present invention are the nucleic acid sequences extending from the nucleotide at position 5 to the nucleotide located immediately 5' to the start codon (e.g. the ATG) in the sequences according to SED ID NQs: I-I3G3 of the patent application WO 2013/143700. whose disclosure is incorporated herewith by reference. In this context a particularly preferred fragment of a 5'-0TR of a TOP gene is a 5'-DTR of a TDP gene lacking the 5'TOP motif. The terms "5'-UTR of a TOP gene" or "5'-T0P UTR" preferably refer to the 5'-UTR of a naturally occurring TOP gene.

Orthologues and paralogues: Orthologues and paralogues encompass evolutionary concepts used to describe the ancestral relationships of genes. Paralogues are genes within the same species that have originated through duplication of an ancestral gene; orthologues are genes from different organisms that have originated through speciation, and are also derived from a common ancestral gene. In the context of the invention, an orthologue and/or a paralague of a Norovirus nucleic acid sequence of the invention preferably refers to a sequence having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%. 55%, 56%. 57%, 58%, 59%. 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%. 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequence as represented by SED I0 NOs: 4411-39690, 39713-39746. In the context of the invention, an orthologue and/or a paralague of a Norovirus amino acid sequence of the invention refers preferably to a sequence having in increasing order of preference at least 50%. 5I%, 52%, 53%, 54%, 55%, 56%, 57%. 58%. 59%. G0%. 61%. 62%, 63%. 64%, 65%, 66%, 67%, 68%, 69%. 70%. 71%, 72%, 73%, 74%, 75%, 76%. 77%, 78%, 79%, 80%. 81%. 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89% 90%. 91%, 92%, 93%. 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequence as represented by SEQ I0 NOs: 1-4410.

Hybridization/Homology: Nucleic acid molecules which are advantageously for the process according to the invention can be isolated based on their homology to the nucleic acid molecules or a complement sequence of the nucleic acid molecules disclosed herein using the sequences or part thereof as hybridization probe and following standard hybridization techniques under stringent hybridization conditions. In this context, it is possible to use, for example, isolated nucleic acid molecules of at least 15,

2D, 25, 3D, 35, 4D, 5D, 6D or more nucleotides, preferably of at least 15, 20 or 25 nucleotides in length which hybridize under stringent conditions with the above-described nucleic acid molecules, in particular with those which encompass a nucleotide sequence of the nucleic acid molecule used in the invention or encoding a protein used in the invention or of the nucleic acid molecule of the invention. Nucleic acid molecules with 3D, 5D, IOD, 25D or more nucleotides may also be used.

The term "homology" means that the respective nucleic acid molecules or encoded proteins are functionally and/or structurally equivalent. The nucleic acid molecules that are homologous to the nucleic acid molecules described above and that are derivatives of said nucleic acid molecules are, for example, variations of said nucleic acid molecules which represent modifications having the same biological function, in particular encoding proteins with the same or substantially the same biological function. They may be naturally occurring variations, such as sequences from other species, strains, or mutations. These mutations may occur naturally or may be obtained by mutagenesis techniques. The allelic variations may be naturally occurring allelic variants as well as synthetically produced or genetically engineered variants. Structurally equivalents can, for example, be identified by testing the binding of said polypeptide to antibodies or computer based predictions.

By "hybridizing" it is meant that such nucleic acid molecules hybridize under conventional hybridization conditions, preferably under stringent conditions such as described by, e.g., Sambrook (Molecular Cloning; A Laboratory Manual, 2nd Edition, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY (1989)) or in Current Protocols in Molecular Biology, John Wiley B Sons, N. Y. (1989), 6.3.1-6.3.6.

According to the invention, DNA as well as RNA molecules of the nucleic acid of the invention can be used as probes. Further, as template for the identification of functional homologues Northern blot assays as well as Southern blot assays can be performed. The Northern blot assay advantageously provides further information about the expressed gene product: e.g. expression pattern, occurrence of processing steps, like splicing and capping, etc. The Southern blot assay provides additional information about the chromosomal localization and organization of the gene encoding the nucleic acid molecule of the invention.

A preferred, no limiting example of stringent hydridization conditions are hybridizations in B x sodium chloride/sodium citrate (= SSC) at approximately 45°C, followed by one or more wash steps in 0.2 x SSC, 0.1% SDS at 5D to B5°C, for example at 50°C, 55°C or BD°C. The skilled worker knows that these hybridization conditions differ as a function of the type of the nucleic acid and, for example when organic solvents are present, with regard to the temperature and concentration of the buffer. The temperature under "standard hybridization conditions" differs for example as a function of the type of the nucleic acid between 42°C and 58°C, preferably between 45°C and 5D°C in an aqueous buffer with a concentration of D.I x D.5 x, 1 x, 2x, 3x, 4x or 5 x SSC (pH 7.2). If organic solvent(s) is/are present in the abovementioned buffer, for example 50% formamide, the temperature under standard conditions is approximately 40°C, 42°C or 45°C. The hybridization conditions for DNA:DNA hybrids are preferably for example 0.1 x SSC and 20°C, 25°C, 3D°C, 35°C, 40°C or 45°C, preferably between 30°C and 45°C. The hybridization conditions for DNA:RNA hybrids are preferably for example 0.1 x SSC and 3D°C, 35°C. 4D°C, 45°C, 5D°C or 55°C, preferably between 45°C and 55°C. The abovementioned hybridization temperatures are determined for example for a nucleic acid approximately ID0 bp (= base pairs) in length and a G + C content of 50% in the absence of formamide. The skilled worker knows to determine the hybridization conditions required with the aid of textbooks, for example the ones mentioned above, or from the following textbooks: Sambrook et al., "Molecular Cloning", Cold Spring Harbor Laboratory, 1989 ; Hames and Higgins (Ed.) 1985, "Nucleic

Acids Hybridization: A Practical Approach", IRL Press at Oxford University Press, Oxford ; Brown (Ed.) 1991, "Essential Molecular Biology: A Practical Approach", IRL Press at Oxford University Press, Oxford .

A further example of one such stringent hybridization condition is hybridization at 4XSSC at G5°G, followed by a washing in O.IXSSC at G5°C for one hour. Alternatively, an exemplary stringent hybridization condition is in 50% formamide, 4XSSC at 42°C. Further, the conditions during the wash step can be selected from the range of conditions delimited by low-stringency conditions (approximately 2X SSC at 50°C) and high-stringency conditions (approximately 0.2X SSC at 50°C, preferably at 65°C) (20X SSC: D.3M sodium citrate, 3M NaCI, pH 7.0). In addition, the temperature during the wash step can be raised from low-stringency conditions at room temperature, approximately 22°C, to higher-stringency conditions at approximately G5°C. Both of the parameters salt concentration and temperature can be varied simultaneously, or else one of the two parameters can be kept constant while only the other is varied. Denaturants, for example formamide or SDS, may also be employed during the hybridization. In the presence of 50% formamide, hybridization is preferably effected at 42°C. Relevant factors like i) length of treatment, ii) salt conditions, iii) detergent conditions, iv) competitor DNAs, v) temperature and vi) probe selection can be combined case by case so that not all possibilities can be mentioned herein.

Some examples of conditions for DNA hybridization (Southern blot assays) and wash step are shown herein below:

(1) Hybridization conditions can be selected, for example, from the following conditions:

a) 4XSSC at 65°C,

b) 6x SSC at45 °C,

c) GX SSC, 100 mg/ ml denatured fragmented fish sperm DNA at B8°C,

d) GX SSC, 0.5% SDS, I0D mg/ml denatured salmon sperm DNA at 68°C,

e) 6x SSC, 0.5% SDS, 100 mg/ ml denatured fragmented salmon sperm DNA, 50% formamide at 42°C,

f) 50% formamide, 4X SSC at 42°C,

g) 50% (vol/ vol) formamide, 0.1% bovine serum albumin, 0.1% Ficoll, D.l% polyvinylpyrrolidone, 5DmM sodium phosphate buffer pH 6.5, 750 mM NaCI, 75 mM sodium citrate at 42°C,

h) 2X or 4X SSC at 50°C (low-stringency condition), or

i) 3D to 40% formamide, 2X or 4X SSC at 42°C (low-stringency condition).

(2) Wash steps can be selected, for example, from the following conditions:

a) D.0I5 M NaCI/0.0015 M sodium citrate/0.1% SDS at 5D°C.

b) O.IX SSC at 65°C.

c) O.IXSSC, 0.5% SDS at GB°C.

d) 0.IX SSC, 0.5% SDS, 50% formamide at 42°C.

e) 0.2X SSC, 0.1% SDS at 42°C.

f) 2X SSC at G5°C (low-stringency condition).

Further, some applications have to be performed at low stringency hybridisation conditions, without any consequences for the specificity of the hybridisation. For example, a Southern blot analysis of total DNA could be probed with a nucleic acid molecule

of the present invention and washed at low stringency (55 °C in 2xSSPE, 0,1% SDS). A further example of such low-stringent hybridization conditions is 4XSSC at 5D°C or hybridization with 3D to 40% formamide at 42 °C. Such molecules comprise those which are fragments, analogues or derivatives of the polypeptide of the invention or used in the methods of the invention and differ, for example, by way of amino acid and/or nucleotide deletion(s), insertion(s), substitution (s), addition(s) and/or recombination (s) or any other modification(s) known in the art either alone or in combination from the above-described amino acid sequences or their underlying nuclentide sequence(s). However, it is preferred to use high stringency hybridisation conditions.

Hybridization should advantageously be carried out with fragments of at least 5, 10, 15, 2D, 25, 30, 35 or 4D bp, advantageously at least 5D, 6D, 7D or 80 bp, preferably at least 90, 100 or 110 bp. Most preferably are fragments of at least 15, 2D, 25 or 30 bp. Preferably are also hybridizations with at least IDD bp or 200, very especially preferably at least 400 bp in length. In an especially preferred embodiment, the hybridization should be carried out with the entire nucleic acid sequence with conditions described above.

The term "hybridizes under stringent conditions" is defined above. In one embodiment, the term "hybridizes under stringent conditions" is intended to describe conditions far hybridization and washing under which nucleotide sequences at least 30%, 40%, 50% or 65% identical to each other typically remain hybridized to each other. Preferably, the conditions are such that sequences at least about 70%, more preferably at least about 75% or 80%. and even more preferably at least about 85%, 90% or 95% or more identical to each other typically remain hybridized to each other,

To determine the percentage homology (= identity, herein used interchangeably) of two amino acid sequences nr of two nucleic acid molecules, the sequences are written one underneath the other for an optimal comparison (for example gaps may be inserted into the sequence of a protein or of a nucleic acid in order to generate an optimal alignment with the other protein or the other nucleic acid).

The amino acid residues or nucleic acid molecules at the corresponding amino acid positions or nucleotide positions are then compared. If a position in one sequence is occupied by the same amino acid residue or the same nucleic acid molecule as the corresponding position in the other sequence, the molecules are homologous at this position (i.e. amino acid or nucleic acid "homology" as used in the present context corresponds to amino acid or nucleic acid "identity". The percentage homology between the two sequences is a function of the number of identical positions shared by the sequences (i.e. % homology = number of identical positions/total number of positions x 100). The terms "homology" and "identity" are thus to be considered as synonyms.

For the determination of the percentage homology (= identity) of two or more amino acids or of two or more nucleotide sequences several computer software programs have been developed. The homology of two or more sequences can be calculated with for example the software fasta, which presently has been used in the version fasta 3 (W. R. Pearson and D. J. Lipman (1388), Improved Tools for Biological Sequence Comparison. PNAS 85:2444-2448; W. R. Pearson (1330) Rapid and Sensitive Sequence Comparison with FASTP and FASTA, Methods in Enzymology 183:63-38; W. R. Pearson and D. J. Lipman (1388) Improved Tools for Biological Sequence Comparison. PNAS 85:2444-2448; W. R. Pearson (1330); Rapid and Sensitive Sequence Comparison with FASTP and FASTAMethods in Enzymology 183:33-38). Another useful program for the calculation of homologies of different sequences is the standard blast program, which is included in the Biomax pedant software (Biomax, Munich, Federal Republic of

Germany). This leads unfortunately sometimes to suboptimal results since blast does not always include complete sequences of the subject and the query. Nevertheless as this program is very efficient it can be used for the comparison of a huge number of sequences. The following settings are typically used for such a comparisons of sequences: -p Program Name [String]; -d Database [String]; default = nr: -i Query File [File In]; default = stdin; -e Expectation value (E) [Real]; default = 10.0; -m alignment view options: 0 = pairwise; 1 = query-anchored showing identities; 2 = query-anchored no identities; 3 = flat query-anchored, show identities; 4 = flat query-anchored, no identities; 5 = query-anchored no identities and blunt ends; B = flat query-anchored, no identities and blunt ends; 7 = XML Blast output: 8 = tabular; B tabular with comment lines [Integer]; default = 0; -o BLAST report Output File [File Out] Optional; default = stdnut; -F Filter query sequence (DUST with blastn, SEG with others) [String]; default = T; -G Cost to open a gap (zero invokes default behavior) [Integer]; default = 0; -E Cost to extend a gap (zero invokes default behavior) [Integer]; default = 0; -X X drop-off value for gapped alignment (in bits) (zero invokes default behavior); blastn 30, mega blast 20, tblastx 0, all others 15 [Integer]; default = 0; -I Show GI's in deflines [T/F]; default = F; -q Penalty for a nucleotide mismatch (blastn only) [Integer]; default = -3; -r Reward for a nucleotide match (blastn only) [Integer]; default = 1; -v Number of database sequences to show one-line descriptions for (V) [Integer]; default = 500; -b Number of database sequence to show alignments for (B) [Integer]; default = 250; -f Threshold for extending hits, default if zero; blastp 11, blastn 0, blastx 12, tblastn 13; tblastx 13, mega blast 0 [Integer]; default = 0; -g Perfom gapped alignment (not available with tblastx) [T/F]; default = T; -Q Query Genetic code to use [Integer]; default = 1; -D DB Genetic code (for tblast[nx] only) [Integer]; default = 1; -a Number of processors to use [Integer]: default = 1; -O SeqAlign file [File Out] Optional; -J Believe the query defline [T/F]; default = F: -M Matrix [String]; default = BL0SUMB2; -W Word size, default if zero (blastn 11, megablast 28, all others 3) [Integer]; default = D; -z Effective length of the database (use zero for the real size) [Real]; default = 0; -K Number of best hits from a region to keep (off by default, if used a value of 100 is recommended) [Integer]; default = 0; -P 0 for multiple hit, I for single hit [Integer]; default = 0; -Y Effective length of the search space (use zero for the real size) [Real]; default = 0: -S Query strands to search against database (for blast[nx], and tblastx); 3 is both, 1 is top, 2 is bottom [Integer]; default = 3; -T Produce HTML output [T/F]; default = F; -I Restrict search of database to list of GI's [String] Optional; -U Ose lower case filtering of FASTA sequence [T/F] Optional; default = F; -y X dropoff value for ungapped extensions in bits (0.0 invokes default behavior); blastn 20, megablast 10, all others 7 [Real]; default = 0.0: -Z X dropoff value for final gapped alignment in bits (0.0 invokes default behavior); blastn/megablast 50, tblastx 0, all others 25 [Integer]; default = 0; -R PSI-TBLASTN checkpoint file [File In] Optional; -n MegaBlast search [T/F]; default = F; -L Location on query sequence [String] Optional; -A Multiple Hits window size, default if zeru (blastn/megablast D, all others 40 [Integer]; default = 0: -w Frame shift penalty (OOF algorithm for blastx) [Integer]; default = 0; -t Length of the largest intron allowed in tblastn for linking HSPs (0 disables linking) [Integer]; default = 0.

Results of high quality are reached by using the algorithm of Needleman and Wunsch or Smith and Waterman. Therefore programs based on said algorithms are preferred. Advantageously the comparisons of sequences can be done with the program PileUp (J. Mol. Evolution., 25, 351 (1987), Higgins et al., CABI0S 5, 151 (1989)) or preferably with the programs "Gap" and "Needle", which are both based on the algorithms of Needleman and Wunsch (J. Mol. Biol. 48; 443 (1970)), and "BestFit", which is based on the algorithm of Smith and Waterman (Adv. Appl. Math. 2; 482 (1981)). "Gap" and "BestFit" are part of the GCG software-package (Genetics Computer Group, 575 Science Drive, Madison, Wisconsin, USA 53711 (1991); Altschul et al., (Nucleic Acids Res. 25, 3389

(1937)), "Needle" is part of the European Molecular Biology Dpen Software Suite (EMBOSS) (Trends in Genetics IB (B), 27B (200D)). Therefore preferably the calculations to determine the percentages of sequence homology are done with the programs "Gap" or "Needle" over the whole range of the sequences. The following standard adjustments for the comparison of nucleic acid sequences were used for "Needle": matrix: EDNAFULL, Gapjenalty: ID.D, Extendjenalty: D.5. The following standard adjustments for the comparison of nucleic acid sequences were used for "Gap": gap weight: 5D, length weight: 3, average match: ID.DDD, average mismatch: D.DDD.

For example a sequence, which has 80% homology with sequence SED ID NO: 4411 at the nucleic acid level is understood as meaning a sequence which, upon comparison with the sequence SED ID ND: 4411 by the above program "Needle" with the above parameter set, has a 80% identity.

Homology between two polypeptides is understood as meaning the identity of the amino acid sequence over in each case the entire sequence length which is calculated by comparison with the aid of the above program "Needle" using Matrix: EBL0SUMG2, Gap_penalty: 8.D, Extend_penalty: 2.D.

For example a sequence which has a 80% homology with sequence SEQ ID NO: I at the protein level is understood as meaning a sequence which, upon comparison with the sequence SEQ ID NO: I by the above program "Needle" with the above parameter set, has a 80% identity.

Detailed Description:

In a first aspect, the invention relates to an artificial nucleic acid comprising or consisting of at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof. In another embodiment, the artificial nucleic acid comprises at least one coding region encoding at least one polypeptide comprising or consisting of at least one Norovirus capsid protein, and/Or a fragment or variant thereof.

In one embodiment, the artificial nucleic acid molecule according to the invention comprises at least one coding region encoding the Norovirus capsid protein VPI or VP2. In another embodiment, the artificial nucleic acid encodes Norovirus capsid protein VPI. In this context, a reference to a Norovirus capsid protein VPI equals a reference to a VPI capsid protein derived from a Norovirus, a Norovirus VPI, capsid protein, capsid protein VPI, major capsid protein, major capsid protein VPI, major capsid region, major viral capsid protein, or VPI capsid protein.

In particular, the invention relates to an artificial nucleic acid comprising or consisting of at least one coding region encoding at least one polypeptide selected from the group consisting of Norovirus capsid protein VPI (also termed "Major capsid protein" or "capsidprotein"), Norovirus capsid protein VP2 (also termed "Minor capsid protein") and/Or a Norovirus non-structural protein, such as NSI/NS2 (also termed p48 or Nterm (amino terminal protein)), NS3 (also termed NTPase or Nucleoside triphosphatase).

NS4 (also termed p22 or 3A-like protein), NS5 (also termed VPg or Genome-linked viral protein), NSB (also termed Pro or Proteinase), or NS7 (also termed Pol or RNA-dependent RNA polymerase), and/or a fragment or variant of any of these proteins.

In one embodiment of the invention, vaccines and/or compositions contain VPI proteins and/or VP2 proteins. Preferably each vaccine and/or composition contains VPI and/or VP2 proteins from only one Norovirus genogroup giving rise to a monovalent vaccine. As used herein, the term "monovalent" means the antigenic proteins are derived from a single Norovirus genogroup. For example, the vaccines and/or compositions contain VPI and/or VP2 from a virus strain of genogroup I (e.g. VPI and VP2 from Norwalk virus).

Preferably the vaccines and/or compositions are comprised of predominantly VPI proteins. In one embodiment of the invention, the antigen is a mixture of monovalent vaccines and/or compositions wherein the composition includes vaccines and/or compositions comprised of VPI and/or VP2 from a single Norovirus genogroup mixed with vaccines and/or compositions comprised of VPI and/or VP2 from a different Norovirus genogroup taken from multiple viral strains (e.g. a Norovirus from Genogroup IV.2 and a Norovirus from Genogroup I.I). Purely by way of example the composition can contain monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup I together with monovalent vaccines and/or compositions from one or more strains of Norovirus genagroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup IV.2 and Norovirus from Genogroup 1.1 or from different genus or species of a Norovirus from Genogroup IV.2.

Preferably the vaccines and/or compositions are comprised of predominantly VPI proteins. In one embodiment of the invention, the antigen is a mixture of monovalent vaccines and/or compositions wherein the composition includes vaccines and/or compositions comprised of VPI and/or VP2 from a single Norovirus genogroup mixed with vaccines and/or compositions comprised of VPI and/or VP2 from a different Norovirus genogroup taken from multiple viral strains (e.g. a Norovirus from Genogroup 11.4 and a Norovirus from Genogroup I.I). Purely by way of example the composition can contain monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup I together with monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup 11.4 and Norovirus from Genogroup I.I or from different genus or species of a Norovirus from Genogroup 11.4.

In this context, the amino acid seguence of the at least one antigenic peptide or protein may be selected from any peptide or protein derived from a capsid protein VPI, capsid protein VP2, NSI/NS2, NS3, NS4, NS5, NS6, or NS7 of a Norovirus or a fragment or variant thereof.

Further, in an alternative embodiment of the invention, the vaccines and/or compositions may be multivalent vaccines and/or compositions that comprise, for example, VPI and/or VP2 proteins from one Norovirus genogroup intermixed with VPI and/or VP2 proteins from a second Norovirus genogroup, wherein the different VPI and VP2 proteins are not chimeric VPI and VP2

proteins, but associate together within the same capsid structure to form immunogenic Vaccines and/or compositions. As used herein, the term "multivalent" means that the antigenic proteins are derived from two or more Norovirus genogroups. Multivalent vaccines and/or compositions may contain vaccines and/or composition antigens taken from two or more viral strains. Purely by way of example the composition can contain multivalent vaccines and/or compositions comprised of capsid monomers or multimers from one or more strains of Norovirus genogroup I together with capsid monomers or multimers from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup IV.2 and Narovirus from Genogroup II or from different genus or species of a Narovirus from Genogroup IV.2.

Further, in an alternative embodiment of the invention, the vaccines and/or compositions may be multivalent vaccines and/or compositions that comprise, for example, VPI and/or VP2 proteins from one Norovirus genogroup intermixed with VPI and/or VP2 proteins from a second Norovirus genogroup, wherein the different VPI and VP2 proteins are not chimeric VPI and VP2 proteins, but associate together within the same capsid structure to form immunogenic Vaccines and/or compositions. As used herein, the term "multivalent" means that the antigenic proteins are derived from two or more Norovirus genogroups. Multivalent vaccines and/or compositions may contain vaccines and/or composition antigens taken from two or more viral strains. Purely by way of example the composition can contain multivalent vaccines and/or compositions comprised of capsid monomers or multimers from one or more strains of Norovirus genogroup I together with capsid monomers or multimers from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup II.4 and Norovirus from Genogroup I.I or from different genus or species of a Narovirus from Genogroup II.4.

In another embodiment, the artificial nucleic acid may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10 or more coding regions encoding at least one polypeptide selected from the group consisting of Norovirus capsid protein VPI, Norovirus capsid protein VP2, NS1/NS2. NS3, NS4, NS5, NS6, or NS7, and/or a fragment or variaot of any of these proteins.

In a preferred embodiment, the compositions or vaccines of the present invention comprise a multivalent vaccine, e.g., comprising a polynucleotide which encodes at least two different VPI, for example a Norovirus capsid protein VPI from a GII.4 strain and a Norovirus capsid protein VPI from a GI.I strain. In another embodiment, the compositions or vaccines comprises a multivalent vaccine, e.g., comprising two different polynucleotides, whereby one polynucleotide encodes for example a Norovirus capsid protein VPI from a GII.4 strain and the other polynucleotide encodes a Norovirus capsid protein VPI from a GI.I strain.

In a further embodiment, the compositions or vaccines of the present invention may comprise a multivalent vaccine, e.g., comprising a polynucleotide which encodes at least two different VPI, for example a Norovirus capsid protein VPI from two different GII.4 strains. In another embodiment, the compositions or vaccines comprise a multivalent vaccine, e.g., comprising two different polynucleotides, whereby one polynucleotide encodes for example a Norovirus capsid protein VPI from two different GII.4 strains.

In some embodiments, as defined above, the composition or the vaccine is multivalent, i.e. compositions or vaccines of the present invention may vary in their valency. Valency refers to the number of antigenic components in the composition or vaccine. In some embodiments, the compositions or vaccines are monovalent. In some embodiments, the compositions or vaccines are divalent or bivalent. In some embodiments the compositions or vaccines are trivalent. In some embodiments the compositions or vaccines are teravalent. In some embodiments the compositions or vaccines are multi-valent. Multivalent vaccines may comprise at least 2, 3, 4, 5, G, 7, 8, 9, 10, II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45. 4B. 47, 48, 49, 50. 51, 52, 53, 54, 55, 5B, 57, 58, 59, BO. Bl, B2, B3, B4, B5, BB, B7, B8, B9, 70, 71, 72, 73, 74, 75, 7B. 77, 78, 79, 80, 81. 82, 83, 84, 85, 8B. 87, 88, 89, 90, 91, 92, 93, 94, 95, 9B, 97, 98, 99, 100 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.). The antigenic components of the compositions or vaccines may be on a single polynucleotide or on separate polynucleotides. In another embodiment, multivalent vaccines may comprise or at least 10, 15, 20, 30. 40 or 50 or 100 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.). In another embodiment, multivalent vaccines may comprise 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.).

In a preferred embodiment, the multivalent composition or vaccine comprises about 30 to about 50 antigens or antigenic moieties.

In some embodiments, the open reading frame of the one or more RNA polynucleotides encodes at least 2, 3, 4, 5, G, 7, 8, 9 or 10 or at least 10, 15, 20 or 50 or 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 antigenic polypeptides.

In this context it is particularly preferred that the composition comprises at least two mRNA sequences, wherein at least one mRNA sequence encodes at least one antigenic peptide or protein, i.e. VPI, is derived from a GII.4 Norovirus and at least one mRNA sequence encodes at least one antigenic peptide or protein, derived from Norovirus VPI, is derived from another GII.4 Norovirus.

In another preferred embodiment each mRNA sequence encodes at least one different antigenic peptide or protein derived from proteins of different Noroviruses. Preferably each mRNA sequence encodes at least one antigenic peptide or protein, derived from Norovirus VPI, of different GII.4 Noroviruses or different GI.I Noroviruses, or a combination thereof.

In a further embodiment, the invention relates to a composition comprising or consisting of 2, 3, 4, 5, G, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25. 2B. 27, 28, 29, 30, 31. 32, 33, 34, 35, 3G, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50, 51, 52. 53, 54. 55. 5B, 57, 58, 59, BD, Bl, B2. G3, 64, B5. BB. G7, B8, B9, 70, 71, 72, 73, 74, 75, 7B, 77, 78, 79, 80, 81, 82, 83, 84, 85, 8B, 87, 88, 89, 90, 91, 92, 93, 94, 95, 9B, 97, 98, 99, 100 or more separate artificial nucleic acids selected from the group of SEQ ID NOs: 44II- 3960. 397I3-3974B comprising at least one coding region encoding at least one polypeptide derived from a Norovirus selected from the group SEQ ID NOs: 1-4410 or a fragment or variant of any of these proteins.

In some embodiments, the open reading frame of the one or more RNA polynucleotides encode at least 10, 15, 2D, 3D, 40 or 5D or IDD antigenic polypeptides. In some embodiments, the open reading frame of the one or more RNA polynucleotides encode 2-ID, ID-I5. 15-2D, 20-5D, 5D-IDD or I00-2D0 antigenic polypeptides.

The present invention is based on the surprising finding that the at least one Norovirus protein comprised in the at least one polypeptide encoded by the artificial nucleic acid as described herein can efficiently be expressed in a mammalian cell. It was further unexpectedly found that the artificial nucleic acid is suitable for eliciting an immune response against Norovirus in a subject.

Furthermore, the present invention is based on the surprising finding that mRNA-based or artificial nucleic acid vaccines comprising mRNA or artificial nucleic acid sequences encoding different antigens of a Norovirus (particularly Norovirus capsid protein VPI) were extremely effective in inducing an antigen-specific immune response against Norovirus. Furthermore, the inventors surprisingly found that many mRNA sequences encoding different antigens of different Norovirus can be effectively combined in ooe mRNA-based vaccine.

In one embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide derived from a Norovirus and/or a fragment or variant thereof.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide selected from the group consisting of Norovirus non-structural proteins NSI/NS2, NS3, NS4, NS5, NSB, NS7, Norovirus capsid protein VPI and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

Norovirus:

In the context of the present invention, the term "Norovirus" comprises any Norovirus, irrespective of strain or origio. Preferably, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of Genogroup I, Genogroup II, Genogroup III, Genogroup IV, or Genogroup V (abbreviated as GI, GiI, GiII, GIV or GV. respectively).

In a further embodiment, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of

(i) Genogroup I genotype I (abbreviated as GI.I), GI.2, GI.3, GI.4, GI.5, GI.G, GI.7, GI.8, GI.9. GI.IO, GUI, GI.I2, GI.I3. GI.I4, GI.I5. GI.IG and/or GI.I7;

(it) Genogroup II genotype I (abbreviated as GII.I), GII.2, GII.3. GII.4, GII.5, GII.G, GII.7, GII.8, GII.9. GII.IO, GII.II. GII.I2. GII.I3, GII.I4. GII.I5, GII.IG. GII.I7, GII.IB. GII.IO, GII.20, GII.2I, GII.22, GII.23, and/or GII.24;

(iii) Genogroup III genotype I (abbreviated as GIII.I), GIII.2, GIII.3, and/or GIII.4;

(iv) Genogroup IV genotype I (abbreviated as GIV.I). GIV.2, GIV.3, and/or GIV.4;

(v) Genogroup V genotype I (abbreviated as GV.I), GV.2, GV.3. and/or GV.4;

and/ or combinations of 2, 3, 4, 5, G, 7. 8. 9, or 10, or more of any of the above Noroviruses from different Genogroups and/ Or different Genotypes,

In a further embodiment, the nucleic acid of the invention, preferably a VPI nucleic acid derived from a Norovirus, is derived from a Norovirus selected from the group consisting of

(i) Genogroup I genotype I (abbreviated as GI.I), GI.2, GI.3, GI.4, GI.5, GI.G, GI.7. GI.B. GI.9, GI.IO, GUI. GI.I2. GI.I3. GI.I4, GI.I5, GLIB and/or GI.I7;

(ii) Genogroup II genotype I (abbreviated as GII.I), GII.2, GII.3, GII.4, GII.5, GII.G, GII.7, GII.8, GII.9, GII.ID, GII.II. GII.I2, GII.I3. GII.I4. GII.I5. GII.IG, GII.I7. GIU8, GII.I9, GII.2Q, GII.2I. GII.22, GII.23, and/or GII.24:

(iii) Genogroup III genotype I (abbreviated as GIII.I), GIII.2, GIII.3, and/or GIII.4;

(iv) Genogroup IV genotype I (abbreviated as GIV.I), GIV.2, GIV.3, and/or GIV.4; and

(v) Genogroup V genotype I (abbreviated as GV.I), GV.2, GV.3, and/ Or GV.4.

In the case, 2, 3, 4. 5, B. 7, 8, 9, ID or more different VPI nucleic acids are utilized Or employed, for example in a composition of the invention or a vaccine of the invention, the VPI nucleic acids can be derived from 2, 3, 4, 5, B, 7, 8, B, or IQ, or more of any of the above Noroviruses from different Genogroups and/or different Genotypes.

In the context of the invention, a reference to GI.I to GI.I7 means a reference to GI.I, GI.2, GI.3, GI.4. GI.5, GI.B, GI.7, GI.8, GI.B, GI.IO, GUI, GI.I2, GI.I3, GI.I4, GI.I5, GLIB and/or GI.I7; a reference to GII.I to GII.24 means a reference to GII.I, GII.2, GII.3, GII.4, GII.5, GII.G. GII.7, GII.8. GII.9, GII.ID, GII.II, GII.I2, GII.I3, GII.I4, GII.I5. GII.IG. GII.I7, GII.IB. GII.I9, GII.2D, GII.ZI. GII.22, GII.23. and/or GII.24; a reference to GIII.I to GIII.4 means to a reference to GIII.I, GIII.2, GIII.3, and/or GIII.4; a reference to GIV.I to GIV.4 means to a reference to GIV.I, GIV.2, GIV.3, and/or GIV.4; a reference to GV.I to GV.4 means to a reference to GV.I, GV.2, GV.3, and/or GV.4.

In other embodiments, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of a GII.4 Norovirus and/or a GI.I Norovirus. In a further embodiment, the term "Norovirus" as used herein refers to Norovirus GII.4 CIN-I (also termed Norovirus Hu/GII.4/D3IB33/USA/2DD3 or having Accession No. JD3B58ID.I), GII.4 (Accession No; AY5D2D23.I), GII.4 CIN-D02 and/ Or GII.4 Sydney. In another embodiment, the Norovirus is a GII.4 Sydney Norovirus or a GII.4 Sydney 2DI2 Norovirus.

In other embodiments, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of a GII.4 Norovirus and/or a GI.I Norovirus. In a further embodiment, the term "Norovirus" as used herein refers to Norovirus GII.4-03IG93-USA-2D03, Norovirus GII.4/Farmington Hills/20D2/DSA, Norovirus GII.4-2006b 092895-0-2008, Norovirus GII.4-GZ20I0-L87-Guangzhou-2011, Norovirus GII.4-USA-I997, Norovirus GU-OSA-IGBB-Capsidprotein.

In another embodiment, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of Norovirus Hu/GII.4/Dijon/E872/2DD2/FRA. Norovirus Hu/GII.4/MDI2D-l2 /ie87/USA, Norovirus Hu/GIIJ/7EK/Hawaii/l97l/USA, Norovirus Hu/GII.B/CHDC4073/l984/USA, Norovirus Hu/GII.4/Hiroshima/IB/2G0l/JPN, Norovirus Hu/GII.4/Hiroshima/67/2DDG/JPN. Norovirus Hu/GII/JP/2DI5/GII.Pe_GII.4/0saka/0SF78, Norovirus GII/Hu/NL/2DI2/GII.4/Groningen, Norovirus GII/Hu/NL/2DI4/GII.2/Groningen. Norovirus Hu/GII.4/New 0rleansl5DD/2D08/USA, Norovirus Hu/GII.B/0hio/49D/2D!2/USA. Norovirus Hu/GII.3/Jingzhou/2DI3402/CHN. Norovirus Hu/GII.4/Jingzhou/2DI34D3/CHN, Norovirus Hu/GII.I7/Gaithersburg/2D14/US, Norovirus Hu/GII.4/CI27/GF/l978, Norovirus Hu/GII.4/CHDC39G7/l988/US, Norovirus Hu/GII.4/CH0C4ID8/l887/US. Norovirus Hu/GII.4/CHDC487l/l977/US. Norovirus Hu/GII.3/CHDC526l/l990/US, Norovirus Hu/GII.3/Milwaukee009/20IO/USA, Norovirus Hu/GII.4/Miranda/NSW8l7L/20!0/AU. Norovirus Hu/Gll.2/KLI09/MY/l978, Norovirus Hu/GII.I4/HK74/CN/l978, Nurovirus Hu/Gll.7/HK4/CN/I97B. Norovirus Hu/GII.I7/C!42/GF/l978. Norovirus Hu/GII.5/CI5/GF/l978. Norovirus Hu/GI.5/E57/UG/!B75, Norovirus Hu/GII.4/Randwick/NSW882J/20ll/AU, Nurovirus Hu/GII.4/Berowra/NSW7G7L/2DI2/AU, Norovirus Hu/GII.4/Sydney/NSW05l4/2DI2/AU, Norovirus Hu/GII.4/Hong Kong/CUHK3B30/20I2/CHN, Norovirus Hu/GII.4/VPII72/Shanghai/2DI2/CHN. Norovirus Hu/GII-4/New Taipei/CGMHGI/2DI2/TW. Norovirus GII/Hu/HKG/2DI3/GII.4/CUHK-NS-l4l, Norovirus GII/Hu/JP/20D2/GII.PI2_GII.I3/Saitama/T8D. Norovirus GII/Hu/JP/20DI/GII.PI2_GII.I2/Saitama/TI5. Norovirus GII/Hu/JP/20D7/GII.P2l_GII.2l/, Kawasaki/Y0284, Norovirus GII/Hu/JP/2DD7/GII.PI5_GII.I5/ Sapporo/HK299, Norovirus GI/Hu/JP/2DD7/GI.P3_GI.3/Shimizu/KK28GB. Norovirus GII/Hu/JP/2DD7/GII.P7_GII.I4/Fukuoka/KK282, Norovirus GI/Hu/JP/2DD7/GI.P8_GI.8/Nagoya/KY53l. Norovirus Hu/GIU/SJTUHI/CHN/2014, Norovirus Hu/GII.4/variant Sydney 2DI2/FRA. Norovirus Hu/GII-4/Hokkaido4/2DDB/JP, Norovirus GIV/Hu/Jp/2DDI/GIV.I/DCDIDI7023. Nurovirus Hu/GII.4/Beijing/53B7l/2007/CHN, Norovirus Hu/ll.4/220DBBI/HK/20IO, Norovirus Hu/GII.4/Aichi3B8-!4/20l4, Norovirus Hu/GII.4/Hunter 284E/040/AU, Norovirus Hu/GII-4/0saka/l398/JPN. Norovirus Hu/GI.I/P774.Delsjo2004/Gothenburg/Sweden, Norovirus pig/Gll.lt/FI8-ID/2DD5/CAN, Norovirus Hu/Gll.4/Wellington/I995/OSA. Norovirus Hu/GII.4/Henry/2000/OSA, Norovirus Hu/GII.4/SSCS/2005/USA, Norovirus GII/Hu/IN/200B/GII.P4_GII.4_ Yerseke200Ba/Pune-PC2l, Norovirus Hu/GI.I/P7-587/2007/Stromstad/Swed.n, Norovirus Hu/GI.2/Leuven/2003/BEL Nurovirus Hu/GII.7/NSW743L/2008/AUS. Norovirus Hu/GII.2/NF20D2/USA/2Q02, Norovirus Hu/GII.4/NF2003/USA/2D03, Norovirus Hu/GII.3/1999, Norovirus Hu/GIV.I/Ahrenshoop24B/DEU/20l2, Norovirus Hu/GII.4/Xi'an/PI9/20IO/CHN. Nurovirus Hu/GII.4/PA3G3/20ll/ITA. Norovirus Hu/Gll.4/P3/20I2/Gothenburg/Sweden. Norovirus Hu/GII.4/Tanger/TMG87/20ll/MAR. Norovirus t2-X-2/20l2/GII.P22/GII.5. Norovirus Hu/GII.4/Kobe034/200G/JP. Norovirus Hu/GGII.4/TiBl00l/l995/NL. Norovirus Hu/GGII.4/DenHaagOI5/2000/NL. Norovirus Hu/GGII.4/SchiedamOI8/200l/NL, Norovirus Hu/GGII.4/Apeldoorn023/2003/NL Norovirus Hu/GGII.4/Middelburg007/20D4/NL, Norovirus Hu/GII-4/Matsudo/02l07l/2D02/JP, Norovirus Hu/GII-4/Kaiso/03055B/2003/JP. Norovirus Hu/GII-4/Awa/040354/2004/JP, Norovirus Hu/GII.4/Apeldoorn317/2007/NL, Norovirus Hu/GII.2/Rotterdam39E/2002/NL. Norovirus Hu/GII.4/RotterdamP200/2005/NL, Norovirus Hu/Gll.4/Stockholm/I98B5/2008/SE. Norovirus Hu/GII.B/DC040B2VLP/2004/JP, Norovirus Hu/GII.4/HSI94/2DD9/US. Norovirus Hu/GII.I2/HS2IO/20IO/OSA, Norovirus Hu/GI.I/8Flla/l9G8/0SA. Norovirus Hu/Gll.4/CHDC5I9I/I974/USA, Norovirus Hu/GII.4/N7G/20!0/HuZhou. Norovirus Hu/GII.B/S9c/I97G/SEN. Norovirus Hu/GIIML45/I978/MYS. Norovirus

Hu/GII.4/NIHICI7.5/2DIZ/USA. Norovirus Hu/GII.4/NIHIC9/20ll/DSA, Norovirus Hu/Gll.4/Cll0/I378/GUF, Norovirus **Hu/GII.4/HSBB/200l/USA.** Norovirus **Hu/GII/JP/2DI5/GII.PI7_GII.I7/Kawasaki3DB.** Norovirus Hu/GII/JP/2DI4/GII.PI7_GII.I7/NaganoB-l, Norovirus **Hu/GII/JP/2DI5/GII.PE_GII.4/Dsaka/DSF7B.** Norovirus GI/Hu/NL/2Qtl/GI.4/Groningen, Norovirus Gll/Hu/NL/20I4/Gll.4/Groningen0i, Norovirus **Hu/GII.4/KanBpupu/NZ327/20DB/NZL.** Norovirus **Hu/GII.4/Rathminas/NSW2B7R/2D07/AUS.** Norovirus Hu/GII.4/Turramurra/NSW8B2U/2DD9/AUS, Norovirus Hu/GII.4/Seoul/0389/2009/K0R, Norovirus **HU/GII .4/SBDUI/0B45/2DQ9/KGR**. Norovirus Hu/GIU2/Shelby/2D09/DSA, Norovirus Hu/GI.7/TCH-OGD/USA/2003, Norovirus Hu/GII.I/Ascension2D8/2DI0/USA, Norovirus Hu/GII.I3/VAI73/2DI0/USA, Norovirus Hu/GII.2l/Salisburyl50/20ll/DSA. Norovirus Hu/Gll.4/I997/USA, Norovirus Hu/GII.4/Farmington Hills/2BD4/USA, Norovirus Hu/GII.4/MinervB/2D0B/USA, Norovirus Hu/GII.4/Dhio/7l/2DI2/USA, Norovirus **Hu/GII.4/AlbertaEIDB5/2DII/CA.** Norovirus Hu/GII.4/SG4D5l-D9/2DD9/SG. Norovirus Hu/GII.3/TCH-ID4/USA/2QD2, Norovirus Hu/GI.G/TCH-D99/USA/2DD3, Norovirus 06-AM-**tt/2DDB/GII.4/Yerseke/20D6B.** Norovirus **D9-BI-2/2DD9/GII.4/NewDrlBans/2D0B.** Norovirus Hu/GII.4/PR328/2DI3/ITA, Norovirus Hu/GII.PI7_GII.I7/PRBB8/2DI5/ITA, Norovirus Hu/GII.4/Alb ertaSPI/2DI3/CA, Norovirus **HU/GII .4/CDDDD7BB2/2DII/UK.** Norovirus Hu/GII.6/GZ20IO-LB6/Guangzhou/CHN/2DII. Norovirus **Bo/GIII.I/Aba-**Z5/ZDD2/HUN, Norovirus GI.3, Norovirus Hu/GII.I7/CDHK-NS-B70/HKG/2D15, Norovirus GII/Hu/SI/2DI5/GIIJ7/LjubljanalBB2, Norovirus Hu/Gll.I7/CDHK-NS-B47/HKG/2D15, Norovirus Hu/GII.2l/CUHK-NS-GD9/HKG/2DI5. Norovirus Hu/GII.4/MBlbournBBB23/2DIB/AUS, Norovirus **GII/Hu/JP/2DIB/GII.PIB_GII.4**_ SydnBy2DI2/DHIB002, Norovirus Hu/GII/JP/20IB/GII.PIB_GII.4_ SydnBy2DI2/Kawasakil94. Norovirus IBF2l49_GII.2_Guangdong_CHN_2DIB, Norovirus Hu/GII.I7/CUHK-NS-8B4/HKG/2DIB. Norovirus GII/Hu/ZAF/2D12/GII.P4_GII.4/ CapeTown/9772, Norovirus GII.I2, Snow Nountain virus. Human calicivirus strain Melksham.

In OTIB Bmbodiment, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus, genogroup II Norovirus, genogroup III Norovirus, gBnogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived frOm a Norovirus selscted from the group consisting of a Gl.I to GI.I7 Norovirus, Gll.l to GII.24 Norovirus, Glil.l to GIII.4 Norovirus. GIV.I to GIV.4 Norovirus and GV.I to GV.4 Norovirus; more prefErably. the artificial nucleic acid is derived from a Norovirus selected from the group consisting of Gl.I Norovirus and GII.4 Norovirus, even mOre preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 ClN-I Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2DI2 Norovirus.

In preferred embodimBnts, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of Norovirus GII.4-03IB93-USA-2D03, Norovirus GIU/Farmington Hills/2DD2/DSA, Norovirus GII.4-2DDBb 0928B5-DSA-2008, Norovirus GII.4-GZ2DI0-L87-Guangzhou-2DII. Norovirus GII.4-USA-I997, Norovirus GI.I-DSA-I9G8-Capsidprotein.

Norovirus peptides or protBins:

The at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises at least one Norovirus protein. The RNA genome of Norovirus typically encodes a plurality of structural and non -structural proteins.

Translation of Norovirus RNA typically leads to a precursor protein comprising a plurality of individual viral (structural and non-structural) proteins (or precursor of these proteins) in one polypeptide chain, which is typically referred to as "polyprotein" or "precursor protein".

In the context of the present invention, a Norovirus polyprotein typically comprises amino acid sequences that are target sites for enzymes that specifically cleave the polyprotein in order to yield fragments of the polyprotein, wherein the fragments preferably comprise an individual Norovirus protein or two or more Norovirus proteins, or a fragment or variant thereof. In the context of the present invention, the term "polyprotein" may also refer to a polypeptide chain comprising the amino acid sequences of at least two individual Norovirus proteins, or a fragment or variant thereof. Cleavage of a Norovirus polyprotein preferably occurs between individual Norovirus proteins (e.g. between the capsid protein VP1 and the capsid protein VP2, or fragments or variants thereof. An individual Norovirus protein, or a fragment or variant thereof, e.g. as obtained from a polyprotein by cleavage, is preferably referred to as "mature Norovirus protein". In the context of the present invention, the term "mature Norovirus protein" is not limited to an individual Norovirus protein, or a fragment or variant thereof, which was generated by cleavage of a polyprotein, but also comprises an individual Norovirus protein of another origin, such as an individual Norovirus protein expressed recombinantly from an artificial nucleic acid. Preferably, a mature Norovirus protein lacks an amino acid sequence that is typically present in a corresponding amino acid sequence encoding said Norovirus protein in a Norovirus polyprotein (precursor protein) and wherein said amino acid sequence lacking in the mature Norovirus protein preferably corresponds to an amino acid sequence, which is usually removed by cleavage during processing of a Norovirus polyprotein. For example, an amino acid sequence, which is a target site for a protease, may be present in a Norovirus polyprotein, but may be absent from a mature Norovirus protein derived from said Norovirus polyprotein.

In one embodiment, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprises at least one Norovirus capsid protein VP1 or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

In another embodiment, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprises at least one Norovirus capsid protein VP1 and/or a fragment or variant thereof. In a further embodiment, the artificial nucleic acid comprises a Norovirus capsid protein VP1 and/or a fragment or variant thereof.

In the context of the present invention, the term "Norovirus protein" may refer to any amino acid encoded by a Norovirus nucleic acid. In the context of the invention, a Norovirus capsid protein VP1 or VP1 protein is preferred. For example, a "Norovirus protein" may be any polypeptide comprising or consisting of an amino acid sequence according to any one of the following amino acid sequences from Genbank, or a fragment or variant of any of these sequences as provided in Table I (Column 2: "NCBI or Genbank Accession No.") and Table 3 (Column 2; "NCBI or Genbank Accession No.").

In particular, the term "Norovirus protein" as used herein comprises an individual structural or non-structural Norovirus protein. For example, a Norovirus protein in the meaning of the present invention may be a protein selected from the group consisting of

Norovirus capsid protein VPI. Norovirus capsid protein VP2. and a Norovirus non-structural protein (NS). such as NSI/NS2, NS3, NS4, NS5, NSB, or NS7.

In particular, the term "Norovirus protein" as used herein is a Norovirus capsid protein VPI. Further, in particular, the term "Norovirus protein" as used herein is a Norovirus capsid protein derived from a GII.4 Norovirus.

As used herein, the term "Norovirus protein" may also refer to an amino acid sequence corresponding to an individual Norovirus protein as present in a Norovirus polyprotein (precursor protein). Said amino acid sequence in the polyprotein may differ from the amino acid sequence of the corresponding amino acid sequence of the respective mature Norovirus protein (i.e. after cleavage/processing the polyprotein). For example, the corresponding amino acid sequence comprised in the polyprotein may comprise amino acid residues that are removed during cleavage/processing of the polyprotein (such as a signal sequence or a target site for a protease) and that are no longer present in the respective mature Norovirus protein. In the context of the present invention, the term "Norovirus protein" comprises both, the precursor amino acid sequence comprised in a Norovirus polyprotein (i.e. as part of a polypeptide chain optionally further comprising other viral proteins) as well as the respective mature individual Norovirus protein. For example, the term "Norovirus capsid protein VPI" as used herein may refer to an amino acid sequence in a Norovirus polyprotein corresponding to the precursor sequence of Norovirus capsid protein VPI (comprising, for example, a (C-terminal) signal sequence) as present in a Norovirus polyprotein as well as to a mature (separate) Norovirus capsid protein VPI (no longer comprising, for example, a (C-terminal) signal sequence).

Where reference is made to amino acid residues and their position in a Norovirus protein or in a Norovirus polyprotein, any numbering used herein - unless stated otherwise - relates to the position of the respective amino acid residue in a Norovirus polyprotein (precursor protein), wherein position "I" corresponds to the first amino acid residue, i.e. the amino acid residue at the N-terminus of a Norovirus polyprotein. More preferably, the numbering with regard to amino acid residues refers to the respective position of an amino acid residue in a Norovirus polyprotein, which is preferably derived from a Norovirus strain selected from the group consisting of Genogroup II Dr Genogroup I (abbreviated as GiI, or GI, respectively), more preferably from the group consisting of Genogroup II genotype 4 (abbreviated as GII.4) or Genogroup I genotype 1 (abbreviated as GII.4 and GI.l), or even more preferably the strain is selected from strain Norovirus strain GII.4 CIN-I or CIN-DD2.

Preferred Norovirus protein in the context of the invention may be any polypeptide comprising or consisting of an amino acid sequence according to any one of the following amino acid sequences from Genbank, or a fragment or variant of any of these sequences: AC0550B8, AFS33552, AFS33555, AFX7IGB5, BAI49904, BAI4B9I4, BAS02D83, CRL4G958, CRL4B973, ADB27D27, AGI9B397, AGXDI095, AGX0I098, AKI300B0, AGL984I3, ACT7BI45, ACT7BI48, ACT7BI5I, AED02034, AEXI0549, AFJ2I448, AFN0B72B, AFN0B727, AFN0B73I, AFNDB732, AFN0B733, AFN0B735, AFV0877I, AFV08777, AFV08795, AFX95940, AGI99552, AGK25912, AI0B858I, AII737I7, AII73735, AII7374I, AII73759, AII737B5, AII73780, AII73783, AIS400I9, AIY27747, BAG70437, BAUIB30B, ACY00BI5, ADK47I70, BAQ2080I, AAZ3I37B, ABI9798I, ABW74I28, ACCB9D23, ACL272B7, ACL272B8, ACL272B9, ACL3I322, ACN32270, ACU5G258, ACX858I0, AFBI80I0, AFBI80I3, AFK75854, AFNBI3I5, AF0005II, AHCI2G55, AHZI29I2, AIC32559, AI05I48B,

BAF458GI. BAF745D8, BAF74509, BAF745I2, BAF745I7, BAF745ZI, BAF95499, BAF955DI. BAFB55D5, BAG55289, BAGG87I3, BAGB88DI, BAH30707, BAL4D873. ADB279I4, ADT7BB84, AFJ385IB, AFJ385I9, AFWI5943, AGE99599, AGE99GI2, AGTI7839, AFX7IBB9. AGE99B07, AHI59IBB, BAR4229D. BARB3722, BASD2D84, CRL4B953, CRL4B9B2, ABDB3283, ACWI9927, ADQ43783. ADV37805, ADV379I9, AEI834G9, AEQ77282, AFA55I74, AFC89B5B, AFC89BG5, AFJG47D7, AFJD47D8. AFJ04709, AFP89593. AFU5573I. AFU927IQ, AGDB4D38. AGTG252I. AJZ77BB4, AJZ77DI5, AKE3I86I, ALDD9BI8. ALT54494, CCX28BI9. AGC9B535, ABYB7257, AHA9IB5B, KT3I57I8. KT59I50I. KT3I57QB, KR9ZI940. KX7B7083, LCI53I2I. LCI754B8. KY485I25, **KU55584I.** KP784B96, KP0G4D99. U7BD59, X8I879.

Preferred examples of Norovirus which may be used for providing the nucleic acid molecules of the invention may include Norovirus GII.4-03IB93-USA-ZBB3. Norovirus GII.4/Farmington Hills/ZBBZ/USA, Norovirus GII.4-ZB06b B9Z895-USA-ZBB8. Norovirus GII.4-GZZBI0-L87-Guangzhou-ZDII. Norovirus GII.4-USA-I997. Norovirus GI.I-USA-I9B8.

Further Preferred examples of Noroviruses which may be used for providing the nucleic acid molecules of the invention may include Norovirus Hu/GII.4/Dijon/E87Z/ZD02/FRA, Norovirus Hu/GII.4/NDI2D-I2/I987/USA, Norovirus **Hu/GII.I/7EK/Hawaii/IB7I/USA.** Norovirus Hu/GII.B/CHDC4D73/I984/USA, Norovirus Hu/GII.4/Hiroshima/I9/ZBOI/JPN. Norovirus Hu/GII.4/Hiroshima/B7/2GBB/JPN. Norovirus Hu/GII/JP/2BI5/GII.Pe_GII.4/Dsaka/DSF78. Norovirus GII/Hu/NL/2DI2/GIL4/Groningen, Norovirus GII/Hu/NL/2B!4/GII.2/Groningen. Norovirus Hu/GII.4/New Drleansl5DD/2DD8/USA, Norovirus **Hu/GII.G/Ohio/490/2012/USA.** Norovirus Hu/GII.3/Jingzhou/20I3402/CHN, Norovirus Hu/GII.4/Jingzhou/2DI34D3/CHN. Norovirus Hu/GII.I7/Gaithersburg/20I4/US, Norovirus Hu/GII.4/CI27/GF/I978. Norovirus Hu/GII.4/CHDC39G7/I988/US, Norovirus Hu/GII.4/CHDC4ID8/I987/US, Norovirus Hu/GII.4/CHDC487I/I977/US, Norovirus Hu/GII.3/CHDC52BI/I99Q/US, Norovirus **Hu/GII.3/Milwaukee009/ZDI0/USA.** Norovirus Hu/GII.4/Miranda/NSW8I7L/2DID/AU, Norovirus Hu/GII.Z/KLID9/MY/I978, Norovirus Hu/GIf.14/HK74/CN/J97S. Norovirus Hu/GIl.7/HK4/CN/I97B, Norovirus Hu/GII.I7/CI42/GF/I978. Norovirus Hu/GII.5/CI5/GF/I978. Norovirus Hu/GI.5/E57/UG/I975, Norovirus Hu/GII.4/Randwick/NSW882J/2QII/AU, Norovirus Hu/GII.4/BBrowra/NSW7G7L/2DI2/AU, Norovirus Hu/GII.4/Sydney/NSWB5I4/2DI2/AU. Norovirus Hu/GII.4/Hong Kong/CUHK3B3D/2DI2/CHN, Norovirus Hu/GII.4/VPII72/Shanghai/2DI2/CHN. Norovirus Hu/GII-4/New Taipei/CGMH6I/2DI2/TW. Norovirus GII/Hu/HKG/2DI3/GII.4/CUHK-NS-I4I, Norovirus GII/Hu/JP/2DDZ/GII.PIZ_GII.I3/Saitama/T8D, Norovirus GII/Hu/JP/2DDI/GII.PI2_GII.IZ/Saitama/TI5, Norovirus GII/Hu/JP/ZBD7/GII.P2I_GII.2I/, Kawasaki/YDZ84. Norovirus GII/Hu/JP/ZDD7/GII.PI5_GII.I5/ Sapporo/ HKZ99, Norovirus GI/Hu/JP/20D7/GI.P3J3I.3/Shimizu/KK28BB. Norovirus GII/Hu/JP/Z007/GII.P7_GII.I4/Fukuoka/KKZ8Z. Norovirus GI/Hu/JP/Z0D7/GI.P8_GI.8/Nagoya/KY53I, Norovirus Hu/GII.4/SJTDHI/CHN/ZDI4, Norovirus Hu/GII.4/variant Sydney Z0I2/FRA, Norovirus Hu/GII-4/Hokkaido4/ZDDB/JP. Norovirus GIV/Hu/Jp/2DDI/GIV.I/OCOIOI7D23, Norovirus Hu/GII.4/Beijing/53G7I/2DD7/CHN. Norovirus Hu/Il.4/220DBGI/HK/2DI0. Norovirus Hu/GII.4/Aichi3B8-I4/20I4, Norovirus **Hu/BfI.4/Hunter** 284E/D4D/AD. Norovirus Hu/GII-4/Dsaka/I998/JPN, Norovirus Hu/GI.I/P774.Delsjo20D4/Gothenburg/Sweden, Norovirus pig/GII.II/FI8-IO/2D05/CAN, Norovirus Hu/GII.4/Wellington/I995/USA, Norovirus Hu/ GII.4/ Henry/ ZOOO/ DSA, Norovirus **Hu/GII.4/SSCS/2DD5/USA.** Norovirus GII/Hu/IN/2DDG/GII.P4 _**GII.4**_ YErseke2DDBa/Pune-PC2I, Norovirus Hu/GI.I/P7-587/20D7/Stromstad/Sweden. Norovirus

Hu/GI.2/LeuvEn/2003/BEL Norovirus **Hu/GII.7/NSW743L/ZD08/AUS.** Norovirus Hu/GII.2/NF2DD2/USA/2002, Norovirus Hu/Gli.4/NF2DD3/USA/20D3, Norovirus **Hu/BII.3/1399.** Norovirus Hu/GIV.!/AhrBnshoop24G/0EU/20l2, Norovirus Hu/GII.4/XiWPI9/20IO/CHN, Norovirus Hu/GII.4/PA3G3/2DII/iTA, Norovirus **Hu/GH.4/P3/ZDIZ/Gothenburg/SwedBn.** Norovirus **Hu/BII.4/Tanger/TM687/2D(f/MAR.** Norovirus I2-X-2/20I2/GII.P22/GII.5, Norovirus Hu/GII.4/KobBQ34/2DDG/JP. Norovirus Hu/GGII.4/Ti ΒID0l/l995/NL. Norovirus **Hu/GGII.4/DenHaagOI5/200Q/NL.** Norovirus Hu/GGII.4/SchiedamDI8/2DDl/NL, Norovirus Hu/GGII.4/Apeldoorn023/2003/NL, Norovirus Hu/GGII.4/MiddelburgDD7/2Q04/NL, Norovirus Hu/GII-4/Matsudo/Q2l07l/2Q02/JP, Norovirus Hu/GII-4/Kaiso/D3D55G/2QD3/JP, Norovirus Hu/GII-4/Awa/04D354/2G04/JP, Norovirus Hu/GII.4/Apeldoorn3l7/2Q07/NL, Norovirus Hu/GII.2/Rotterdam39E/2002/NL, Norovirus **Hu/GII.4/RottBrdamPZD0/2005/NL** Norovirus **Hu/GII.4/StDckholm/I98B5/2D08/SE.** Norovirus **Hu/GII.G/DC04DB2VLP/2DD4/JP.** Norovirus Hu/GII.4/HSI94/2QD9/US. Norovirus Hu/GII.I2/HS2ID/20tO/USA, Norovirus Hu/GI.I/8Flla/l9B8/USA, Norovirus Hu/Gll.4/CHDC5I9I/I974/USA, Norovirus Hu/GII.4/N7B/2DID/HuZhou. Norovirus Hu/GII.B/S9c/I97B/SEN, Norovirus **Hu/GII.4/KL45/I97B/MYS.** Norovirus Hu/GII.4/NIHICI7.5/2DI2/USA, Norovirus Hu/GII.4/NIHIC9/2DII/USA, Norovirus Hu/Gll.4/Cl!0/I978/GUF, Norovirus Hu/GII.4/HSBB/2DDI/USA. Norovirus Hu/GII/JP/2DI5/GII.PI7_GII.I7/Kawasaki3D8. Norovirus Hu/GII/JP/2DI4/GII.PI7_GII.I7/Nagano8-l. Norovirus **Hu/GII/JP/2DI5/GII.Pe_GII.4/Dsaka/0SF78.** Norovirus **GI/Hu/NL/20ll/GI.4/GroningBn.** Norovirus GII/Hu/NL/20l4/GII.4/GroniogEnDI. Norovirus **Hu/BII.4/Kenepuru/NZ327/2DDB/NZL.** Norovirus Hu/GIU/Rathmines/NSW287R/2007/A0S, Norovirus Hu/GII.4/Turramurra/NSW892U/20D9/AUS, Norovirus HU/GII.4/SEOUI/0389/2D09/KDR, Norovirus Hu/GII.4/Seoul/0945/2D09/KDR, Norovirus **Hu/GII.I2/Shelby/2009/LISA.** Norovirus Hu/GI.7/TCH-DBD/USA/2003, Norovirus Hu/Gll.t/Ascension208/20IO/USA, Noravirus Hu/GII.I3/VAI73/20ID/USA. Norovirus Hu/GII.2l/Salisburyl50/20tl/USA. Norovirus Hu/Gll.4/I997/USA, Norovirus Hu/Gli.4/Farmiogton Hills/20D4/USA, Norovirus Hu/GII,4/MioErvs/2006/USA, Norovirus **Hu/GII.4/Dhio/7I/2DI2/USA.** Noravirus Hu/GII.4/AlbertaEI065/20ll/CA, Noravirus Hu/GII.4/SG4D5l-09/2DD9/SG, Noravirus Hu/GII.3/TCH-IQ4/USA/2DD2. Norovirus Hu/GI.B/TCH-099/USA/2D03, Norovirus 06-AM-**ll/2DDG/GII.4/YBPSBke/2DDGa.** Norovirus **09-BI-2/2D09/Bli.4/NewQHeans/2D09.** Norovirus **Hu/Gll.4/PR32B/20I3/ITA.** Norovirus Hu/GII.PI7_GII.I7/PRBB8/20I5/ITA, Noravirus **Hu/GII.4/AIbBrtaSPI/20I3/CA.** Norovirus **HU/GII.4/CBD007B92/2DII/UK.** Norovirus Hu/GII.B/GZ2DID-L9B/Guangzhou/CHN/2DII, Norovirus **Bo/GIII.I/Aba-**Z5/2QD2/HUN. Norovirus GI.9, Norovirus Ho/GII.!7/CUHK-NS-G70/HKG/2D15, Norovirus **GII/Hu/SI/2DI5/GII.I7/LiubljanalGB2.** Norovirus **Hu/GII.I7/CUHK-NS-G47/HKB/2DI5.** Norovirus Hu/GII.2l/CUHK-NS-B09/HKG/2DI5. Norovirus **Hu/BII.4/MelbourneBB23/2DIB/AUS.** Noravirus **GII/Hu/JP/2DIG/GII.PIG_GII.4**_ Sydney2D12/0HfBDD2, Norovirus Hu/GII/JP/20IG/GII.PIB_GII.4_ Sydney20l2/Kawasakil94, Norovirus **IGF2I49_GII.2_Guangdong_CHN_20IG.** Norovirus Hu/GII.I7/C0HK-NS-8G4/HKG/20IB, Norovirus Gll/Hu/ZAF/20I2/GII.P4_GII.4/ CapBTowo/9772. Norovirus GII.I2, Snow Mountain virus. Human calicivirus strain Mslksham.

Preferred ExamplBS of NorovirusBS which may be used for providing the nucleic acid molecules of the invention are provided in Table I (Column B "Strain/Isolate"). Even mor B preferred examples of Noroviruses which may be used for providing the nuc!eic acid molecules of the invention are provided in Table 3 (Column I "Strain/Isolate").

The nucleic acid and corresponding amino acid sequences of each are all incorporated by reference in their entirety. In some embodiments, a cryptogram can be used for identification purposes and is organized: host species from which the virus was isolated/genus abbreviation/species abbreviation/strain name/year of occurrence/country of origin. (Green et al., Human Caliciviruses, in Fields Virology Vol. I 841-874 (Knipe and Howley, editors-in-chief, 4th ed„ Lippincott Williams S Wilkins 2001)). Use of a combination of Norovirus genogroups such as a genogroup I.I (Norwalk virus) and 11.4 (f.e. Houston virus) or other commonly circulating strains, or synthetic constructs representing combinations or portions thereof are preferred in some embodiments. New strains of Noroviruses are routinely identified (Centers for Disease Control, Morbidity and Mortality Weekly Report, 56(33):842-846 (2007)) and consensus sequences of two or more viral strains may also be used to express Norovirus antigens.

In some embodiments described herein, the at least one polypeptide encoded by the at least one coding region of the artificial nucleic acid may consist of an individual Norovirus protein, the amino acid sequence of which does typically not comprise an N-terminal methionine residue. It is thus understood that the phrase "polypeptide consisting of Norovirus protein ..." relates to a polypeptide comprising the amino acid sequence of said Norovirus protein and - if the amino acid sequence of the respective Norovirus protein does not comprise such an N-terminal methionine residue - an N-terminal methionine residue.

Norovirus sequences:

According to a preferred embodiment, the inventive artificial nucleic acid comprises at least one coding region encoding at least one polypeptide comprising or consisting of at least one Norovirus protein as described herein, wherein the at least one Norovirus protein comprises an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences.

In one embodiment, the term "sequence", "sequence of the invention", "artificial nucleic acid" or "artificial nucleic acid of the invention" refers to any one of SEQ ID NOs: I-39B90, 337I3-3B746.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one encoded polypeptide comprising

(i) at least one of the amino acid sequences according to any one of SEQ ID NOs: 1-4410; and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 58%, 60%, 81%, 82%, 83%, 84%, 85%, 66%, 87%, 88%, 89%, 70%, 71%, 72%, 73%, 74%, 75%, 78%, 77%, 78%, 78%, 80%, 81%, 82%, 83%, 84%, 85%, 88%, 87%, 88%, 88%, 80%, 91%, 82%, 83%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the amino acid sequence represented by any one of SEQ ID NOs: 1-4410; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NOs: 1-33890, 39713-39748; and/or a fragment or variant of any of these sequences.

In another embodiment the artificial nucleic acid of the invention comprises at least one coding region comprising

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 44II-396B0, 3[illegible]7I3-3[illegible]74[illegible]; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%. 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 5[illegible]%, 60%. 61%, 62%, 63%. 64%, 65%, 66%, 67%, 68%, 6[illegible]%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 70%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 8[illegible]%, 00%, [illegible]1%, [illegible]2%, 93%, [illegible]4%, [illegible]5%, 9B%, 97%, 98%, or 9[illegible]% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 44[illegible]-39[illegible]0, 3[illegible]3-3[illegible]; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SEQ ID NOs: 1-4410, and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NOs: 1-30690, 39713-39746: and/or a fragment or variant of any of these sequences.

In the context of the present invention a fragment of a protein or a variant thereof encoded by the at least one coding sequence of the artificial nucleic acid according to the invention may typically comprise an amino acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 8[illegible]%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with an amino acid sequence of the respective naturally occurring full-length protein or a variant thereof, preferably as disclosed in Table I, column [illegible]. column 2 or column 3, more preferably as disclosed in Table 3, column [illegible], column 2, column 3.

In a preferred embodiment, the at least one coding sequence of the artificial nucleic acid sequence according to the invention preferably encodes Norovirus proteins selected from the proteins provided in Table [illegible], or a fragment or variant thereof. Any Norovirus protein provided in Table [illegible], or any a fragment or variant thereof, can cause an immune response when administered to an individual. Therefore, all Norovirus proteins provided in Table [illegible] and Table 3 can be considered as preferred Norovirus antigens in the context of the present invention.

It is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes a Norovirus protein or peptide, or a fragment or variant thereof, wherein the Norovirus protein or peptide is an antigen selected from the antigens listed in Table I. Therein, each row (row I - row 4410) corresponds to a Norovirus protein or antigen as identified by the respective gene name (first column, column I "Name") and the database accession number of the corresponding protein (second column, column 2 "NCBI or Genbank Accession No."). The third column, column 3 ("A") in Table I indicates the SED ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type nucleic acid sequence encoding the Norovirus protein or peptide is indicated in the fourth column, column 4 ("B"), The fifth column, column 5 ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the nucleic acid sequences as described herein that encode the Norovirus protein or peptide preferably having the

amino acid sequence as defined by the SED ID NDs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Denbank Accession No.").

In this context it is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes at least one Nnrovirus protein or peptide which is derived from Norovirus polyprotein, or a fragment or variant thereof, wherein the Norovirus polyprotein is selected from the Nnrovirus polyprotein amino acid sequences listed in Table I. Therein, each row corresponds to a Norovirus polyprotein as identified by the respective gene name (first column "Name", derived from NCBI or Genbank) and the database accession number of the corresponding protein (second column "NCBI or Benbank Accession No."). The third column ("A") in Table I indicates the SED ID NDs corresponding to the respective amino acid sequence as provided herein. The SED ID NDs corresponding to the nucleic acid sequence of the wild type nucleic acid encoding the Norovirus protein or peptide is indicated in the fourth column ("B"). The fifth column ("C") provides the SED ID NDs corresponding to modified nucleic acid sequences of the nucleic acids as described herein that encode the Norovirus protein or peptide preferably having the amino acid sequence as defined by the SEQ ID NDs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accessioo No.").

Particularly preferred in this context are the Norovirus polyprotein and nucleic acid sequences according to SEQ ID NDs: 397I3-3374G.

In specific embodiments the Norovirus protein or peptide is derived from a Norovirus capsid protein VPI according to SEQ ID NOs: 1-4410.

In this context it is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes at least one Norovirus protein or peptide which is derived from Norovirus capsid protein VPI, or a fragment or variant thereof, wherein the Norovirus capsid protein VPI is selected from the Norovirus capsid protein VPI amino acid sequences listed in Table I. Therein, each row corresponds to a Norovirus capsid protein VPI as identified by the respective gene name (first column "Name") and the database accessinn number of the corresponding protein (second column "NCBI or Genbank Accession No"). The third column ("A") in Table I indicates the SEQ ID NDs corresponding to the respective amino acid sequence as provided herein. The SED ID NDs corresponding to the nucleic acid sequence of the wild type RNA encoding the Norovirus antigen is indicated in the fourth column ("B"). The fifth column ("C") provides the SED ID NDs corresponding to modified nucleic acid sequences of the RNAs as described herein that encode the Norovirus antigen preferably having the amino acid sequence as defined by the SEQ ID NDs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accession No").

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of at least one coding sequence encoding at least one Norovirus protein or peptide as described herein. Preferably, the inventive artificial nucleic acid comprises

or consists of a coding sequence according to any one of SEQ ID NOs: 44II-3BG9D. 39713-30746, or a homolag, fragment or variant of any of these sequences (see Table I, column "B" and "C").

Accordingly, in another embodiment, a nucleic acid molecule of the invention is at least 15, 2D, 25 or 30 nucleotides in length. Preferably, it hybridizes under stringent conditions to a nucleic acid molecule comprising a nucleotide sequence of the nucleic acid molecule of the present invention or used in the methods of the present invention. The nucleic acid molecule is preferably at least 20, 30, 50, IDD, 250 or more nucleotides in length.

In a preferred embodiment, the present invention thus provides artificial nucleic acid sequences comprising at least one coding sequence, wherein the coding sequence encoding Norovirus capsid protein VPI comprises or consists any one of the nucleic acid sequences defined in Table I, preferably in the fourth or fifth column (column "B" or "C", respectively) of Table I, or a fragment or variant of any one of these sequences.

In particularly preferred embodiments the nucleic acid sequence comprises or consists of at least one coding sequence encoding Norovirus capsid protein VPI according to SEQ ID NDs: 44II-3969D, 39713-39746.

In these context it is particularly preferred that the nucleic acid sequence according to the invention comprises at least one coding sequence encoding Norovirus capsid protein VPI comprising a nucleic acid sequence selected from sequences being identical or at least 50%. 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to the nucleic acid sequences as disclosed in Table I, preferably in the fourth or fifth column (column "B" or "C", respectively) of Table I or a fragment or variant thereof.

According to a particularly preferred embodiment, the present invention provides an nucleic acid sequence as defined herein comprising at least one coding sequence encoding at least one Norovirus peptide or protein derived from Norovirus capsid protein VPI, wherein the coding sequence comprises or consists of any one of the (modified) nucleic acid sequences defined in the Column "C" of Table I, or of a fragment or variant of any one of these sequences.

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of at least one coding sequence encoding at least one Norovirus protein or peptide as described herein, wherein the at least one Norovirus protein comprises an amino acid sequence according to any one of SEQ ID NDs: 1-4410, or a homolog, fragment or variant of any of these sequences (see Table I, third column, column "A"). According to a preferred embodiment, the inventive artificial nucleic acid comprises at least one coding sequence encoding at least one protein or peptide derived from a Norovirus, or a fragment or variant thereof, wherein the Norovirus protein or peptide preferably comprises or consists of any one of the amino acid sequences defined in the third column (column "A") of Table I, or a fragment or variant of any one of these sequences. In other words, the at least one coding sequence preferably encodes a Norovirus protein comprising or consisting of an amino acid sequence selected from the group consisting of SEQ ID NOs: 1-4410.

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, G0%, 70%, 80%, 85%, 86%, 87%, 88%, 83%, 80%, 91%, **02%.** 93%. 94%, 95%. 9G%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (G/C modified) RNA sequences defined in the fifth column (column "C") of Table I, or of a fragment or variant of any one of these sequences.

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%. preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Table I, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the at least one coding sequence of the RNA sequence according to the invention comprises or consists of an nucleic acid sequence having a sequence identity of at least 80% with any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Tables I, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the present invention provides an nucleic acid sequence as defined herein comprising at least one coding sequence encoding at least one Norovirus peptide or protein derived from Norovirus capsid protein VPI, wherein the coding sequence comprises or consists of any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Table I, or of a fragment or variant of any one of these sequences.

Norovirus peptide or protein derived from Norovirus capsid protein VPI, wherein the coding sequence comprises or consists of any one of the (codon optimized) RNA sequences defined in the fifth column (column "C") of Table I, or of a fragment or variant of any one of these sequences.

Accordingly, in another embodiment, a nucleic acid molecule of the invention is at least 15, 20, 25 or 30 nucleotides in length. Preferably, it hybridizes under stringent conditions to a nucleic acid molecule comprising a nucleotide sequence of the nucleic acid molecule of the present invention or used in the methods of the present invention, e.g. comprising the sequence shown in SEQ ID NOs: 4411-39690, 39713-39746. The nucleic acid molecule is preferably at least 20. 30, 50, 100, 250 or more nucleotides in length.

In one Embodiment of the invention, a complement sequence derived from SEQ 10 NDs: 4411-39690, 39713-39746, or a fragment or variant thereof is used in the hybridization. Preferably, a complement of a nucleic acid molecule of the invention that hybridizes under stringent conditions to a sequence shown in SEQ ID NDs: 4411-39690. 39713-39746 correspond to a naturally-occurring nucleic acid molecule of the invention. As used herein, a "naturally-occurring" nucleic acid molecule refers to an RNA or DNA molecule having a nucleotide sequence that occurs in nature (e.g., encodes a natural protein).

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%. 80%, 85%, 86%, 87%, 88%, 89%, 90%. 91%, 92%, 93%, 94%, 95%, 96%, 97%, 88%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (codon optimized) RNA sequences defined in the fifth column 5 (column "C") of Table 1, or of a fragment or variant of any nne of these sequences.

In the context of the present invention, a "fragment" of an amino acid sequence, such as a polypeptide or a protein, e.g. the at least one Norovirus protein as described herein, may typically comprise a sequeoce of a protein or peptide as defined herein, which is, with regard to its amino acid sequence (or the respective coding nucleic acid molecule), N-terminally and/or C-terminally truncated compared to the amino acid sequence of the original (native) protein (or respective coding nucleic acid molecule). Such truncation may thus occur either on the amino acid level or correspondingly on the nucleic acid level. A sequence identity with respect to such a fragment as defined herein may therefore preferably refer to the entire protein or peptide as defined herein or to the entire (coding) nucleic acid molecule of such a protein or peptide.

Preferably, a fragment of an amino acid sequence comprises or consists of a continuous stretch of amino acid residues corresponding to a continuous stretch of amino acid residues in the protein the fragment is derived from, which represents at least 5%, 10%, 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, and most preferably at least 8D% of the total (i.e. full-length) protein, from which the fragment is derived.

In the context of the present invention, a fragment of a protein or of a peptide may furthermore comprise a sequence of a protein or peptide as defined herein, which has a length of for example at least 5 amino acids, preferably a length of at least 6 amino acids, preferably at least 7 amino acids, more preferably at least 8 amino acids, even more preferably at least 9 amino acids: even more preferably at least 10 amino acids: even more preferably at least II amino acids: even more preferably at least 12 amino acids: even more preferably at least 13 amino acids: even more preferably at least 14 amino acids: even more preferably at least 15 amino acids: even more preferably at least 16 amino acids: even more preferably at least 17 amino acids: even more preferably at least 18 amino acids; even more preferably at least 19 amino acids; even more preferably at least 20 amino acids; even more preferably at least 25 amino acids; even more preferably at least 30 amino acids; even more preferably at least 35 amino acids; even more preferably at least 50 amino acids; or most preferably at least ID0 amino acids. For example such

fragment may have a length of about 6 to about 2D or even more amino acids, e.g. fragments as processed and presented by MHC class I molecules, preferably having a length of about 8 to about ID amino acids, e.g. 8, 9, or ID, (or even 6, 7, II, or 12 amino acids), or fragments as processed and presented by MHC class II molecules, preferably having a length of about 13 or more amino acids, e.g. 13, 14, 15, IB, 17, 18, 19, 2D or even more amino acids, wherein these fragments may be selected from any part of the amino acid sequence. These fragments are typically recognized by T-cells in form of a complex consisting of the peptide fragment and an MHC molecule, i.e. the fragments are typically not recognized in their native form. Fragments of proteins or peptides may comprise at least one epitape of those proteins or peptides. Furthermore also domains of a protein, like the extracellular domain, the intracellular domain or the transmembrane domain and shortened or truncated versions of a protein may be understood to comprise a fragment of a protein.

As used herein, a "variant" of a protein or a peptide may be generated, having an amino acid sequence, which differs from the original sequence in one or more mutation(s), such as one or more substituted, inserted and/or deleted amino acid(s). Preferably, these fragments and/or variants have the same biological function or specific activity compared to the full-length native protein, e.g. its specific antigenic property. "Variants" of proteins or peptides as defined in the context of the present invention may comprise conservative amino acid substitution(s) compared to their native, i.e. non-mutated physiological, sequence. Those amino acid sequences as well as their encoding nucleotide sequences in particular fall under the term variants as defined herein. Substitutions in which amino acids, which originate from the same class, are exchanged for one another are called conservative substitutions. In particular, these are amino acids having aliphatic side chains, positively or negatively charged side chains, aromatic groups in the side chains or amino acids, the side chains of which can enter into hydrogen bridges, e.g. side chains which have a hydroxyl function. This means that e.g. an amino acid having a polar side chain is replaced by another amino acid having a likewise polar side chain, or, for example, an amino acid characterized by a hydrophobic side chain is substituted by another amino acid having a likewise hydrophobic side chain (e.g. serine (threonine) by threonine (serine) or leucine (isoleucine) by isnleucine (leucine)). Insertions and substitutions are possible, in particular, at those sequence positions which cause no modification to the three-dimensional structure or do not affect the binding region. Modifications to a three-dimensional structure by insertion(s) or deletion(s) can easily be determined e.g. using CD spectra (circular dichroism spectra) (Urry, 1985, Absorption, Circular Dichroism and DRD of Polypeptides, in: Modern Physical Methods in Biochemistry, Neuberger et al. (ed.), Elsevier, Amsterdam).

In the context of the present invention, a "variant" of a protein or peptide may have at least 50%, 51%, 52%, 53%, 54%, 55%, 5B%, 57%, 58%, 59%, B0%, 61%. B2%, 63%, 64%. 65%. 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%. 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 60%. 91%. 92%. 93%, 94%, 95%, 96%, 97%, 98%, or 99% amino acid identity over a stretch of at least ID, at least 20, at least 30, at least 5D, at least 75 or at least 100 amino acids of such protein or peptide. More preferably, a "variant" of a protein or peptide as used herein is at least 40%, preferably at least 50%, more preferably at least 60%, more preferably at least 70%, even more preferably at least 80%, even more preferably at least 90%. most preferably at least 95% identical to the protein or peptide, from which the variant is derived.

Alternatively or additionally, a protein of the invention, a capsid protein, a Norovirus capsid protein VPI or a Norovirus capsid protein VP2 as defined herein refers to any polypeptide being identical or having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%. 57%, 58%, 59%, BD%, Gl%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%. 74%, 75%, 76%, 77%, 78%, 79%, 80%. 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%. 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more amino acid sequence identity to the protein of the invention, a capsid proteio, a Norovirus capsid protein VPI or a Norovirus capsid protein VP2 as represented by SEQ ID NOs: 1-4410, or to any of the full length polypeptide sequences given in SEQ ID NOs: 1-4410.

Furthermore, variants of proteins or peptides as defined herein, which may be encoded by a nucleic acid, may also comprise those sequences, wherein nucleotides of the encoding nucleic acid sequence are exchanged according to the degeneration of the genetic code, without leading to an alteration of the respective amino acid sequence of the protein or peptide, i.e. the amino acid sequence or at least part thereof may not differ from the original sequence in one or more mutatioo(s) within the above meaning.

According to a preferred embodiment, the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one nucleic acid sequence according to any one of SE0 ID NOs: 4411-39690, 39713-39746, or a fragment or variant of any of these sequences.

As used herein, a "fragment" of a nucleic acid sequence comprises or consists of a continuous stretch of nucleotides corresponding to a continuous stretch of nucleotides in the full-length nucleic acid sequence which is the basis for the nucleic acid sequence of the fragment, which represents at least 20%. preferably at least 30%. more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, even more preferably at least 80%, and most preferably at least 90% of the full-length nucleic acid sequence. Such a fragment, in the sense of the present invention, is preferably a functional fragment of the full-length nucleic acid sequence.

In the context of the present invention, the phrase "variant of a nucleic acid sequence" typically relates to a variant of a nucleic acid sequence, which forms the basis of a nucleic acid sequence. For example, a variant nucleic acid sequence may exhibit one or more nucleotide deletions, insertions, additions and/or substitutions compared to the nucleic acid sequence, from which the variant is derived. Preferably, a variant of a nucleic acid sequence is at least 40%, preferably at least 50%. more preferably at least 60%, more preferably at least 70%, even more preferably at least 80%, even more preferably at least 90%, most preferably at least 95% identical to the nucleic acid sequence the variant is derived from. Preferably, the variant is a functional variant. A "variant" of a nucleic acid sequence may have at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%. 66%, 67%, 68%. 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% nucleotide identity over a stretch of at least 10, at least 20, at least 30, at least 50, at least 75 or at least 100 nucleotides of such nucleic acid sequence.

Alternatively or additionally, a nuclBic acid sequence encoding a protein of the invention, a capsid protein, a Norovirus capsid protein VPI or a Norovirus capsid protein VP2 as defined herein refers to any nucleic acid sequence having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%. 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the nucleic acid sequence as represented by SEQ ID NOs: 4411-39690, 39713-39746, or to any of the full length polypeptide sequences given in SEQ. ID NOs: I-4410.

Preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of Norovirus capsid protein VPI, or a fragment or variant thereof. More preferably, the at least one encoded polypeptide comprises or consists of an amino acid sequence according to any one of SED ID NOs: 1-4410, or a fragment or variant of any of these sequences.

Alternatively or additionally, a nucleic acid sequence encoding a Norovirus capsid protein VPI as defined herein refers to any nucleic acid sequence being identical or having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%. 59%, 60%, 61%, 62%, 63%, 64%, 65%. 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%. 74%. 75%, 76%, 77%, 78%, 79%, 80%. 81%. 82%. 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the full-length nucleic acid sequence as represented by SED ID NOs: 4411-39690, 39713-39746.

In certain embodiments, the at least one encoded polypeptide comprises or consists of a fragment of Norovirus capsid protein VPI or a variant of such a fragment. Preferably, the at least one encoded polypeptide comprises or consists of a C-terminal fragment of Norovirus capsid protein VPI, or a variant of such a fragment. In another embodiment, the at least one encoded polypeptide comprises or consists of an N-terminal fragment of Norovirus capsid protein VPI, or a variant of such a fragment.

Preferably, the at least one encoded polypeptide comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of a Norovirus capsid protein VPI as present in a Norovirus polyprotein (precursor protein) before cleavage. In the context of the present invention, the phrase "Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage" typically refers to a continuous amino acid sequence beginning at the N-terminus of a Norovirus polyprotein (before cleavage) and comprising the amino acid residue immediately N-terminal of the first amino acid residue of a precursor of Norovirus pr protein as present in the Norovirus polyprotein. In other words, the phrase "Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage" may refer to a part of a Norovirus polyprotein corresponding to Norovirus capsid protein VPI comprising a C-terminal fragment, preferably a C-terminal signal sequence, which is typically not present in mature Norovirus protein VPI. For example, a 'Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage' as used herein may comprise an amino acid sequence derived from an amino acid sequence corresponding to amino acid residues 1 to 122 of a Norovirus polyprotein before cleavage. According to a preferred embodiment, a Norovirus capsid protein VPI as

present in a Norovirus polyprotein before cleavage comprises an amino acid sequence according to any one of SEQ ID NDs: I-4410, or a fragment or variant of any of these sequences.

Hence, a "C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VPI as present in a Norovirus pnlyprotein (precursor protein) before cleavage" preferably comprises an amino acid sequence corresponding to a continuous amino acid sequence, which is located immediately N-terminal of Norovirus pr protein in a Norovirus polyprotein before cleavage, or to a fragment or variant of said amino acid sequence. Preferably, the C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VPI as present in a Nnrovirus polyprotein (precursor protein) before cleavage comprises or consists of at least 3, 4, 5, G, 7, 8, 9, or, most preferably, at least ID amino acid residues. Alternatively, the C-terminal fragment, nr a variant of such a fragment, of Norovirus capsid protein VPI as present in a Norovirus polyprotein (precursor protein) before cleavage may consist of 3 to 4D, 3 to 3D, 3 to 2D, 5 to 2D or ID to 2D amino acid residues.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence, or a fragment or variant thereof.

As used herein, the term "signal sequence" preferably refers to an amino acid sequence, which is involved in the targeting of a protein, e.g. a Norovirus protein, to a cellular compartment, preferably a membrane, more preferably a membrane of the endoplasmic reticulum (ER). A signal sequence in the context of the present invention preferably comprises from 3 to 4D, 3 to 3D, 3 to 2D, 5 to 20 or 10 to 2D amino acid residues. Such a signal sequence may be present, for example, in a Norovirus polyprotein and may be removed during processing of said polyprotein. A signal sequence is preferably no longer present in a mature Norovirus protein. For example, Norovirus capsid protein VPI as present in a Norovirus polyprotein typically comprises a C-terminal signal sequence, corresponding to the amino acid sequence immediately N-terminal of Norovirus pr protein (e.g. amino acid residues ID5 to 122 in a Nnrovirus polyprotein before cleavage). That signal sequence is involved in targeting Norovirus capsid protein VPI to the ER membrane and is typically removed in order to yield mature Norovirus capsid protein VPI, which no longer comprises said C-terminal fragment comprising a signal sequence.

Preferably, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof, comprises at least 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 19 or at least 2D amino acid residues. Alternatively, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof may consist of 3 to 4D, 3 to 30, 3 to 2D, 5 to 20 or ID to 2D amino acid residues. Most preferably, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof consists of from 3 to 2D amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence, which comprises or consists of an amino acid sequence that is bound by signal recognition particle (SRP). More preferably, the at least one amino

acid sequence derived from a signal sequence comprises or consists of an amino acid sequence that is recognized by signal peptide peptidase (SPP), by a viral protease and/or by furin or a furin-like protease. Most preferably, the at least one amino acid sequence derived from a signal sequence comprises an amino acid sequence that is recognized by a viral protease comprising one or more of a Norovirus non-structural protein selected from the group consisting of NSI/NS2, NS3, NS4, NS5, NSB. and NS7.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence of a secretory protein or from a signal sequence of a membrane protein. More preferably, the at least one amino acid sequence derived from a signal sequence, preferably derived from a signal sequence of a membrane protein, targets the at least one encoded protein to a cellular compartment, preferably to the endoplasmic reticulum (ER), more preferably to the ER membrane.

It is further preferred that the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence corresponding to a signal sequence from a Norovirus protein, preferably from Norovirus capsid protein VPI, more preferably from Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage, or a fragment or variant of any of these.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence corresponding to a signal sequence from Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage, or a fragment or variant thereof, wherein the signal sequence is preferably derived from a C-terminal fragment of Norovirus capsid protein VPI as present in a Norovirus polyprotein before cleavage, preferably as described herein.

According to another preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of a mature Norovirus protein, preferably of a mature Norovirus capsid protein VPI. In this context, it is preferred that the mature Norovirus protein is a mature Norovirus protein as defined herein.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VPI, wherein the mature Norovirus capsid protein VPI does preferably not comprise a C-terminal signal sequence as described herein with respect to a Norovirus capsid protein VPI as present in a Norovirus polyprotein (before cleavage). More preferably, the mature Norovirus capsid protein VPI comprises or consists of an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant thereof.

Preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a C-terminal fragment, preferably as defined herein, or a variant of such a fragment, of mature Norovirus capsid protein VPI.

Preferably, the C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VPI comprises or consists of at least 3, 4, 5, 6, 7. 8, 9, or, most preferably, at least ID amino acid residues. Alternatively, the C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VPI may comprise or consist of 3 to 40, 3 to 3D, 3 to 2D, 3 to ID, 5 to 2D or 10 to 20 amino acid residues.

According to another embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence derived from a

a) a C-terminal fragment, or a variant of such a fragment, of a mature Norovirus capsid protein VPI, preferably as defined herein

and

b) a C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VPI as present in a Norovirus polyprotein (precursor protein) before cleavage, preferably as defined herein; or

a signal sequence, or a fragment or variant thereof, preferably as defined herein.

Therein, the amino acid sequence according to a) may be in continuation with the amino acid sequence according to b), wherein the sequences may be positioned relative to each other in any manner. Alternatively, the amino acid sequences according to a) and b) may be separated in the at least one encoded protein by another amino acid sequence. Most preferably, the amino acid sequence according to a) is located N-terminally with respect to b).

According to a preferred embodiment, the at least **Dne** polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence corresponding to a fragment of Norovirus non-structural protein I (NSI/2), or a variant of such a fragment.

As used herein, the term "fragment of Norovirus non-structural protein I (NSI/2)" preferably relates to a continuous amino acid sequence derived from Norovirus non-structural protein I (NSI/2), or to a fragment or variant of said continuous amino acid sequence.

Preferably, the fragment, or variant thereof, of Norovirus non-structural protein I (NSI/2) comprises or consists of at least 3, 4, 5, G, 7, 8, 9, or, most preferably, at least 10 amino acid residues. Alternatively, the fragment, or variant thereof, of Norovirus non-structural protein I (NSI/2) may comprise or consist of 3 to 40, 3 to 30. 3 to 20, 3 to 10, 5 to 2D or 10 to 2D amio0 acid residues. Most preferably, the fragment, or variant thereof, of Norovirus non-structural protein I (NSI/2) comprises or consists of from 3 to 20 amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence corresponding to an N-terminal fragment of Norovirus non-structural protein 1 (NSI/2). or a variant of said fragment.

In the context of the present invention, the term "N-terminal fragment of Norovirus non-structural protein I (NSI/2)" relates to a continuous amino acid sequence derived from the N-tBrminus of Norovirus non-structural protein I (NSI/2). More preferably, the N-terminal fragment of Norovirus non-structural protein I (NSI/2) comprises or consists of from 3 to 2D amino acid residues. In a preferred embodiment, the at least one encoded polypeptide comprises an N-terminal fragment of Norovirus non-structural protein 1 (NSI/2), wherein the N-terminal fragment of Norovirus non-structural protein I (NSI/2) is a continuous amino acid sequence comprising or consisting of 3 to 2D amino acid residues corresponding to a continuous amino acid sequence of 3 to 2D amino acid residues in the first 2D amino acid residues (counting from the N-terminus) of Norovirus non-structural protein I (NSI/2), or a variant thereof.

In one embodiment, the at least one encoded polypeptide comprises or consists of an N-terminal fragment of Norovirus non-structural protein 1 (NSI/2), wherein the N-terminal fragment of Norovirus non-structural protein 1 (NSI/2) is a continuous amino acid sequence comprising or consisting of 3 to 20 amino acid residues corresponding to a continuous amino acid sequence of 3 to 2D amino acid residues in the first 2D amino acid residues (counting from the N-terminus) of a mature Norovirus non-structural protein I (NSI/2), or a variant thereof. Therein, the first 2D amino acid residoes of a mature Norovirus non-structural protein I (NSI/2) preferably comprise or consist of the N-terminus itself (i.e. the amino acid residue at the N-terminus) and the I9 following amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises a first Norovirus protein, which is preferably a Norovirus protein as described herein, or a fragment or variant thereof, and further comprises at least one second or further Norovirus protein, or a fragment or variant thereof, wherein the at least one second or further Norovirus protein, or the fragment or variant thereof, is distinct from the first Norovirus protein, or the fragment or variant thereof.

In that embodiment, the first Norovirus protein is preferably selected from the groop consisting of Norovirus NSI/NS2, NS32A, NS42B, NS53, NSG4A, NS4B or NS75, or a fragment or variant thereof. Preferably, the second or further Norovirus protein is selected from the group consisting of Norovirus capsid protein VPI, Norovirus capsid protein VP2 and a Norovirus non-structural protein, preferably Norovirus NSI/NS2, NS3, NS4, NS5, NS6, or NS7, or a fragment or variant thereof.

More preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises Norovirus capsid protein VPI and/or VP2, or a fragment or variant thereof, and further comprises at least one of the following:

a) an amino acid sequence corresponding to a C-terminal fragment, or a variant thereof, of mature Norovirus capsid protein VP1, preferably as described herein;

b) an amino acid sequence corresponding to a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus polyprotein before cleavage, preferably as described herein;

c) an amino acid sequence corresponding to an N-terminal fragment, or a variant thereof, of Norovirus non-structural protein 1 (NS1/NS2), preferably as described herein; and/or

d) an amino acid corresponding to a fragment of Norovirus NS1/NS2, NS3, NS4, NS5, NS6, or NS7.

In a further embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of, preferably in this order from N-terminus to C-terminus, Norovirus capsid protein VP1, or a fragment or variant thereof,

and Norovirus non-structural protein 1 (NS1/NS2), or a fragment or variant thereof.

According to a preferred embodiment, the inventive artificial nucleic acid is monocistronic, bicistronic or multicistronic.

Preferably, the inventive artificial nucleic acid is monocistronic. In that embodiment, the inventive artificial nucleic acid comprises one coding region, wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins, preferably as defined herein, or a fragment or variant thereof.

Alternatively, the inventive artificial nucleic acid can be bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one different Norovirus protein, preferably as described herein, or a fragment or variant of any one of these proteins. For example, the inventive artificial nucleic acid may comprise two coding regions, wherein the first ending region encodes a first polypeptide comprising a first Norovirus protein, or a fragment or variant thereof, and wherein the second coding region encodes a second polypeptide comprising a second Norovirus protein, or a fragment or variant thereof, wherein the first and second Nnrovirus proteins or a fragment or variant thereof are distinct from each other.

The inventive artificial nucleic acid may be provided as DNA or as RNA, preferably an RNA as defined herein. More preferably, the inventive artificial nucleic acid is an artificial mRNA.

The inventive artificial nucleic acid may further be single stranded or double stranded. When provided as a double stranded nucleic acid, the inventive artificial nucleic acid preferably comprises a sense and a corresponding antisense strand.

Preferably, the inventive artificial nucleic acid as defined herein typically comprises a length of about 50 to about 20000, or 100 to about 20000 nucleotides, preferably of about 25D to about 20000 nucleotides, more preferably of about 500 to about 10000, even more preferably of about 500 to about 5000.

Nucleic acid modifications:

According to one embodiment, the inventive artificial nucleic acid as defined herein, may be in the form of a modified nucleic acid, preferably a modified mRNA, wherein any modification, as defined herein, may be introduced into the inventive artificial nucleic acid. Modifications as defined herein preferably lead to a stabilized artificial nucleic acid, preferably a stabilized artificial RNA, of the present invention.

According to one embodiment, the inventive artificial nucleic acid, preferably an mRNA, may thus be provided as a "stabilized nucleic acid", preferably as a "stabilized mRNA", that is to say as a nucleic acid, preferably an mRNA, that is essentially resistant to in vivo degradation (e.g. by an exo- or endo-nuclease). Such stabilization can be effected, for example, by a modified phosphate backbone of an artificial mRNA of the present invention. A backbone modification in connection with the present invention is a modification in which phosphates of the backbone of the nucleotides contained in the mRNA are chemically modified. Nucleotides that may be preferably used in this connection contain e.g. a phosphorothioate-modified phosphate backbone, preferably at least one of the phosphate oxygens contained in the phosphate backbone being replaced by a sulfur atom. Stabilized artificial nucleic acids, preferably mRNAs, may further include, for example: non-ionic phosphate analogues, such as, for example, alkyl and aryl phosphonates, in which the charged phosphonate oxygen is replaced by an alkyl or aryl group, or phosphodiesters and alkylphosphotriesters, in which the charged oxygen residue is present in alkylated form. Such backbone modifications typically include, without implying any limitation, modifications from the group consisting of methylphosphonates, phosphoramidates and phosphorothioates (e.g. cytidine-5'-0-(l-thiophosphate)).

In the following, specific modifications are described, which are preferably capable of "stabilizing" the inventive artificial nucleic acid, preferably an mRNA, as defined herein.

Chemical modifications:

The terms "nucleic acid modification" as used herein may refer to chemical modifications comprising backbone modifications as well as sugar modifications or base modifications.

In this context, a modified artificial nucleic acid, preferably an mRNA, as defined herein may contain nucleotide analogues/modifications, e.g. backbone modifications, sugar modifications or base modifications. A backbone modification in connection with the present invention is a modification, in which phosphates of the backbone of the nucleotides contained in an artificial nucleic acid, preferably an mRNA, as defined herein are chemically modified. A sugar modification in connection with the present invention is a chemical modification of the sugar of the nucleotides of the artificial nucleic acid, preferably an mRNA, as defined herein. Furthermore, a base modification in connection with the present invention is a chemical modification of the base moiety of the nucleotides of the artificial nucleic acid, preferably an mRNA. In this context, nucleotide analogues or modifications are preferably selected from nucleotide analogues, which are applicable for transcription and/ or translation.

Sugar Modifications:

The modified nucleosides and nucleotides, which may be incorporated into a modified artificial nucleic acid, preferably an mRNA, as described herein, can be modified in the sugar moiety. For example, the 2' hydroxyl group (OH) can be modified or replaced with a number of different "oxy" or "deoxy" substituents. Examples of "oxy" -2' hydroxy! group modifications include, but are not limited to, alkoxy or aryloxy (-DR. e.g., R = H, alkyl, cycloalkyl, aryl, aralkyl, heteroaryl or sugar); polyethyleneglycols (PEG), -O(CH2CH2Q)nCH2CH2OR; "locked" nucleic acids (LNA) in which the 2' hydroxyl is connected, e.g., by a methylene bridge, to the 4' carbon of the same ribose sugar; and amino groups (-D-amino, wherein the amino group, e.g., HRR, can be alkylamino, dialkylamino, heteracyclyl. arylamino, diarylaminn, heteroarylamino, or diheteroaryl amino, ethylene diamine, polyamino) or aminoalkoxy.

"Deoxy" modifications include hydrogen, amino (e.g. NH2; alkylamino, dialkylamino, heteracyclyl, arylamino, diaryl amino, heteroaryl amino, diheteroaryl amino, or amino acid); or the amino group can be attached to the sugar through a linker, wherein the linker comprises one or more of the atoms C, N, and D.

The sugar group can also contain one or more carbons that possess the opposite stereochemical configuration than that of the corresponding carbon in ribose. Thus, an artificial nucleic acid, preferably an mRNA, can include nucleotides containing, for instance, arabinose as the sugar.

Backbone Modifications:

The phosphate backbone may further be modified in the modified nucleosides and nucleotides, which may be incorporated into a modified artificial nucleic acid, preferably an mRNA, as described herein. The phosphate groups of the backbone can be modified by replacing one or more of the oxygen atoms with a different substituent. Further, the modified nucleosides and nucleotides can include the full replacement of an unmodified phosphate moiety with a modified phosphate as described herein. Examples of modified phosphate groups include, but are not limited to, phosphorothioate, phosphoroselenates, borano phosphates, borano phosphate esters, hydrogen phosphonates, phosphoroamidates, alkyl or aryl phosphonates and phasphotriesters. Phosphorodithioates have both non-linking oxygens replaced by sulfur. The phosphate linker can also be modified by the replacement of a linking oxygen with nitrogen (bridged phosphoroamidates), sulfur (bridged phosphorDthioates) and carbon (bridged methylene-phosphonates).

Base Modifications:

The modified nucleosides and nucleotides, which may be incorporated into a modified nucleic acid, preferably an mRNA, as described herein can further be modified in the nucleobase moiety. Examples of nuclenbases found in a nucleic acid such as RNA include, but are not limited to. adenine, guanine, cytosine and uracil. For example, the nucleosides and nucleotides described herein can be chemically modified on the major groove face. In some embodiments, the major groove chemical modifications can include an amino group, a thiol group, an alkyl group, or a halo group.

In particularly preferred embodiments of the present invention, the nucleotide analogues/ modifications are selected from base modifications, which are preferably selected from 2-amino-B-chloropurineriboside-5'-triphosphate, 2-Aminopurine-riboside-5'-

triphasphate; 2-aminaadenosine-5'-triphosphatE, 2'-Amino-2'-deoxycytidine-triphDsphatB, 2-thiocytidinB-5'-triphosphate. 2-thiouridinB-5'-triphosphatE, 2'-FluarathymidinB-5'-triphosphate, 2'-D-Methyl inDsine-5'-triphosphate 4-thiouridine-5'-triphosphate, 5-aminoallylcytidine-5'-triphasphatB, 5-aminoallyluridine-5'-triphosphatB, 5-brDmacytidinB-5'-triphDsphatE, 5-bromouridine-5'-triphosphate, 5-Bromo-2'-deoxycytidine-5'-triphosphate, 5-BromQ-2'-dEDxyuridine-5'-triphosphate, 5-iodocytidinE-5'-triphasphatE, 5-IOdO-2'-dEoxycytidinE-5'-triphosphatB. 5-iodouridinE-5'-triphosphatB. 5-Iodo-2'-dBoxyuridine-5'-triphosphate, 5-mBthylcytidinE-5'-triphDsphatE, 5-mBthyluridinE-5'-triphosphate, 5-Propynyl-2'-dBOxycytidine-5'-triphosphate, 5-Prapynyl-2'-dEDxyuridinE-5'-triphDsphatE, B-azacytidine-5'-triphosphate, B-azauridine-5'-triphosphatB, 6-chlDrapurinEribDside-5'-triphosphatB, 7-deazaadenDsine-5'-triphDsphate, 7-dBazaguanasinB-5'-triphosphatB, 8-azaadenasine-5'-triphosphatB. 8-azidoadBnosinB-5'-triphosphate, benzimtdazalB-ribosidE-5'-triphasphate, NI-mEthyladenosine-5'-triphosphate. NI-mBthylguanasinE-5'-triphasphatE, N6-mBthyladEnosinB-5'-triphosphate, 06-mBthylguanosinE-5'-triphosphatB, pseudouridinB-5'-triphosphatB, or puromycin-5'-triphosphatE, xanthosine-S'-triphosphatB. Particular prBfereocE is given to nuclBotidEs for bass modifications selected from the group of basB-modifiEd nuclBotidEs consisting of 5-methylcytidine-5'-triphosphatB, 7-dEazaguanosinB-5'-triphosphatB, 5-bromocytidine-5'-triphosphate. and pseudouridine-5'-triphosphatE.

In somE Embodiments, modified nuclBosides includE pyridin-4-nnB ribonuclBosidE. 5-aza-uridine, 2-thio-5-aza-uridine, 2-thiouridine, 4-thio-pseudouridine, 2-thio-psBudouridinB, 5-hydroxyuridinB, 3-mBthyluridine, 5-carboxymBthyl-uridine, l-carboxymethyl-psEudouridinB, 5-propynyl-uridine, 1-propynyl-psEudouridinE, 5-taurinomethyluridinB. l-taurinomethyl-psEudouridinB, 5-taurinomBthyl-2-thio-uridinB, l-taurinomBthyl-4-thio-uridinE, 5-mEthyl-uridinE, l-mEthyl-psBudouridine, 4-thio-l-methyl-psBudauridinB, 2-thio-l-methyl-pseudouridine, 1-methyl-l-dEaza-psEudouridinB, 2-thio-l-mBthyl-l-dEaz8-psEudouridinB, dihydrouridine, dihydropsEudouridinB, 2-thio-dihydrouridinE, 2-thio-dihydropsBudouridinB, 2-mEthoxyuridinB, 2-mEthoxy-4-thio-uridine, 4-methoxy-psBudouridine, and 4-methDxy-2-thio-psEudouridine.

In some embodiments, modified nucleosidBs includE 5-aza-cytidinB, pseudoisocytidinE, 3-mBthyl-cytidinB, N4-acetylcytidinE, 5-formylcytidinE, N4-methylcytidine, 5-hydroxymethylcytidinE, 1-mEthyl-psEudoisocytidinE, pyrrolo-cytidinE, pyrrolo-psBudoisocytidinE, 2-thio-cytidinE, 2-thio-5-mEthyl-cytidine, 4-thio-pseudoisocytidine, 4-thio-l-mBthyl-pseudoisocytidine, 4-thio-l-mEthyl-l-deaza-psBudoisocytidinE, 1-methyl-l-dEaza-psBudoisocytidinE, ZEbularins, 5-aza-zEbularine, 5-methyl-ZBbularinB, 5-aza-2-thio-zEbularine, 2-thio-zebularinB, 2-mEthoxy-cytidinB, 2-mBthoxy-5-methyl-cytidine, 4-methoxy-pseudoisocytidinE, and 4-mEthoxy-l-mEthyl-psEudoisocytidine. In Dther embodiments, modified nuclBosidBS include 2-aminopurine, 2, B-diaminopurinB, 7-deaza-adEnine, 7-dBaza-8-aza-adBninB, 7-dEaza-2-aminopurinE, 7-dEaza-8-aza-2-aminopurinB, 7-deaza-2,B-diaminopurinB, 7-dBaza-8-aza-2,6-diaminopurinE, 1-methyladEnosine, NB-mBthyladEnosinE, NB-isopentenyladenasine, N6-(cis-hydroxyisopentenylJadEnosine, 2-mEthylthio-NB-(cis-hydroxyisopBntBnyl) adenosine, NB-glycinylcarbamoyladenosine, NB-threonylcarbamoyladenosine, 2-mBthylthio-NB-threonyl carbamoyladenosine, NG.NB-dimBthyladenosinB, 7-methyladenine. 2-mEthylthio-adeninB. and 2-mBthoxy-adEnine.

In other embodiments, modified **nucleosides include** inosine, l-mBthyl-inosinE, **wyosinE,** wybutnsine, **7-dsaza-guanosinE, 7-deaza-8-aza-guanosine, B-thio-guanosine, B-thio-7-deaza-guanosine, B-thio-7-deaza-8-aza-guanosine, 7-methyl-guanosine, B-thio-7-mEthyl-guanosinB, 7-methyfinosinB, B-methoxy-guanosine, f-methylguanasine, N2-methylguanosinB. N2,N2-dimEthylguanosinE, 8-oxo-guanosino, 7-methyl-8-oxo-guanosinE, l-mEthyl-B-thio-guanosinE, N2-mBthyl-B-thio-guanosinB, and N2,N2-dimethyl-6-thio-guanosine.

In some embodiments, the nucleotide can be modified on the major groove face and can include replacing hydrogen on C-5 of uracil with a methyl group or a halo group. In specific embodiments, a modified nucleoside is 5'-O-(1-thiophosphate)-adenosine, 5'-O-(1-thiophosphate)-cytidine, 5'-O-(1-thiophosphate)-guanosine, 5'-O-(1-thiophosphate)-uridine or 5'-O-(1-thiophosphate)-pseudouridine.

In further specific embodiments, a modified artificial nucleic acid, preferably an mRNA, may comprise nucleoside modifications selected from 6-aza-cytidine, 2-thio-cytidine, a-thio-cytidine, Pseudo-iso-cytidine, 5-aminoallyl-uridine, 5-iodo-uridine, N1-methyl-pseudouridine, 5,6-dihydrouridine, a-thio-uridine, 4-thio-uridine, B-aza-uridine, 5-hydroxy-uridine, deoxy-thymidine, 5-methyl-uridine, Pyrrolo-cytidine, inosine, a-thio-guanasine, B-methyl-guanosine, 5-methyl-cytdine, 8-oxo-guanosine, 7-deaza-guanosine, N1-methyl-adenosine, 2-amino-B-Chloro-purine, N6-methyl-2-amino-purine, Pseudo-iso-cytidine, 6-Chloro-purine, N6-methyl-adenosine, α-thio-adenosine, 8-azido-adenosine, 7-deaza-adenosine.

Lipid modification:

According to a further embodiment, a modified artificial nucleic acid, preferably an mRNA, as defined herein can contain a lipid modification. Such a lipid-modified artificial nucleic acid as defined herein typically further comprises at least one linker covalently linked with that artificial nucleic acid, and at least one lipid covalently linked with the respective linker. Alternatively, the lipid-modified artificial nucleic acid comprises at least one artificial nucleic acid as defined herein and at least one (Afunctional) lipid covalently linked (without a linker) with that artificial nucleic acid. According to a third alternative, the lipid-modified artificial nucleic acid comprises an artificial nucleic acid molecule as defined herein, at least one linker covalently linked with that artificial nucleic acid, and at least one lipid covalently linked with the respective linker, and also at least one (Afunctional) lipid covalently linked (without a linker) with that artificial nucleic acid. In this context, it is particularly preferred that the lipid modification is present at the terminal ends of a linear artificial nucleic acid.

Coding sequence modifications:

G/C content modification:

According to another embodiment, the artificial nucleic acid of the present invention may be modified, and thus stabilized, by modifying the G/C content of the artificial nucleic acid, preferably an mRNA, preferably of the coding region of the inventive artificial nucleic acid.

Preferably, the G/C content of the at least one coding region of the artificial nucleic acid, preferably an mRNA, is modified, preferably increased, compared to the G/C content of the corresponding coding sequence of the wild type nucleic acid, preferably an mRNA, wherein the encoded amino acid sequence is preferably not modified compared to the amino acid sequence encoded by the corresponding wild type nucleic acid (i.e. the non-modified nucleic acid), preferably an mRNA. This modification of the inventive artificial nucleic acid, preferably of an mRNA, as described herein is based on the fact that the sequence of any mRNA region to be translated is important for efficient translation of that mRNA. Thus, the composition and the sequence of various nucleotides are important. In particular, sequences having an increased G (guanosine)/C (cytosine) content are more stable than sequences having an increased A (adenosine)/U (uracil) content. According to the invention, the codons of the artificial

nucleic acid, preferably an mRNA, are therefore varied compared to the respective wild type mRNA, while retaining the translated amino acid sequence, such that they include an increased amount of G/C nucleotides. In respect to the fact that several codons encode one and the same amino acid (so-called degeneration of the genetic code), the most favorable codons for the stability can be determined (so-called alternative codon usage). Depending on the amino acid to be encoded by the artificial nucleic acid, preferably an mRNA, there are various possibilities for modification of its sequence, compared to its wild type sequence. In the case of amino acids which are encoded by codons, which contain exclusively G or C nucleotides, no modification of the codon is necessary. Thus, the codons for Pro (CCC or CCG), Arg (CGC or CGG), Ala (GCC or GCG) and Gly (GGC or GGG) require no modification, since no A or U is present. In contrast, codons which contain A and/or U nucleotides can be modified by substitution of other codons, which code for the same amino acids but contain no A and/or U. Examples of these are: the codons for Pro can be modified from CCU or CCA to CCC or CCG; the codons for Arg can be modified from CGU or CGA or AGA or AGG to CGC or CGG; the codons for Ala can be modified from GCU or GCA to GCC or GCG; the codons for Gly can be modified from GGU or GGA to GGC or GGG. In other cases, although A or U nucleotides cannot be eliminated from the codons, it is however possible to decrease the A and U content by using codons, which contain a lower content of A and/ or U nucleotides. Examples of these are: the codons for Phe can be modified from UUU to UUC; the codons for Leu can be modified from UUA, UUG, CUU or CUA to CUC or CUG; the codons for Ser can be modified from UCU or UCA or AGU to UCC, UCG or AGC; the codon for Tyr can be modified from UAU to UAC; the codon for Cys can be modified from UGU to UGC; the codon for His can be modified from CAU to CAC; the codon for Gin can be modified from CAA to CAG: the codons for Ile can be modified from AUU or AUA to AUG; the codons for Thr can be modified from ACU or ACA to ACC or ACG; the codon for Asn can be modified from AAU to AAC; the codon for Lys can be modified from AAA to AAG; the codons for Val can be modified from GUU or GUA to GUC or GUG; the codon for Asp can be modified from GAU to GAC; the codon for Glu can be modified from GAA to GAG; the stop codon UAA can be modified to UAG or UGA. In the case of the codons for Met (AUG) and Trp (UGG), on the other hand, there is no possibility of sequence modification. The substitutions listed above can be used either individually or in all possible combinations to increase the G/C content of the inventive artificial nucleic acid, preferably an mRNA, compared to its corresponding wild type sequence, such as the corresponding wild type mRNA sequence. Thus, for example, all codons for Thr occurring in the wild type sequence can be modified to ACC (or ACG). Preferably, however, for example, combinations of the above substitution possibilities are used:

substitution of all codons coding for Thr in the original sequence (wild type mRNA) to ACC (or ACG) and substitution of all codons originally coding for Ser to UCC (or UCG or AGC); substitution of all codons coding for Ile in the original sequence to AUC and substitution of all codons originally codiog for Lys to AAG and substitution of all codons originally coding for Tyr to UAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Arg to CGC (or CGG); substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Gly to GGC (or GGG) and substitution of all codons originally coding for Asn to AAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Phe to UUC and substitution of all codons originally coding for Cys to UGC and substitution of all codons originally coding for Leu to CUG (or CUC) and substitution of all codons originally coding for Gin to CAG and substitution of all

codons originally coding for Pro to CCC (or CCG); etc. Preferably, the G/C content of the coding region of the inventive artificial nucleic acid, preferably an mRNA, is increased by at least 7%. more preferably by at least 15%, particularly preferably by at least 20%, compared to the G/C content of the coding region of the wild type nucleic acid. According to a specific embodiment at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, more preferably at least 70%, even more preferably at least 80% and most preferably at least 90%, 95% or even 100% of the substitutable codons in the coding region or the whole sequence of the wild type nucleic acid sequence, preferably an mRNA sequence, are substituted, thereby increasing the G/C content of said sequence. In this context, it is particularly preferable to increase the G/C content of the inventive artificial nucleic acid to the maximum (i.e. 100% of the substitutable codons), in particular in the region coding for the at least one protein, compared to the wild type sequence.

In one embodiment of the invention, the G/C content of the artificial nucleic acid of the invention is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the codon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased or maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

In a further embodiment, the artificial nucleic acid according to the invention is codon optimized,

wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, BD%, 70%, 80%, 85%, 86%. 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 26461-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any of these sequences; and/or

(iv) the artificial nucleic acid of the invention, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least **50%.** 60%, 7D%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid of the invention, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NDs: 22051-26460, or a fragment or variant of aoy of these sequences.

According to the invention, a further preferred modification of the artificial nucleic acid of the present invention is based on the finding that the translation efficiency is also determined by a different frequency in the occurrence of tRNAs in cells. It is thus preferred that the at least one coding region of the artificial nucleic acid according to the invention comprises a nucleic acid sequence, which is codon-optimized. The term "codon-optimized" as used herein typically refers to an artificial nucleic acid, preferably to a nucleic acid sequence in the at least one coding region therein, wherein at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. Most preferably, that modification also increases the G/C content of the at least one coding region of the artificial nucleic acid.

Thus, if so-called "rare codons" are present in the artificial nucleic acid of the present invention to an increased extent, the corresponding modified nucleic acid sequence, preferably an mRNA sequence, is translated to a significantly poorer degree than in the case where codons coding for relatively "frequent" tRNAs are present. According to the invention, in the modified artificial nucleic acid of the present invention, the region which encodes the at least one protein as defined herein is modified compared to the corresponding region of the wild type nucleic acid, preferably an mRNA, such that at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. By this modification, the sequences of the artificial nucleic acid of the present invention is modified such that codons for which frequently occurring tRNAs are available are inserted. In other words, according to the invention, by this modification all codons of the wild type sequence which code for a tRNA which is relatively rare in the cell can in each case be exchanged for a codon which codes for a tRNA which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Which tRNAs occur relatively frequently in the cell and which, in contrast, occur relatively rarely is known to a person skilled in the art; cf. e.g. Akashi, Curr. Dpin. Genet. Dev. 2DDI, 11(G): GGD-GBG. The codons which use for the particular amino acid the tRNA which occurs the most frequently, e.g. the Gly codon, which uses the tRNA, which occurs the most frequently in the (human) cell, are particularly preferred. According to the invention, it is particularly preferable to link the sequential G/C content which is increased, in particular maximized, in the modified artificial nucleic acid of the present invention, with the "frequent" codons without modifying the amino acid sequence of the protein encoded by the coding region of the corresponding wild type nucleic acid, preferably an mRNA. This preferred embodiment allows provision of a particularly efficiently translated and stabilized (modified) artificial nucleic acid of the present invention. The determination of an artificial nucleic acid of the present invention as described above (increased G/C content; exchange of tRNAs) can be carried out using the computer program explained in WD D2/098443 - the disclosure content of which is included in its full scope in the present invention. Using this computer program, the nucleotide sequence of any desired mRNA can be modified with the aid of the genetic code or the degenerative nature thereof such that a maximum G/C content results, in combination with the use of codons which code for tRNAs occurring as frequently as possible in the ceil, the amino acid sequence encoded by the artificial nucleic acid preferably not being modified compared to the non-modified sequence. Alternatively, it is also possible to modify only the G/C content or only the codon usage compared to the original sequence. The source code in Visual Basic G.D (developmeot environment used: Microsoft Visual Studio Enterprise G.O

with Servieepack 3) is also described in WO 02/098443. In a further preferred embodiment of the present invention, the A/U content in the environment of the ribosome binding site of the artificial nucleic acid of the present invention is increased compared to the A/U content in the environment of the ribosome binding site of its particular wild type nucleic acid, preferably an mRNA. This modification (an increased A/U content around the ribosome binding site) increases the efficiency of ribosome binding to the artificial nucleic acid. An effective binding of the ribosomes to the ribosome binding site (e.g. a Kozak sequence as known in the art) in turn has the effect of an efficient translation of the artificial nucleic acid. According to a further embodiment of the present invention, the artificial nucleic acid of the present invention may be modified with respect to potentially destabilizing sequence elements. Particularly, the coding region and/or the 5' and/or 3' untranslated region of the artificial nucleic acid may be modified compared to the particular wild type nucleic acid such that it contains no destabilizing sequence elements, the amino acid sequence encoded by the modified artificial nucleic acid preferably not being modified compared to its particular wild type nucleic acid. It is known that, for examplG, in sequences of eukaryotic RNAs destabilizing sequence elements (DSE) occur, to which signal proteins bind and regulate enzymatic degradation of RNA in vivo. For further stabilization of the modified artificial nucleic acid, optionally in the region which encodes the at least one protein as defined herein, one or more such modifications compared to the corresponding region of the wild type nucleic acid, preferably an mRNA, can therefore be carried out, so that no or substantially no destabilizing sequence elements are contained there. According to the invention, DSE present in the untranslated regions (3'- and/or 5'-UTR) can also be eliminated from the artificial nucleic acid of the present invention by such modifications. Such destabilizing sequences are e.g. AU-rich sequences (AURES), which occur in 3'-UTR sections of numerous unstable RNAs (Caput et al„ Proc. Natl. Acad. Sci. USA I98B, 83: 1670 to IB74). The artificial nucleic acid of the present invention is therefore preferably modified compared to the wild type nucleic acid such that the artificial nucleic acid contains no such destabilizing sequences. This also applies to those sequence motifs which are recognized by possible endonucleases, e.g. the sequence GAACAAG, which is contained in the 3'-UTR segment of the gene which codes for the transferrin receptor (Binder et al., EMBU J. 1394, 13: 19B9 to 1980). These sequence motifs are also preferably removed in the artificial nucleic acid of the present invention. It is further preferred that the artificial nucleic acid of the present invention has, in a modified form, at least one IRES as defined above and/or at least one 5' and/or 3' stabilizing sequence, in a modified form, e.g. to enhance ribosome binding or to allow expression of different encoded polypeptides located on an artificial nucleic acid of the present invention. This particularly applies to embodiments, wherein the artificial nucleic acid is bi- or multicistronic and wherein an IRES is preferably located between individual coding regions.

According to a preferred embodiment, the at least one coding region of the artificial nucleic acid or artificial nucleic acid molecule comprises or consists of at least one nucleic acid sequence according to any one of SEQ ID NOs: 8821-39690, 39715. 397IB, 39717, 39720, 39721, 39724. 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences. More preferably, the at least one coding region of the artificial nucleic comprises or consists of an RNA sequence, which is at least 5D%, 51%, 52%, 53%, 54%, 55%, 56%. 57%, 58%, 59%, 60%, 61%. 62%. 63%, 64%, 65%. 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 70%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%. or 99% identical to any one of SEQ ID NOs:

882I-39690, 3B7I5, 397I6, 397I7, 39720. 397ZI, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 3974I, 39742, 39745 and 3974B.

G/C content modification:

According to another embodiment, the RNA of the present invention, preferably an mRNA, may be modified, and thus stabilized, by modifying the guanosine/ cytosine (G/C) content of the RNA, preferably of the at least one coding sequence of the RNA of the present invention.

In a particularly preferred embodiment of the present invention, the G/C content of the coding region of the RNA of the present invention is modified, particularly increased, compared to the G/C content of the coding region of the respective wild type RNA, i.e. the unmodified RNA. The amino acid sequence encoded by the RNA is preferably not modified as compared to the amino acid sequence encoded by the respective wild type RNA. This modification of the RNA of the present invention is based on the fact that the sequence of any RNA region to be translated is important for efficient translation of that RNA. Thus, the composition of the RNA and the sequence of various nucleotides are important. In particular, sequences having an increased G (guanosine)/C (cytosine) content are more stable than sequences having an increased A (adenosine)/U (uracil) content. According to the invention, the codons of the RNA are therefore varied compared to the respective wild type RNA, while retaining the translated amino acid sequence, such that they include an increased amount of G/C nucleotides. In respect to the fact that several codons code for one and the same amino acid (so-called degeneration of the genetic code), the most favourable codons for the stability can be determined (so-called alternative codon usage). Depending on the amino acid to be encoded by the RNA, there are various possibilities for modification of the RNA sequence, compared to its wild type sequence. In the case of amino acids, which are encoded by codons, which contain exclusively G or C nucleotides, no modification of the codon is necessary. Thus, the codons for Pro (CCC or CCG), Arg (CGC or CGG), Ala (GCC or GCG) and Gly (GGC or GGG) require no modification, since no A or U is present. In contrast, codons which contain A and/or U nucleotides can be modified by substitution of other codons, which code for the same amino acids but contain no A and/ Or U. Examples of these are: the codons for Pro can be modified from CCU or CCA to CCC or CCG: the codons for Arg can be modified from CGU or CGA or AGA or AGG to CGC or CGG; the codons for Ala can be modified from GCU or GCA to GCC or GCG; the codons for Gly can be modified from GGU or GGA to GGC or GGG. In other cases, although A or U nucleotides cannot be eliminated from the codons, it is however possible to decrease the A and U content by using codons which contain a lower content of A and/ Or U nucleotides. Examples Of these are: the codons for Phe can be modified from UUU to UUC; the codons for Leu can be modified from UUA. DUG, CUU or CUA to CUC or CUG; the codons for Ser can be modified from UGU or UCA or AGU to UCC, UCG or AGC; the codon for Tyr can be modified from UAU to UAC; the codon for Cys can be modified from UGU to UGC; the codOo for His can be modified from CAU to CAC; the codon for Gin can be modified from CAA to CAG; the codons for Ile can be modified from AUU or AUA to AUG; the codons for Thr can be modified from ACU or ACA to ACC or AGG; the codon for Asn can be modified from AAU to AAC; the codon for Lys can be modified from AAA to AAG; the codons for Val can be modified from GUU or GUA to GUC or BUG; the codon for Asp can be modified from GAU to GAC; the codon for Glu can be modified from GAA to GAG; the stop codon UAA can be modified to UAG or UGA. In the case of the codons for Met (AUG) and Trp (UGG), on the other hand, there is no possibility of sequence modification. The substitutions listed above can be used either individually or

in all passible combinations to increase the G/C content of the at least one mRNA of the composition of the present invention compared to its particular wild type mRNA (i.e. the original sequence). Thus, for example, all codons for Thr occurring in the wild type sequence can be modified to ACC (or ACG). Preferably, however, for example, combinations of the above substitution possibilities are used:

substitution of all codons coding for Thr in the original sequence (wild type mRNA) to ACC (or ACG) and substitution of all codons originally coding for Ser to UCC (or UCG or AGC); substitution of all codons coding for lie in the original sequence to AUC and substitution of all codons originally coding for Lys to AAG and substitution of all codons originally coding for Tyr to UAC; substitution of all codons coding for Val in the ariginal sequence to GUC (or GUG) and sobstitution of all cadans originally coding for Glu to GAG and

substitution of all codons originally coding far Ala to GCC (or GCG) and substitution of all codons originally coding for Arg to CGC (or CGG); substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Gly to GGC (or GGG) and substitution of all cadons originally coding for Asn to AAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Phe to UUC and

substitution of all codons originally coding far Cys to UGC and substitution of all codons originally coding far Leu to CUG (or CUC) and substitution of all cadons originally coding for Gin to CAG and substitution of all cadons originally coding for Pro to CCC (or CCG); etc.

Preferably, the G/C content of the coding region of the RNA of the present invention is increased by at least 7%, more preferably by at least 15%, particularly preferably by at least 2D%, compared to the G/C content of the coding region of the wild type RNA, which codes for an antigen as defined herein or a fragment or variant thereof. According ta a specific embodiment at least 5%, 10%. 20%, 30%, 40%, 50%, 60%. more preferably at least 70%, even more preferably at least 80% and most preferably at least 90%, 95% or even 100% of the substitutable cadons in the region coding for an antigen as defined herein or a fragment or variant thereof or the whale sequence of the wild type RNA sequence are substituted, thereby increasing the GC/cantent of said sequence. In this context, it is particularly preferable to increase the G/C content of the RNA of the present invention, preferably of the at least one coding region of the RNA according to the invention, to the maximum (i.e. 100% of the substitutable codons) as compared to the wild type sequence. According to the invention, a further preferred modification of the RNA of the present invention is based on the finding that the translation efficiency is also determined by a different frequency in the occurrence of tRNAs in cells. Thus, if so-called "rare codons" are present in the RNA of the present invention to an increased extent, the corresponding modified RNA sequence is translated to a significantly poorer degree than in the case where codons coding for relatively "frequent" tRNAs are present. According to the invention, in the modified RNA of the present invention, the region which codes for an antigen as defined herein or a fragment or variant thereof is modified compared to the corresponding region of the wild type RNA such that at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. By this modification, the sequences of the RNA of the present invention are modified such that codons for which frequently occurring tRNAs are available are inserted. In other words, according to the invention, by this

modification all codons of the wild type sequence, which code for a tRNA which is relatively rare in the cell, can in each case be exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Which tRNAs occur relatively frequently in the cell and which, in contrast, occur relatively rarely is known to a person skilled in the art; cf. e.g. Akashi, Curr. Dpin. Genet. Dev. 2DDI, 1KB): GG0-BG6. The codons, which use fur the particular amino acid the tRNA which occurs the most frequently, e.g. the Gly codon, which uses the tRNA, which occurs the most frequently in the (human) cell, are particularly preferred. According to the invention, it is particularly preferable to link the sequential G/C content which is increased, in particular maximized, in the modified RNA of the present invention, with the "frequent" codons without modifying the amino acid sequence uf the protein encoded by the coding region of the RNA. This preferred embodiment allows provision of a particularly efficiently translated and stabilized (modified) RNA of the present invention. The determination of a modified RNA of the present invention as described above (increased G/C content; exchange of tRNAs) can be carried out using the computer program explained in WD 02/098443 - the disclosure content of which is included in its full scope in the present invention. Using this computer program, the nucleotide sequence of any desired RNA can be modified with the aid of the genetic code or the degenerative nature thereof such that a maximum G/C content results, in combination with the use of codons which code for tRNAs occurring as frequently as possible in the cell, the amino acid sequence coded by the modified RNA preferably not being modified compared to the non-modified sequence. Alternatively, it is also possible to modify only the G/C content or only the codon usage compared to the original sequence. The source code in Visual Basic 6.0 (development environment used: Microsoft Visual Studio Enterprise G.D with Servicepack 3) is also described in WD 02/D38443.

In a further preferred embodiment of the present invention, the A/U content in the environment of the ribosome binding site of the RNA of the present invention is increased compared to the A/U content in the environment of the ribosome binding site of its respective wild type mRNA. This modification (an increased A/U content around the ribosome binding site) increases the efficiency of ribosome binding to the RNA. An effective binding of the ribosomes to the ribosome binding site (Kozak sequence: SEQ ID NDs: 39711, 39712; the AUG forms the start codon) in turn has the effect of an efficient translation of the RNA. According to a further embodiment of the present invention, the RNA of the present invention may be modified with respect to potentially destabilizing sequence elements. Particularly, the coding region and/or **the** 5' and/or 3' untranslated region of this RNA may be modified compared to the respective wild type RNA such that it contains no destabilizing sequence elements, the encoded amino acid sequence of the modified RNA preferably not being modified compared to its respective wild type RNA. It is known that, for example in sequences of eukaryotie RNAs, destabilizing sequence elements (DSE) occur, to which signal proteins bind and regulate enzymatic degradation of RNA in vivo. For further stabilization of the modified RNA, optionally in the region which encodes an antigen as defined herein or a fragment or variant thereof, one or more such modifications compared to the corresponding region of the wild type RNA can therefore be carried out, so that no or substantially no destabilizing sequence elements are contained there. According to the invention, DSE present in the untranslated regions (3'- and/or 5'-UTR) can also be eliminated from the RNA of the present invention by such modifications. Such destabilizing sequences are e.g. AU-rich sequences (AURES), which occur in 3'-UTR sections of numerous unstable RNAs (Caput et al„ Proc. Natl. Acad. Sci. USA I98B, 83: IB7D **tD** IB74). The RNA of the present invention is therefore preferably modified compared tu the respective wild type RNA such that the RNA of the present invention contains no such destabilizing sequences. This also applies to those sequence motifs which are recognized by possible endonucleases. e.g. the sequence GAACAAG, which is contained in the 3'-UTR segment of the gene encoding the

transferrin receptor (Binder et al., EMBO J. I3B4, 13: 19BB to 1980). These sequence motifs are also preferably removed in the RNA of the present invention.

According to a preferred embodiment, the present invention provides an RNA as defined herein comprising at least one coding sequence, wherein the coding sequence comprises or consists of any one of the (modified) nucleic acid sequences defined in SEO ID NOs: 8821-13230. 39715, 397IB, 39717, 39720, 39721, 39724, 39725, 33728, 3B729, 39730, 33733, 3B734, 39737, 33738, 33741, 39742, 39745. 3974B, and/or SEO ID NBs: 2B4BI-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281-39690, and/or SEQ ID ND: 33713 to SEQ ID N0:3974B. and/or SED ID NO: 33714, 39716, 39729, 39734. 33738, 3B725, or of a fragment or variant of any one of these sequences. In other words, the at least one coding sequence preferably comprises or consists of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 33715, 397IB, 33717, 3972B, 39721. 33724, 33725, 33728, 39729, 39730, 39733. 39734, 39737, 39738, 39741, 39742, 39745, 3974B, and/or SEQ ID NOs: 2B46I-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 3528I-39690, and/or SEQ ID NO: 33713 to SEQ ID NO: 3974B, and/or SEQ ID NO: 39714. 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

In a further preferred embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%. 87%. 88%, 83%, 30%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%. more preferably of at least 8B%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (modified) nucleic acid sequences defined in SEQ ID NOs: 8821-13230, 39715, 337IB, 39717, 33720, 39721. 33724, 39725, 39728, 33729. 39730. 39733, 33734, 3B737, 39738, 39741, 33742, 33745, 39746, and/or SEQ ID NOs: 264BI-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 3528I-3363D, and/or SEQ ID NO: 39713 to SEQ ID NO: 3974B. and/or SEQ ID NOs: 39714. 337IB. 39729. 39734, 39738, 39725, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 8B% with any one of the (modified) nucleic acid sequences defined in SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 3972D, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 3B745, 3974B, and/or SEQ ID NOs: 2B46I-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 3528I-33B90, and/or SEQ ID NO: 39713 to SEQ ID NO: 39746, and/or SEQ ID NOs: 39714, 397IB, 39729, 39734, 39738, 39725, or of a fragment or variant of any one of these sequences.

GC optimized sequences:

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises or consists of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 39714, 39716, 39729. 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%. 20%, 30%, 40%, 50%. BD%, 70%, 8D%, 85%, 86%. 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 9B%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NDs: 39714, 397IB. 39729, 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

Sequences adapted to human codon usage:

According to the invention, a further preferred modification of the RNA of the present invention is based on the finding that codons encoding the same amino acid typically occur at different frequencies. According to the invention, in the modified RNA of the present invention, the coding sequence (coding region) as defined herein is preferably modified compared to the corresponding region of the respective wild type RNA such that the frequency of the codons encoding the same amino acid corresponds to the naturally occurring frequency of that codon according to the human codon usage as e.g. shown in Table 2.

For example, in the case of the amino acid alanine (Ala) present in an amino acid sequence encoded by the at least one coding sequence of the RNA according to the invention, the wild type coding sequence is preferably adapted in a way that the codon "GCC" is used with a frequency of D.4D, the codon "GCT" is used with a frequency of 0.28, the codon "GCA" is used with a frequency of 0.22 and the codon "GCG" is used with a frequency of 0.ID etc. (see Table 2).

Table 2: Human codon usage table

Amino acid	codon	fraction	/10 ПО	Amino acid	codon	fraction	/IDDD
Ala	GCG	D.ID	7.4	Pro	CCG	0.11	6.9
Ala	GCA	0.22	15.8	Pro	CCA	0.27	IB.9
Ala	GCT	0.28	18.5	Pro	CCT	0,29	17.5
Ala	GCC*	0.4D	27.7	Pro	GCC*	0.33	19.8
Cys	TGT	0.42	I0.B	Gin	CAG*	0.73	34.2
Cys	TGC*	0.58	I2.B	Gin	CAA	0.27	12.3
Asp	GAT	0.44	21.8	Arg	AGG	0.22	12.0
Asp	GAC*	D.5B	25.1	Arg	AGA*	0.21	12.1
Glu	GAG*	D.59	39.B	Arg	CGG	0.19	11.4
Glu	GAA	0.41	29.D	Arg	CGA	0.10	B.2
Phe	TTT	0.43	I7.B	Arg	CGT	0.D9	4.5
Phe	TTC*	0.57	20.3	Arg	CGC	0.19	10.4
Gly	GGG	D.23	IB.5	Ser	AGT	0.14	12.1

Amino acid	codon	fraction	/1DDO	Amino acid	codon	fraction	/ 1DDD
Gly	GGA	0.26	IG.5	Ser	AGC*	0.25	19.5
Gly	GGT	Q.I8	10.8	SET	TCG	O.OG	4.4
Gly	GGC*	0.33	22.2	Ser	TCA	0.15	12.2
His	CAT	0.41	10.9	Ser	TCT	0.18	15.2
His	CAC*	0.59	15.1	Ser	TCC	0.23	17.7
Ile	ATA	0.14	7.5	Thr	ACG	0.12	B.I
Ile	ATT	0.35	IG.O	Thr	ACA	0.27	15.1
Ile	ATC*	0.52	20.8	Thr	ACT	0.23	13.1
Lys	AAG*	O.GO	31.9	Thr	ACC*	0.38	18.9
Lys	AAA	0.40	24.4	Val	GTG*	0.48	28.1
Leu	TTG	0.12	12.9	Val	GTA	0.10	7.1
Leu	TTA	O.OG	7.7	Val	GTT	0.17	11.0
Leu	CTG*	0.43	39.G	Val	GTC	0.25	14.5
Leu	CTA	0.07	7.2	Trp	TGG*	1	13.2
Leu	CTT	0.12	13.2	Tyr	TAT	0.42	12.2
Leu	CTC	0.20	I9.G	Tyr	TAC*	0.58	15.3
Met	ATG*	1	22.0	Stop	TGA*	O.GI	1.6
Asn	AAT	0.44	17.0	Stop	TAG	0.17	0.8
Asn	AAC*	D.5G	19.1	Step	TAA	0.22	1.0

* : most frequent codon

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting of SEQ 10 NOs: 17641-22050, or a fragment or variant of any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises Dr consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 9D% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any one of said nucleic acid sequences.

Codon-optimized sequences:

As described above it is preferred according to the invention, that all codons of the wild type sequence which code for a tRNA. which is relatively rare in the cell, are exchanged for a codon which codes for a tRNA, which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Therefore it is particularly preferred that the most frequent codons are used for each encoded amino acid (see Table 2, most frequent codons are marked with asterisks). Such an optimization procedure increases the codon adaptation index (CAI) and ultimately maximises the CAI. In the context of the invention, sequences with increased or maximized CAI are typically referred to as "codon-optimized" sequences and/or CAI increased and/or maximized sequences. According to a preferred embodiment, the RNA of the present invention comprises at least one coding sequence, wherein the coding sequence is codon-optimized as described herein. More preferably, the codon adaptation index (CAI) of the at least one coding sequence is at least D.5, at least 0.8, at least 0.9 or at least 0.35. Most preferably, the codon adaptation index (CAI) of the at least one coding sequence is I.

For example, in the case of the amino acid alanine (Ala) present in the amino acid sequence encoded by the at least one coding sequence of the RNA according to the invention, the wild type coding seqoence is adapted in a way that the most frequent human codon "GCC" is always used for said amino acid, or for the amino acid Cysteine (Cys), the wild type sequence is adapted in a way that the most frequent human codon "TGC" is always used for said amino acid etc.

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting nf SEQ ID NOs: 2205I-2G4B0, or a fragment or variant nf any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, B0%, 70%, 80%, 85%, **86%.** 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any one of said nucleic acid sequences.

C-optimized sequences:

According to another embodiment, the RNA of the composition of the present invention may be modified by modifying, preferably increasing, the cytosine (C) content of the RNA, preferably of the coding region of the RNA.

In a particularly preferred embodiment of the present invention, the C content of the coding region of the RNA of the present invention is modified, preferably increased, compared to the C content of the coding region of the respective wild type RNA, i.e. the unmodified RNA. The amino acid sequence encoded by the at least one coding sequence of the RNA of the present invention is preferably not modified as compared to the amino acid sequence encoded by the respective wild type mRNA.

In a preferred embodiment of the present invention, the modified RNA is modified such that at least 10%, 20%, 30%, 40%, 50%, 60%, 70% or 80%. or at least 90% of the theoretically possible maximum cytosine-content or even a maximum cytosine-cDntent is achieved.

In further preferred embodiments, at least 10%, 20%, 30%, 40%, 50%, 60%. 70%, 80%, 90% or even 100% of the codons of the target RNA wild type sequence, which are "cytosine content optimizable" are replaced by codons having a higher cytosine-content than the ones present in the wild type sequence.

In a further preferred embodiment, some of the codons of the wild type coding sequence may additionally be modified such that a codDn for a relatively rare tRNA in the cell is exchanged by a codon for a relatively frequent tRNA in the cell, provided that the substituted codon for a relatively frequent tRNA carries the same amino acid as the relatively rare tRNA of the original wild type codon. Preferably, all of the codons for a relatively rare tRNA are replaced by a codon for a relatively frequent tRNA in the cell, except codons encoding amino acids, which are exclusively encoded by codons not containing any cytosine, or except for glutamine (Gin), which is encoded by two codons each containing the same number of cytosines.

In a further preferred embodiment of the present invention, the modified target RNA is modified such that at least 80%, or at least 90% of the theoretically passible maximum cytosine-content or even a maximum cytosine-content is achieved by means of codons, which code for relatively frequent tRNAs in the cell, wherein the amino acid sequence remains unchanged.

Due to the naturally occurring degeneracy of the genetic code, more than one codon may encode a particular amioo acid. Accordingly, 18 out of 20 naturally occurring amino acids are encoded by more than one codnn (with Tryp and Met being an exception), e.g. by 2 codons (e.g. Cys, Asp, Glu), by three codons (e.g. lie), by 4 codons (e.g. Al, Gly, Pro) or by G codons (e.g. Leu, Arg, Ser). However, not all codons encoding the same amino acid are utilized with the same frequency under in vivo conditions. Depending on each single organism, a typical codon usage profile is established.

The term "cytosine content-optimizable codon" as used within the context of the present invention refers to codons, which exhibit a lower content of cytosines than other codons encoding the same amino acid. Accordingly, any wild type codon, which may be replaced by another codon encoding the same amino acid and exhibiting a higher number of cytosines within that codon, is considered to be cytosine-optimizable (C-optimizable). Any such substitution of a C-optimizable wild type codon by the specific C-optimized codon within a wild type coding region increases its overall C content and reflects a C-enriched modified mRNA sequence. According to a preferred embodiment, the RNA of the present invention, preferably the at least one coding sequence of the RNA of the present invention comprises or consists of a C-maximized RNA sequence containing C-optimized codons for all potentially C-optimizable codons. Accordingly, I0D% or all of the theoretically replaceable C-optimizable codons are preferably replaced by C-optimized codons over the entire length of the coding region.

In this context, cytosine-content optimizable codons are codons, which contain a lower nomber of cytosines than other codons coding for the same amino acid. Any of the codons GCG, GCA, GCU codes for the amino acid Ala, which may be exchanged by the codon GCC encoding the same amino acid, and/or the codon UGU that codes for Cys may be exchanged by the codon UGC encoding the same amino acid, and/or the codon GAU which codes for Asp may be exchanged by the codon GAC encoding the same amino acid, and/or the codon that UUU that codes for Phe may be exchanged for the codon UUC encoding the same amino acid, and/or any of the codons GGG, GGA, GGU that code Gly may be exchanged by the codon GGC encoding the same amino acid, and/or the codon CAU that codes for His may be exchanged by the codon CAC encoding the same amino acid, and/or any of the codons AUA, AUU that code for Ile may be exchanged by the codon AUC, and/or any of the codons UUG, UUA, CUG, CUA, CUU coding for Leu may be exchanged by the codon CUC encoding the same amino acid, and/or the codon AAU that codes for Asn may be exchanged by the codon AAC encoding the same amino acid, and/or any of the codons CCG, CCA, CCU coding for Pro may be exchanged by the codon CCC encoding the same amino acid, and/or any of the codons AGG, AGA, CGG, CGA, CGU coding for Arg may be exchanged by the codon CGC encoding the same amino acid, and/or any of the codons AGU, AGC, UCG, UCA, UCU coding for Ser may be exchanged by the codon UCC encoding the same amino acid, and/or any of the codons ACG, ACA, ACU coding for Thr may be exchanged by the codon ACC encoding the same amino acid, and/or any of the codons GUG, GUA, GUU coding for Val may be exchanged by the codon GUC encoding the same amino acid, and/or the codon UAU coding for Tyr may be exchanged by the codon UAC encoding the same amino acid.

In any of the above instances, the number of cytosines is increased by 1 per exchanged codon. Exchange of all non C-optimized codons (corresponding to C-optimizable codons) of the coding region results in a C-maximized coding sequence. In the context of the invention, at least 70%, preferably at least 80%, more preferably at least 90%, of the non C-optimized codons within the at least one coding region of the RNA according to the invention are replaced by C-optimized codons.

It may be preferred that for some amino acids the percentage of C-optimizable codons replaced by C-optimized codons is less than 70%, while for other amino acids the percentage of replaced codons is higher than 70% to meet the overall percentage of C-optimization of at least 70% of all C-optimizable wild type codons of the coding region.

Preferably, in a C-optimized RNA of the invention, at least 50% of the C-optimizable wild type codons for any given amino acid are replaced by C-optimized codons, e.g. any modified C-enriched RNA preferably contains at least 50% C-optimized codons at C-optimizable wild type codon positions encoding any one of the above mentioned amino acids Ala, Cys, Asp, Phe, Gly, His, He, Leu, Asn, Pro, Arg, Ser, Thr, Val and Tyr, preferably at least 60%.

In this context codons encoding amino acids, which are not cytosine content-optimizable and which are, however, encoded by at least two codons, may be used without any further selection process. However, the codon of the wild type sequence that codes for a relatively rare tRNA in the cell, e.g. a human cell, may be exchanged for a codon that codes for a relatively frequent tRNA in the cell, wherein both code for the same amino acid. Accordingly, the relatively rare codon GAA coding for Glu may be exchanged by the relative frequent codon GAG coding for the same amino acid, and/or

the relatively rare codon AAA coding for Lys may be exchanged by the relative frequent codon AAG coding for the same amino acid, and/or

the relatively rare codon CAA coding for Gin may be exchanged for the relative frequent codon CAG encoding the same amino acid.

In this context, the amino acids Met (AUG) and Trp (UGG), which are encoded by only one codon each, remain unchanged. Stop codons are not cytosine-content optimized; however, the relatively rare stop codons amber, ochre (UAA, UAG) may be exchanged by the relatively frequent stop codon opal (UGA).

The single substitutions listed above may be used individually as well as in all possible combinations in order to optimize the cytosine-content of the modified RNA compared to the wild type mRNA sequence.

Accordingly, the at least one coding sequence as defined herein may be changed compared to the coding region of the respective wild type RNA in such a way that an amino acid encoded by at least two or more codons, of which one comprises one additional cytosine, such a codon may be exchanged by the C-optimized codon comprising one additional cytosine. wherein the amino acid is preferably unaltered compared to the wild type sequence.

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%. 30%, 40%, 50%, 60%. 70%, 80%, 85%, 8G%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 8D%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NDs: 13231-17640, or a fragment or variant of any one of said nucleic acid sequences.

According to a particularly preferred embodiment, the invention provides an RNA, preferably an mRNA, comprising at least one coding sequence as defined herein, wherein the G/C content of the at least one coding sequence of the RNA is increased compared to the G/C content of the corresponding coding sequence of the corresponding wild type RNA, and/or wherein the C content of the at least one coding sequence of the RNA is increased compared to the G content of the corresponding coding sequence of the corresponding wild type RNA. and/or wherein the codons in the at least one coding sequence of the RNA are adapted to human codon usage, wherein the codon adaptation index (CAI) is preferably increased or maximised in the at least one coding sequence of the RNA, and wherein the amino acid sequence encoded by the RNA is preferably not being modified compared to the amino acid sequence encoded by the corresponding wild type RNA.

5'-cap structure:

Modification af the S'-end of a modified artificial nucleic acid:

According to another preferred embodiment of the invention, the artificial nucleic acid, preferably an mRNA, as defined herein, can be modified by the addition of a so-called "5'-cap" structure, which preferably stabilizes the nucleic acid, preferably an mRNA, as described herein.

In a particularly preferred embodiment, the artificial nucleic acid according to the invention, preferably an mRNA, comprises a 5'-cap structure.

A 5'-cap is an entity, typically a modified nucleotide entity, which generally "caps" the 5'-end of a nucleic acid, for example of a mature mRNA. A 5'-cap may typically be formed by a modified nucleotide, particularly by a derivative of a guanine nucleotide. Preferably, the 5'-cap is linked to the 5'-terminus via a 5'-5'-triphosphate linkage. A 5'-cap may be methylated, e.g. m7GpppN, wherein N is the terminal 5' nucleotide of the nucleic acid carrying the 5'-cap, typically the S'-end of an mRNA. m7GpppN is the 5'-cap structure, which naturally occurs in mRNA transcribed by polymerase II and is therefore preferably not considered as modification comprised in an artificial nucleic acid in this context. Accordingly, a modified artificial nucleic acid, preferably an mRNA, of the present invention may comprise an m7GpppN as 5'-cap, but additionally the modified artificial nucleic acid, preferably an mRNA, typically comprises at least one further modification as defined herein.

Further examples of 5'cap structures include glyceryl, inverted deaxy abasic residue (moiety), 4',5' methylene nucleotide, I-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide, l,5-anhydrohexitol nucleotide, L-nucleatides, alpha-nucleotide, modified base nucleotide, threo-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide. 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-invertBd nucleotide moiety, 3'-2'-inverted abasic moiety, l,4-butanediol phosphate, 3'-phosphoramidate, hexylphasphate, aminohexyl phosphate, 3'-phosphate, 3'phosphorothioate, phosphorodithioate, or bridging or non-bridging methylphosphonate moiety. These modified 5'-cap structures are regarded as at least one modification in this context.

Particularly preferred modified 5'-cap structures are capl (methylation of the ribose of the adjacent nucleotide of m7G), cap2 (additional methylation of the ribose of the 2nd nucleotide downstream of the m7G), cap3 (additional methylation of the ribose of the 3rd nucleotide downstream of the m7G), cap4 (additional methylation of the ribose of the 4th nucleotide downstream of the m7G), ARCA (anti-reverse cap analogue, modified ARCA (e.g. phosphothioate modified ARCA), inosine, Nl-methyl-guanosine, 2'-fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine. LNA-guanosine. and 2-azido-guanosine.

S'-UTRs:

According to a further embodiment, the artificial nucleic acid comprises an untranslated region (UTR). More preferably, the artificial nucleic acid according to the invention, preferably an mRNA. comprises at least one of the following structural elements:

a 5'- and/or 3'- untranslated region element (UTR element), particularly a 5'-UTR element, which comprises or consists of a nucleic acid sequence which is derived from the 5'-UTR of a TOP gene or from a fragment, homolog or a variant thereof, or a 5'- and/or 3'-UTR element which may be derivable from a gene that provides a stable mRNA or from a homolog, fragment or variant thereof; a histone-stem-loop structure, preferably a histone-stem-loop in its 3' untranslated region; a 5'-cap structure; a poly-A tail; or a poly(C) sequence.

In a preferred embodiment, the artificial nucleic acid, preferably an mRNA, comprises at least one 5'- or 3'-UTR element. In this context, an UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'- or 3'-UTR of any naturally occurring gene or which is derived from a fragment, a homolog or a variant of the 5'- or 3'-UTR of a gene. Preferably the 5'- or 3'-UTR element used according to the present invention is heterologous to the coding region of the inventive artificial nucleic acid. Even if 5'- or 3'-UTR elements derived from naturally occurring genes are preferred, also synthetically engineered UTR elements may be used in the context of the present invention.

According to a preferred embodiment, the artificial nucleic acid according to the invention comprises a 5'-UTR. More preferably, the artificial nucleic acid comprises a 5'-UTR comprising at least one heterologous 5'-UTR element.

In a particularly preferred embodiment, the artificial nucleic acid comprises at least one 5'-untranslated region element (5'-UTR element), preferably a heterologous 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene or which is derived from a fragment, homolog or variant of the 5'-UTR of a TOP gene.

It is particularly preferred that the 5'-UTR element does not comprise a TDP-motif or a 5'TOP, as defined above.

In some embodiments, the nucleic acid sequence of the 5'-UTR element, which is derived from a 5'-UTR of a TDP gene, terminates at its 3'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 upstream of the start codon (e.g. A(U/T)G) of the gene or mRNA it is derived from. Thus, the 5'-UTR element does not comprise any part of the protein coding region. Thus, preferably, the only protein coding part of the artificial nucleic acid is provided by the at least one coding region.

The nucleic acid sequence, which is derived from the 5'-UTR of a TDP gene, is typically derived from a eukaryotic TDP gene, preferably a plant or animal TDP gene, more preferably a chordate TDP gene, even more preferably a vertebrate TDP gene, most preferably a mammalian TDP gene, such as a human TDP gene.

For example, the 5'-UTR element is preferably selected from 5'-UTR elements comprising or consisting of a nucleic acid sequence, which is derived from a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-1383, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, whose disclosure is incorporated herein by reference, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from a variant thereof, or preferably from a corresponding RNA sequence. The term "homologs of SEQ ID NOs: 1-

1363, SEQ ID NO: I3B5, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700" refers to sequences of other species than homo sapiens, which are homologous to the sequences according to SEQ ID NDs: I-I3B3, SEQ ID NO: 1305, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700,

In a preferred embodiment, the 5'-UTR element of the artificial nucleic acid, preferably an mRNA, comprises or consists of a nucleic acid sequence, which is derived from a nucleic acid sequence extending from nucleotide position 5 (i.e. the nucleotide that is located at position 5 in the sequence) to the nucleotide position immediately 5' to the start codon (located at the 3' end of the sequences), e.g. the nucleotide position immediately 5' to the ATG sequence, of a nucleic acid sequence selected from SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: I3B5, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700 from a variant thereof, or a corresponding RNA sequence. It is particularly preferred that the 5'-0TR element is derived from a nucleic acid sequence extending from the nucleotide position immediately 3' to the 5T0P to the nucleotide position immediately 5' to the start codon (located at the 3'-end of the sequences), e.g. the nucleotide position immediately 5' to the ATG sequence, of a nucleic acid sequence selected from SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from a variant thereof, or a corresponding RNA sequence.

In a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein or from a variant of a 5'-UTR of a TOP gene encoding a ribosomal protein. For example, the 5'-0TR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a nucleic acid sequence according to any of SEQ ID NO: 67, 170, 193, 244, 259, 554, 650, 675, 700, 721, 913, 1016, 1063, 1120, 1138. and 1284-1360 of the patent application W0 2DI3/I43700, a corresponding RNA sequence, a homolog thereof, or a variant thereof as described herein, preferably lacking the STOP motif. As described above, the sequence extending from position 5 to the nucleotide immediately 5' to the ATG (which is located at the 3'-end of the sequences) corresponds to the 5'-UTR of said sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences, wherein these sequences resemble VPI protein sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 4411-8820, 39713, 30714, 3B7I8, 39719, 39722, 39723, 39726, 39727, 39731, 39732, 39735, 39736, 39739, 39740, 39743 and 39744, or a fragment or variant of any of these sequences, wherein these sequences resemble VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 8821-13230, 39715, 3B7I6, 33717, 39720, 39721, 33724, 33725. 39728, 33723, 33730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NDs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281-39630, and/or SEQ ID N0:397I3 to SEQ

ID N0:39746, and/or SEQ ID NO: 39714, 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: I323I-I7B4D, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NDs: I7B4I-22050. or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NDs: 22D5I-2B4BD, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SED ID NDs: 2B4BI-3D87D, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NDs: 3D87I-3528Q, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NDs: 3528I-3969Q, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VPI nucleotide wild type sequences.

Preferably, the artificial nucleic acid according to the invention comprises a 5'-UTR comprising at least one heterologous 5'-DTR sequence, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a homolog, a fragment or a variant thereof, preferably lacking the 5'TOP motif.

Preferably, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-DTR of a TOP gene encoding a ribosomal Large protein (RPL) or from a homolog or variant of a 5'-UTR of a TDP gene encoding a ribosomal Large protein (RPL). For example, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-DTR of a nucleic acid sequence according to any of SEQ ID NDs: 67, 259, 1284-1318, 1344, 1346, 1348-1354, 1357, 1358, 1421 and 1422 of the patent application WD 2013/143700, a corresponding RNA sequence, a homolog thereof, or a variant thereof as described herein, preferably lacking the 5'TOP motif.

In a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'-0TR of a ribosomal protein Large 32 gene, preferably from a vertebrate ribosomal protein Large 32 (L32) gene, more preferably from a mammalian ribosomal protein Large 32 (L32) gene, most preferably from a human ribosomal protein Large

32 (L32) gene, or from a variant of the 5'-UTR of a ribosomal protein Large 32 gene, preferably from a vertebrate ribosomal protein Large 32 (L32) gene, more preferably from a mammalian ribosomal protein Large 32 (L32) gene, most preferably from a human ribosomal protein Large 32 (L32) gene, wherein preferably the 5'-UTR element does not comprise the 5'TOP of said gene.

Accordingly, in a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 93% to the nucleic acid sequence according to SEO ID NO: 20649 (5'-UTR of human ribosomal protein Large 32 lacking the 5'-terminal oligopyrimidine tract; corresponding to SEQ ID NO: 1368 of the patent application W0 2013/143700) or preferably to a corresponding RNA sequence, such as SEO ID NO: 39692, or wherein the at least one 5'-UTR element comprises or consists of a fragment of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 7D%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to the nucleic acid sequence according to SEQ ID NO: 39691, or more preferably to a corresponding RNA sequence, such as SEO ID NO: 39692, wherein, preferably, the fragment is as described above, i.e. being a continuous stretch of nucleotides representing at least 20% etc. of the full-length 5'-UTR. Preferably, the fragment exhibits a length of at least about 20 nucleotides or more, preferably of at least about 30 nucleotides or more, more preferably of at least about 40 nucleotides or more. Preferably, the fragment is a functional fragment as described herein.

In some embodiments, the artificial nucleic acid according to the invention comprises a 5'-0TR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-0TR of a vertebrate TOP gene, such as a mammalian, e.g. a human TOP gene, selected from RPSA, RPS2, RPS3, RPS3A, RPS4, RPS5. RPS6, RPS7, RPS8. RPS9, RPSI0, RPSII, RPSI2, RPSI3, RPSI4, RPSI5, RPSI5A, RPSI6, RPSI7, RPSI8, RPSI9, RPS20, RPS2I. RPS23, RPS24, RPS25, RPS26, RPS27, RPS27A, RPS28, RPS29, RPS30, RPL3, RPL4, RPL5, RPL6, RPL7, RPL7A, RPL8, RPL9, RPLI0, RPLI0A, RPLII. RPLI2, RPLI3, RPLI3A, RPLI4, RPLI5, RPLI7, RPLI8, RPLI8A, RPLI9, RPL2I, RPL22, RPL23, RPL23A, RPL24, RPL26, RPL27, RPL27A, RPL28, RPL29, RPL30, RPL3I, RPL32, RPL34, RPL35, RPL35A, RPL36, RPL36A, RPL37, RPL37A, RPL38, RPL39, RPL40, RPL4I. RPLP0, RPLPI, RPLP2, RPLP3, RPLP0, RPLPI, RPLP2, EEFIAI, EEFIB2, EEFID, EEFIG, EEF2, EIF3E, EIF3F, EIF3H, EIF2S3, EIF3C, EIF3K, EIF3EIP, EIF4A2, PABPCI, HNRNPAI, TPTI, TUBBI, 0BA52, NPMII. ATP5G2, GNB2LI, NME2, UQCRB, or from a homolog or variant thereof, wherein preferably the 5'-0TR element does not comprise a TDP-motif or the 5'TOP of said genes, and wherein optionally the 5'-UTR element starts at its 5'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 downstream of the 5'-terminal oligopyrimidine tract (TOP) and wherein further optionally the 5'-UTR element which is derived from a 5'-0TR of a TOP gene terminates at its 3'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 upstream of the start codon (A(U/T)G) of the gene it is derived from.

According to a preferred embodiment, the artificial nucleic acid comprises at least one heterologous 5'-UTR element comprising a nucleic acid sequence, which is derived from a 5'-0TR of a TDP gene encoding a ribosomal Large protein (RPL), preferably

RPL32 or" RPL35A, al" from a gene selected from the group consisting of HSDI7B4, ATP5AI, AIGI. ASAHI, CDXBC or ABCB7 (also referred to herein as MDR), or from a holMolOg, a fragment or variant of any one of these genes, preferably lacking the 5'TDP motif.

In further particularly preferred embodiments, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a ribosomal protein Large 32 gene (RPL32). a ribosomal protein Large 35 gene (RPL35), a ribosomal protein Large 2l gene (RPL2I), an ATP synthase, H+ transporting, mitochondrial Fl complex, alpha subunit I, cardiac muscle (ATP5AI) gene, an hydroxysteroid (17-beta) dehydrogenase 4 gene (HSDI7B4), an androgen-induced I gene (AIGI), cytochrome c oxidase subunit Vic gene (CDXBC), a N-acylsphingosine amidohydrolase (acid ceramidase) I gene (ASAHI), or an ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, preferably from a vertebrate ribosomal protein Large 32 gene (RPL32), a vertebrate ribosomal protein Large 35 gene (RPL35), a vertebrate ribosomal protein Large 21 gene (RPL2I), a vertebrate ATP synthase, H+ transporting, mitochondrial Fl complex, alpha subunit I, cardiac muscle (ATP5AI) gene, a vertebrate hydroxysteroid (17-beta) dehydrogenase 4 gene (HSDI7B4), a vertebrate androgen-induced I gene (AIGI), a vertebrate cytochrome c oxidase subunit Vic gene (CDXBC), a vertebrate N-acylsphingosine amidohydrolase (acid ceramidase) I gene (ASAHI), or a vertebrate ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, more preferably from a mammalian ribosomal protein Large 32 gene (RPL32), a ribosomal protein Large 35 gene (RPL35), a ribosomal protein Large 2l gene (RPL2I), a mammalian ATP synthase, H+ transporting, mitochondrial Fl complex, alpha subunit I, cardiac muscle (ATP5AI) gene, a mammalian hydroxysteroid (17-beta) dehydrogenase 4 gene (HSDI7B4), a mammalian androgen-induced I gene (AIGI), a mammalian cyto-chrome c oxidase subunit Vic gene (CDXBC), a mammalian N-acylsphingosine ami-dohydrolase (acid ceramidase) I gene (ASAHI), or a mammalian ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, most preferably from a human ribosomal protein Large 32 gene (RPL32), a human ribosomal protein Large 35 gene (RPL35), a human ribosomal protein Large 2l gene (RPL2I), a human ATP synthase. H+ transporting, mitochondrial Fl complex, alpha subunit I, cardiac muscle (ATP5AI) gene, a human hydroxysteroid (17-beta) dehydrogenase 4 gene (HSDI784), a human androgen-induced I gene (AIGI), a human cytochrome c oxidase subunit Vic gene (CDXBC), a human N-acylsphingosine amidohydrolase (acid ceramidase) I gene (ASAHI), or a human ATP-Binding Cassette, Sub-Family B (MDR/TAP). Member 7 gene (ABCB7), or from a variant thereof, wherein preferably the 5'-DTR element does not comprise the 5'TDP of said gene.

Accordingly, in a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 30%, even more preferably of at least about 95%, even more preferably of at least about 93% to the nucleic acid sequence according to SED ID NO: I3G8, or SED ID NOs: 1412-1420 of the patent application WD 2013/143700, or a corresponding RNA sequence, or wherein the at least one 5'-UTR element comprises Or consists of a fragment of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%. preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about

39% to the nucleic acid sequence according to SEQ ID NO: 1368. or SEQ ID NDs: 1412-1420 of the patent application WO 2013/143DD, wherein, preferably, the fragment is as described above, i.e. being a continuous stretch of nucleotides representing at least 20% etc. of the full-length 5'-UTR. Preferably, the fragment exhibits a length of at least about 20 nucleotides or more, preferably of at least about 30 nucleotides or more, more preferably of at least about 40 nucleotides or more. Preferably, the fragment is a functional fragment as described herein.

According to a particularly preferred embodiment, the artificial nucleic acid comprises a 5'-UTR comprising at least one heterologous 5'-0TR element, wherein the heterologous 5'-0TR element comprises a nucleic acid sequence according to SEQ ID NO: 39691 to SEQ ID NO: 39FJ94. or a homolog, a fragment or a variant thereof. Preferably, the at least one heterologous 5'-UTR element comprises or consists of a nucleic acid sequence, which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to a nucleic acid sequence according to any one of SEQ ID NO: 33631 to SEQ ID NO: 39694.

According to a preferred embodiment, the artificial nucleic acid according to the invention comprises a 3'-untranslated region (3'-UTR). More preferably, the artificial nucleic acid according to the invention comprises a 3'-UTR comprising or consisting of at least one heterologous 3'-0TR element, preferably as defined herein.

Poly(A) sequence and Poly(C) sequence:

According to a further preferred embodiment, the artificial nucleic acid, preferably the 3'-UTR, may contain a poly-A tail of typically about 10 to 200 adenosine nucleotides, preferably about 10 to 100 adenosine nucleotides, more preferably about 40 to 80 adenosine nucleotides or even more preferably about 50 to 70 adenosine nucleotides.

Preferably, the poly(A) sequence in the artificial nucleic acid, preferably an mRNA, is derived from a DNA template by in vitro transcription. Alternatively, the poly(A) sequence may also be obtained in vitro by common methods of chemical-synthesis without being necessarily transcribed from a DNA progenitor. Moreover, poly(A) sequences, or poly(A) tails may be generated by enzymatic polyadenylation of the RNA according to the present invention using commercially available polyadenylation kits and corresponding protocols known in the art, or using immobilized poly(A)polymerases e.g. in a polyadenylation reactor (WO 2016/174271).

Alternatively, the artificial nucleic acid, preferably an mRNA, optionally comprises a polyadenylation signal, which is defined herein as a signal, which conveys polyadenylation to a (transcribed) mRNA by specific protein factors (e.g. cleavage and polyadenylation specificity factor (CPSF), cleavage stimulation factor (CstF), cleavage factors I and II (CF I and CF II), poly(A) polymerase (PAP)). In this context, a consensus polyadenylation signal is preferred comprising the NN(U/T)ANA consensus sequence. In a particularly preferred aspect, the polyadenylation signal comprises one of the following sequences: AA(U/T)AAA or A(0/T)(U/T)AAA (wherein uridine is usually present in RNA and thymidine is usually present in DNA).

According to a further preferred embodiment, the artificial nucleic acid of the present invention, preferably the S'-UTR of the artificial nucleic acid, may contain a poly-C tail of typically about ID to 20D cytosine nucleotides, preferably about 1D to IDO cytosine nucleotides, more preferably about 2D to 70 cytosine nucleotides or even more preferably about 20 to GO or even 10 to 40 cytosine nucleotides.

3'-UTRs:

In a further preferred embodiment, the artificial nucleic acid according to the invention further comprises at least one S'-UTR element, which comprises or consists of a nucleic acid sequence derived from the 3'-UTR of a chordate gene, preferably a vertebrate genE, more preferably a mammalian gene, most preferably a human gene, or from a variant of the 3'-UTR of a chordate gene, preferably a vertebrate gene, more preferably a mammalian gene, most preferably a human gene.

The tfirm "3'-0TR element" refers to a nucleic acid sequence, which comprises or consists of a nucleic acid sequence that is derived from a 3'-UTR or from a variant of a S'-UTR. A 3'-DTR element in the sense of the present invention may represent the 3'-DTR on a DNA or on an RNA level. Thus, in the sense of the present invention, preferably, a 3'-DTR element may be the 3'-UTR of an mRNA, preferably Of an artificial mRNA, or it may be the transcription template for a 3'-UTR of an mRNA. Thus, a 3'-UTR element preferably is a nucleic acid sequence, which corresponds to the 3'-UTR of an mRNA, preferably to the S'-UTR of an artificial mRNA, such as an mRNA obtained by transcription of a genetically engineered vector construct. Preferably, the 3'-UTR element fulfils the function of a 3'-UTR or encodes a sequence, which fulfils the function of a 3'-DTR.

Preferably, the artificial nucleic acid comprises a 3'-UTR element comprising or consisting of a nucleic acid sequence derived from a S'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment Dr a variant of said gene. In particular, the 3'-UTR element may be derivable from a gene that relates to an mRNA with an enhanced half-life (that provides a stable mRNA), for example a 3'-UTR element as defined and described below.

In a particularly preferred embodiment, the 3'-UTR element comprises or consists of a nucleic acid sequence which is derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(1) gene, or from a homolog, a fragment or a variant of a 3'-DTR of a gene selected from the group consisting of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(1) gene. More preferably, the 3'-DTR element comprises or consists of a nucleic acid sequence which is derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(1) gene, or from a homolog, a fragment or a variant of a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(1) gene according to SE0 ID NOs: I3G9-I300 of

the patent application WD 2013/143700, whose disclosure is incorporated herein by reference, or from a homolog, a fragment or a variant thereof.

In a particularly preferred embodiment, the 3'-0TR element comprises or consists of a nucleic acid sequence, which is derived from the 3'-UTR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-0TR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR of a human albumin gene or from a variant thereof, even more preferably from the 3'-0TR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof. More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEO ID NO: 39703, or SEQ ID NO: 39704 (corresponding to SEQ ID NO: 1369 of the patent application WO 2013/143700), or a fragment, homolog or variant thereof.

Most preferably the 3'-0TR element comprises or consists of the nucleic acid sequence derived from a fragment of the human albumin gene according to SEQ ID NO: 39705, or SEO ID NO: 39706 (corresponding to SEQ ID NO: 137G of the patent application W0 2013/143700), or a fragment, homolog or variant thereof. Further preferably, the 3'-0TR element comprises or consists of a nucleic acid according to SEO ID NO: 39707, or SEQ ID NO: 397D8, (Albumin 7), or a fragment, homolog or variant thereof.

In another particularly preferred embodiment, the at least one heterologous 3'-0TR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of an a-globin gene, preferably a vertebrate a-or β-globin gene, more preferably a mammalian a-or β-globin gene, most preferably a human a-or β-globin gene.

More preferably, the 3'-0TR element comprises or consists of a nucleic acid according to SEQ ID NO: 39G95, or SEQ ID NO: 39G96 (corresponding to SEQ ID NO: 1370 of the patent application W0 2013/143700). or a homolog, a fragment, or a variant thereof

Preferably, the at least one heterologous 3'-0TR element comprises or consists of a nucleic acid sequence derived from a 3'-0TR of Homo sapiens hemoglobin, alpha 1 (HBAI). More preferably, the 3'-0TR element comprises or consists of a nucleic acid according to SEQ ID ND: 39695, or SEQ ID NO: 3969G (corresponding to SEQ ID NO: 137D of the patent application W0 2013/143700), or a homolog, a fragment, or a variant thereof.

In another embodiment, the at least one heterologous 3'-UTR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of Homo sapiens hemoglobin, alpha 2 (HBA2). More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39697 or SEO ID NO: 39698 (corresponding to SEQ ID NO: 1371 of the patent application W0 2013/I4370D), or a homolog, a fragment, or a variant thereof.

According to another embodiment, the at least one heterologous 3'-0TR element comprises or consists of a nucleic acid sequence derived from a 3'-0TR of Homo sapiens hemoglobin, beta (HBB). More preferably, the 3'-0TR element comprises or consists of a

nucleic acid according to SEQ ID NO: 39699, or SED ID NO: 39700 (corresponding to SEO ID NO: 1372 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

The at least one heterologous 3'-DTR element may further comprise or consist of the center, α-complex-binding portion of the 3'-0TR of an a-globin gene, such as of a human a-globin gene, or a homolog, a fragment, or a variant of an a-globin gene, preferably according to SEQ ID NO: 39701 or SEO ID NO: 39702 (also referred to herein as "muag") (corresponding to SEO ID NO: 1393 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

The term "a nucleic acid sequence which is derived from the 3'-0TR of a [...] gene" preferably refers to a nucleic acid sequence which is based on the 3'-UTR sequence of a [...] gene or on a part thereof, such as on the 3'-UTR of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, or a collagen alpha gene, such as a collagen alpha 1(1) gene, preferably of an albumin gene or on a part thereof. This term includes sequences corresponding to the eotire 3'-0TR sequence, i.e. the full length 3'-0TR sequence of a gene, and sequences corresponding to a fragment of the 3'-UTR sequence of a gene, such as an albumin gene, α-globin gene, β-globin gene, tyrosine hydroxylase gene, lipoxygenase gene, or collagen alpha gene, such as a collagen alpha 1(1) gene, preferably of an albumin gene.

The term "a nucleic acid sequence which is derived from a variant of the 3'-UTR of a [...] gene" preferably refers to a nucleic acid sequence, which is based on a variant of the 3'-0TR sequence of a gene, such as on a variant of the 3'-UTR of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, or a collagen alpha gene, such as a collagen alpha 1(1) gene, or on a part thereof as described above. This term includes sequences corresponding to the entire sequence of the variant of the 3'-UTR of a gene, i.e. the full length variant 3'-UTR sequence of a gene, and sequences corresponding to a fragment of the variant 3'-0TR sequence of a gene. A fragment in this context preferably consists of a continuous stretch of nucleotides corresponding to a continuous stretch of nucleotides in the full-length variant 3'-UTR, which represents at least 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, even more preferably at least 80%, and most preferably at least 90% of the full-length variant 3'-0TR. Such a fragment of a variant, in the sense of the present invention, is preferably a functional fragment of a variant as described herein.

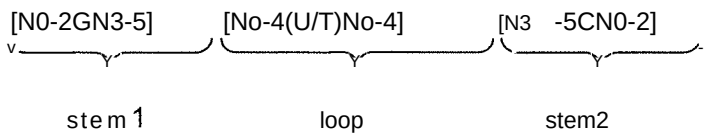
Preferably, the at least one 5'-UTR element and the at least one 3'-0TR element act synergistically to increase protein production from the inventive artificial nucleic acid as described above.

Histone-stem-loop:

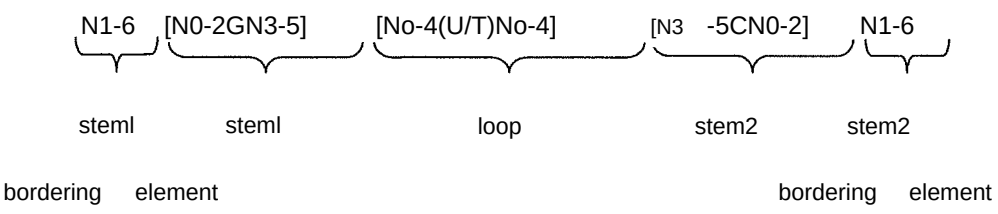
In a particularly preferred embodiment, the inventive artificial nucleic acid as described herein comprises a histone stem-loop sequence/structure (histone stem-loop). Such histone stem-loop sequences are preferably selected from histone stem-loop sequences as disclosed in W0 2012/019780, whose disclosure is incorporated herewith by reference.

A histnne stem-loop sequence, suitable to be used within the present invention, is preferably selected from at least one of the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):



formula (II) (stem-loop sequence with stem bordering elements):



wherein:

steml or stem2 bordering elements N_{1-6} is a consecutive sequence of 1 to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof:

steml [N0-2GN3.5] is reverse complementary or partially reverse complementary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof:

wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and

wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;

loop sequence [ND-4(U/T)ND-A] is located between elements steml and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably of 4 nucleotides;

wherein each N_{0-4} is independent from another a consecutive sequence of 0 to 4, preferably of 1 to 3, more preferably of 1 to 2 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and

wherein U/T represents uridine, or optionally thymidine;

stem2 $[N_3\text{-}5CN_{0\text{-}2}]$ is reverse complementary or partially reverse complementary with element steml, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein $N_{3\text{-}5}$ is a consecutive sequence of 3 to 5. preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein $N_{0\text{-}z}$ is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G or C or a nucleotide analogue thereof; and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleoside guanosine in steml is replaced by cytidine;

wherein

steml and stem2 are capable of base pairing with each other forming a reverse complementary sequence, wherein base pairing may occur between steml and stem2, e.g. by Watson-Crick base pairing of nucleotides A and U/T or G and C or by non-Watson-Crick base pairing e.g. wobble base pairing, reverse Watson-Crick base pairing, Hoogsteen base pairing, reverse Hoogsteen base pairing or are capable of base pairing with each other forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between steml and stem2. on the basis that one ore more bases in one stem do not have a complementary base in the reverse complementary sequence of the other stem.

According to a further preferred embodiment of the first inventive aspect, the inventive artificial nucleic acid may comprise at least one histone stem-loop sequence according to at least one of the following specific formulae (Ia) or (Ha):

formula (Ia) (stem-loop sequence without stem bordering elements):

$$\underbrace{[\mathbf{N0}\text{-}1GN3\text{-}5]}_{\text{steml}}\ \underbrace{[\mathbf{Ni\text{-}_3(U/T)No\text{-}_2}]}_{\text{loop}}\ \underbrace{[N3\text{-}5CN0\text{-}1]}_{\text{stem2}}$$

formula (Ha) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{2\text{-}5}}_{\text{bordering element}}\ \underbrace{[N_{0\text{-}1}GN_{3\text{-}5}]}_{\text{steml}}\ \underbrace{[N_{1\text{-}3}(U/T)N_{0\text{-}2}]}_{\text{loop}}\ \underbrace{[N_{3\text{-}5}CN_{0\text{-}1}]}_{\text{stem2}}\ \underbrace{N_{2\text{-}5}}_{\text{bordering element}}$$

wherein: N, C, G, T and U are as defined above.

According to a further more particularly preferred embodiment of the first aspect, the inventive artificial nucleic acid may comprise at least one histone stem-loop sequence according to at least one of the following specific formulae (Ib) or (Iib):

formula (Ib) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N1GN4]}_{\text{steml}}\ \underbrace{[\mathbf{N_2(U/T)Ni}]}_{\text{loop}}\ \underbrace{[N4CN1]}_{\text{stem2}}$$

formula (Iib) (stem-loop sequence with stem bordering elements):

$$\underbrace{N4\text{-}5}_{\text{bordering element}}\ \underbrace{[N1GN4]}_{\text{steml}}\ \underbrace{[\mathbf{N_2(U/T)Ni}]}_{\text{loop}}\ \underbrace{[N4CN1]}_{\text{stem2}}\ \underbrace{N4\text{-}5}_{\text{bordering element}}$$

wherein: N. C, G, T and U are as defined above.

A particular preferred histone stem-loop sequence is the nucleic acid sequence according to SEQ ID NO: 30703, or more preferably the corresponding RNA sequence according to SEQ ID NO: 3B7I0.

Additional peptide or protein elements:

According to other preferred embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode further peptide or protein elements that e.g., promote secretion of the protein (secretory signal peptides), promote anchoring of the encoded antigen in the plasma membrane (transmembrane domains), promote virus-like particle formation (VLP forming domains). In addition, the artificial nucleic acid sequence according to the present invention may additionally encode peptide linker elements, self-cleaving peptides or helper peptides.

According to another particularly preferred embodiment, the inventive artificial nucleic acid may additionally or alternatively encode a secretory signal peptide (signal sequence). Such signal peptides are sequences, which typically exhibit a length of about 10 to 30 amino acids and are preferably located at the N-terminus of the encoded peptide, without being limited thereto. Signal peptides as defined herein preferably allow the transport of the at least one protein encoded by the at least one coding region of the inventive artificial nucleic acid into a defined cellular compartment, preferably the cell surface, the endoplasmic reticulum (ER) or the endosomal-lysosomal compartment. Examples of secretory signal peptide sequences as defined herein include, without being limited thereto, signal sequences of classical or non-classical MHC-molecules (e.g. signal sequences of MHC I and II molecules, e.g. of the MHC class I molecule HLA-A*0201), signal sequences of cytokines or immunoglobulines as defined herein, signal sequences of the invariant chain of immunoglobulines or antibodies as defined herein, signal sequences of Lampl, Tapasin, Erp57, Calretikulin, Calnexin, and further membrane associated proteins or of proteins associated with the endoplasmic reticulum (ER) or the endosomal-lysosomal compartiment. More preferably, signal sequences of MHC class I molecule HLA-A*0201 may be used according to the present invention.

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one transmembrane domain element.

Transmembrane elements or membrane spanning polypeptide elements are present in proteins that are integrated or anchored in plasma membranes of cells. Typical transmembrane elements are alpha-helical transmembrane elements. Such transmembrane elements are composed essentially of amino acids with hydrophobic side chains, because the interior of a cell membrane (lipid bilayer) is also hydrophobic. From the structural perspective, transmembrane elements are commonly single hydrophobic alpha helices or beta barrel structures; whereas hydrophobic alpha helices are usually present in proteins that are present in membrane anchored proteins (e.g., seven transmembrane domain receptors), beta-barrel structures are often present in proteins that generate pores or channels.

For target proteins, such as antigenic peptides or proteins according to the present invention (derived from Norovirus) it may be beneficial to introduce a transmembrane element into the respective constructs. By addition of a transmembrane element to the target peptide/protein it may be possible to further enhance the immune response, wherein the translated target peptide/protein, e.g. a viral antigen, anchors to a target membrane, e.g. the plasma membrane of a cell, thereby increasing immune responses. This effect is also referred to as antigen clustering.

When used in combination with a polypeptide or protein of interest in the context of the present invention, such transmembrane element can be placed N-terminal or C-terminal to the Norovirus antigenic peptide or protein of interest. On nucleic acid level, the coding sequence for such transmembrane element is typically placed in frame (i.e. in the same reading frame), 5' or 3' to the coding sequence of the polypeptide as defined herein.

The transmembrane domain may be selected from the transmembrane domain of Hemagglutinin (HA) of Influenza virus, Env of HIV-I, EIAV (equine infectious anaemia virus), MLV (murine leukaemia virus), mouse mammary tumor virus, G protein of VSV (vesicular stomatitis virus). Rabies virus, or a transmembrane element of a seven transmembrane domain receptor.

According to other embodiments, the artificial **nucleic acid** sequence, particularly the RNA **sequence according** to the **invention** may additionally encode at least one VLP forming domain.

VLPs are self-assembled viral structural proteins (envelope proteins or capsid proteins) that structurally resemble viruses (without containing viral genetic material). VLPs contain repetitive high density displays of antigens which present conformational epitopes that can elicit strong T cell and B cell immune responses.

When used in combination with a Norovirus antigenic peptide or protein in the context of the present invention, such VLP forming element can be placed N-terminal or C-terminal to the polypeptide nf interest. On nucleic acid level, the coding sequence for such VLP forming element is typically placed in frame (i.e. in the same reading frame), 5' or 3' to the coding sequence of the polypeptide as defined herein.

For nucleic acid (e.g. RNA) encoding a polypeptide or protein of interest, particularly Norovirus antigenic polypeptides or proteins, it may be beneficial to introduce a VLP forming element into the respective constructs. In addition to the "clustering" of epitopes, an improved secretion of the VLP particle may also increase the immunogenicity of the respective antigen.

VLP forming elements fused to an antigen may generate virus like particles containing repetitive high density displays of antigens. Essentially, such VLP farming elements can be chosen from any viral or phage capsid or envelope protein.

According to another embodiment, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one peptide linker element.

In protein constructs composed of several elements (e.g., Norovirus antigenic peptide or protein fused to a transmembrane domain), the protein elements may be separated by peptide linker elements. Such elements may be beneficial because they allow for a proper folding of the individual elements and thereby the proper functionality of each element. Alternatively, the term "spacer" or "peptide spacer" is used herein.

When used in the context of the present invention, such linkers or spacers are particularly useful when encoded by a nucleic acid encoding at least two functional protein elements, such as at least one polypeptide or protein of interest (Norovirus antigens) and at least one further protein or polypeptide element (e.g., VLP forming domain, transmembrane domain). In that case, the linker is typically located on the polypeptide chain in between the polypeptide of interest and the at least one further protein element. On nucleic acid level, the coding sequence for such linker is typically placed in the reading frame, 5' or 3' to the coding sequence for the polypeptide or protein of interest, or placed between coding regions for individual polypeptide domains of a given protein of interest.

Peptide linkers are preferably composed of small, non-polar (e.g. Gly) or polar (e.g. Ser or Thr) amino acids. The small size of these amino acids provides flexibility, and allows for mobility of the connecting functional domains. The incorporation of Ser or Thr can maintain the stability of the linker in aqueous solutions by farming hydrogen bonds with the water molecules, and therefore reduces an interaction between the linker and the protein moieties. Rigid linkers generally maintain the distance between the protein domains and they may be based on helical structures and/or they have a sequence that is rich in proline. Cleavable linkers (also termed "cleavage linkers") allow for in vivo separation of the protein domains. The mechanism of cleavage may be based e.g. on reduction of disulfide bonds within the linker sequence or proteolytic cleavage. The cleavage may be mediated by an enzyme (enzymatic cleavage), e.g. the cleavage linker may provide a protease sensitive sequence (e.g., furin cleavage).

A typical sequence of a flexible linker is composed of repeats of the amino acids Glycine (G) and Serine (S). For instance, the linker may have the following sequence: GS, GSG, SGG, SG, GGS, SGS, GSS, SSG. In some embodiments, the same sequence is repeated multiple times (e.g. two, three, four, five or six times) to create a longer linker. In other embodiments, a single amino acid residue such as S or G can be used as a linker.

Linkers or spacers may be used as additional elements to promote or improve the secretion of the target protein (Norovirus antigenic peptides or proteins).

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one self-cleaving peptide.

Viral self-cleaving peptides (2A peptides) allow the expression of multiple proteins from a single open reading frame. The terms 2A peptide and 2A element are used interchangeably herein. The mechanism by the 2A sequence for generating two proteins from one transcript is by ribosome skipping - a normal peptide bond is impaired at 2A, resulting in two discontinuous protein fragments from one translation event.

When used in the context of the present invention, such 2A peptides are particularly useful when encoded by a nucleic acid encoding at least two functional protein elements (e.g. two Norovirus antigenic peptides or proteins). In general, a 2A element is useful when the nucleic acid molecule encodes at least one polypeptide or protein of interest and at least one further protein element. In a preferred embodiment, a 2A element is present when the polynucleotide of the invention encodes two proteins or polypeptides of interest, e.g. two antigens.

The coding sequence for such 2A peptide is typically located in between the coding sequence of the polypeptide of interest and the coding sequence of the least one further protein element (which may also be a polypeptide of interest), so that cleavage of the 2A peptide leads to two separate polypeptide molecules, at least one of them being a polypeptide or protein of interest.

For example, for expressing target proteins (Norovirus antigenic peptides or proteins) that are composed of several polypeptide chains it may be beneficial to provide coding information for both polypeptide chains on a single nucleic acid molecule, separated by a nucleic acid sequence encoding a 2A peptide. 2A peptides may also be beneficial when cleavage of the protein of interest from another encoded polypeptide element is desired.

2A peptides may be derived from foot-and-mouth diseases virus, from equine rhinitis A virus, Thosea asigna virus, Porcine teschovirus-l.

According to Dther embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one helper peptide.

In essence, helper peptides binds to class II MHC molecules as a nonspecific vaccine helper epitope (adjuvant) and induces an increased (and long term) immune response by increasing the helper T-cell response. In an embodiment, such a helper peptide may be N-terminally and/or C-terminally fused to the antigenic peptide or protein derived from Norovirus.

mRNA structures:

Any of the above modifications may be applied to the artificial nucleic acid of the present invention, and further to any nucleic acid as used in the context of the present invention and may be, if suitable or necessary, be combined with each other in any combination, provided, these combinations of modifications do not interfere with each other in the artificial nucleic acid. A person skilled in the art will be able to take his choice accordingly.

The artificial nucleic acid as defined herein, may preferably comprise a 5'-UTR, a coding region encoding the at least one polypeptide comprising at least one Norovirus protein as described herein, or a fragment, variant or derivative thereof; and/or a 3'-UTR preferably containing at least one histone stem-loop. The 3'-UTR of the artificial nucleic acid preferably comprises also a poly(A) and/or a poly(C) sequence as defined herewithin. The single elements of the 3'-UTR may occur therein in any order from 5' to 3' along the sequence of the artificial nucleic acid. In addition, further elements as described herein, may also be

contained, such as a stabilizing sequence as defined herewitbin (e.g. derived from the UTR of a globin gene), IRES sequences, etc. Each of the elements may also be repeated in the artificial nucleic acid according to the invention at least once (particularly iП di- or multicistronic constructs), preferably twice or more. As an example, the single elements may be present in the artificial nucleic acid in the following order:

5' - coding region - histone stem-loop - poly(A)/(C) sequence - 3'; or

5' - coding region - poly(A)/(C) sequence - histone stem-loop - 3'; or

5' - coding region - histone stem-loop - polyadenylation signal - 3'; or

5' - coding region - polyadenylation signal- histone stem-loop - 3'; or

5' - coding region - histone stem-loop - histone stem-loop - poly(A)/(C) sequence - 3'; or

5' - coding region - histone stem-loop - histone stem-loop - polyadenylation signal- 3'; or

5' - coding region - stabilizing sequence - poly(A)/(C) sequence - histone stem-loop - 3'; or

5' - coding region - stabilizing sequence - poly(A)/(C) sequence - poly(A)/ (C) sequence - histone stem-loop - 3'; etc.

In this context, it is particularly preferred that - if, in addition to the at least oПe encoded polypeptide defined herein, a further peptide or protein is encoded by the artificial nucleic acid - the encoded peptide Dr protein is preferably no histone protein, no reporter protein (e.g. Luciferase, GFP, EGFP, β-Galactosidase, particularly EGFP) and/or no marker or selection protein (e.g. alpha-Globin, Galactokinase aПd Xanthine:Guanine phosphoribosyl transferase (GPT)). In a preferred embodiment, the artificial nucleic acid according to the invention does not comprise a reporter gene or a marker gene. Preferably, the artificial nucleic acid according to the invention does Пot encode, for instance, luciferase; green fluorescent protein (GFP) and its variants (such as eGFP, RFP or FJFP); α-globin; hypoxanthine-guanine phosphoribosyltransferase (HGPRT); β-galactosidase; galactokinase; alkaline phosphatase; secreted embryonic alkaline phosphatase (SEAP)) or a resistance gene (such as a resistance gene against neomycin, puromycin, hygramycin and zeocin). In a preferred embodiment, the artificial nucleic acid according to the invention does not encode luciferase. In another embodiment, the artificial nucleic acid according to the invention does not encode GFP or a variant thereof.

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (capD, capl, cap2), preferably m7GpppN,

b) a coding region encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,

c) optionally a poly(A) tail, preferably consisting of 10 to 20D, ID to IOD, 4D to 8D or 50 to 70 adenosine nucleotides,

d) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to IOD, 20 to 70, 20 to B0 or Io to 40 cytosine nucleotides, and

e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 3970О to SEQ ID NO: 3971О.

More preferably, the artificial nucleic acid according to the invention comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (capD, capl, cap2), preferably m7GpppN,

b) a coding region encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,

c) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an a -globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 3970B to SEQ ID NO: 397IQ.

According to a particularly preferred embodiment the RNA sequence according to the invention comprises, preferably in 5'- to 3'-direction:

a) a 5'-cap structure (capO, capl. cap2), preferably m7GpppN;

b) a 5'-0TR element which comprises or consists of a nucleic acid sequence corresponding to a nucleic acid sequence according to SEQ ID NO: 39691, or SEQ ID NO: 39G92, or SEQ ID NO: 39G93, or SEQ ID NO: 3969 4, a homolog, a fragment or a variant thereof:

c) at least one coding sequence according to any one of SEQ ID NOs: 8821-39690, 39717, and/or 39730 or a variant or fragment thereof encoding at least one antigenic peptide or protein derived from a Norovirus protein or peptide or a fragment or variant thereof according to any one of SEQ ID NOs: 1-4410, preferably comprising or consisting of any one of the nucleic acid sequences according to, or a fragment or variant thereof,

d) a 3'-UTR element comprising or consisting of a nucleic acid sequence which is derived from a gene providing a stable RNA, preferably comprising or consisting of the corresponding to a nucleic acid sequence according to SEQ ID NO: 39707, or SEQ ID NO: 39708, or SEQ ID NO: 39703, or SEQ ID NO: 39704, a homolog, a fragment or a variant thereof:

e) optionally, a poly(A) sequence preferably comprising 64 adenosines; and

f) optionally, a poly(C) sequence, preferably comprising 30 cytosines.

More preferably, the artificial nucleic acid according to the invention comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (capO, capl, cap2), preferably m7GpppN,

b) a 5'-QTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably comprising a nucleic acid sequence according to SEQ ID NO: 39691 to SED ID NO: 39694, or a homolog, a fragment or a variant thereof,

c) a coding sequence encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,

d) a 3'-DTR element comprising a nucleic acid **sequencE,** which is derived from an albumin gene, preferably comprising the corresponding RNA **sequence** of the nucleic acid **SEquence** according to SEO ID NO: 33705, or SEQ ID NO: 39706, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of 10 to 20D, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of 10 to 2D0, 10 to IDO, 20 to 70, 2D to 60 or 10 to 4D cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39700 to SEQ ID NO: 39710.

In some embodiments, the at least one coding region of the artificial nucleic acid according to the present invention comprises a nucleic acid sequence encoding a molecular tag. More preferably, the molecular tag is selected from the group consisting of a FLAG tag, a glutathionE -S-transferase (GST) tag, a His tag, a Myc tag, an Etag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

In particularly preferred Embodiments the mRNA sequBnce according to the invention comprises the following mRNA sequences (or RNA sequences being identical or at least 50%, 60%, 7096. 80%. 85%, 86%. 87%, 88%, 8B%, 90%, 91%, 92%, 93%, 94%, 95%, 36%. 97%, 98%, or 99% identical to the following RNA sequences):

- mRNA encoding VPI protein of Norovirus GII.4-03IG93-USA-2003; SEQ ID NO: 39713.
- mRNA encoding VPI protein of Norovirus GII.4-03I693-USA-2003; SEQ ID NO: 39714.
- mRNA encoding VPI protein of Norovirus GII.4-03I693-0SA-2D03: SEQ ID NO: 39715.
- mRNA encoding VPI protein of Norovirus GII.4-03I693-USA-2DD3: SEO ID NO: 397IG.
- mRNA encoding VPI protein of Norovirus GII.4-D3I693-0SA-20D3: SEO ID NO: 39717.
- mRNA encoding VPI protein of Norovirus GII.4 Farmington Hills-2002-DSA; SEQ ID NO: 39718.
- mRNA encoding VPI protein of Norovirus GII.4 Farmington Hills-2002-0SA: SEQ ID NO: 39719.
- mRNA encoding VPI protein of Norovirus GII.4 Farmington Hills-20D2-USA: SEQ ID NO: 39720.
- mRNA encoding VPI protein of Norovirus GII.4 Farmington Hills-20D2-USA; SEQ ID NO: 39721.
- mRNA encoding VPI protein of Norovirus GI.I-JSA-1968 : SEQ ID NO: 30722.
- mRNA encoding VPI protein of Norovirus GI.I-JSA-I9B8 ; SEQ ID NO: 39723.
- mRNA encoding VPI protein of Norovirus GI.I-JSA-I9B8 : SEQ ID NO: 39724.
- mRNA encoding VPI protein of Norovirus GI.I-JSA-I9B8 : SEQ ID ND: 39725.
- mRNA encoding VPI protein of Norovirus GII.4 2006b 092835-0SA-2D08; SEQ ID NO: 39726.

- mRNA encoding VPI protein of Norovirus GII.4 ZDDBb 092895-USA-2008; SEQ ID ND: 39727.
- mRNA encoding VPI protein of Norovirus GII.4 2006b D92895-USA-2D08; SEQ ID ND: 39728.
- mRNA encoding VPI protein of Norovirus GII.4 2006b 092895-DSA-2008; SE0 ID ND: 39729.
- mRNA encoding VPI protein of Norovirus GII.4 2006b D92895-USA-2008: SED ID ND: 39730.
- mRNA encoding VPI protein of Norovirus GII.4 GZ2DID-L87-Guangzhou-2DII; SED ID ND: 3973I.
- mRNA encoding VPI protein of Norovirus GII.4 GZ2DI0-L87-Guangzhou-2DII; SED ID ND: 39732.
- mRNA encoding VPI protein of Norovirus GII.4 GZ20IO-L87-Guangzhou-20ll; SED ID ND: 39733.
- mRNA encoding VPI protein of Norovirus GII.4 GZ2DI0-L87-Guangzhou-2DII; SEQ ID ND: 39734.
- mRNA encoding VPI protein of Norovirus GII.4 DSA-I997: SEQ ID ND: 39735.
- mRNA encoding VPI protein of Norovirus GII.4 USA-I997: SED ID ND: 39736.
- mRNA encoding VPI protein of Norovirus GII.4 USA-I997: SED ID ND: 39737.
- mRNA encoding VPI protein of Norovirus GII.4 DSA-I997; SEQ ID ND: 39738.
- mRNA encoding VPI protein of Norovirus Melksham; SEQ ID ND: 39739.
- mRNA encoding VPI protein of Norovirus Melksham; SEQ ID ND: 3974D.
- mRNA encoding VPI protein of Norovirus Melksham: SED ID ND: 3974I.
- mRNA encoding VPI protein of Norovirus Melksham; SED ID ND: 39742.
- mRNA encoding VPI protein of Norovirus GII.2-Vaals87-2DD5-NL; SEQ ID NO: 39743.
- mRNA encoding VPI protein of Norovirus GII.2-Vaals87-20054 L; SEQ ID ND: 39744.
- mRNA encoding VPI protein of Norovirus GII.2-Vaals87-20054 L; SED ID NO: 39745.
- mRNA encoding VPI protein of Norovirus GII.2-Vaals87-20054 L; SED ID ND: 39746.

RNA production:

The artificial nucleic acid according to the invention may be prepared by using any suitable method known in the art, including synthetic methods such as e.g. solid phase synthesis, as well as recombinant and in vitro methods, such as in vitro transcription reactions.

In a preferred embodiment, a linear DNA template is transcribed in vitro using DNA dependent T7 RNA polymerase in the presence of a nucleotide mixture and cap analog (m7GpppG) under suitable buffer conditions. In a particularly preferred embodiment, RNA production is performed under current good manufacturing practice, implementing various quality control steps, e.g. according to W0 2DI6/I80430. The obtained RNAs are HPLC purified using PureMessenger® (CureVac, Tubingen, Germany; W0 2D08/D77592). In a preferred embodiment, purified RNA product is lyophilized according to WD 2DI6/I6583I to yield a temperature stable Norovirus artificial nucleic acid. For the production of polyvalent Norovirus compositions, methods as disclosed in the PCT application PCT/EP20I6/Q82487 are preferably used and adapted accordingly.

Composition:

In a further aspect, the present invention provides a composition comprising at least one artificial nucleic acid as described herein and a suitable carrier, preferably a pharmaceutically acceptable carrier. The inventive composition comprising the artificial nucleic acid as described herein is preferably a (pharmaceutical) composition or a vaccine as described herein.

The inventive composition may comprise either only one type of artificial nucleic acid or at least two different artificial nucleic acids. In particular, the inventive composition may comprise at least two artificial nucleic acids as described herein, wherein each of the at least two artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a different one of the Norovirus proteins as described herein, or a fragment or a variant of any one of these proteins. Alternatively, the composition may comprise at least two artificial nucleic acids as described herein, wherein each of the at least two artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins as described herein, or a fragment or a variant of any one of these proteins. In another embodiment, the composition may also comprise at least two different artificial nucleic acids, which are bi- or multicistronic nucleic acids as described herein and wherein each of the artificial nucleic acids encodes at least two polypeptides, each comprising at least one Norovirus protein, or a fragment or variant thereof.

Preferably, the inventive composition comprises or consists of at least one artificial nucleic acid as described herein and a pharmaceutically acceptable carrier. The expression "pharmaceutically acceptable carrier" as used herein preferably includes the liquid or non-liquid basis of the inventive composition, which is preferably a pharmaceutical composition or a vaccine. If the inventive composition is provided in liquid form, the carrier will preferably be water, typically pyrogeo-free water; isotonic saline or buffered (aqueous) solutioos, e.g phosphate, citrate etc. buffered solutions. Water or preferably a buffer, more preferably an aqueous buffer, may be used, containing a sodium salt, preferably at least 50 mM of a sodium salt, a calcium salt, preferably at least 0,01 mM of a calcium salt, and optionally a potassium salt, preferably at least 3 mM of a potassium salt. According to a preferred embodiment, the sodium, calcium and, optionally, potassium salts may occur in the form of their halogenides, e.g. chlorides, iodides, or bromides, in the form of their hydroxides, carbonates, hydrogen carbonates, or sulfates, etc. Without being limited thereto, examples of sodium salts include e.g. NaCI, Nal, NaBr, NazC03, NaHC03, Na2SO4, examples of the optional potassium salts include e.g. KCI, Kl, KBr, **K2CO3, KHCO3,** K_2SO_4, and examples of calcium salts include e.g. CaClz. Cab, **CaBr2,** CaCOs, CaSOi, Ca(DH)z. Furthermore, organic anions of the aforementioned cations may be contained in the boffer.

Furthermore, one or more compatible solid or liquid fillers or diluents or encapsulating compounds may be used as well, which are suitable for administration to a person. The term "compatible" as used herein means that the constituents of the inventive composition are capable of being mixed with the at least one artificial nucleic acid of the composition, in such a manner that no interaction occors, which would substantially reduce the biological activity or the pharmaceutical effectiveness of the inventive composition under typical use conditions. Pharmaceutically acceptable carriers, fillers and diluents must, of course, have sufficiently high purity and sufficiently low toxicity to make them suitable for administration to a person to be treated. Some examples of compounds which can be used as pharmaceutically acceptable carriers, fillers or constituents thereof are sugars,

such as, for example, lactose, glucose, trehalose and sucrose; starches, such as, for example, corn starch or potato starch; dextrose; cellulose and its derivatives, such as, for example, sodium carboxymethylcellulose, ethylcellulose, cellulose acetate; powdered tragacanth; malt; gelatin; tallow; solid gliddants, such as, for example, stearic acid, magnesium stearate; calcium sulfate; vegetable oils, such as, for example, groundnut oil, cottonseed oil, sesame oil, olive oil, corn oil and oil from theobroma; polyols, such as, for example, polypropylene glycol, glycerol, sorbitol, mannitol and polyethylene glycol; alginic acid.

Further additives which may be included in the inventive composition are emulsifiers, such as, for example, Tween; wetting agents, such as, for example, sodium lauryl sulfate; colouring agents; taste-imparting agents, pharmaceutical carriers; tablet-forming agents; stabilizers; antioxidants; preservatives.

In another embodiment, the composition of the invention comprises at least 2, 3, 4, 5, 6, 7, 8, 3, ID, II, 12, 13, 14. 15, IB, 17, 18, 13, 20, 21 22. 23, 24, 25, 2B, 27, 28, 23, 30, 31, 32, 33, 34, 35, 3B, 37, 38, 33, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50, 51 52, 53, 54, 55, 5B, 57, 58, 53, GO, Gl, 62, 63, G4, 65, 66, 67. 68. 63. 70. 71. 72, 73. 74, 75, 76, 77, 78, 73, 80, 81, 82, 83, 84, 85, 86, 87, 88, 83, 30, 31, 92, 33, 34, 95, 36, 97, 38, 39, 100 or more artificial nucleic acids of the invention, wherein each of the at least 2, 3, 4, 5, B, 7, 8. 3. 10, II, 12. 13, 14, 15, 16, 17, 18, 19. 20, 21, 22, 23, 24, 25, 26, 27. 28, 29, 30, 31 32, 33. 34, 35, 3B. 37. 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 43, 50, 51 52, 53, 54, 55, 56, 57, 58, 59, 60, 61 B2, B3, 64, 65, B6, 67, B8, 69. 70, 71, 72, 73, 74, 75, 76, 77, 78, 73, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 30, 91, 92, 93, 34, 95, 96, 97, 98, 99, 10D or more artificial nucleic acids of the invention comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein, and/ or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VPI of a different Norovirus.

In another embodiment, the composition of the invention comprises at least 2, 3, 4, 5, B, 7, 8, 9, 10, II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21 22, 23, 24, 25,26, 27, 28, 29. 30, 31, 32. 33, 34, 35, 36, 37, 38, 39, 40, 41, 42. 43. 44, 45, 46, 47, 48, 49, 5051, 52, 53. 54, 55, 56, 57, 58, 59, B0, 61 62, 63, 64, 65, B6, B7, 68, B9, 70, 71, 72, 73, 74, 75, 76, 77, 78. 79, 80. 81, 82, 83, 84, 85, 86, 87, 88, 89, 30, 31, 32, 93, 34, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention, wherein each of the at least 2, 3, 4, 5, B, 7, 8. 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 22, 23, 24, 25, 26, 27, 28, 29. 30. 31. 32. 33. 34. 35. 3B. 37, 38, 39, 40, 41, 42, 43, 44, 45, 46. 47. 48, 49, 5051, 52, 53, 54, 55, 5B, 57, 58, 59, 60, 61 62. 63, 64, B5, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 7B, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins. preferably VPI and VP2, and/ or a fragment or a variant of any one of these proteins.

In a preferred embodiment, the inventive composition, which is preferably a pharmaceutical composition or a vaccine, comprises at least one artificial nucleic acid as described herein, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably a cationic protein or peptide. Accordingly, in a further embodiment of the invention it is preferred that the at least one artificial nucleic acid as defined herein or any other nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine is associated with or complexed

with a cationic or polycationic compound or a polymeric carrier, optionally in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/ w) to about 0.5:1 (w/ w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of the artificial nucleic acid or any other nucleic acid to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate (N/P) ratio of the artificial nucleic acid or any other nucleic acid to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9. More preferably, the N/P ratio of the at least one artificial nucleic acid to the one or more polycations is in the range of about 0.1 to 10, including a range of about 0.3 to 4, of about 0.5 to 2, of about 0.7 to 2 aod of about 0.7 to 1.5.

In another embodiment, the composition comprising at least one artificial nucleic acid of the invention is defined as follows:

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w); or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about B:l (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10. preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-O.B or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

Preferably, the inventive composition comprises at least one artificial nucleic acid as described herein, which is complexed with one or more polycations and/or a polymeric carrier, and at least one free nucleic acid, wherein the at least one complexed nucleic acid is preferably identical to the at least one artificial nucleic acid according to the present invention. In this context it is particularly preferred that the at least one artificial nucleic acid of the inventive composition is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably cationic proteins or peptides. In this context, the disclosure of W0 2010/037539 and W0 2012/113513 is incorporated herewith by reference. Partially means that only a part of the inventive artificial nucleic acid is complexed with a cationic compound and that the rest of the inventive artificial nucleic acid is (comprised in the inventive pharmaceutical composition or vaccine) in uncnmplexed form ("free").

In a further embodiment, the composition of the invention comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in the invention: or

(ii) at least 10, 15, 20 nr 50 artificial nucleic acids as defined in the invention; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in the invention;

and a pharmaceutically acceptable carrier.

In one embodiment, the compositions and/or vaccines of the invention comprise artificial nucleic acids encoding one or more capsid proteins VPI derived from one or more Noroviruses. In another embodiment, the compositions and/or vaccines of the invention comprise artificial nucleic acids encoding one or more capsid proteins VP2 derived from one or more Noroviruses.

In another embodiment, the composition of the invention is further defined as composition, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,

82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 37, 98, 93, 100 or more different GI Noroviruses and additionally from a single Gil, Gill, GIV or GV Norovirus and/or from 2, 3, 4, 5, G, 7, 8, 9, 10, II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 30, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69. 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 36, 97, 98, 99, 100 and/or more Gil. Gill, GIV or GV Noroviruses.

In a further embodiment, the composition of the invention further is defined as composition, wherein

(i) the artificial nucleic acids are derived from a single Gl.l Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26. 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50. 51, 52, 53, 54, 55, 56, 57. 58, 59, 60, 61, 62, 63, 64, 65, 66. 67, 68, 69, 7D, 71, 72, 73, 74, 75, 76, 77, 78, 79, 8D, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 00, 10D or more different Gl.l Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 20, 30, 31, 32, 33, 34, 35, 36, 37, 38, 30, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 50, 60, 61, 62, 63, 64, 65, 66, 67, 68, 60, 70, 71, 72, 73. 74, 75, 76, 77, 78, 70. 80, 81, 82, 83, 84, 85, 86, 87, 88, 80, **90.** 91, 92, 93, 94, 95, 96, 97, 08, 99, 100 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gl.l Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single Gl.l Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 10, 20, 21, 22, 23, 24, 25, 26. 27, 28, 20, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49. 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84. 85. 86, 87, 88, 80, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different Gl.l Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10. II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61. 62. 63, 64. 65, 66, 67, 68, 60, 70, 71, 72, 73, 74, 75, 76, 77, 78, 70, 80, 81, 82, 83, 84, 85, 86, 87, 88, 80, 90, 91, 92, 93, 94, 95, 96. 97, 98, 90, 10D or more GII.4 Noroviruses.

In a further embodiment, the composition of the invention further is defined as composition, wherein

(i) the artificial nucleic acids are derived from a single Gl.l Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 20, 30, 31, 32, 33, 34, 35, 36, 37, 38, 30, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D. 51, 52, 53, 54, 55, 56. 57. 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 60, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89. 90, 91, 92, 93, 94, 95, 96, 97, 98, 90, 100 or more different Gl.l Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15. 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gl.l Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.I Nornvirus or from 2, 3, 4, 5, G, 7, 8, 9, ID. II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21, 22, 23, 24, 25, 2G, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3G, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4G, 47, 48, 49, 5D, 51, 52, 53, 54, 55, 5G, 57, 58, 59, GO, GI, 62, 63, 64, 65, 66, 67, 68, 69, 70. 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98. 99, 100 or more different GI.I Norovir uses and additionally from a single GII.4 Norovirus or from 2. 3. 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58. 59, 60, 61, 62, 63, 64, 65, 66. 67, 68, 69, 70, 71. 72. 73. 74, 75, 76, 77, 78, 79, 8D, 81, 82, 83, 84, 85, 86, 87, 88, 89, 9D, 91, 92, 93, 94, 95, 96, 97, 98, 99, 10D or more GII.4 Nornviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 4411-39690, 39713-39746; and/ Or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, **7096.** 71%. 72%. 73%. 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEO ID NOs: 4411-39690, 39713-39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or

(iv) an Orthologue or a paralogue of any one of SEO ID NOs: 4411-39690, 39713-39746; and/ Or a fragment or variant of any of these sequences.

and/or

wherein

(i) at least one nf the nucleic acid sequences according to any one of SEQ ID ND: 39713 to SEO ID NO: 39746; and/ Or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%. 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEO ID NO: 39713 to SED ID NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEO ID NO: 39713 to SEO ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SED ID ND: 39713 to SED ID NO: 39746; and/or a fragment or variant of any of these sequences.

In a preferred embodiment, the composition of the invention further is defined as a composition comprising two different nucleic acid sequences (bivalent, divalent composition), wherein one of the two different nucleic acid sequences is derived from Norovirus GII.4 and one of the two different nucleic acid sequence is derived from Norovirus GI.I, wherein the one nucleic acid sequence of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants

of these sequences, and wherein the one nucleic acid sequence of Noravirus GI.I may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants of these sequences. Preferably, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of one nucleic acid sequence derived from Nurovirus GII.4 selected from SED ID NDs: 39713-39721, 39726-39742, and one nucleic acid sequence derived from Noravirus GI.I selected from SED ID NDs: 39722-39725.

In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 397IG (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.I). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 33721 (Norovirus GII.4) and SED ID ND: 39725 (Norovirus GI.I). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 39729 (Norovirus GII.4) and SED ID ND: 39725 (Norovirus GI.I). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID ND: 39734 (Norovirus GII.4) and SED ID ND: 39725 (Norovirus GI.I). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 39738 (Norovirus GII.4) and SED ID ND: 39725 (Norovirus GI.I).

In a preferred embodiment, the composition of the invention further is defined as a composition comprising two different nocleic acid sequences (bivalent, divalent composition) derived from Norovirus GII.4, wherein the two different nucleic acid sequences of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants of these sequences. Preferably, the composition comprising two different nucleic acid sequences derived from Norovirus GII.4 (bivalent, divalent composition) comprises or consists of one nucleic acid sequence selected from SED ID NDs: 39713-39721, 39726-39742.

In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 39716 (Norovirus GII.4) and SEQ ID ND: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID ND: 39729 (Norovirus GII.4) and SEQ ID ND: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID NO: 39734 (Norovirus GII.4) and SED ID ND: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID ND: 39738 (Norovirus GII.4) and SED ID ND: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID ND: 39716 (Norovirus GII.4) and SED ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid seqoences SEQ ID ND:

39734 (Norovirus GII.4) and SEQ ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEfl ID NO: 38738 (Norovirus GII.4) and SEO ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEO 10 NO: 397IG (Norovirus GII.4) and SEQ ID NO: 39734 (Norovirus Gll.4).In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SED ID NO: 39738 (Norovirus GII.4) and SEfl ID NO: 39734 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEfl ID NO: 397IG (Norovirus GII.4) and SEfl ID NO: 39738 (Norovirus GII.4).

In further a preferred embodiment, the composition of the invention further is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein each of the four different nucleic acid sequences is derived from Norovirus GII.4, wherein each of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants of these sequences. Preferably, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises or consists of four nucleic acid sequence derived from Norovirus GII.4 selected from SEfl ID NOs: 39713-39721, 3972G-39742.

In a specific preferred embodiment, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises four of the nucleic acid sequences selected from SEQ ID NOs: 39716, 39721, 39729, 39734 or 39738.

In a further preferred embodiment, the composition of the invention is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein at least one of the four different nucleic acid sequences is derived from Norovirus GII.4 and at least one of the four different nucleic acid sequence is derived from Norovirus GI.I, wherein the at least one of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants of these sequences, and wherein the at least one of the four of nucleic acid sequence of Norovirus GI.I may be any one of the nucleic acid sequences as defined herein and in Table I, or fragment or variants of these sequences.

In a further preferred embodiment, the composition of the invention is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein three of the four different nucleic acid sequences are derived from Norovirus GII.4 and one of the four different nucleic acid sequence is derived from Norovirus GI.I, wherein the three of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined in Table I, or fragment or variants of these sequences, and wherein the one of the four of nucleic acid sequence of Norovirus GI.I may be any one of the nucleic acid sequences as defined in Table I, or fragment or variants of these sequences. Preferably, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises of consists of three nucleic acid sequence derived from Norovirus GII.4 selected from SEfl ID NOs: 39713-39721, 3972B-39742 and one nucleic acid sequence derived from Norovirus GI.I SEQ ID NOs: 39722-39725.

In a specific preferred embodiment, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises three of the nucleic acid sequences derived from Norovirus GII.4 selected from SEQ ID NOs: 3971 6. 3972I, 3372B, 39734 or 39738 and one nucleic acid sequence derived from Norovirus GI.I SEQ ID NO: 39725.

In further a preferred embodiments, the composition of the invention is defined as a composition comprising multiple different nucleic acid sequences (multivalent composition) defined as a composition comprising 5, G, 7, 8, 9, ID, II, I2, 13, 14, 15, IB, I7, 18, I9, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36. 37, 38, 39, 4Q, 41, 42, 43. 44, 45, 4G, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 7D, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86. 87. 88, 89, 90, 9I, 92, 93, 94, 95, 96, 97, 98, 99, 100 different nucleic acid sequences derived from Norovirus GI.I, Norovirus GI.2, Norovirus GI.3, Norovirus GI.4, Norovirus GI.5, Norovirus GI.6, Norovirus GI.7, Norovirus GI.8, Norovirus GI.9, Norovirus GII.I, Norovirus GII.Z Norovirus GII.3, Norovirus GII.4, Norovirus GII.5, Norovirus GII.6, Norovirus GII.7, Norovirus GII.II, Norovirus GII.I2, Norovirus GII.I3, Norovirus GII.I4, Norovirus GII.I5, Norovirus GII.I6, Norovirus GII.I7, Norovirus GII.2I, Norovirus GIII.I, Norovirus GV.I or Norovirus GIV.I.

In further a preferred embodiments, the composition of the invention is defined as a composition comprising multiple different nucleic acid sequences (multivalent composition) defined as a composition comprising 5, 6, 7, 8, 9,I0, II, I2, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D, 51, 52, 53, 54, 55, 56. 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84. 85. 8G, 87, 88, 89, 90, 9I, 92, 93, 94, 95, 96, 97, 98, 99, 100 different nucleic acid sequences selected from Table 3 (column 4 and column 5). In Table 3, each row (row I - row I38) corresponds to selected Norovirus protein or antigen as identified by the respective name (first column, column I "Strain/Isolate") and the database accession number of the corresponding protein (second column, column 2 "NC6I or Genbank Accession No."). The third column, column 3 ("A") in Table 3 indicates the SEQ ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type nucleic acid sequence encoding the Norovirus protein or peptide is indicated in the fourth column, column 4 ("B"). The fifth column, column 5 ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the nucleic acid sequences as described herein that encode the Norovirus protein or peptide preferably having the amino acid sequence as defined by the SEQ ID NOs indicated in the third column ("A") or by the database entry indicated in the second column ("NC8I or Genbank Accession No.").

Table 3: Selected VPI Norovirus sequences (row 1 - row 138)

	column 1	column 2	column 3	column 4	column 5
Row	Strain/Isolate	NCBI or Geribank Accession No.	A	B	C
1	Norovirus Hu/GII.4/Dijon/E872/2002/FRA	AC055068	2	4412	8822, 13232, 17642, 22052, 26462, 30872, 35282
2	Norovirus Hu/GII.4/MDI2D-I2/I987/USA	AFS33552	IB	442B	8836, 1324G, 17656, 220B6, 2B476, 30886, 3529B
3	Norovirus Hu/GII.I/7EK/Hawaii/I97I/USA	AFS33555	17	4427	8837, 13247, 17657, 22067, 26477, 30887, 35297
4	Norovirus Hu/GII.G/CHDC4D73/I984/USA	AFX7IGG5	27	4437	8847, 13257, 17667, 22077, 26487, 30897, 35307
5	Norovirus Hu/GiI.4/Hiroshima/13/200i/JPN	BAI49904	327	4737	9147, 13557, 17967, 22377, 26787, 31197, 35607
6	Norovirus Hu/GII.4/Hiroshima/67/2006/JPN	BAI499I4	335	4745	9155, 13565, 17975, 22385, 26795, 31205, 35BI5
7	Norovirus Hu/GII/JP/2QI5/GII.Pe_GII.4/Dsaka/QSF78	BASD2D83	3B4	4774	9184, 13594, 18004, 22414, 26824, 31234, 35644
8	Norovirus GII/Hu/NL/20I2/GII.4/Groningen	CRL4G958	3B7	4777	9187, 13597, 18007, 22417, 26827, 31237, 35647
9	Norovirus GII/Hu/Nt/20I4/GII.2/Groningen	CRL4BB73	372	4782	9192, 13602, 18012, 22422, 26832, 31242, 35652
ID	Norovirus Hu/GII.4/New Drleansl500/2DD8/ySA	ADB27D27	37B	478B	9I9B, 13606, 18016, 22426, 26836, 31246, 35656
II	Norovirus Hu/GII.B/Dhio/49D/20I2/USA	AGI9B397	38B	479B	9206, 13616, 18026, 22436, 2G84B, 31256, 35666
I2	Norovirus Hu/GII.3/Jingzhou/2DI34D2/CHN	AGX0I095	391	4801	9211, 13621, 18031, 22441, 26851, 31261, 35671
I3	Norovirus Hu/GII.4/Jingzhou/20I34D3/CHN	AGXDI098	392	4802	9212, 13622, 18032, 22442, 26852, 31262, 35672
I4	Norovirus Hu/GIU7/Gaithersburg/20I4/US	AKI3DDB0	393	4803	9213, 13623, 18033, 22443, 26853, 3I2B3, 35673

I5	Noravirus Hu/BII.4/CI27/GF/l978	AGL984I3	4D4	4814	9224. 13B34, 18044, 22454, 2B8B4, 31274, 35B84
IB	Norovirus Hu/GII.4/CHDC3967/l988/US	ACT7BI45	458	48B8	9278, 13B88. 18098, 22508, 2B9I8, 3I328, 35738
I7	Norovirus Hu/GII.4/CHDC4ID8/l987/US	ACT7BI48	459	48B9	9279, 13B89, I80B9, 22509, 26919, 31329, 35739
I8	Nornvirus Hu/GII.4/CHDC487l/l977/US	ACT7BI5I	4BD	4870	928D, 13690, 18100, 22510, 26920, 3I330, 35740
I9	Noravirus Hu/B!L3/CH0C52Bl/19B0/US	AED02034	5DI	4911	9321, 13731, 18141, 22551, 2B9BI, 31371, 35781
ZD	Norovirus Hu/GII.3/MilwaukeB009/20l0/0SA	AEXID549	534	4944	9354, 13764. 18174, 22584, 26994, 31404, 35814
2I	Norovirus Hu/BII.4/Miranda/NSW8l7L/2DI0/AU	AFJ2I448	597	5D07	9417, 13827, 18237,22647, 27057, 31467, 35877
22	Norovirus Hu/Gll.2/KLI09/MY/I978	AFNDB72B	B03	5DI3	9423, 13833, 18243, 22653, 27DB3, 31473, 35883
23	Noravirus Hu/Gll.l4/HK74/CN/I978	AFNDB727	BD4	5014	9424, 13834, 18244, 22B54, 27064, 31474, 35884
24	Noravirus Hu/Gll.7/HK4/CN/I97B	AFNDB73I	BD8	5018	9428, 13838,18248, 22658, 270B8, 31478, 35888
25	Noravirus Hu/BII.I7/CI42/GF/l978	AFN0B732	BOB	5019	9429, 13839, 18249, 22659, 27DB9, 31479, 35889
2B	Noravirus Hu/BII.5/CI5/GF/l978	AFN0B733	BIO	5020	9430, 13840, 18250, 22660, 2707D, 31480, 35890
27	Norovirus Hu/Bl.5/E57/0B/I975	AFN0B735	BI2	5022	9432, 13842, 18252, 22662, 27072, 31482, 35892
28	Noravirus Hu/BII.4/Randwick/NSW882J/20ll/AD	AFVD877I	GIB	502B	943B, 13846. 18256, 22B66, 27076, 31486, 35896
29	Norovirus Hu/BII.4/Berowra/NSW7B7L/2DI2/AU	AFVD8777	6I8	5028	9438, 13848, 18258, 22668, 27078. 31488, 35898
3D	Norovirus Hu/BII.4/Sydoey/NSW05l4/20l2/AU	AFV08795	B24	5D34	9444, 13854, 18264, 22674, 27084, 31494.35904
3I	Norovirus Hu/BII.4/Hong Kong/CDHK3630/20I2/CHN	AFX9594D	B25	5D35	9445, 13855, 18265, 22675, 27085, 31495, 35905

32	Norovirus Hu/GII.4/VPII72/Shanghai/20I2/CHN	AGI99552	629	5039	9449, 13859, 18269, 22679, 27D89, 31499, 35909
33	Norovirus HU/GII-4/NBW Taipei/CGMH6I/2QI2/TW	AGK25912	B44	5054	9464, 13874, 18284, 22694, 27104, 31514, 35924
34	Norovipus GII/Hu/HKG/2D13/Bil.4/GUHK-NS-i4I	AIDG858I	859	5269	9679, 14089, 18499. 22909, 27319, 31729, 36139
35	Narovirus GII/Hu/JP/2D02/GII.PI2_GII.!3/Saitama/T80	AII737I7	877	5287	9697, 14107, 18517, 22927, 27337, 31747, 36157
36	Norovirus GII/Hu/JP/200I/GII.P!2_GI!.I2/Saitama/TI5	AII73735	883	5293	9703, 14113, 18523, 22933, 27343, 31753, 36163
37	Norovirus GII/Hu/JP/2007/GII.P2I_GII.2I/Kawasaki/Y0284	AII7374I	885	5295	9705. 14115, 18525, 22935, 27345, 31755, 3BIB5
38	Norovirus GII/Hu/JP/2007/GII.PI5_GII.I5/Sapporo/HK299	AII73759	891	5301	9711, 14121, 18531, 22941, 27351, 31761, 36171
39	Norovirus GI/Hu/JP/2DD7/GI.P3_BI.3/Shimizu/KK28BB	AII73765	893	5303	9713, 14123, 18533, 22943, 27353, 31763, 36173
40	Norovirus GII/Hu/JP/2007/GII.P7_GII.I4/Fukuoka/KK282	AII73780	898	5308	9718, 14128, 18538, 22948, 27358, 31768, 36178
41	Norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY53I	AII73783	899	5309	9719, 14129, 18539, 22949, 27359, 31769, 36179
42	Narovirus Hu/GII.4/SJT0HI/CHN/20I4	AIS400I9	901	5311	9721, 14131, 18541, 22951, 27361, 31771, 3BI81
43	Norovirus Hu/GII.4/variant Sydney 2012/FRA	AIY27747	930	5340	9750. 14160. 18570, 22980, 27390, 31800, 36210
44	Norovirus Hu/GII-4/Hokkaido4/200G/JP	BA670437	1033	5443	9853, 14263. 18673, 23083, 27493, 31903, 36313
45	Norovirus GIV/Hu/Jp/20DI/GIV.I/OBOIOI7023	BAUI6306	1345	5755	10165, 14575, 18985, 23395, 278D5, 32215, 36625
46	Narovirus Hu/GII.4/Beijing/53G7I/2Q07/CHN	ABY00BI5	1454	5864	10274, 14684, 19094, 23504. 27914, 32324, 36734
47	Norovirus Hu/II.4/22006BI/HK/20IO	ADK47I70	1467	5877	10287, 14697, 19107, 23517, 27927, 32337, 36747
48	Narovirus Hu/GII.4/Aichi368-I4/2DI4	BAD2080I	1477	5887	10297, 14707, 19117, 23527, 27937, 32347, 36757

43	Noravirus Hu/GII.4/Hunter 284E/040/AU	AAZ3I37B	I552	5962	ID372, 14782. 1318 2, 23B02, 28DI2, 32422,36832
5D	NORovirus Hu/G!I-4/Dsaka/fB9B/JPN	ABI9798I	I5B9	5979	ID389, 14799,19209, 23BI9, 28B29, 32439, 3B849
5I	Noravirus Hu/BI.f/P774.DeIsjo2DD4/Bothenburg/Sweden	ABW74I28	IBID	BD2D	10430, 14840, 19250, 23GB0, 28070, 32480,36890
52	Noravirus pig/GII.I!/FI8-IG/2005/CAN	ACCB9023	IB29	BD39	10449, 14859, 192B9, 23679, 28089, 32499, 36909
53	Noravirus Hu/GII.4/Wellingtan/I935/USA	ACL27297	IG70	6D80	10490, 14900,19310, 23720, 28130, 32540,36950
54	Noravirus Hu/GII.4/Henry/2000/USA	ACL27298	IB7I	B08I	10491, 14901, 19311, 23721, 28131, 32541, 3B951
55	Noravirus Hu/GII.4/SSCS/2DD5/USA	ACL27299	IB72	BD82	10492, 14902, 19312, 23722, 28132, 32542,36952
5G	Norovirus GII/Hu/IN/20DG/GII.P4_GII.4_ YErseke2QQGa/Pune-PC2I	ACL3I322	IB80	B090	10500, 14910, 19320, 23730. 28140, 32550, 369B0
57	Naravirus Hu/GI.I/P7-587/2007/Stromstad / SwBden	ACN32270	IG92	BID2	10512, 14922, 19332, 23742, 28152, 32562,36972
58	Narovirus Hu/GI.2/L BuvBn /2DB3/BEL	ACU5B258	IB98	BI08	10518, 14928, 10338, 23748, 28158, 32568,36978
53	Noravirus Hu/GII.7/NSW743L/ZDD8/AUS	ACX858ID	I7I2	BI22	10532, 14942, 19352,23762, 28172, 32582,36992
BD	Noravirus Hu/GII.2/NF2DD2/USA/2DD2	AFBI8DI0	I73I	6I4I	10551, 14961, 19371, 23781, 28191, 32601. 37011
B!	Noravirus Hu/GII.4/NF2003/0SA/2003	AFBI8013	I732	BI42	10552, 14962, 19372, 23782, 28192, 32602, 37012
B2	Noravirus Hu/GII.3/I393	AFK75854	I739	BI49	10559, 14969, 10379, 23783, 28199, 32609, 37019
B3	Narovirus Hu/GIV.I / AhrBnshaa P24G/DEU/20I2	AFNB13I5	I74D	BI50	10560, 14970, 10380, 23790, 28200, 32610, 37020
B4	Noravirus Hu/GII.4/Xi 'an/P!9/2DI0/CHN	AFQDD5II	I74I	6I5I	10561, 14971, 19381, 23791, 282DI, 32611, 37021
B5	Noravirus Hu/GII.4/PA3G3/20II/ITA	AHCI2B55	I770	BI8D	10590, 15000, 10410, 23820, 28230, 32640, 37050

6B	**Norovirus Hu/GII.4/P3/2DI2/GothBnburg/SwEdBn**	AHZI29I2	I778	BI88	I059B, 15008, I94I8. 23828, 28238, 32648,37058
B7	Norovirus Hu/GII.4/Tanger/TM687/20II/MAR	AIC32559	I787	BI97	10607, 15017, 19427, 23837, 28247, 32657, 37067
B8	Norovirus I2-X-2/20I2/GII.P22/GII.5	AI05I489	I793	B203	**10613.** 15023, 19433, 23843. 28253, 32663,37073
B9	Norovirus Hu/GII.4/Kobe034/2006 **/JP**	BAF458BI	I82B	B23B	10646, I505B, I946B, 23876, 28286, 32696,37106
70	Norovirus Hu/GGII.4/Tiel00I/I995/NL	BAF74508	I827	B237	10647, 15057, I9467, 23877, 28287, 32697, 37107
7I	NorQvirus Hu/GGII.4/DenHaagOI5/2000/NL	BAF74509	I828	B238	10648, 15058,19468. 23878. 28288, 32698,37108
72	Norovirus Hu/GGII.4/SchiBdamOI8/200I/NL	BAF745I2	I83I	B24I	I065I, I506I, I947I, 23881, 28291, 32701, 37111
73	Norovirus **Hu/GGII.4/Apeldoorn023/2003/NL**	BAF745I7	I83B	G24B	I0B5B, 15066, 19476, 23886, 28296, 32706, 37116
74	Norovirus Hu/GGII.4/Middelburg007/20D4/NL	BAF7452I	I840	B250	10660, 15070, 19480. 23890, 28300. 32710, 37120
75	Norovirus Hu/GII-4/Matsudo/02I07I/2D02 **/JP**	BAF95499	I847	B257	10667, 15077, 19487, 23897, 28307. 32717, 37127
7B	Norovirus Hu/GII-4/Kaiso/030556/2003 **/JP**	BAF9550I	I848	B258	10668, 15078,19488, 23898. 28308, 32718, 37128
77	Norovirus Hu/GII-4/Awa/040354/2004 **/JP**	BAF95505	I850	B2B0	10670, 15080,19490.23900, 28310, 32720, 37130
78	Norovirus Hu/GII.4/Apeldoorn3I7/2007/NL	BAG55289	I885	6295	10705. I5115, 19525. 23935, 28345, 32755, 37165
79	Norovirus Hu/GII.2/RottBrdam39E/2002/NL	BAGB87I3	I89I	B30I	I071I, I5I2I, I953I, 2394I, 28351, 327BI, 37171
80	Norovirus **Hu/GII.4/RotterdamP2Du72005/NL**	BAGB880I	I897	6307	I07I7, 15127, 19537, 23947. 28357, 32767, 37177
8!	Norovirus Hu/GII.4/Stockholm/I98B5/2008/SE	BAH30707	I9IB	6326	I073B. I5I46, 19556. 23966. 28376, 32786, 37196
82	Norovirus Hu/GII.G/0C040B2VLP/2004 **/JP**	BAL40873	I92I	633I	I074I. I5I5I. I9556I, 23971, 28381, 32791, 37201

83	Norovirus Hu/BII.4/HSI94/2D03/US	ADB279I4	I96I	B37I	I078I, I5I9I, I9B0I, 240II, 28421, 32831, 3724I
84	Norovirus Hu/GII.12/HS210/20l0/0SA	ADT70684	I965	6375	10785, 15195, 19605, 24015, 28425, 32835, 37245
85	Narovirus Hu/GI.I/8Flla/l968/USA	AFJ385IB	I97B	6380	10790, 15200, 19GlD. 24020, 28430, 32840,37250
86	Norovirus Hu/Gll.4/CHDC5I9I/I974/USA	AFJ385I9	I97I	B38I	10791, 15201, 19611, 24021, 28431, 32841, 37251
87	Norovirus Hu/GII.4/N76/2DID/HuZhou	AFWI5943	I975	6385	10795, 15205, 19615, 24025, 28435, 32845,37255
88	Norovirus Hu/GII.B/S9c/I976/SEN	AGE99599	2D0D	64I0	10820, 15230,19640. 24050, 28460, 32870, 37280
89	Norovirus Hu/Gll.4/KL45/I978/MYS	AGE996I2	2D0I	64I!	ID821, 15231, 19641, 24051, 28461, 32871, 37281
9D	Norovirus Hu/GII.4/NIHICI7.5/2DI2/USA	AGTI7839	2DB5	64I5	10825, 15235,19645, 24055, 28465, 32875, 37285
9I	Norovirus Hu/GII.4/NIHIC9/2DII/USA	AFX7I6G9	4I98	8608	13018, 17428,21838. 26248, 30658, 35068,39478
92	Norovirus Hu/GII.4/CII0/l978/GUF	AGE99607	4336	8746	13156, 17566, 21976, 26386, 30796, 35206, 39616
93	Norovirus Hu/GII.4/HS66/20DI/USA	AHI59I6B	4379	8789	13199, 17609,22019, 26429, 30839, 35249, 39659
94	Norovirus Hu/GII/JP/20l5/GII.PI7_Gll.l7/Kawasaki308	BAR42290	4395	8805	13215, 17625.22035, 26445, 3D855, 35265. 39B75
95	Norovirus Hu/GII/JP/20l4/GII.PI7_GII.I7/Nagano8-I	BARB3722	4399	8809	13219. 17629.22039. 26449, 30859, 35269, 30679
96	Norovirus Hu/GII/JP/20l5/GII .PE_GII.4/Dsaka/DSF78	BASD2B84	4400	88I0	13220, 17630,22040, 26450, 30860, 35270, 39680
97	Norovirus Gl/Hu/NL/2QII/GI.4/Groningen	CRL46953	440I	88II	13221, 17631, 22041, 26451, 30861, 35271, 39681
98	Norovirus GII/Hu/NL/2DI4/GII.4/GroningBnDI	CRL46962	4404	88I4	13224, 17634, 22044, 26454, 30864, 35274,30684
99	Norovirus Hu/GIU/KenEpuru/NZ327/20DG/NZL	ABQ63283	20I8	6428	10838, 15248, 19658. 24068, 28478, 32888,372 98

100	Norovirus Hu/**BII.4** /Rathmines/NSW287R/2DD7/AUS	ACWI9927	2023	B433	I0843, 15253.I9BB3, 24073, 28483, 32893, 37303
101	Norovirus Hu/GII.4/Turratrarra/NSW8920/Z009/ADS	AOQ43783	2D3Z	B442	I0852, I5ZBZ. I9672, 24082, 28492, 32902,37312
ID2	Norovirus **HU/GII.4/SBDUI/D389/200B/KDR**	A0V37805	2033	B443	10853, 15263,19673,24083. 28493, 32903, 37313
ID3	Norovirus Hu/BII.4/Seoul/0945/20D9/K0R	ADV379I9	2038	B448	10858, 15268, 19678, 24088, 28498, 32908,37318
ID4	Norovirus **Hu/GII.I2/ Shelby/20D9/ USA**	AEI834B9	2039	B449	10859, 15269,19679, 24083, 28499, 32909,37319
I05	Norovirus Hu/GI.7/TCH-0G0/0SA/Z003	AEQ77282	204I	B45I	I0861, **15271.** I9681, 24091, 28501, 32911, 37321
IDB	Norovirus Hu/GII.I/Ascension 208/20IO/OSA	AFA55I74	2042	B452	10862, 15272,19682, 24092. 28502. 32912, 37322
I07	Norovirus Hu/GII.I3/VAI73/20IO/OSA	AFC83B5B	2043	B453	10863, 15273, 19683, 24093, 28503, 32913, 37323
IDB	Norovirus Hu/GII.2I/Salisburyl50/20II/0SA	AFC89665	204B	B45B	I08B6, I5276, I9686. 24096, 2850B. 329IG. 37326
IDB	Norovirus Hu/GII.4/I997/USA	AFJ04707	204B	B459	10869, 15279.19683. 24099. 28509. 32919, 37329
110	Norovirus Hu/GII.4/Farmington Hills/2004/USA	AFJ047D8	2050	B4B0	10870, 15280,19690,24100, 28510, 32920, 37330
III	Norovirus Hu/GII.4/Minerva/2006/DSA	AFJD4709	Z05I	B4BI	10871, 15281, 19691, 24101, 28511, 32921, 37331
HZ	Norovirus Hu/GII.4/0hio/7I/20I2/USA	AFP89593	2052	B4B2	10872, 15282,19692, 24102, 28512, 32922,37332
II3	Norovirus Flu/GII.4/AlbertaEI065/20II/CA	AF05573I	20B8	B478	10888, 15298, 19708,24118, 285Z8, 3Z938, 37348
II4	Norovirus Hu/GII.4/SG405I-09/2009/SG	AF0927I0	2II9	B529	10333. 15349, 19759,24169, 28579, 32989, 37399
II5	Norovirus Hu/GII.3/TCH-I04/0SA/2002	AG0B4038	2I70	B580	10990, 15400, 19810, 24220, 28630, 33D4D, 37450
IIB	Norovirus Hu/GI.G/TCH-D9B/USA/2003	AGTB252I	2I74	B584	10994, 15404, 19814. 24224, 28634, 33044, 37454

II7	Naravirus 0G-AM-Il/2006/GII.4/YBrsekB/2006a	AJZ77DD4	2228	BB38	11048, 15458, 19868, 24278, 28688, 33098, 37508
II8	Norovirus D9-Bi-2/2DD9/GtI.4/NEwDrleans/2DD9	AJZ770I5	2231	BB4I	11051, 15461, 19871, 24281, 28691, 33101, 37511
IIo	Naravirus Hu/GII.4/PR328/20I3/ITA	AKE3I86I	2242	BB52	11062, 15472, 19882. 24292, 28702, 33112, 37522
IZO	Naravirus Hu/GII.PI7_GII.I7/PR6G8/2DI5/ITA	ALD09BI8	2253	BBB3	11073, 15483, 19893. 24303, 28713, 33123. 37533
I2I	Naravirus Hu/GII.4/AlbBrtaSPI/2DI3/CA	ALT54494	2274	BB84	11094, 15504, 19914, 243Z4, 28734. 33144, 37554
I22	Noravirus Hu/GIi.4/C00007B92/2011/UK	CCX28BI9	2280	BB90	11100, 15510, 19920, 24330, 28740, 33150, 37560
I23	Noravirus Hu/GII.G/GZ2DID-LB6/Guangzhou/ CHN/20II	AGC96535	2330	B740	11150, 15560, 19970, 24380, 28790. 33200, 37610
I24	Noravirus Bo/GIII.I/Aba-Z5/20D2/HUN	ABYB7257	2341	B75I	11181. 15571, 19981, 24391, 28801, 33211, 37621
I25	Noravirus GI.9	AHA9IB5B	2342	B752	11162. 15572, 19982, 24392, 28802, 33212, 37622
I26	Naravirus Hu/GII.I7/CUHK-NS-B7Q/HKG/2QI5	KT3I57I8	2488	B898	11308, 15718, 20128, 24538, 28948, 33358, 377B8
I27	Naravirus GII/Hu/SI/2DI5/GII.I7/LjubljaaalBBZ	KT59I5GI	2509	6919	11329, 15739. 20149, 24559. 28969, 33379, 37789
I28	Norovirus Hu/GII.I7/CUHK-NS-B47/HKG/2DI5	KT3I570B	2529	B939	11349. 15759, 20169. 24579. 28989, 33399, 37809
I29	Norovirus Hu/GII.ZI/CUHK-NS-BDB/HKG/ZDI5	KR92I940	2540	6950	11360, 15770, 20180, 24590, 29000, 33410, 37820
I30	Norovirus Hu/BII.4/MelbaurnBBB23/2DIB/AUS	KX7B7D83	2B00	7010	11420, 15830, 20240, 24650, 29060, 33470, 37880
I3I	Norovirus GII/Hu/JP/20IG/GII.PIB_GII.4_ Sydney20I2/0HIGD02	LCI53I2I	2BB4	7074	11484. 15894, 20304, 24714, 29124, 33534, 37944
I32	Norovirus Hu/GII/JP/ZDIB/GII.PIG_GII.4_ SydnBy2DI2/Kawasakil94	LCI754B8	3556	70BB	12376, 16786, 21196, 25B0B, 30016, 34426, 38836
I33	Noravirus I6F2I49_GII.2_Guangdong_CHN_20IG	KY485I25	2438	B848	11258, 15668, 20078, 24488, 28898, 33308, 37718

I34	Norovirus Hu/GII.17/CUHK-NS-8G4/HKG/201B	KU55584I	25B4	7004	11414. 15824, 20234, 24B44, 2S054, 33464, 37874
I35	NOrOvirus GII/Hu/ZAF/20i2/B!f.P4_Bif.4/CapeTDwn/3772	KP784B96	2BI3	7023	11433, 15843, 20253, 24BB3, 23073, 33483, 37893
I3B	NORoviPus GII.I2	KP064099	4D3B	844B	I285B, 17266, 2IB76, 2B086, 3049B, 34306, 39316
I37	Snow Mountain virus	U7D05B	2441	B85I	II2BI, 15671, 20081, 24491, 28301, 33311, 37721
I38	Human calicivirus strain Melksham	X8I879	2359	B7B9	1179, 15583, 19999, 24409, 28819, 33229, 37633

Preferably, the molar ratio of the complexed nucleic acid to the free nucleic acid is selected from a molar ratio of about 0.001:1 to about 1:0.001, including a ratio of about 1:1. In a preferred embodiment, the invention provides a composition comprising at least one artificial nucleic acid as described herein, wherein the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w).

In one embodiment, at least one artificial nucleic acid as defined herein or any other nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine can also be associated with a vehicle, transfection or complexation agent for increasing the transfection efficiency and/or the immunostimulatory properties of the at least one artificial nucleic acid or of optionally comprised further included nucleic acids.

In the context of the present invention, a cationic or polycationic compound is preferably selected from any cationic or polycationic compound, suitable for complexing and thereby stabilizing a nucleic acid, particularly the at least one artificial nucleic acid of the inventive composition, e.g. by associating the at least one artificial nucleic acid with the cationic or polycationic compound. Such a cationic or polycationic compound per se does not need to exhibit any adjuvant properties, since an adjuvant property, particularly the capability of inducing an innate immune response, is preferably created upon complexing the at least one artificial nucleic acid with the cationic or polycationic compound. When complexing the at least one artificial nucleic acid with the cationic or polycationic compound, the adjuvant component is formed.

Particularly preferred, cationic or polycationic peptides or proteins (preferably also as component P2 in a polymeric carrier according to formula IV herein) may be selected from protamine, nucleoline, spermine or spermidine, poly-L-lysine (PLL), basic polypeptides, poly-arginine, cell penetrating peptides (CPPs), chimeric CPPs, such as Transportan, or MPG peptides, HIV-binding peptides, Tat. HIV-I Tat (HIV), Tat-derived peptides, oligoarginines, members of the penetratin family, e.g. Penetratin, Antennapedia-derived peptides (particularly from Orosophila antennapedia), pAntp, plsl, etc., antimicrobial-derived CPPs e.g.

Buforin-2, Bac7l5-24. SynB, SynB(l), pVEC. hCT-derived peptides, SAP, MAP, KALA, PpTG2B, Proline-rich peptides, L-Dligomers, Arginine-rich peptides, Calcitonin-peptides, FGF, Lactoferrin, poly-L-Lysine, pnly-Arginine, histones, VP22 derived or analog peptides, HSV, VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpTB2D, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, Pep-I, Calcitonin peptide(s), etc.

According to a preferred embodiment, cationic or polycationic proteins or peptides are selected from the following proteins or peptides having the following total formula (III):

(Arg)i;(Lysk(His)„;(Orn)„;(Xaa)», formula (III)

wherein l + m + n +o + x = 8-I5, and I, m, n or o independently of each other may be any number selected from D, l. 2, 3, 4, 5, B, 7. 8. 9, ID, II, I2, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Orn; and x may be any number selected from D, l. 2, 3, 4, 5, B, 7, or 8, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide. Preferred cationic peptides in this context are e.g. Arg7, Args, Argg, *Ms.* RgHs, **H3R9H3,** YSSRgSSY. (RKH)4, Y(RKH)2R, etc. In this context the disclosure of WD 2DDB/D3D48I is incorporated herewith by reference.

Further preferred cationic or polycationic compounds, which can be used for complexing the at least one artificial nucleic acid according to the invention may include cationic polysaccharides, for example chitosan, polybrene, cationic polymers, e.g. polyethyleneimine (PEI), cationic lipids, e.g. DDTMA: [l-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-CI4-amidine, DDTIM, SAINT, DC-Chol, BGTC, CTAP,DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DDSPA, DDDAB, DDIC, DMEPC, DDGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl bydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-B-14: D,D-ditetradecanoyl-N-(a-trimethylammonioacetyl)diethanolamine chloride, CLIPi: rac-[(2.3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIPG: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]trimethylammonium, CLIPB: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, e.g. modified polyaminoacids, such as β-aminoacid-polymers or reversed polyamides, etc., modified polyethylenes, such as PVP (poly(N-ethyl-4-vinylpyridinium bromide)), etc., modified acrylates, such as pDMAEMA (poly(dimethylaminoethyl methylacrylate)), etc., modified amidoamines such as pAMAM **(pDly**(amidoamine)), etc., modified **polybetaaminoester** (PBAE), such as diamine end modified 1,4 **butanediol** diacrylate-co-5-amino-t-pentanol polymers, etc., dendrimers, such as polypropylamine dendrimers or pAMAM based dendrimers, etc., polyimine(s), such as PEL poly(ethyleneimine), poly(propyleneimine), etc., polyallylamine, sugar backbone based polymers, such as cyclodextrin based polymers, dextran based polymers, chitosan, etc., silan backbone based polymers, such as PMDXA-PDMS copolymers, etc., blockpolymers consisting of a combination of one or more cationic blocks (e.g. selected from a cationic polymer as mentioned above) and of one or more hydrophilic or hydrophobic blocks (e.g. polyethyleneglycole); etc. Association or

complexing the at least one artificial nucleic acid of the inventive composition with cationic or polycationic compounds preferably provides adjuvant properties to the at least one artificial nucleic acid and confers a stabilizing effect to the at least one artificial nucleic acid of the adjuvant component by complexation. The procedure for stabilizing the at least one artificial nucleic acid is in general described in EP-A-1083232, the disclosure of which is incorporated by reference into the present invention in its entirety. Particularly preferred as cationic or polycationic compounds are compounds selected from the group consisting of protamine, nucleoline, spermin, spermidine, oligoarginines as defined above, such as Arg7, Arg8, Args, Arg?, H3RB, RgH3. H3RgH3, YSSRaSSY. (RKH)4, Y(RKH)zR, etc.

According to a preferred embodiment, the inventive composition is formulated by using the at least ooe artificial nucleic acid according to the invention and one or more liposomes, lipoplexes, or lipid nanoparticles. In one embodiment, the inventive composition comprises liposomes. Liposomes are artificially-prepared vesicles, which may primarily be composed of a lipid bilayer and may be used as a delivery vehicle for the administration of nutrients and pharmaceutical formulations. Liposomes can be of different sizes such as, but not limited to, a multilamellar vesicle (MLV) which may be hundreds of nanometers in diameter and may contain a series nf concentric bilayers separated by narrow aqueous compartments, a small unicellular vesicle (SUV) which may be smaller than 50 nm in diameter, and a large unilamellar vesicle (LUV) which may be between 5D and 500 nm in diameter. Liposome design may include, but is not limited to, opsonins or ligands in order to improve the attachment of liposomes to unhealthy tissue or to activate events such as, but not limited to, endocytosis. Liposomes may contain a low or a high pH in order to improve the delivery of the inventive composition, in particular when applied as a pharmaceutical composition or a vaccine as described herein.

According to a preferred embodiment, the inventive composition comprises the artificial nucleic acid as described herein and a polymeric carrier. A polymeric carrier used according to the invention might be a polymeric carrier formed by disulfide-crosslinked cationic components. The disulfide-crosslinked cationic components may be the same or different from each other. The polymeric carrier can also contain further components. It is also particularly preferred that the polymeric carrier used in the composition according to the present invention comprises mixtures of cationic peptides, proteins or polymers and optionally further components as defined herein, which are crosslinked by disulfide bonds as described herein. In this context, the disclosure of W0 2012/013332B is incorporated herewith by reference.

In this context, the cationic components, which form basis for the polymeric carrier by disulfide-crosslinkage, are typically selected from any suitable cationic or polycationic peptide, protein or polymer suitable for this purpose, particular any cationic or polycationic peptide, protein or polymer capable to complex the at least one artificial nucleic acid as defined herein or a further nucleic acid comprised in the composition, and thereby preferably condensing the mRNA or the nucleic acid. The cationic or polycationic peptide, protein or polymer, is preferably a linear molecule, however, branched cationic or polycationic peptides, proteins or polymers may also be used.

Every disulfide-crasslinking cationic or polycationic protein, peptide or polymer of the polymeric carrier, which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine contains at least one -SH moiety, most preferably at least one cysteine residue or any further chemical group exhibiting an -SH moiety, capable to form a disulfide linkage upon condensation with at least one further cationic or polycationic protein, peptide or polymer as cationic component of the polymeric carrier as mentioned herein.

As defined above, the polymeric carrier, which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine may be formed by disulfide-crosslinked cationic (or polycationic) components. Preferably, such cationic or polycationic peptides or proteins or polymers of the polymeric carrier, which comprise or are additionally modified to comprise at least one -SH moiety, are selected from, proteins, peptides and polymers as defined above for complexation agent.

In a further particular embodiment, the polymeric carrier which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine may be selected from a polymeric carrier molecule according to generic formula (IV):

$$L\text{-}P^1\text{-}S\text{-}[S\text{-}P^2\text{-}S]_n\text{-}S\text{-}P^3\text{-}L \quad \text{formula (IV)}$$

wherein,

P^1 and P^3 are different or identical to each other and represent a linear or branched hydrophilic polymer chain, each P^1 and P^3 exhibiting at least one -SH-moiety, capable to form a disulfide linkage upon condensation with component P^2, or alternatively with (AA), (AA)*. or $[(AA)«]_z$ if such components are used as a linker between P^1 and P^2 or P^3 and P^2) and/or with further components (e.g. (AA), (AA)*, $[(AA)_x]_z$ or L), the linear or branched hydrophilic polymer chain selected independent from each other from polyethylene glycol (PEG), paly-*N*-(2-hydroxypropyl)methacrylamide, poly-2-(methacryloyloxy)ethyl phosphorylcholines, poly(hydroxyalkyl L-asparagine). poly(2-(methacryloyloxy)ethyl phosphorylcholine), hydroxyethylstarch or poly(hydroxyalkyl L-glutamine), wherein the hydrophilic polymer chain exhibits a molecular weight of about 1 kDa to about 100 kDa, preferably of about 2 kDa to about 25 kDa; or more preferably of about 2 kDa to about 10 kDa, e.g. about 5 kDa to about 25 kDa or 5 kDa to about 10 kDa;

P^2 is a cationic or polycationic peptide or protein, e.g. as defined above for the polymeric carrier formed by disulfide-crosslinked cationic components, and preferably having a length of about 3 to about 100 amino acids, more preferably having a length of about 3 to about 50 amino acids, even more preferably having a length of about 3 to about 25 amino acids, e.g. a length of about 3 to 10, 5 to 15, 10 to 20 or 15 to 25 amino acids, more preferably a length of about 5 to about 20 and even more preferably a length of about 10 to about 20; or

is a cationic or polycationic polymer, e.g. as defined above for the polymeric carrier formed by disulfide-crosslinked cationic components, typically having a molecular weight of about 0.5 kDa to about 30 kDa, including a molecular weight of about 1 kDa to about 20 kDa, even more preferably of about 1.5 kDa to about 10 kDa, or having a molecular

weight of about D.5 kDa to about 1DD kDa, including a molecular weight of about ID kDa to about 5D kDa, even more preferably of about 1D kDa to about 3D kDa;

each P^2 exhibiting at least two -SH-moieties, capable to form a disulfide linkage upon condensation with further components P^2 or component(s) P' and/or P^3 or alternatively with further components (e.g. (AA), $(AA)_x$, or $[(AA)_x]_z$);

-S-S- is a (reversible) disulfide bond (the brackets are omitted for better readability), wherein S preferably represents sulphur or a -SH carrying moiety, which has formed a (reversible) disulfide bond. The (reversible) disulfide bond is preferably formed by condensation of -SH-moieties of either components P^1 and P^2, P^2 and P^2, or P^2 and P^3, or optionally of further components as defined herein (e.g. L, (AA), $(AA)_{3-4}$ [(AA)xL, etc); The -SH-maiety may be part of the structure of these components or added by a modification as defined below;

L is an optional ligand, which may be present or not, and may be selected independent from the other from RGD, Transferrin, Folate, a signal peptide or signal sequence, a localization signal or sequence, a nuclear localization signal or sequence (NLS), an antibody, a cell penetrating peptide, (e.g. TAT or KALA), a ligand of a receptor (e.g. cytokines, hormones, growth factors etc), small molecules (e.g. carbohydrates like mannose or galactose or synthetic ligands), small molecule agonists, inhibitors or antagonists of receptors (e.g. RGD peptidomimetic analogues), or any further protein as defined herein, etc.;

n is an integer, typically selected from a range of about 1 to 50, preferably from a range of about 1, 2 or 3 to 30, more preferably from a range of about 1, 2, 3, 4, or 5 to 25, or a range of about 1, 2, 3, 4. or 5 to 20, or a range of about 1, 2, 3, 4, or 5 to 15, or a range of about 1, 2, 3, 4, or 5 to 10, including e.g. a range of about 4 to 9, 4 to 10, 3 to 20, 4 to 20, 5 to 20, or 10 to 20, or a range of about 3 to 15, 4 to 15, 5 to 15, or 10 to 15, or a range of about Gto 11 or 7 to 10. Most preferably, n is in a range of about 1, 2, 3, 4, or 5 to 10, more preferably in a range of about 1, 2, 3, or 4 to 9, in a range of about 1, 2, 3, or 4 to 8, or in a range of about 1, 2, or 3 to 7.

In this context, the disclosure of WD 2DII/D2G64I is incorporated herewith by reference. Each of hydrophilic polymers P' and P^3 typically exhibits at least one -SH-moiety. wherein the at least one -SH-moiety is capable to form a disulfide linkage upon reaction with component P^2 or with component (AA) or (AA)*, if used as linker between P' and P^2 or P^3 and P^2 as defined below and optionally with a further component, e.g. L and/or (AA) or $(AA)_x$, e.g. if two or more -SH-moieties are contained. The following subformulae "P'-S-S-P^2" and "P^2-S-S-P^3" within generic formula (IV) above (the brackets are omitted for better readability), wherein any of S, P' and P^3 are as defined herein, typically represent a situation, wherein one-SH-moiety of hydrophilic polymers P' and P^3 was condensed with one -SH-moiety of component P^2 of generic formula (IV) above, wherein both sulphurs of these -SH-moieties form a disulfide bond -S-S- as defined herein in formula (IV), These -SH-moieties are typically provided by each of the hydrophilic polymers P' and P^3, e.g. via an internal cysteine or any further (modified) amino acid or compound which carries a -SH moiety. Accordingly, the subformulae "P'-S-S-P^2" and "P^2-S-S-P^3" may also be written as "P'-Cys-Cys-P^2" and "P^2-Cys-Cys-P^3", if the -SH- moiety is provided by a cysteine, wherein the term Cys-Cys represents two cysteines coupled via a disulfide bond, not via a peptide bond. In this case, the term "-S-S-" in these formulae may also be written as "-S-Cys", as "-Cys-S" or as "-Cys-Cys-". In this context, the term "-Cys-Cys-" does not represent a peptide bond but a linkage of two cysteines via their -SH-moieties to form a disulfide bond. Accordingly, the term "-Cys-Cys-" also may be understood generally as "-(Cys-S)-(S-Cys)-", wherein in

this specific case S indicates the sulphur of the -SH-moiety of cysteine. Likewise, the terms "-S-Cys" and "-Cys-S" indicate a disulfide bond between a -SH containing moiety and a cysteine, which may also be written as "-S-(S-Cys)" and "-(Cys-S)-S". Alternatively, the hydrophilic polymers P^1 and P^3 may be modified with a -SH moiety, preferably via a chemical reaction with a compound carrying a -SH moiety, such that each of the hydrophilic polymers P^1 and P^3 carries at least one such -SH moiety. Such a compound carrying a -SH moiety may be e.g. an (additional) cysteine or any further (modified) amino acid, which carries a -SH moiety. Such a compound may also be any non-amino compound or moiety, which contains or allows to introduce a -SH moiety into hydrophilic polymers P^1 and P^3 as defined herein. Such non-amino compounds may be attached to the hydrophilic polymers P^1 and P^3 of formula (IV) of the polymeric carrier according to the present invention via chemical reactions or binding of compounds, e.g. by binding of a 3-thio propionic acid or thioimolane, by amide formation (e.g. carboxylic acids, sulphonic acids, amines, etc), by Michael addition (e.g maleinimide moieties, α,β-unsatured carbonyls, etc), by click chemistry (e.g. azides or alkines), by alkene/alkine methatesis (e.g. alkenes or alkines), imine or hydrozone formation (aldehydes or ketons, hydrazins, hydroxylamins, amines), complexation reactions (avidin, biotin, protein G) or components which allow S_n-type substitution reactions (e.g halogenalkans, thiols, alcohols, amines, hydrazines, hydrazides, sulphonic acid esters, oxyphosphonium salts) or other chemical moieties which can be utilized in the attachment of further components. A particularly preferred PEG derivate in this context is alpha-methoxy-omega-mercapto polyethylene glycol). In each case, the SH-moiety, e.g. of a cysteine or of any further (modified) amino acid or compound, may be present at the terminal ends or internally at any position of hydrophilic polymers P^1 and P^3. As defined herein, each of hydrophilic polymers P^1 and P^3 typically exhibits at least one -SH-moiety preferably at one terminal end, but may also contain two or even more -SH-moieties, which may be used to additionally attach further components as defined herein, preferably further functional peptides or proteins e.g. a ligand, an amino acid component (AA) or (AA)x, antibodies, cell penetrating peptides or enhancer peptides (e.g. TAT, KALA), etc.

The complexed artificial nucleic acid in the inventive (pharmaceutical) composition or vaccine, is preferably prepared according to a first step by complexing the at least one artificial with a cationic or polycationic compound and/nr with a polymeric carrier, preferably as defined herein, in a specific ratio to form a stable complex. In this context, it is highly preferable, that no free cationic or polycationic compound or polymeric carrier or only a negligibly small amount thereof remains in the component of the complexed artificial nucleic acid after complexing the artificial nucleic acid. Accordingly, the ratio of the at least one artificial nucleic acid and the cationic or polycationic compound and/or the polymeric carrier in the component of the complexed at least one artificial nucleic acid is typically selected in a range that the at least one artificial nucleic acid is entirely complexed and no free cationic or polycationic compound or polymeric carrier or only a negligibly small amount thereof remains in the composition.

The inventive composition comprising at least one artificial nucleic acid according to the invention may be provided in liquid and or in dry (e.g. lyophylized) form. In a preferred embodiment, the inventive artificial nucleic acid or the inventive composition is provided in lyophilized form. The inventive artificial nucleic acid and the inventive composition thus provide a possibility to store (irrespective of the ambient temperature and also without cooling) an artificial nucleic acid and a composition suitable for vaccination against Norovirus and related diseases or disorders. Preferably, the at least one lyophilized artificial nucleic acid is

reconstituted in a suitable buffer, advantageously based on an aqueous carrier, e.g. Ringer-Lactate solution, prior to use, such as administration to a subject.

In one embodiment, the composition according to the invention

a) comprises a plurality or more than one of the mRNA sequences as defined in the invention;

or

b) comprises at least 2, 3, 4, 5, B, 7, 8, 9, ID, II, I2, 13, 14, I5, IB, I7, 18, 19, ZD, Zl. 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 3I, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42. 43, 44, 45, 4B, 47, 48, 43, 5D, 51, 52, 53, 54, 55, 5B, 57, 58, 59, BD, Bl, B2, B3, B4, B5, BB, B7, 68, 69, 7D, 7l, 72, 73, 74, 75, 7B, 77, 78, 79, 80, 81, 82, 83, 84, 85, 8B, 87, 88, 89, 9D, 91, 92, 93, 94, 95, 96, 97, 98, 99, IDO or more artificial nucleic acids as defined in the invention, wherein each of the at least 2, 3, 4, 5, B, 7, 8. 9, ID, II, 12, 13, 14, 15, IB. 17, 18, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44. 45. 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, Bl, 62, 63, B4, B5, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85. 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in the invention, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VPI of a different Norovirus.

In another embodiment, the composition according to the invention comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 5B, 57, 58, 59, B0, 61, 62, 63, 64, B5, BB, B7, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95. 96, 97, 98, 99, 10D or more artificial nucleic acids of the invention, wherein each of the at least 2, 3. 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21. 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43. 44. 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 58, 60, 61, 62, 63, 64, 65, 6B. B7. 68. 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, SB, 87, 88, 89, 90, 81, 92, 93, 94, 95, 96, 97, 98, 99, IDO or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VPI and VP2, as defined in the invention, and/or a fragment or a variant of any one of these proteins, and/or wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus.

In a further embodiment, the composition according to the invention comprises mRNA sequences, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of the same Norovirus.

In a further embodiment, the composition according to the invention comprises mRNA sequences, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of different Noroviruses.

In a further aspect, the invention concerns a vaccine comprising the artificial nucleic acid as described herein or the inventive composition comprising at least one artificial nucleic acid according to the invention. Therein, the at least one artificial nucleic acid preferably elicits an adaptive immune response upon administration to a subject.

In a preferred embodiment, the inventive vaccine comprises the artificial nucleic acid as described herein or the inventive composition comprising at least one artificial nucleic acid according to the invention and a pharmaceutically acceptable carrier. Accordingly, the inventive vaccine is based on the same components as the inventive composition comprising at least one artificial nucleic acid according to the invention as defined above. Insofar, it may be referred to the above disclosure defining the inventive composition.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of the same Norovirus.

In another embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of different Noroviruses.

In one embodiment, the vaccine of the invention is multivalent and comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids of the invention: or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids of the invention; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids of the invention.

in a further embodiment of the invention, the artificial nucleic acids of the vaccine of the invention

(i) are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50. 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95. 96, 97, 98, 99, 100 or more different GI Noroviruses; or

(ii) are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII Noroviruses; or

(iii) are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIII Noroviruses; or

(iv) are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIV Noroviruses; or

(v) are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GV Noroviruses; or

(vi) are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses and additionally from a single GII, GIII, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more GII, GIII, GIV and/or GV Noroviruses.

In another embodiment of the invention, the artificial nucleic acids of the vaccine of the invention

(i) are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses; nr

(ii) are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII.4 Noroviruses; or

(iii) are derived from a single Gl.l Norovirus and additionally from a single GII.4 Norovirus; or

(iv) are derived from a single Gl.l Norovirus or from 2, 3. 4, 5. G, 7, 8, 9, 10, II. I2, 13. 14. 15, IB, I7, 18, IB, 20, 2I, 22, 23. 24, 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3G, 37, 38, 39, 4D, 41, 42, 43, 44. 45, 46, 47, 48, 49, 5D, 51, 52, 53, 54, 55, 56, 57, 58, 59, 6D, 61, 62, 63, 64, 65. 66, 67, 68, 69. 7D. 71, 72. 73. 74, 75, 76, 77, 78, 70, 8D, 81, 82, 83, 84, 85, 86, 87, 88, 89, 9D, 91, 92, 93, 94, 95, 96, 97. 98, 99, IDO or more different Gl.l Nnroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7. 8, 9, ID, II, 12, 13, 14. I5, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 7D. 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87. 88, 89, 90, 91, 92. 93, 94, 95. 96, 97. 98, 99, 10D or more GII.4 Noroviruses.

As with the composition according to the present invention, the entities of the vaccine may be provided in liquid and or in dry (e.g. lyophylized) form. They may contain further components, in particular further components allowing for its pharmaceutical use. The inventive vaccine or the inventive composition may, e.g., additionally contain a pharmaceutically acceptable carrier and/or further auxiliary substances and additives and/or adjuvants.

The inventive vaccine or composition typically comprises a safe and effective amount of the inventive artificial nucleic acid as defined herein. As used herein, "safe and effective amount" means an amount of the artificial nucleic acid of the composition or the vaccine as defined above, that is sufficient to significantly induce an immune response against a Norovirus protein. At the same time, however, a "safe and effective amount" is small enough to avoid serious side effects that is to say to permit a sensible relationship between advantage and risk. The determination of these limits typically lies within the scope of sensible medical judgment. In relation to the inventive vaccine or composition, the expression "safe and effective amount" preferably means an amount of the artificial nucleic acid that is suitable for stimulating the adaptive immune system in such a manner that no excessive or damaging immune reactions are achieved but, preferably, also no such immune reactions below a measurable level. Such a "safe and effective amount" of the artificial nucleic acid of the composition or vaccine as defined above may furthermore be selected in dependence of the type of artificial nucleic acid, e.g. monocistronic, bi- or even multicistronic mRNA, since a bi- or even multicistronic mRNA may lead to a significantly higher expression of the encoded polypeptide(s) than use of an equal amount of a monocistronic mRNA. A "safe and effective amount" of the artificial nucleic acid of the composition or vaccine as defined above may furthermore vary in connection with the particular objective of the treatment and also with the age and physical condition of the patient to be treated, and similar factors, within the knowledge and experience of the accompanying doctor. The vaccine or composition according to the invention can be used according to the invention for human and also for veterinary medical purposes, as a pharmaceutical composition or as a vaccine.

In a preferred embodiment, the artificial nucleic acid of the composition, vaccine or kit of parts according to the invention is provided in lyophilized form. Preferably, the lyophilized artificial nucleic acid is reconstituted in a suitable buffer, advantageously based on an aqueous carrier, prior to administration, e.g. Ringer-Lactate solution, which is preferred. Ringer solution, a phosphate buffer solution.

According to a preferred embodiment, the buffer suitable for injection may be used as a carrier in tbe inventive vaccine or composition or for resuspending the inventive vaccine or the inventive composition. Such a buffer suitable for injection may contain salts selected from sodium chloride (NaCl). calcium chloride ($CaCl_2$) and optionally potassium chloride (KCl), wherein further anions may be present additional to the chlorides. $CaCl_2$ can also be replaced by another salt like KCl. Typically, the salts in the injection buffer are present in a concentration of at least 50 mM sodium chloride (NaCl), at least 3 mM potassium chloride (KCl) and at least 0,01 mM calcium chloride ($CaCl_2$). The injection buffer may be hypertonic, isotonic or hypotonic with reference to the specific reference medium, i.e. the buffer may have a higher, identical or lower salt content with reference to the specific reference medium, wherein preferably such concentrations of the afore mentioned salts may be used, which do not lead to damage of cells due to osmosis or other concentration effects. Reference media are e.g. in "in vivo" methods occurring liquids such as blood, lymph, cytosolic liquids, or other body liquids, or e.g. liquids, which may be used as reference media in "in vitro" methods, such as common buffers or liquids. Such common buffers or liquids are known to a skilled person. Ringer-Lactate solution is particularly preferred as a liquid basis.

The choice of a pharmaceutically acceptable carrier is determined, in principle, by the manner, in which the inventive vaccine or the inventive composition is administered. The inventive vaccine or composition can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, the inventive vaccine or the inventive composition may be administered by an intradermal, subcutaneous, or intramuscular route, preferably by injection, which may be needle-free and/or needle injection. Compositions/vaccines are therefore preferably formulated in liquid or solid form. The suitable amount of the inventive vaccine or composition to be administered can be determined by routine experiments with animal models. Such models include, without implying any limitation, rabbit, sheep, mouse, rat, dog and non-human primate models. Preferred unit dose forms for injection include sterile solutions of water, physiological saline or mixtures thereof. The pH of such solutions should be adjusted to about 7.4. Suitable carriers for injection include hydrogels, devices for controlled or delayed release, polylactic acid and collagen matrices. Suitable pharmaceutically acceptable carriers for topical application include those which are suitable for use in lotions, creams, gels and the like. If the inventive vaccine is to be administered perorally, tablets, capsules and the like are the preferred unit dose form. The pharmaceutically acceptable carriers for the preparation of unit dose forms which can be used for oral administration are well known in the prior art. The choice thereof will depend on secondary considerations such as taste, costs and storability, which are not critical for the purposes of the present invention, and can be made withoot difficulty by a person skilled in the art.

Adjuvants:

According to another embodiment, the inventive (pharmaceutical) composition or the inventive vaccine may comprise an adjuvant. An adjuvant may be used, for example, in order to enhance the immunostimulatory properties of the vaccine or composition. In this context, an adjuvant may be understood as any compound, which is suitable to support administration and delivery of the vaccine or composition according to the invention. Furthermore, such an adjuvant may, without being bound thereto, initiate or increase an immune response of the innate immune system, i.e. a nan-specific immune response. In other words, when administered, the vaccine or composition according to the invention typically initiates an adaptive immune response due to the at least one polypeptide encoded by the artificial nucleic acid contained in the inventive vaccine or composition. Additionally, the vaccine or composition according to the invention may generate an (supportive) innate immune response due to addition of an adjuvant as defined herein to the vaccine or composition according to the invention.

In one embodiment, the adjuvant is selected from the group consisting of:

cationic or polycationic compounds, comprising cationic or polycationic peptides or proteins, including protamine, nucleoline, spermin or spermidine, poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-I Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpTFJ20, proline-rich peptides, arginine-rich peptides, lysine-rich peptides, MPG-peptide(s), Pep-I, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from Drosophila antennapedia), pAntp, plsl, FGF, Lactoferrin, Transportan, Buforin-2, FJac7l5-24, SynB, SynB(l), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones, cationic polysaccharides, including chitosan, polybrene, cationic polymers, including polyethyleneimine (PEI), cationic lipids, including DOTMA: [l-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-CI4-amidine. DDTIM. SAINT, DC-Choi, BGTC, CTAP, DDPC. DDDAP, DOPE: Dioleyl phosphatidylethanol-amine. DDSPA, DDDAB, DDIC, DMEPC, DOGS: Dioetadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DDTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-G-I4: 0,D-ditetradecanoyl-N-(a-trimethylammoniaacetyljdiethanolamine chloride, CLIP: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIPS: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]-trimethylammanium, CLIPFJ: rac-[2(2,3-dihexadEcyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium. oligofectamine, or cationic or polycationic polymers, including modified polyaminoacids, including β-aminoacid-polymers or reversed polyamides, modified polyethylenes, including PVP (poly(N-ethyl-4-vinylpyridinium bromide)), modified acrylates, including pDMAEMA (poly(dimethylaminoethyl methylacrylate)), modified Amidaamines including pAMAM (poly(amidoamine)), modified polybetaaminoester (PBAE), including diamine end modified l,4 butanediol diacrylate-co-5-amino-l-pentanol polymers, dendrimers, including polypropylamine dendrimers or pAMAM based dendrimers, polyimine(s), including PEI: poly(ethyleneimine), poly(propyleneimine), polyallylamine, sugar backbone based polymers, including cyclodextrin based polymers, dextran based polymers, Chitosan, etc., silan backbone based polymers , such as PMDXA-PDMS copolymers, etc., block polymers consisting of a combination of one or more cationic blocks selected from a cationic polymer as mentioned before, and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole);

or

cationic or polycationic proteins or peptides, selected from the following proteins or peptides having the following total formula (III): (Arg)l;(Lys)m;(His)n;(Orn)o;(Xaa)x, wherein l + m + n +□ + x = 8-I5, and I, m, n or o independently of each other may be any number selected from D. I, 2, 3, 4, 5, G, 7, 8, 9, ID, II, I2, 13, 14 or I5, provided that the overall content of Arg, Lys, His and Drn represents at least 5D% of all amino acids of the oligopeptide: and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except from Arg, Lys, His or Drn; and x may be any number selected from D, I, 2, 3 or 4, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide; or

nucleic acids having the formula (V): GIXmGn, wherein: G is guanosine, uracil or an analogue of guanosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 4D, wherein, when l = I G is guanosine or an analogue thereof, when l > I at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from I to 40, wherein when n = I G is guanosine or an analogue thereof, when n > I at least 50% of the nucleotides are guanosine or an analogue thereof;

or

nucleic acids having the formula (VI): ClXmCn, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; I is an integer from 1 to 40, wherein when I = 1 C is cytosine or an analogue thereof, when I > I at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from I to 40, wherein when n = I C is cytosine or an analogue thereof, when n > I at least 50% of the nucleotides are cytosine or an analogue thereof;

or

adjuvants selected from the group consisting of:

TDM, MDP. muramyl dipeptide, pluronics, alum solution, aluminium hydroxide, ADJUMER™ (polyphosphazene); aluminium phosphate gel; glucans from algae; algammulin; aluminium hydroxide gel (alum); highly protein-adsorbing aluminium hydroxide gel; low viscosity aluminium hydroxide gel; AF or SPT (emulsion of squalane (5%), Tween 8D (0.2%), Pluronic LI2I (1.25%), phosphate-buffered saline, pH 7.4); AVRID1NE™ (propanediamine); BAY RI005™ ((N-(2-deoxy-2-L-leucylamino-b-D-glucopyranosyl)-N-octadecyl-dodecanoyl-amide hydroacetate); CALCITRIOL™ (l-alpha,25-dihydroxy-vitamin 03); calcium phosphate gel; CAP™ (calcium phosphate nanoparticles); cholera holotoxin, cholera-toxin-Al-prDtein-A-D-fragment fusion protein, sub-unit B of the cholera toxin; CRL 1005 (block copolymer PI205); cytokine-containing liposomes; DDA (dimethyldioctadecylammonium bromide); DHEA (dehydroepiandrosterone); 0MPC (dimyristoylphosphatidylcholine); DMPG (dimyristoylphosphatidylglycerol); OOC/alum complex (deoxycholic acid sodium salt); Freund's complete adjuvant; Freund's incomplete adjuvant; gamma inulin; Gerbu adjuvant (mixture of: i) N-acetylglucosaminyl-(PI-4)-N-acetylmuramyl-L-alanyl-D-glutamine (GM0P), ii) dimethyldioctadecylammonium chloride (DDA), iii) zinc-L-proline salt complex (ZnPro-8); GM-CSF); GMDP (N-acetylglucosaminyl-(bl-4)-N-acetylmuramyl-L-alanyl-D-isoglutamine); imiquimod (l-(2-methypropyl)-IH-imidazo[4,5-c]quinoline-4-amine); ImmTher™ (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-glycerol dipalmitate); DRVs (immunoliposomes prepared from dehydration-rehydration vesicles); interferon-gamma; interleukin-Ibeta; interleukin-2; interleukin-7; interleukin-12; ISCOMSTM; ISCDPREP 7.0.3.TM; liposomes; L0XDRIBINE™ (7-allyl-8-oxoguanosine); LT oral adjuvant

(E.coli labile enterotoxin-protoxin); microspheres and microparticles of any composition; MF59TM; (squalene-water emulsion); MDNTANIDE ISA 5I™(purified incomplete Freund's adjuvant); MDNTANIDE ISA 720™ (metabolisable oil adjuvant); MPL™ (3-Q-desacyl-4'-monophospharyl lipid A); MTP-PE and MTP-PE liposomes ((N-aeetyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(l,2-dipalmitoyl-sn-glycero-3-(hydroxyphasphoryloxy))-ethylamide, monosodium salt): MURAMETIDE™ (Nac-Mur-L-Ala-D-Gln-0CH3); MURAPALMITINE™ and D-MURAPALMITINE™ (Nac-Mur-L-Thr-D-isoGln-sn-glyceroldipalmitoyl); NAGO (neuraminidase-galactose oxidase); nanospheres or nanoparticles of any composition; NISVs (non-ionic surfactant vesicles); PLEURAN™ (β-glucan); PLGA, PGA and PLA (homo- and co-polymers of lactic acid and glycolic acid; microspheres/nanospheres); PLORONIC LI2ITM; PMMA (polymethyl methacrylate); PODDS™ (proteinoid microspheres); polyethylene carbamate derivatives; poly-rA: poly-rU (polyadenylic acid-polyuridylic acid complex); polysorbate 80 (Tween 80); protein cochleates (Avanti Polar Lipids, Inc., Alabaster, AL); STIMOLON™ (QS-2I): Duil-A (Quil-A saponin); S-284G3 (4-amino-otec-dimethyl-2-ethnxymethyl-IH-imidazo[4,5 c]quinoline-l-ethanol); SAF-I™ ("Syntex adjuvant formulation"); Sendai proteoliposomes and Sendai-containing lipid matrices; Span-85 (sorbitan trioleate); Specol (emulsion of Marcol 52, Span 85 and Tween 85); squalene or Robane® (2,6,10.15.19.23-hexamethyltetracosan and 2,G.I0,l5.l9,23-hexamethyl-2,B,l0J4,l8,22-tetracosahexane); stearyltyrosine (octadecyltyrosine hydrochloride); Therarnid® (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-dipalmitoxypropylamide); Theronyl-MDP (Termurtide™ or [thr l]-MDP; N-acetylmuramyl-L-threonyl-D-isoglutamine); Ty particles (Ty-VLPs or virus-like particles); Walter-Reed liposomes (liposomes containing lipid A adsorbed on aluminium hydroxide), and lipopeptides, including Pam3Cys, in particular aluminium salts, such as Adju-phos, Alhydrogel, Rehydragel; emulsions, including GFA, SAF, IFA, MF59, Provax, TiterMax, Montanide, Vaxfectin; copolymers, including Optivax (CRLI005), LI2I, Polaaxmer40IO), etc.; liposomes, including Stealth, cochleates, including BIORAL; plant derived adjuvants, including QS2I, Qui) A, Iscomatrix, ISCOM; adjuvants suitable for costimulation including Tomatine, biopolymers, including PLG, PMM, Inulin; microbe derived adjuvants, including Romurtide, DETDX, MPL, CWS, Mannose, CpG nucleic acid sequences, CpG7909, ligands of human TLR 1-10, ligands of murine TLR 1-13, ISS-I0I8, IC3I, Imidazoquinolines, Ampligen, Ribi529, IMOxine, IRIVs, VLPs, cholera toxin, heat-labile toxin, Pam3Cys. Flagellin, GPI anchor, LNFPIII/Lewis X, antimicrobial peptides, UC-IVI50. RSV fusion protein, cdiGMP; and adjuvants suitable as antagonists including GGRP neuropeptide.

Particularly preferred are aluminium salts, such as aluminium phosphate (AIPO-s) or aluminium hydroxide (AI(OH)s) and adjuvant compounds based thereon. More preferably, an aluminium salt, such as AIP0/ı (e.g. Adju-Phos) may be used in combination with the inventive artificial nucleic acid in its free form or with the inventive artificial nucleic acid complexed with a cationic or polycationic compound as described herein. Most preferably, an aluminium salt, such as AlPOi (e.g. Adju-Phos) may be used as adjuvant in combination with the inventive artificial nucleic acid in its free form.

Suitable adjuvants may also be selected from cationic or polycationic compounds, preferably as described herein, wherein the adjuvant is preferably prepared upon complexing the at least one artificial nucleic acid of the inventive composition or vaccine with the cationic or polycationic compound. Association or complexing the artificial nucleic acid with cationic or polycationic compounds as defined herein preferably provides adjuvant properties and confers a stabilizing effect to the artificial nucleic acid.

The ratio of the artificial nucleic acid to the cationic or polycationic compound in the adjuvant component may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire artificial nucleic acid complex, i.e. the ratio of positively charged (nitrogen) atoms of the cationic or polycationic compound to the negatively charged phosphate atoms of the nucleic acids. For example, 1 pg RNA typically contains about 3 nmol phosphate residues, provided the RNA exhibits a statistical distribution of bases. Additionally, 1 pg peptide typically contains about x nmol nitrogen residues, dependent on the molecular weight and the number of basic amino acids. When exemplarily calculated for (Arg)g (molecular weight 1424 g/mol, 9 nitrogen atoms), 1 pg (Arg)a contains about 700 pmol (Arg)g and thus 700 x 9=6300 pmol basic amino acids = 6.3 nmol nitrogen atoms. For a mass ratio of about 1:1 RNA/(Arg)9 an N/P ratio of about 2 can be calculated. When exemplarily calculated for protamine (molecular weight about 4250 g/ mol, 21 nitrogen atoms, when protamine from salmon is used) with a mass ratio of about 2:1 with 2 pg RNA, 6 nmol phosphate are to be calulated for the RNA; 1 pg protamine contains about 235 pmol protamine molecues and thus 235 x 21 = 4935 pmol basic nitrogen atoms = 4.9 nmol nitrogen atoms. For a mass ratio of about 2:1 RNA/protamine an N/P ratio of about 0.81 can be calculated. For a mass ratio of about 8:1 RNA/protamine an N/P ratio of about 0.2 can be calculated. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of nucleic acid:peptide in the complex, and most preferably in the range of about 0.7-1.5.

In a preferred embodiment, the inventive vaccine or the inventive composition is obtained in two separate steps in order to obtain both, an efficient immunostimulatory effect and efficient translation of the artificial nucleic acid according to the invention. Therein, a so called "adjuvant component" is prepared by complexing - in a first step - a nucleic acid, preferably an RNA, of the adjuvant component with a cationic or polycationic compound in a specific ratio to form a stable complex. In this context, it is important, that no free cationic or polycationic compound or only a neglibly small amount remains in the adjuvant component after complexing the nucleic acid. Accordingly, the ratio of the nucleic acid, preferably an RNA, and the cationic or polycationic compound in the adjuvant component is typically selected in a range that the artificial nucleic acid is entirely cDmplexed and no free cationic or polycationic compound or only a neglectably small amount remains in the composition. Preferably the ratio of the adjuvant component, i.e. the ratio of the artificial nucleic acid to the cationic or polycationic compound is selected from a range of about 6:1 (w/w) to about 0,25:1 (w/w), more preferably from about 5:1 (w/w) to about 0,5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w).

According to a preferred embodiment, the artificial nucleic acid, preferably an mRNA, is added in a second step to the complexed nucleic acid, preferably an RNA, of the adjuvant component in order to form the (immunostimulatory) composition of the invention. Therein, the artificial nucleic acid is added as free nucleic acid, i.e. nucleic acid, which is not complexed by Dther compounds. Prior to addition, the free artificial nucleic acid is not complexed and will preferably not undergo any detectable or significant complexation reaction upon the addition of the adjuvant component. This is due to the strong binding of the cationic or polycationic compound to the above described artificial nucleic acid in the adjuvant component. In other words, when the artificial nucleic

acid according to the invention, is added to the "adjuvant component", preferably no free or substantially no free cationic or polycationic compound is present, which may form a complex with the free artificial nucleic acid. Accordingly, an efficient translation of the free artificial nucleic acid of the inventive vaccine or composition is possible in vivo. Therein, the free artificial nucleic acid may occur, for example, as a mono-, di-, or multicistronic nucleic acid, i.e. an artificial nucleic acid which carries the coding sequences of one or more polypeptides. Such coding sequences in a di-, or even multicistronic nucleic acid may be separated by at least one IRES sequence, e.g. as defined herein.

In a particularly preferred embodiment, the free artificial nucleic acid, which is comprised in the inventive vaccine or composition, may be identical or different to the RNA of the adjuvant component of the inventive composition, depending on the specific requirements of therapy. Even more preferably, the artificial nucleic acid, preferably an mRNA, which is comprised in the inventive vaccine or composition, is identical to the RNA of the adjuvant component of the inventive vaccine or composition.

In a particularly preferred embodiment, the composition comprises the artificial nucleic acid, preferably an mRNA, wherein said artificial nucleic acid is present in the composition partially as free nucleic acid and partially as complexed nucleic acid. Preferably, the artificial nucleic acid, preferably an mRNA, is complexed as described above and the same artificial nucleic acid is then added as free nucleic acid, wherein preferably the compound, which is used for complexing the artificial nucleic acid is not present in free form in the composition at the moment of addition of the free nucleic acid component.

The ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid complexed with a cationic or polycationic compaund) and the second component (i.e. the free nucleic acid) may be selected in the inventive composition according to the specific requirements of a particular therapy. Typically, the ratio of the nucleic acid, preferably an RNA, in the adjuvant component and the at least one free artificial nucleic acid, preferably an mRNA, (artificial nucleic acid, preferably mRNA in the adjuvant component : free RNA) of the inventive composition is selected such that a significant stimulation of the innate immune system is elicited due to the adjuvant component. In parallel, the ratio is selected such that a significant amount of the at least one free artificial nucleic acid, preferably an mRNA, can be provided in vivo leading to an efficient translation and concentration of the expressed protein in vivo, e.g. the at least one encoded polypeptide as defined herein. Preferably, the ratio of the mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a range of about 5:1 (w/ w) to about 1:10 (w/ w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/ w), even more preferably from a range of about 3:1 (w/ W) to about 1:5 (w/ w) or 1:3 (w/ w), and most preferably the ratio of mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a ratio of about 1:1 (w/w).

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid complexed with a cationic or polycationic compound) and the second component (i.e. free artificial nucleic acid) may be calculated on the basis of the nitrogen/ phosphate ratio (N/P-ratio) of the entire mRNA complex. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a

range of about 0.5-2 or 0.7-2 regarding the ratio of mRNA:peptide in the complex, and most preferably in the range of about 0.7-I.5.

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid, preferably mRNA, complexed with a cationic or polycationic compound) and the second component (i.e. free artificial nucleic acid, preferably mRNA) may also be selected in the inventive composition on the basis of the molar ratio of both nucleic acids to each other, i.e. the nucleic acid of the adjuvant component, being complexed with a cationic or polycationic compound and the free nucleic acid of the second component. Typically, the molar ratio of the nucleic acid of the adjuvant component to the free nucleic acid of the second component may be selected such, that the molar ratio suffices the above (w/w) and/or N/P-definitions. More preferably, the molar ratio of the nucleic acid, preferably an mRNA, of the adjuvant component to the free nucleic acid, preferably an mRNA, of the second component may be selected e.g. from a molar ratio of about 0.00l:l, 0.01:1. 0.1:1, 0.2:1, 0.3:1, 0.4:1. 0.5.1, 0.G-.I. 0.7:1, 0.8:1, 0.9:1, 1:1, 1:0.9. 1:0.8, 1:0.7. 1:0.6. 1:0.5, 1:0.4. 1:0.3, 1:0.2, 1:0.1, 1:0.01, 1:0.001, etc. or from any range formed by any two of the above values, e.g. a range selected from about 0.001:1 to 1:0.001, including a range of about 0.01:1 to 1:0.001, 0.1:1 to 1:0.001, 0.2:1 to 1:0.001, 0.3:1 to 1:0.001, 0,4:1 to 1:0.001, 0.5:1 to 1:0.001, 0.G:l to 1:0.001, 0.7:1 to 1:0.001, 0.8:1 to 1:0.001, D.9:l to 1:0.001, 1:1 to 1:0.001, 1:0.9 to 1:0.001, 1:0.8 to 1:0.001, 1:0.7 to 1:0.001, 1:0.6 to 1:0.001, 1:0.5 to 1:0.001, 1:0.4 to 1:0.001, 1:0.3 to 1:0.001, 1:0.2 to 1:0.001, 1:0.1 to 1:0.001, 1:0.01 to 1:0.001, or a range of about 0.01:1 to 1:0.01, 0.1:1 to 1:0.01, 0.2:1 to 1:0.01, 0.3:1 to 1:0.01. 0.4:1 to 1:0.01, 0.5:1 to 1:0.01, 0.6:1 to 1:0.01, 0.7:1 to 1:0.01, 0.8:1 to 1:0.01, 0.9:1 to 1:0.01, 1:1 to 1:0.01, 1:0.9 to 1:0.01, 1:0.8 to 1:0.01. 1:0.7 to 1:0.01. 1:0.6 to 1:0.01, 1:0.5 to 1:0.01, 1:0.4 to 1:0.01, 1:0.3 to 1:0.01, 1:0.2 to 1:0.01, 1:0.1 to 1:0.01, 1:0.01 to 1:0.01, or including a range of about 0.001:1 to 1:0.01, 0.001:1 to 1:0.1. 0.001:1 to 1:0.2, 0.001:1 to 1:0.3, 0.001:1 to 1:0.4. 0.001:1 to 1:0.5, 0.001:1 to 1:0.6. 0.001:1 to 1:0.7, 0.001:1 to 1:0.8, 0.001:1 to 1:0.9, 0.001:1 to 1:1. 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1. D.00I to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, or a range of about 0.01:1 to 1:0.01, 0.01:1 to 1:0.1, 0.01:1 to 1:0.2, 0.01:1 to 1:0.3, 0.01:1 to 1:0.4, 0.01:1 to 1:0.5, 0.01:1 to 1:0.6, 0.01:1 to 1:0.7, 0.01:1 to 1:0.8, 0.01:1 to 1:0.9, 0.01:1 to 1:1. 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, etc.

Even more preferably, the molar ratio of the artificial nucleic acid, preferably an mRNA, of the adjuvant component to the free nucleic acid, preferably an mRNA, of the second component may be selected e.g. from a range of about 0.01:1 to 1:0.01. Most preferably, the molar ratio of the nucleic acid of the adjuvant component to the free nucleic acid of the second component may be selected e.g. from a mnlar ratio of about 1:1. Any of the above definitions with regard to (w/w) and/or N/P ratio may also apply.

Suitable adjuvants may furthermore be selected from nucleic acids having the formula (V): $G_lX_mG_n$, wherein: G is goanosine, uracil or an analogue of guanosine or uracil: X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides: I is an integer from I to 40, wherein when $l = 1$ G is guanosine or an analogue thereof, when $I > 1$ at least 50% of the nucleotides are guanosine or an analogue thereof: m is an integer and is at least 3: wherein when $m = 3$ X is uracil or an analogue thereof, when $m > 3$ at least 3 successive uracils or analogues of uracil occur: n is an integer from 1 to 40,

wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof.

Other suitable adjuvants may furthermore be selected from nucleic acids having the formula (VI): $C_lX_mC_n$, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 C is cytosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytosine or an analogue thereof.

The inventive vaccine or composition can additionally contain one or more auxiliary substances in order to further increase the immunogenicity. A synergistic action of the artificial nucleic acid of the composition or vaccine as defined herein and of an auxiliary substance, which may be optionally be co-formulated (or separately formulated) with the inventive vaccine or composition as described above, is preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms can come into consideration in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipopolysaccharides, TNF-alpha or CD40 ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP9B, etc.) or cytokines, such as GM-CFS, which allow an immune response produced by the immune-stimulating adjuvant according to the invention to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokines, that - additional to induction of the adaptive immune response by the encoded at least one antigen - prnmote the innate immune response, such as IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8. IL-8, IL-10, IL-12. IL-13, IL-14, IL-15, IL-18. IL-17. IL-18, IL-18, IL-20. IL-21, IL-22, IL-23, IL-24, IL-25, IL-26. IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, INF-alpha, IFN-beta, INF-gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH. Preferably, such immunogenicity increasing agents or compounds are provided separately (not co-formulated with the inventive vaccine or composition) and administered individually.

The inventive vaccine or composition can also additionally contain any further compound, which is known to be immune-stimulating due to its binding affinity (as ligands) to human Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, or due to its binding affinity (as ligands) to murine Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12 or TLR13.

Another class of compounds, which may be added to an inventive vaccine or composition in this context, may be CpG nucleic acids, in particular CpG-RNA or CpG-DNA. A CpG-RNA or CpG-DNA can be a single-stranded CpG-DNA (ss CpG-DNA). a double-stranded CpG-DNA (dsDNA), a single-stranded CpG-RNA (ss CpG-RNA) or a double-stranded CpG-RNA (ds CpG-RNA). The CpG nucleic acid is preferably in the form of CpG-RNA, more preferably in the form of single-stranded CpG-RNA (ss CpG-RNA). The CpG nucleic acid preferably contains at least one or more (mitogenic) cytosine/guanine dinucleotide sequence(s) (CpG motif(s)).

According to a first preferred alternative, at least one CpG motif contained in these sequences, that is to say the C (cytosine) and the G (guanine) of the CpG motif, is unmethylated. All further cytosines or guanines optionally contained in these sequences can be either methylated or unmethylated. According to a further preferred alternative, however, the C (cytosine) and the G (guanine) of the CpG motif can also be present in methylated form.

Preferably, the above compounds are formulated and administered separately from the above composition or vaccine (of the invention) containing the artificial nucleic acid according to the invention.

Polypeptide:

In a further aspect, the present invention concerns a polypeptide encoded by the inventive artificial nucleic acid as described herein, or a fragment of said polypeptide.

More preferably, the inventive polypeptide comprises or consists of, preferably in this order from N-terminus to C-terminus:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, or an amino acid sequence derived from a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus pulyprotein before cleavage, preferably as described herein.

More preferably, the inventive polypeptide is selected from the group coosisting of Norovirus NS1/NS2, NS3, NS4, NS5, NS6, NS7, VP1, and VP2, or a fragment or variant of any of these proteins, and

at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein NS1/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 20 amino acid residues.

In a preferred embodiment, the inventive polypeptide does not comprise an amino acid sequence from Norovirus capsid protein VP1 or from Norovirus non-structural protein 1 (NS1) distinct from the following amino acid sequences:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues.

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, or an amino acid sequence derived from a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus polyprotein before cleavage, preferably as described herein, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein (NS1). or a variant thereof, wherein the N-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues.

According to a preferred embodiment, the inventive polypeptides as described herein comprises a molecular tag, wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathiane-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag,

In a further aspect, the present invention provides a composition comprising at least one of the inventive polypeptides as described herein. In a preferred embodiment, the inventive composition comprises one type of polypeptide as described herein. Alternatively, the inventive composition may comprise at least two different inventive polypeptides as described herein.

Preferably, the inventive composition comprises or consists of at least one of the inventive polypeptides described herein and a pharmaceutically acceptable carrier. In this context, the pharmaceutically acceptable carrier as well as optional further components of the composition are preferably as described herein with respect to the inventive composition comprising at least one inventive artificial nucleic acid.

In a further aspect, the invention concerns a vaccine comprising the inventive composition comprising at least one of the polypeptides according to the invention. Therein, the at least one of the inventive polypeptides preferably elicits an adaptive immune response upon administration to a subject. More preferably, the vaccine according to the invention comprising at least one of the inventive polypeptides or the inventive composition comprising at least one of the polypeptides according to the invention is preferably a vaccine as described herein. Reference is made to the respective description herein.

As used herein, the term 'inventive composition' may refer to the inventive composition comprising at least one artificial nucleic acid according to the invention as well as to the inventive composition comprising at least ooe of the polypeptides according to the invention. Likewise, the term 'inventive vaccine', as used in this context, may refer to an inventive vaccine, which is based on the inventive artificial nucleic acid, i.e. which comprises at least one artificial nucleic acid according to the invention or which comprises the inventive composition comprising said artificial nucleic acid, as well as to an inventive vaccine, which is based on the inventive polypeptide(s), i.e. which comprises at least one polypeptide according to the invention or which comprises the inventive composition comprising said at least one polypeptide according to the invention.

According to another embodiment, the present invention also provides kits, particularly kits of parts, comprising the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide

or the inventive vaccine as described herein, optionally a liquid vehicle for solubilising and optionally technical instructions with information on the administration and dosage of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine. The technical instructions may contain information about administration and dosage. Such kits, preferably kits of parts, may be applied e.g. for any of the applications or uses mentioned herein, preferably for the use of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine for the treatment or prophylaxis of a Norovirus infection or diseases or disorders related thereto. The kits may also be applied for the use of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine for the treatment or prophylaxis of Norovirus infection or diseases or disorders related thereto, wherein the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine may induce or enhance an immune response in a mammal as defined above. Preferably, the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, or the inventive vaccine is provided in a separate part of the kit, wherein the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, or the inventive vaccine are preferably lyophilised. More preferably, the kit further contains as a part a vehicle for solubilising the artificial nucleic acid according as described herein, the inventive composition comprising at least One artificial nucleic acid according to the invention, or the inventive vaccine, the vehicle preferably being Ringer-lactate solution. Any of the above kits may be used in a treatment or prophylaxis as defined above. More preferably, any of the above kits may be used as a vaccine, preferably a vaccine against Norovirus infection or a related disease or disorder.

The present invention furthermore provides several applications and uses of the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid accordiog to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine or of kits comprising same. In particular, the inventive (pharmaceutical) composition(s) or the inventive vaccine may be used for human and also for veterinary medical purposes, preferably for human medical purposes, as a pharmaceutical composition in general or as a vaccine.

In a further aspect, the invention provides the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts for use in a method of prophylactic (pre-exposure prophylaxis or post-exposure prophylaxis) and/or therapeutic treatment of Norovirus infections. Consequently, in a further aspect, the present invention is directed to the first medical use of the artificial

nuclEic acid according to the invention, the inventive composition comprising at least oΠe artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts as defined herein as a medicament. Particularly, the invention provides the use of an artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least oΠe Norovirus protein as defined herein, or a fragment or variant thereof as described herein for the preparation of a medicament.

According to another aspect, the present invention is directed to the second medical use of the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts far the treatment of an infection with Norovirus or a disease or disorder related to an infection with Norovirus as defined herein. Particularly, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least one Norovirus protein as defined herein, or a fragment or variant thereof as described herein to be used in a method as said above is an artificial nucleic acid formulated together with a pharmaceutically acceptable vehicle and an optionally additional adjuvant and an optionally additional further component as defined herein.

The invention provides the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts for medical use, in particular for the treatment of an infection with Norovirus or a disease or disorder related to an infection with Norovirus, wherein preferably an infection with Norovirus may involve any Norovirus strain. More preferably, the Norovirus infection is caused by a Norovirus strain, which is selected from the group consisting of GII.4 CIN-I Norovirus or a GII.4 Sydney Norovirus, Gl.l and GII.4 Sydney 2DI2 Norovirus. Further preferably, the Norovirus infection is caused by a Norovirus strain GII.4 Sydney or GII.4 Sydney 2DI2.

As used herein, "a disorder related to a Norovirus infection" or "a disease related to a Norovirus infection" may preferably comprise a complication of Norovirus infection, such as abdominal paio, diarrhea, DIG (disseminated intravascular coagulation), fever, fever/chills, gastrointestinal symptoms, headache, nausea, neck stiffness, obtundation, photophobia, and/or vomiting. In a preferred embodiment, the inventive composition or vaccine is thus used for treatment or prophylaxis, preferably prophylaxis, of complications associated with a Norovirus infection.

The inventive composition or the inventive vaccine, in particular the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein or the inventive composition comprising at least one inventive polypeptide, can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular

injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, vaccines may be administered by an intradermal, subcutaneous, or intramuscular route. Inventive vaccines are therefore preferably formulated in liquid (or sometimes in solid) form. Preferably, the inventive vaccine may be administered by conventional needle injection or needle-free jet injection. In a preferred embodiment the inventive vaccine or composition may be administered by jet injection as defined herein, preferably intramuscularly or intradermal^, more preferably intradermally.

In a preferred embodiment, a single dose of the inventive artificial nucleic acid, composition or vaccine comprises a specific amount of the artificial nucleic acid according to the invention. Preferably, the inventive artificial nucleic acid is provided in an amount of at least ID pg per dose, 40 pg per dose, preferably in an amount of from 4D to 70D pg per dose, more preferably in an amount of from 80 to 4DD pg per dose. More specifically, in the case of intradermal injection, which is preferably carried out by using a conventional needle, the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 2D0 µg, preferably from 2DD µg to 1,000 µg, more preferably from 300 pg to 850 µg, even more preferably from 300 pg to 7DD pg. In the case of intradermal injection, which is preferably carried out via jet injection (e.g. using a Tropis device), the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 80 pg, preferably from 80 pg to 700 pg, more preferably from 80 pg to 400 pg. Moreover, in the case of intramuscular injection, which is preferably carried out by using a conventional needle or via jet injection, the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 80 pg, preferably from 80 pg to I0D0 pg, more preferably from 8[] pg to 850 pg, even more preferably from 80 pg to 700 pg.

Depending on the used formulation, the used route of application, and depending on the subject (human, animal), the dose of the inventive artificial nucleic acid may range from about I pg to about ID00 pg, preferably from about 10 pg to about 500 pg.

The immunization protocol for the treatment or prophylaxis of a Norovirus infection, i.e the immunization of a subject against Norovirus, typically comprises a series of single doses or dosages of the inventive composition or the inventive vaccine. A single dosage, as used herin, refers to the initial/first dose, a second dose or any futher doses, respectively, which are preferably administered in order to "boost" the immune reaction.

According to a preferred embodiment, the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts is provided for use in treatment or prophylaxis, preferably treatment or prophylaxis of a Norovirus infection or a related disorder or disease, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient. More preferably, in the case of the inventive vaccine or composition, which is based on the inventive artificial nucleic acid, a polypeptide may be co-administered as a further active pharmaceutical ingredient. For example, at least one Norovirus protein as described herein, or a fragment or variant thereof, may be co-administered in order to induce or enhance an immune response. Likewise, in the case of the inventive vaccine or composition, which is based on the inventive polypeptide as described herein, an artificial

nucleic acid as described herein may be co-administered as a further active pharmaceutical ingredient. For example, an artificial nucleic acid as described herein encoding at least one polypeptide as described herein may be co-administered in order to induce or enhance an immune response.

A further component of the inventive vaccine or composition may be an immunotherapeutic agent that can be selected from immunoglobulins, preferably IgGs, monoclonal or polyclonal antibodies, polyclonal serum or sera, etc, most preferably immunoglobulins directed against a Norovirus, Preferably, such a further immunotherapeutic agent may be provided as a peptide/protein or may be encoded by a nucleic acid, preferably by a DNA or an RNA, more preferably an mRNA. Such an immunotherapeutic agent allows providing passive vaccination additional to active vaccination triggered by the inventive artificial nucleic acid or by the inventive polypeptide.

In a further aspect the invention provides a method of treating or preventing a disorder, wherein the disorder is preferably an infection with Norovirus or a disorder related to an infection with Norovirus, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts.

In particular, such a method may preferably comprise the steps of:

a) providing the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts;

b) applying or administering the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts to a tissue or an organism;

c) optionally administering immune globuline against Norovirus.

According to a further aspect, the present invention also provides a method for expression of at least one polypeptide comprising at least one Norovirus, or a fragment or variant thereof, wherein the method preferably comprises the following steps:

a) providing the inventive artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least one Norovirus, or a fragment or variant thereof, preferably as defined herein, or a composition comprising said artificial nucleic acid; and

b) applying or administering the inventive artificial nucleic acid or the inventive composition comprising said artificial nucleic acid to an expression system, e.g. to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism.

The method may be applied for laboratory, for research, for diagnostic, for commercial production of peptides or prateins and/ or for therapeutic purposes. In this context, typically after preparing the inventive artificial nucleic acid as defined herein *or* of the inventive composition or vaccine as defined herein, it is typically applied or administered to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism, e.g. in naked or complexed form or as a (pharmaceutical) composition or vaccine as described herein, preferably via transfection or by using any of the administration modes as described herein. The method may be carried out in vitro, in vivo or ex vivo. The method may furthermore be carried out in the context of the treatment of a specific disease, particularly in the treatment of infectious diseases, preferably Norovirus infection or a related disorder as defined herein.

In this context, in vitro is defined herein as transfection or transduction of the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein into cells in culture outside of an organism; in vivo is defined herein as transfection or transduction of the inventive artificial nucleic acid or of the inventive composition or vaccine into cells by application of the inventive mRNA or of the inventive composition to the whole organism or individual and ex vivo is defined herein as transfection or transduction of the inventive artificial nucleic acid or of the inventive composition or vaccine into cells outside of an organism or individual and subsequent application of the transfeeted cells to the organism or individual.

Likewise, according to another aspect, the present invention also provides the use of the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, preferably for diagnostic or therapeutic purposes, for expression of an encoded antigenic peptide or protein, e.g. by applying or administering the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, e.g. to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism. The use may be applied for a (diagnostic) laboratory, for research, for diagnostics, for commercial production of peptides or proteins and/or for therapeutic purposes. In this context, typically after preparing the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, it is typically applied or administered to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism, preferably in naked form or complexed form, or as a (pharmaceutical) composition or vaccine as described herein, preferably via transfection or by using any of the administration modes as described herein. The use may be carried out in vitro, in vivo or ex vivo. The use may furthermore be carried out in the context of the treatment of a specific disease, particularly in the treatment of Norovirus infection or a related disorder.

In a particularly preferred embodiment, the invention provides the artificial nucleic acid, the inventive composition or the inventive vaccine for use as defined herein, preferably for use as a medicament, for use in treatment or prophylaxis, preferably treatment or prophylaxis of a Norovirus infection or a related disorder, or for use as a vaccine. The vaccine or composition according to the invention can be used according to the invention for human and also for veterinary medical purposes (mammals, vertebrates), as a pharmaceutical composition or as a vaccine.

Adjuvants:

According to another embodiment, the (pharmaceutical) composition or vaccine according to the invention may comprise an adjuvant, which is preferably added in order to enhance the immunostimulatory properties of the composition. In this context, an adjuvant may be understood as any compound, which is suitable to support administration and delivery of the composition according to the invention. Furthermore, such an adjuvant may, without being bound thereto, initiate or increase an immune response of the innate immune system, i.e. a non-specific immune response. In other words, when administered, the composition according to the invention typically initiates an adaptive immune response due to an antigen as defined herein or a fragment or variant thereof, which is encoded by the at least one coding sequence of the inventive mRNA contained in the composition of the present invention. Additionally, the composition according to the invention may generate an (supportive) innate immune response due to addition of an adjuvant as defined herein to the composition according to the invention.

Particularly preferred, an adjuvant may be selected from adjuvants, which support induction of a Thl-immune response or maturation of naive T-cells, such as GM-CSF, IL-I2, IFND, any immunostimulatory nucleic acid as defined above, preferably an immunostimulatory RNA, CpG DNA, etc.

In a further preferred embodiment it is also possible that the inventive composition contains besides the antigen-providing mRNA further components which are selected from the group comprising: further antigens (e.g. in the form of a peptide or protein) or further antigen-encoding nucleic acids; a further immunotherapeutic agent; one or more auxiliary substances; or any further compound, which is known to be immunostimulating due to its binding affinity (as ligands) to human Toll-like receptors; and/or an adjuvant nucleic acid, preferably an immunostimulatory RNA (isRNA).

The composition of the present invention can additionally contain one or more auxiliary substances in order to increase its immunogenicity or immunostimulatory capacity, if desired. A synergistic action of the mRNA as defined herein and of an auxiliary substance, which may be optionally contained in the inventive composition, is preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms can come into consideration in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipnpolysaccharides. TNF-alpha or CD4D ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP96, etc.) or cytokines, such as GM-CFS, which allow an immune response to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokines, that further promote the innate immune response, such as IL-I, IL-2. IL-3. IL-4. IL-5. IL-G, IL-7, IL-8. IL-9, IL-ID, IL-I2, IL-I3. IL-I4. IL-I5, IL-IG, IL-I7, IL-I8. IL-I9. IL-20. IL-2I, IL-22, IL-23, IL-24, IL-25. IL-26. IL-27, IL-28, IL-2B, IL-3D, IL-3I. IL-32, IL-33, IFN-alpha, IFN-beta, IFN-gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH.

Suitable adjuvants may also be selected from cationic or polycationic compounds wherein the adjuvant is preferably prepared upon complexing the mRNA of the composition according to the invention with the cationic or polycationic compound. Associating

or complexing the mRNA of the composition with cationic or polycationic compounds as defined herein preferably provides adjuvant properties and confers a stabilizing effect to the mRNA of the composition. In particular, such preferred cationic or polycationic compounds are selected from cationic or polycationic peptides or proteins, including protamine, nucleoline, spermin or spermidine, or other cationic peptides or proteins, such as poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-I Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpTG2D, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, MPG-peptide(s), Pep-I, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from Drosophila antennapedia), pAntp, plsl, FGF, Lactoferrin, Transportan, Buforin-2, Bac7l5-24, SynB, SynB(l), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones. Further preferred cationic or polycationic compounds may include cationic polysaccharides, for example chitosan, polybrene, cationic polymers, e.g. polyethyleneimine (PEI). cationic lipids, e.g, DDTMA: [l-(2,3-sinleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE. di-CI4-amidine. OOTIM, SAINT, DC-Chol. BGTC, CTAP,DOPC. DODAP. DOPE: Dioleyl phosphatidylethanol-amine. DDSPA, DODAB, DDIC. DMEPC, DOBS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DDTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-FJ-I4: D,0-ditetradecanoyl-N-(a-trimethylammonioacetyl)diethanolamine chloride, CLIPI: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIPG: rac-[2(2.3-dihexadecyloxypropyl-oxymethyloxy)ethyl]-trimethylammonium, CLIPS: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, e.g. modified polyaminoacids, such as β-aminoacid-polymers or reversed polyamides, etc., modified polyethylenes, such as PVP (poly(N-ethyl-4-vinylpyridinium bromide)), etc., modified acrylates, such as pDMAEMA (poly(dimethylaminoethyl methylacrylate)), etc., modified Amidoamines such as pAMAM (poly(amidoamine)), etc., modified polybetaaminoester (PBAE), such as diamine end modified l,4 butanediol diacrylate-co-5-amino-l-pentanol polymers, etc., dendrimers, such as polypropylamine dendrimers or pAMAM based dendrimers, etc., polyimine(s), such as PEI: poly(ethyleneimine), poly(propyleneimine), etc., polyallylamine, sugar backbone based polymers, such as cyclodextrin based polymers, dextran based polymers, Chitosan, etc., silan backbone based polymers, such as PMOXA-PDMS copolymers, etc., blockpolymers consisting of a combination of one or more cationic blocks (e.g. selected of a cationic polymer as mentioned above) and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole); etc.

Additionally, preferred cationic or polycationic proteins or peptides, which can be used as an adjuvant by complexing the mRNA of the composition according to the invention, may be selected from following proteins or peptides having the following total formula (III): (Arg)l:(Lys)m;(His)n;(Orn)o;(Xaa)x, wherein l + m + n +o + x = 8-I5, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ID, II. I2. 13, 14 or I5, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide: and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Drn; and x may be any number selected from 0, 1, 2. 3 or 4, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide. Particularly preferred oligoarginines in this context are e.g. Arg7, Arg8. ArgB. Arg7. H3R9, R9H3, H3R9H3, YSSR9SSY, (RKH)4, Y(RKH)2R, etc.

The ratio of the mRNA to the cationic or polycationic compound in the adjuvant component may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire mRNA complex, i.e. the ratio of positively charged (nitrogen) atoms of the cationic or polycationic compound to the negatively charged phosphate atoms of the nucleic acids. For example, 1 µg of RNA typically contains about 3 nmol phosphate residues, provided the RNA exhibits a statistical distribution of bases. Additionally, 1 µg of peptide typically contains about x nmol nitrogen residues, dependent on the molecular weight and the number of basic amino acids. When exemplarily calculated for (Arg)9 (molecular weight 1424 g/mol, 9 nitrogen atoms), 1 µg (Arg)E contains about 700 pmol (Arg)9 and thus 700 x 9=6300 pmol basic amino acids = 6.3 nmol nitrogen atoms. For a mass ratio of about 1:1 RNA/(Arg)9 an N/P ratio of about 2 can be calculated. When exemplarily calculated for protamine (molecular weight about 4250 g/mol, 21 nitrogen atoms, when protamine from salmon is used) with a mass ratio of about 2:1 with 2 µg RNA, 6 nmol phosphate are to be calulated for the RNA; 1 µg protamine contains about 235 pmol protamine molecues and thus 235 x 21 = 4935 pmol basic nitrogen atoms = 4.9 nmol nitrogen atoms. For a mass ratio of about 2:1 RNA/protamine an N/P ratio of about 0.81 can be calculated. For a mass ratio of about 8:1 RNA/protamine an N/P ratio of about 0.2 can be calculated. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of RNA : peptide in the complex, and most preferably in the range of about 0.7-1.5.

In a preferred embodiment, the composition of the present invention is obtained in two separate steps in order to obtain both, an efficient immunostimulatory effect and efficient translation of the mRNA according to the invention. Therein, a so called "adjuvant component" is prepared by complexing - in a first step - an mRNA as defined herein of the adjuvant component with a cationic or polycationic compound in a specific ratio to form a stable complex. In this context, it is important, that no free cationic or polycationic compound or only a negligibly small amount remains in the adjuvant component after complexing the mRNA. Accordingly, the ratio of the mRNA and the cationic or polycationic compound in the adjuvant component is typically selected in a range that the mRNA is entirely complexed and no free cationic or polycatiooic compound or only a negligible small amount remains in the composition. Preferably the ratio of the adjuvant component, i.e. the ratio of the mRNA to the cationic or polycationic compound is selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w).

According to a preferred embodiment, the mRNA of the invention comprising at least one mRNA sequence comprising at least one coding region as defined herein is added in a second step to the complexed mRNA of the adjuvant component in order to form the (immunostimulatory) composition of the invention. Therein, the mRNA of the composition according to the invention is added as free mRNA, which is not complexed by other compounds. Prior to addition, the free mRNA is not complexed and will preferably not undergo any detectable or significant complexation reaction upon the addition of the adjuvant component. This is due to the strong binding of the cationic or polycationic compound to the above described mRNA according to the invention comprised in the adjuvant component. In other words, when the mRNA comprising at least one coding region as defined herein is added to the "adjuvant component", preferably no free or substantially no free cationic or polycationic compound is present, which could form

a complex with the free mRNA. Accordingly, an efficient translation of the mRNA of the composition is possible in vivo. Therein, the free mRNA, may occur as a mono-, di-, or multicistronic mRNA, i.e. an mRNA which carries the coding sequences of one or more proteins. Such coding sequences in di-, or even multicistronic mRNA may be separated by at least one IRES sequence, E.g. as dBfined herein.

In a particularly preferred embodiment, the free mRNA as defined herein, which is comprised in the composition of the present invention, may be identical or different to the RNA as defined herein, which is comprised in the adjuvant componEnt of the composition, depending on the specific rEquirEments of therapy. Even more preferably, the free RNA, which is comprised in the composition according to the invention, is identical to the RNA of the adjuvant component of the inventive composition.

In a particularly preferred embodiment, the composition according to the invention comprises the mRNA of the invention, which encodes at least one antigenic peptide or protein as defined herein and wherEin said mRNA is present in the composition partially as free mRNA and partially as complexed mRNA. PrefErably, the mRNA as defined herein is complexed as described above and the samB mRNA is then added as free mRNA, wherein preferably the compound, which is used for complexing the mRNA is not present in free form in the composition at the moment of addition of the free mRNA component.

The ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA as defined herein complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA as defined herein) may be selected in the inventive composition according to the specific requirements of a particular therapy. Typically, the ratio of the mRNA in the adjuvant component and the at least one free mRNA (mRNA in the adjuvant component : free mRNA) of the composition according to the invention is selected such that a significant stimulation of the innate immune system is elicited due to the adjuvant component. In parallel, the ratio is selected such that a significant amount of the free mRNA can be provided in vivo leading to an efficient translation and concentration of the Expressed protein in vivo. E.g. the at least one antigenic peptide or protein as defined herein. Preferably the ratio of the mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a range of about 5:l (w/w) to about l:lD (w/w), morB preferably from a range of about 4:l (w/w) to about l:8 (w/w), even more preferably from a range of about 3:l (w/w) to about l:5 (w/w) or l:3 (w/w), and most preferably the ratio of mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a ratio of about l:l (w/w).

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA) may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire mRNA complex. In the context of the present invention, an N/P-ratio is preferably in the rangE of about D.I-ID, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of mRNA : peptide in the complEx, and most preferably in the range of about 0.7-I.5.

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA) may also be selected in the

campositiDn according to the invention on the basis of the molar ratio of both mRNAs to each other, i.e. the mRNA of the adjuvant component, being complexed with a cationic or polycationic compound and the free mRNA of the second component. Typically, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected such, that the molar ratio suffices the above (w/w) and/or N/P-definitions. More preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a molar ratio of about 0.001:1, D.DI:I, D.I:I, 0,2:1. 0.3:1, 0.4:1, 0.5:1, **0.6:1.** 0.7:1, 0.8:1. 0.0:1, 1:1, **1:0.9.** 1:0.8, 1:0.7, 1:0.6, 1:0.5, 1:0.4. 1:0.3, 1:0.2, 1:0.1, 1:0.01, 1:0.001, etc. or from any range formed by any two of the above values, e.g. a range selected from about 0.001:1 to 1:0.001, including a range of about 0.01:1 to 1:0.001, 0.1:1 to 1:0.001, 0.2:1 to 1:0.001, 0.3:1 to 1:0.001, 0.4:1 to 1:0.001. 0.5:1 to 1:0.001, 0.6:1 to 1:0.001, 0.7:1 to 1:0.001, 0.8:1 to 1:0.001, 0.9:1 to 1:0.001, 1:1 to 1:0.001, 1:0.9 to 1:0.001, 1:0.8 to 1:0.001, 1:0.7 to 1:0.001, 1:0.6 to 1:0.001, 1:0.5 to 1:0.001, 1:0.4 to 1:0.001, 1:0.3 to 1:0.001, 1:0.2 to **1:0.001.** 1:0.1 to 1:0.001, 1:0.01 to 1:0.001, or a range of about 0.01:1 to 1:0.01, 0.1:1 to 1:0.01, 0.2:1 to 1:0.01, 0.3:1 to 1:0.01, 0.4:1 to 1:0.01, 0.5:1 to 1:0.01, 0.6:1 to 1:0.01, 0.7:1 to 1:0.01, 0.8:1 to 1:0.01, 0.9:1 to 1:0.01, 1:1 to 1:0.01, 1:0.9 to 1:0.01, 1:0.8 to 1:0.01. 1:0.7 to 1:0.01, 1:0.6 to 1:0.01, 1:0.5 to 1:0.01, 1:0.4 to 1:0.01, 1:0.3 to 1:0.01, 1:0.2 to 1:0.01, 1:0.1 to **1:0.01.** 1:0.01 to 1:0.01, or including a range of about 0.001:1 to 1:0.01, 0.001:1 to 1:0.1. 0.001:1 to 1:0.2, 0.001:1 to 1:0.3, 0.001:1 to 1:0.4. 0.001:1 to 1:0.5, 0.001:1 to 1:0.6. 0.001:1 to 1:0.7, 0.001:1 to 1:0.8, 0.001:1 to 1:0.9, 0.001:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1. 0.001 to 0.1:1, or a range of about 0.01:1 to 1:0.01, 0.01:1 to 1:0.1, 0.01:1 to 1:0.2, 0.01:1 to 1:0.3, 0.01:1 to 1:0.4, 0.01:1 to 1:0.5, 0.01:1 to 1:0.6, 0.01:1 to **1:0.7.** 0.01:1 to 1:0.8, 0.01:1 to 1:0.9, 0.01:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.0DI to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1. 0.001 to 0.3:1. 0.001 to 0.2:1, 0.001 to 0.1:1, etc.

Even more preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a range of about 0.01:1 to 1:0.01. Most preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a molar ratio of about 1:1. Any of the above definitions with regard to (w/w) and/or N/P ratio may also apply.

Suitable adjuvants may furthermore be selected from nucleic acids having the formula (Va): GIXmGn, wherein: G is guanosine, uracil or an analogue of guanosine or uracil: X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides: I is an integer from 1 to 40, wherein when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof: m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur: n is an integer from 1 to 40, wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nocleotides are guanosine or an analogue thereof, or formula (Vb): (NuGIXmGnNv)a. wherein: G is guanosine (guanine), uridine (uracil) or an analogue of guanosine (guanine) or uridine (uracil), preferably guanosine (guanine) or an analogue thereof; X is guanosine (guanine), uridine (uracil), adenosine (adenine), thymidine (thymine), cytidine (cytosioe), or an analogue of these nucleotides (nucleosides), preferably uridine (uracil) or an analogue thereof; N is a nucleic acid sequence having a length of about 4 to 50, preferably of about 4 to 40, more preferably of about 4 to 30 or 4 to 20 nucleic acids, each N independently being selected from guanosine (guanine), uridine (uracil), adenosine (adenine), thymidine (thymine), cytidine (cytosine) or an analogue of these nucleotides (nucleosides); a is an integer from 1 to 20, preferably from 1 to 15, most preferably from 1 to 10; l is an integer from 1 to 40, wherein when l = 1, G is guanosine

(guanine) or an analogue thereof, when l > 1, at least 50% of these nucleotides (nucleosides) are guanosine (guanine) or an analogue thereof; m is an integer and is at least 3; wherein when m = 3, X is uridine (uracil) or an analogue thereof, and when m > 3, at least 3 successive uridines (uracils) or analogues of uridine (uracil) occur; n is an integer from 1 to 40, wherein when n = 1, G is guanosine (guanine) or an analogue thereof, when n > 1, at least 50% of these nucleotides (nucleosides) are guanosine (guanine) or an analogue thereof; u,v may be independently from each other an integer from 0 to 50, preferably wherein when u = 0, v ≥ 1, or when v = 0, u ≥ 1; wherein the nucleic acid molecule of formula (Vb) has a length of at least 50 nucleotides, preferably of at least 100 nucleotides, more preferably of at least 150 nucleotides, even more preferably of at least 200 nucleotides and most preferably of at least 250 nucleotides.

Other suitable adjuvants may furthermore be selected from nucleic acids having the formula (VI): ClXmCn, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 C is cytosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytosine or an analogue thereof.

In this context the disclosure of WO 2008/014979 and WO 2009/095228 is also incorporated herein by reference.

In a further aspect, the present invention provides a vaccine, which is based on the mRNA sequence according to the invention comprising at least one coding region as defined herein. The vaccine according to the invention is preferably a (pharmaceutical) composition as defined herein.

Accordingly, the vaccine according to the invention is based on the same components as the (pharmaceutical) composition described herein. Insofar, it may be referred to the description of the (pharmaceutical) composition as provided herein. Preferably, the vaccine according to the invention comprises at least one mRNA comprising at least one mRNA sequence as defined herein and a pharmaceutically acceptable carrier. In embodiments, where the vaccine comprises more than one mRNA sequence (such as a plurality of RNA sequences according to the invention, wherein each preferably encodes a distinct antigenic peptide or protein), the vaccine may be provided in physically separate form and may be administered by separate administration steps. The vaccine according to the invention may correspond to the (pharmaceutical) composition as described herein, especially where the mRNA sequences are provided by one single composition. However, the inventive vaccine may also be provided physically separated. For instance, in embodiments, wherein the vaccine comprises more than one mRNA sequences/species, these RNA species may be provided such that, for example, two, three, four, five or six separate compositions, which may contain at least one mRNA species/sequence each (e.g. three distinct mRNA species/sequences), each encoding distinct antigenic peptides or proteins, are provided, which may or may not be combined. Also, the inventive vaccine may be a combination of at least two distinct compositions, each composition comprising at least one mRNA encoding at least one of the antigenic peptides or proteins defined herein. Alternatively, the vaccine may be provided as a combination of at least

one mRNA, preferably at least two, three, four, five, six or more mRNAs, each encoding one of the antigenic peptides or proteins defined herein. The vaccine may be combined to provide one single composition prior to its use or it may be used such that more than one administration is required to administer the distinct mRNA sequences/species encoding any of the antigenic peptides or proteins as defined herein. If the vaccine contains at least one mRNA sequence, typically at least two mRNA sequences, encoding the antigen combinations defined herein, it may e.g. be administered by one single administration (combining all mRNA species/sequences), by at least two separate administrations. Accordingly; any combination of mono-, bi- or multicistronic mRNAs encoding the at least one antigenic peptide or protein or any combination of antigens as defined herein (and optionally further antigens), provided as separate entities (containing one mRNA species) or as combined entity (containing more than one mRNA species), is understood as a vaccine according to the present invention. According to a particularly preferred embodiment of the inventive vaccine, the at least one antigen, preferably a combination as defined herein of at least two, three, four, five, six or more antigens encoded by the inventive composition as a whole, is provided as an individual (monocistronic) mRNA, which is administered separately.

As with the (pharmaceutical) composition according to the present invention, the entities of the vaccine may be provided in liquid and or in dry (e.g. lyophilized) form. They may contain further components, in particular further components allowing for its pharmaceutical use. The vaccine or the (pharmaceutical) composition may, e.g., additionally contain a pharmaceutically acceptable carrier and/or further auxiliary substances and additives and/or adjuvants.

The vaccine or (pharmaceutical) composition typically comprises a safe and effective amount of the mRNA according to the invention as defined herein, encoding an antigenic peptide or protein as defined herein or a fragment or variant thereof or a combination of antigens, preferably as defined herein. As used herein, "safe and effective amount" means an amount of the mRNA that is sufficient to significantly induce a positive modification of cancer or a disease or disorder related to cancer. At the same time, however, a "safe and effective amount" is small enough to avoid serious side-effects, that is to say to permit a sensible relationship between advantage and risk. The determination of these limits typically lies within the scope of sensible medical judgment. In relation to the vaccine or (pharmaceutical) composition of the present invention, the expression "safe and effective amount" preferably means an amount of the mRNA (and thus of the encoded antigen) that is suitable for stimulating the adaptive immune system in such a manner that no excessive or damaging immune reactions are achieved but, preferably, also no such immune reactions below a measurable level. Such a "safe and effective amount" of the mRNA of the (pharmaceutical) composition or vaccine as defined herein may furthermore be selected in dependence of the type of mRNA, e.g. monocistronic, bi- or even multicistronic mRNA, since a bi- or even multicistronic mRNA may lead to a significantly higher expression of the encoded antigen(s) than the use of an equal amount of a monocistronic mRNA. A "safe and effective amount" of the mRNA of the (pharmaceutical) composition or vaccine as defined above will furthermore vary in connection with the particular condition to be treated and also with the age and physical condition of the patient to be treated, the severity of the condition, the duration of the treatment, the nature of the accompanying therapy, of the particular pharmaceutically acceptable carrier used, and similar factors, within the knowledge and experience of the accompanying doctor. The vaccine or composition according to the invention

can be used according to the invention for human and also for veterinary medical purposes, as a pharmaceutical composition or as a vaccine.

In a preferred embodiment, the mRNA of the (pharmaceutical) composition, vaccine or kit of parts according to the invention is provided in lyophilized form. Preferably, the lyophilized mRNA is reconstituted in a suitable buffer, advantageously based on an aqueous carrier, prior to administration, e.g. Ringer-Lactate solution, which is preferred, Ringer solution, a phosphate buffer solution. In a preferred embodiment, the (pharmaceutical) composition, the vaccine or the kit of parts according to the invention contains at least one, two, three, four, five, six or more mRNAs, preferably mRNAs which are provided separately in lyophilized form (optionally together with at least one further additive) and which are preferably reconstituted separately in a suitable buffer (such as Ringer-Lactate solution) prior to their use so as to allow individual administration of each of the (monocistronic) mRNAs.

The vaccine or (pharmaceutical) composition according to the invention may typically contain a pharmaceutically acceptable carrier. The expression "pharmaceutically acceptable carrier" as used herein preferably includes the liquid or non-liquid basis of the inventive vaccine. If the inventive vaccine is provided in liquid form, the carrier will be water, typically pyrogen-free water; isotonic saline or buffered (aqueous) solutions, e.g phosphate, citrate etc. buffered solutions. Particularly for injection of the inventive vaccine, water or preferably a buffer, more preferably an aqueous buffer, may be used, containing a sodium salt, preferably at least 50 mM of a sodium salt, a calcium salt, preferably at least 0,01 mM of a calcium salt, and optionally a potassium salt, preferably at least 3 mM of a potassium salt. According to a preferred embodiment, the sodium, calcium and, optionally, potassium salts may occur in the form of their halogenides, e.g. chlorides, iodides, or bromides, in the form of their hydroxides, carbonates, hydrogen carbonates, or sulfates, etc. Without being limited thereto, examples of sodium salts include e.g. NaCl, Nal, NaBr, Na2CD3, NaHCD3, Na2SD4. examples of the optional potassium salts include e.g. KCI. KI, KBr, K2C03, KHC03, K2S04. and examples of calcium salts include e.g. CaCI2, Cal2, CaBr2, CaC03, CaS04, Ca(0H)2. Furthermore, organic anions of the aforementioned cations may be contained in the buffer. According to a more preferred embodiment, the buffer suitable for injection purposes as defined above, may contain salts selected from sodium chloride (NaCl), calcium chloride (GaCI2) and optionally potassium chloride (KCl), wherein further anions may be present additional to the chlorides. CaCI2 can also be replaced by another salt like KCI. Typically, the salts in the injection buffer are present in a concentration of at least 50 mM sodium chloride (NaCl), at least 3 mM potassium chloride (KCl) and at least 0,01 mM calcium chloride (CaCI2). The injectioo buffer may be hypertonic, isotonic or hypotonic with reference to the specific reference medium, i.e. the buffer may have a higher, identical or lower salt content with reference to the specific reference medium, wherein preferably such concentrations of the afore mentioned salts may be used, which do not lead to damage of cells due to osmosis or other concentration effects. Reference media are e.g. in "in vivo" methods occurring liquids such as blood, lymph, cytosolic liqoids, or other body liquids, or e.g. liquids, which may be used as reference media in "in vitro" methods, such as common buffers or liquids. Such common buffers or liquids are known to a skilled person. Ringer-Lactate solution is particularly preferred as a liquid basis.

However, one or more compatible solid or liquid fillers or diluents or encapsulating compounds may be used as well, which are suitable for administration to a person. The term "compatible" as used herein means that the constituents of the inventive vaccine are capable of being mixed with the mRNA according to the invention as defined herein, in such a manner that no interaction occurs, which would substantially reduce the pharmaceutical effectiveness of the inventive vaccine under typical use conditions. Pharmaceutically acceptable carriers, fillers and diluents must, of course, have sufficiently high purity and sufficiently low toxicity to make them suitable for administration to a person to be treated. Some examples of compounds which can be used as pharmaceutically acceptable carriers, fillers or constituents thereof are sugars, such as, for example, lactose, glucose, trehalose and sucrose; starches, such as, for example, corn starch or potato starch; dextrose; cellulose and its derivatives, such as, for example, sodium carboxymethylcellulose, ethylcellulose, cellulose acetate; powdered tragacanth; malt; gelatin; tallow; solid glidants, such as, for example, stearic acid, magnesium stearate; calcium sulfate; vegetable oils, such as, for example, groundnut oil, cottonseed oil, sesame oil, olive oil, corn oil and oil from theobroma; polyols, such as, for example, polypropylene glycol, glycerol, sorbitol, mannitol and polyethylene glycol; alginic acid.

The choice of a pharmaceutically acceptable carrier is determined, in principle, by the manner, in which the pharmaceutical composition or vaccine according to the invention is administered. The composition or vaccine can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, composition or vaccines according to the present invention may be administered by an intradermal, subcutaneous, or intramuscular route, preferably by injection, which may be needle-free and/or needle injection. Compositions/vaccines are therefore preferably formulated in liquid or solid form. The suitable amount of the vaccine or composition according to the invention to be administered can be determined by routine experiments, e.g. by using animal models. Such models include, without implying any limitation, rabbit, sheep, mouse, rat, dog and non-human primate models. Preferred unit dose forms for injection include sterile solutions of water, physiological saline or mixtures thereof. The pH of such solutions should be adjusted to about 7.4. Suitable carriers for injection include hydrogels, devices for controlled or delayed release, polylactic acid and collagen matrices. Suitable pharmaceutically acceptable carriers for topical application include those which are suitable for use in lotions, creams, gels and the like. If the inventive composition or vaccine is to be administered perorally, tablets, capsules and the like are the preferred unit dose form. The pharmaceutically acceptable carriers for the preparation of unit dose forms which can be used for oral administration are well known in the prior art. The choice thereof will depend on secondary considerations such as taste, costs and storability, which are not critical for the purposes of the present invention, and can be made without difficulty by a person skilled in the art.

The inventive vaccine or composition can additionally contain one or more auxiliary substances in order to further increase the immunogenicity. A synergistic action of the mRNA contained in the inventive composition and of an auxiliary substance, which may be optionally be co-formulated (or separately formulated) with the inventive vaccine or composition as described above, is

preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms may play a role in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipopolysaccharides, TNF-alpha or CD40 ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP9G, etc.) or cytokines, such as GM-CFS, which allow an immune response produced by the immune-stimulating adjuvant according to the invention to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokinss, that - additional to induction of the adaptive immune response by the encoded at least one antigen - promote the innate immune response, such as **IL-I, IL-2. IL-3.** IL-4, IL-5. IL-6, IL-7, IL-8, IL-FJ. IL-IO, **IL-I2. IL-13. IL-I4. IL**-I5, **IL**-IB, **IL**-I7, **IL**-I8, **IL**-13, **IL**-2D, **IL-ZI. IL-Z2, IL**-23, IL-24, IL-25. **IL**-26, **IL-27. IL-28.** IL-29, **IL-30. IL-31. IL-32. IL-33.** INF-alpha, IFN-beta, **INF-**gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH. Preferably, such immunogenicity increasing agents or compounds are provided separately (not co-formulated with the inventive vaccine or composition) and administered individually.

Further additives which may be included in the inventive vaccine or composition are emulsifiers, such as, for example, Tween; wetting agents, such as, for example, sodium lauryl sulfate; colouring agents; taste-imparting agents, pharmaceutical carriers; tablet-forming agents; stabilizers; antioxidants; preservatives.

The inventive vaccine or composition can also additionally contain any further compound, which is known to be immune-stimulating due to its binding affinity (as ligands) to human Toll-like receptors TLRI, TLR2, TLR3, TLR4, TLR5, TLRG, TLR7, TLR8, TLR9, TLRID, or due to its binding affinity (as ligands) to murine Toll-like receptors TLRI, TLR2, TLR3, TLR4, TLR5, TLRG, TLR7, TLR8, TLR9, TLRID, TLRII, TLRI2 orTLRI3.

Another class of compounds, which may be added to an inventive vaccine or composition in this context, may be CpG nucleic acids, in particular CpG-RNA or CpG-DNA. A CpG-RNA or CpG-DNA can be a single-stranded CpG-DNA (ss CpG-ONA), a double-stranded CpG-DNA (dsDNA), a single-stranded CpG-RNA (ss CpG-RNA) or a double-stranded CpG-RNA (ds CpG-RNA). The CpG nucleic acid is preferably in the form of CpG-RNA, more preferably in the form of single-stranded CpG-RNA (ss CpG-RNA). The CpG nucleic acid preferably contains at least one or more (mitogenic) cytosine/guanine dinucleotide seguence(s) (CpG motif(s)). According to a first preferred alternative, at least one CpG motif contained in these sequences, that is to say the C (cytosine) and the G (guanine) of the CpG motif, is unmethylated. All further cytosines or guanines optionally contained in these sequences can be either methylated or unmethylated. According to a further preferred alternative, however, the C (cytosine) and the G (guanine) of the CpG motif can also be present in methylated form.

Application and medical Use:

According to one aspect of the present invention, the mRNA sequence, the (pharmaceutical) composition or the vaccine may be used according to the invention (for the preparation of a medicament) for the treatment or prophylaxis of Norovirus infections or disorders related thereto.

In this context, also included in the present invention are methods of treating or preventing Norovirus infections or disorders related thereto, preferably as defined herein, by administering to a subject in need thereof a pharmaceutically effective amount of the mRNA sequeoce, the (pharmaceutical) composition or the vaccine according to the invention. Such a method typically comprises an optional first step of preparing the mRNA sequence, the composition or the vaccine of the present invention, and a second step, comprising administering (a pharmaceutically effective amount of) said composition or vaccine to a patient/subject in need thereof. A subject in need thereof will typically be a mammal. In the context of the present invention, the mammal is preferably selected from the group comprising, without being limited thereto, e.g. goat, cattle, swine, dog, cat, donkey, monkey, ape, a rodent such as a mouse, hamster, rabbit and, particularly, human. A subject in need thereof may also be a non-mammalian vertebrate, e.g. a bird (chicken).

The invention also relates to the use of the mRNA sequence, the composition or the vaccine according to the invention, preferably for eliciting an immune response in a mammal, preferably for the treatment or prophylaxis of Norovirus infections or a related condition as defined herein.

The present invention furthermore comprises the use of the mRNA sequence, the (pharmaceutical) composition or the vaccine according to the invention as defined herein for modulating, preferably for inducing or enhancing, an immune response in a mammal as defined herein, more preferably for preventing and/or treating Norovirus infections, or of diseases or disorders related thereto. In this context, support of the treatment or prophylaxis of Norovirus infections may be any combination of a conventional Norovirus therapy method such as therapy with antivirals such as neuraminidase inhibitors (e.g. oseltamivir and zanamivir) and M2 protein inhibitors (e.g. adamantane derivatives), and a therapy using the RNA or the pharmaceotical composition as defined herein. Support of the treatment or prophylaxis of Norovirus infections may be also envisaged in any of the other embodiments defined herein. Accordingly, any use of the mRNA sequence, the (pharmaceutical) composition or the vaccine according to the invention in co-therapy with any other approach, preferably ooe or more of the above therapeutic approaches, in particular in combination with antivirals is within the scope of the present invention.

For administration, preferably any of the administration routes may be used as defined herein. In particular, an administration route is used, which is suitable for treating or preventing an Norovirus infection as defined herein or diseases or disorders related thereto, by inducing or enhancing an adaptive immune response on the basis of an antigen encoded by the mRNA sequence according to the invention. Administration of the composition and/or the vaccine according to the invention may then occur prior, concurrent and/or subsequent to administering another composition and/or vaccine as defined herein, which may - in addition - contain another mRNA sequence or combination of mRNA sequences encoding a different antigen or combination of antigens, wherein each antigen encoded by the mRNA sequence according to the invention is preferably suitable for the treatment or prophylaxis of Norovirus infections and diseases or disorders related thereto. In this context, a treatment as defined herein may also comprise the modulation of a disease associated to Norovirus infection and of diseases or disorders related thereto.

According to a preferred embodiment of this aspect of the invention, the (pharmaceutical) composition or the vaccine according to the invention is administered by injection. Any suitable injection technique known in the art may be emplnyed. Preferably, the inventive composition is administered by injection, preferably by needle-less injection, for example by jet-injection,

In one embodiment, the inventive composition comprises at least one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more mRNAs as defined herein, each of which is preferably injected separately, preferably by needle-less injection. Alternatively, the inventive composition comprises at least one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve. I3. 14. IS, IB, I7, 18, 19, 20, Zl. 22, 23, 24, 25, 26, 27, 28. 29, 30, 31 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43. 44, 45, 46, 47. 48, 49, 50 or more mRNAs, wherein the at least one. two. three, four, five, six, seven, eight, nine, ten, eleven, twelve, I3, 14, 15, IB, I7, I8, 19, 20. Zl. 22. 23. 24. 25, 26, 27, 28, 29. 30. 31 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 42. 43, 44, 45, 46, 47, 48, 49. 5D or more mRNAs are administered, preferably by injection as defined herein, as a mixture.

The immunization protocol for the immunization of a subject against an antigen or a combination of at least two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more antigens as defined herein typically comprises a series of single doses or dosages of the (pharmaceutical) composition or the vaccine according to the invention. A single dosage, as used herein, refers to the initial/first dose, a second dose or any further doses, respectively, which are preferably administered in order to "boost" the immune reaction. In this context, each single dosage preferably comprises the administration of the same antigen or the same combination of antigens as defined herein, wherein the interval between the administration of two single dosages can vary from at least one day, preferably 2, 3. 4, 5, 6 or 7 days, to at least one week, preferably 2, 3, 4, 5, 6, 7 or 8 weeks. The intervals between single dosages may be constant or vary over the course of the immunization protocol, e.g. the intervals may be shorter in the beginning and longer towards the end of the protocol. Depending on the total number of single dosages and the interval between single dosages, the immunization protocol may extend over a period of time, which preferably lasts at least one week, more preferably several weeks (e.g. 2, 3, 4, 5, B, 7, 8, 9, 10, II or 12 weeks), even more preferably several months (e.g. 3, 4, 5, 6, 7, 8, 9. 10, II, 12, 18 or 24 months). Each single dosage preferably encompasses the administration of an antigen, preferably of a combination of at least two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more antigens as defined herein and may therefore involve at least one. preferably 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, II or IZ injections. In some cases, the composition or the vaccine according to the invention is administered as a single dosage typically in one injection. In the case, where the vaccine according to the invention comprises separate mRNA formulations encoding distinct antigens as defined herein, the minimum number of injections carried out during the administration of a single dosage corresponds to the number of separate components of the vaccine. In certain embodiments, the administration of a single dosage may encompass more than one injection for each component of the vaccine (e.g. a specific mRNA formulation comprising an mRNA encoding, for instance, one antigenic peptide or protein as defined herein). For example, parts of the total volume of an individual component of the vaccine may be injected into different body parts, thus involving more than one injection. In a more specific example, a single dosage of a vaccine comprising four separate mRNA formulations, each of which is administered in two different body parts, comprises eight injections. Typically, a single dosage comprises all injections required to administer all components of the vaccine, wherein a single component may be involve more than one injection as outlined above. In the case, where the administration of a single

dosage of the vaccine according to the invention encompasses more than one injection, the injection are carried out essentially simultaneously or concurrently, i.e. typically in a time-staggered fashion within the time-frame that is required for the practitioner to carry out the single injection steps, one after the other. The administration of a single dosage therefore preferably extends over a time period of several minutes, e.g. 2, 3, 4, 5, ID, I5, 3D or BO minutes.

Administration of the mRNA sequence as defined herein, the (pharmaceutical) composition or the vaccine according to the invention may be carried out in a time staggered treatment. A time staggered treatment may be e.g. administration of the mRNA sequence, the composition or the vaccine prior, concurrent and/or subsequent to a conventional therapy of Norovirus infections or diseases or disorders related thereto, e.g. by administration of the mRNA sequence, the composition or the vaccine prior, concurrent and/or subsequent to a therapy or an administration of a therapeutic suitable for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. Such time staggered treatment may be carried out using e.g. a kit, preferably a kit of parts as defined herein.

Time staggered treatment may additionally or alternatively also comprise an administration of the mRNA sequence as defined herein, the (pharmaceutical) composition or the vaccine according to the invention in a form, wherein the mRNA encoding an antigenic peptide or protein as defined herein or a fragment or variant thereof, preferably forming part of the composition or the vaccine, is administered parallel, prior or subsequent to another mRNA sequence encoding an antigenic peptide or protein as defined above, preferably forming part of the same inventive composition or vaccine. Preferably, the administration (of all mRNA sequences) occurs within an hour, more preferably within 3D minutes, even more preferably within I5, 10, 5, 4, 3, or 2 minutes or even within I minute. Such time staggered treatment may be carried out using e.g. a kit, preferably a kit of parts as defined herein.

In a preferred embodiment, the pharmaceutical composition or the vaccine of the present invention is administered repeatedly, wherein each administration preferably comprises individual administration of the at least one mRNA of the inventive composition or vaccine. At each time point of administration, the at least one mRNA may be administered more than once (e.g. 2 or 3 times). In a particularly preferred embodiment of the invention, at least two, three, four, five, six or more mRNA sequences (each encoding a distinct one of the antigens as defined herein) are administered at each time point, wherein each mRNA is administered twice by injection, distributed over the four limbs.

Kit or kit of parts:

According to another aspect of the present invention, the present invention also provides a kit, in particular a kit of parts, comprising the mRNA sequence as defined herein, the (pharmaceutical) composition, and/or the vaccine according to the invention, optionally a liquid vehicle for solubilising and optionally technical instructions with information on the administration and dosage of the mRNA sequence, the composition and/or the vaccine. The technical instructions may contain information about administration and dosage of the mRNA sequence, the composition and/or the vaccine. Such kits, preferably kits of parts, may be applied e.g. for any of the above mentioned applications or uses, preferably for the use of the mRNA sequence according to

the invention (for the preparation of an inventive medicament, preferably a vaccine) for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. The kits may also be applied for the use of the mRNA sequence, the composition or the vaccine as defined herein (for the preparation of an inventive vaccine) for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto, wherein the mRNA sequence, the composition **and/Dr** the vaccine may be capable of inducing or enhancing an immune response in a mammal as defined above. Such kits may further be applied for the use of the mRNA sequence, the composition or the vaccine as defined herein (for the preparation of an inventive vaccine) for modulating, preferably for eliciting, e.g. to induce or enhance, an immune response in a mammal as defined above, and preferably for supporting treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. Kits of parts, as a special form of kits, may contain one or more identical or different compositions and/or one or more identical or different vaccines as described herein in different parts of the kit. Kits of parts may also contain an (e.g. one) composition, an (e.g. one) vaccine and/or the mRNA sequence according to the invention in different parts of the kit, e.g. each part of the kit containing an mRNA sequence as defined herein, preferably encoding a distinct antigen. Preferably, the kit or the kit of parts contains as a part a vehicle for solubilising the mRNA according to the invention, the vehicle preferably being Ringer-lactate solution. Any of the above kits may be used in a treatment or prophylaxis as defined above.

In another embodiment of this aspect, the kit according to the present invention may additionally contain at least one adjuvant. In a further embodiment, the kit according to the present invention may additionally contain at least one further pharmaceutically active component, preferably a therapeutic compound suitable for treatment and/or prophylaxis of cancer or a related disorder. Moreover, in another embodiment, the kit may additionally contain parts and/or devices necessary or suitable for the administration of the composition or the vaccine according to the invention, including needles, applicators, patches, injection-devices.

Preferred items:

In one embodiment the invention relates to subject matter summarized as follows:

Item 1. Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof.

Item 2. The artificial nucleic acid according to item 1, wherein the at least one encoded polypeptide is selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

Item 3. The artificial nucleic acid according to item 1 or 2, wherein the at least one encoded polypeptide is selected from the group consisting of Norovirus non-structural proteins NS1/NS2, NS3, NS4, NS5, NS6, NS7, Norovirus capsid protein VP1 and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

Item 4. The artificial nucleic acid according to any one of itEms I to 3, wherein the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus. genogroup II Norovirus, genogroup III Norovirus, genogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived from a Norovirus selected from the group consisting of a GI.I to GI.I7 Norovirus, GII.I to GII.24 Norovirus, GIII.I to GIII.4 Norovirus, GIV.I to GIV.4 Norovirus and GV.I to GV.4 Norovirus; more preferably, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of GI.I Norovirus and GII.4 Norovirus, even more preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 CIN-I Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2QI2 Norovirus.

Item 5. The artificial nucleic acid according to any one of items I to 4, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VPI or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

Item G. The artificial nucleic acid according to any one of items I to 5, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VPI and/or a fragment or variant thereof.

Item 7. The artificial nucleic acid according to any one of items I to G, wherein the at least one encoded polypeptide comprises

(i) at least one of the amino acid sequences according to any one of SEQ ID NDs: I-44I0: and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 5G%, 57%, 58%, 59%, 60%, 6I%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 70%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 9I%, 32%, 93%, 94%, 95%, 96%, 37%, 38%, or 99% sequence identity to the amino acid sequence represented by any one of SEfI ID NDs: I-44I0; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NDs: I-3960, 337I3-33746; and/or a fragment or variant of any of these sequences.

Item 8. The artificial nucleic acid according to any one of items I to 7, wherein the at least one coding region comprises

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NDs: 44II-3963D, 337I3-38746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 58%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 78%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 88%, 90%, 91%, 32%, 93%, 94%, 35%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NDs: 4411-39690, 38713-33746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-33680, 33713-30746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SEQ ID NOs: 1-4410; and/or

(iv) an ortholoque or a paralogue of any one of SEO ID NOs: I-39690, 397I3-39746; and/ or a fragment or variant of any of these sequences.

Item 3. The artificial nucleic acid according to any one of items I to 8. wherein the artificial nucleic acid is monocistronic, bicistronic or multicistronic.

Item ID. The artificial nucleic acid according to any one of items I to 9, wherein the artificial nucleic acid is monocistronic and wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins as defined in any one of items I to 9, or a fragment or variant thereof.

Item II. The artificial nucleic acid according to any one of items I to 9, wherein the artificial nucleic acid is bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one Norovirus protein as defined in any one of items I to 9, or a fragment or variant of any one of these proteins, wherein the at least two polypeptides are preferably different polypeptides.

Item I2. The artificial nucleic acid according to any one of items I to II, wherein the artificial nucleic acid is an RNA, preferably an mRNA.

Item I3. The artificial nucleic acid according to any one of items I to I2, wherein the artificial nucleic acid comprises a 5'-cap structure.

Item I4. The artificial nucleic acid according to any one of items I to I3, wherein the G/C content of the coding region of the mRNA sequence is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the cndon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased nr maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

Item I5. The artificial nucleic acid according to any one of items I to I4, wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%. 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SE0 ID NOs: 8821-13230, 26461-39690, 39715, 39716, 39717, 3972D, 39721, 39724, 39725, 39728, 39729, 39730, 3973 3, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, GD%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%. 91%, 92%, 93%, 94%, 95%, 96%. 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SED ID NDs: I323I-I7640, or a fragment or variant of any of these sequences; and/or

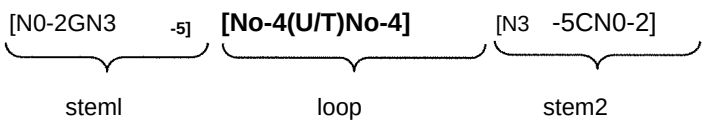
(iv) the artificial nucleic acid according to any one of the preceding items, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%. 60%, 70%, 80%, 85%. 86%, 87%, 88%, 89%. 90%, 91%, 92%. 93%, 94%. 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEfl ID NDs: 17641-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid according to any one of the preceding items, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%. 91%. 92%, 93%, 94%, 95%. 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SED ID NDs: 22051-26460, or a fragment or variant of any of these sequences.

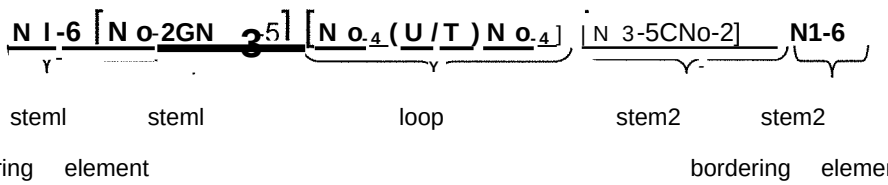
Item 16. The artificial nucleic acid according to any one of items I to 15, wherein the artificial nucleic acid comprises at least one histone stem-loop.

Item 17. The artificial nucleic acid according to item 16, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):



formula (II) (stem-loop sequence with stem bordering elements):



wherein:

steml or stem2 bordering elements $_{N_{1-6}}$ is a consecutive sequence of I to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof;

stem1 [N0-2GN3-5]	is reverse complementary or partially reverse complementary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5. more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and
	wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;
	loop sequence [N0-4(U/T)N0-4] is located between elements stem1 and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably of 4 nucleotides;
	wherein each N_{0-4} is independent from another a consecutive sequence of 0 to 4, preferably of 1 to 3, more preferably of 1 to 2 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and
	wherein U/T represents uridine, or optionally thymidine;
stem2 [N3-5CN0-2]	is reverse complementary or partially reverse complementary with element stem1, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{0-2} is a consecutive sequence of D to 2, preferably of 0 to I, more preferably of I N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleotide guanosine in steml is replaced by cytidine;

wherein

steml and stem2 are capable of base pairing with each other forming a reverse complementary sequence, wherein base pairing may occur between steml and stem2, or

forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between steml and stem2.

Item IS. The artificial nucleic acid according to item I7, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the fallowing formulae (la) or (Ha);

formula (la) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N0\text{ -}1GN3\text{-}5]}_{\text{steml}}\ \underbrace{[Ni\text{-}_3(U/T)No\text{-}_2]}_{\text{loop}}\ \underbrace{[N3\text{ -}5CN0\text{-}1]}_{\text{stem2}}$$

formula (Ha) (stem-loop sequence with stem bordering elements):

$$\underbrace{N2\text{-}5}_{\text{steml}}\ \underbrace{[N0\text{ -}1GN3\text{-}5]}_{\text{steml}}\ \underbrace{[Ni\text{-}_3(U/T)No\text{-}2]}_{\text{loop}}\ \underbrace{[N3\text{ -}5CN0\text{-}1]}_{\text{stem2}}\ \underbrace{N2\text{-}5}_{\text{stem2}}$$

bordering element bordering element

Item IB. The artificial nucleic acid according to any one of items IB to 18, wherein the at least one histone stem loop comprises a nucleic acid sequence according to SED 10 NO: 39709 to SED ID NO: 39710, or a fragment or variant thereof.

Item 20. The artificial nucleic acid molecule according to any one of items I to 19, wherein the artificial nucleic acid comprises an untranslated region (UTR).

Item 21. The artificial nucleic acid according to item 2D. wherein the artificial nucleic acid comprises a 3'-0TR.

Item 22. The artificial nucleic acid according to item 2I, wherein the 3'-DTR comprises at least one heterologous 3'-UTR element.

Item 23. The artificial nucleic acid according to item 2I or 22, wherein the 3'-UTR comprises a poly(A) sequence and/or a poly(C) sequence.

Item 24. The artificial nucleic acid according to item 23, wherein the poly(A) sequence comprises 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides, and/or the poly(C) sequence comprises 10 to 200, 10 to 100, 20 to 70, 20 to 50 or 10 to 40 cytosine nucleotides.

Item 25. The artificial nucleic acid according to any one of items 1 to 24, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment or a variant of said gene.

Item 26. The artificial nucleic acid according to any one of items 1 to 25, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, or from a homolog, a fragment or a variant thereof.

Item 27. The artificial nucleic acid according to any one of items 1 to 26, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-DTR of an a-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 397QI, or SED ID NO: 397D2, a homolog, a fragment, or a variant thereof.

Item 28. The artificial nucleic acid according to any one of items 1 to 27, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence, which is derived from the 3'-UTR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-DTR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR of a human albumin gene or from a variant thereof, even more preferably from the 3'-0TR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof.

Item 20. The artificial nucleic acid according to any one of items 1 to 28, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence according to any one of SEQ ID NO: 397D3 to SED ID NO: 39708, or a homolog, a fragment or a variant thereof.

Item 30. The artificial nucleic acid according to any one of items 1 to 29, wherEin the artificial nucleic acid comprises a 5'-0TR.

Item 3I. The artificial nucleic acid sequence according to any one of items I to 30, wherein the 5'-UTR comprises at least one heterologous 5'-UTR element.

Item 32. The artificial nucleic acid according to any one of items I to 3I, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably from a corresponding RNA sequence, or a homolog, a fragment, or a variant thereof, preferably lacking the 5'TOP motif.

Item 33. The artificial nucleic acid according to any one of items I to 32, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a homolog, a fragment or a variant thereof, preferably lacking the 5'TOP motif.

Item 34. The artificial nucleic acid according to any one of items I to 33, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL), preferably RPL32 or RPL35A, or from a gene selected from the group consisting of HSD17B4, ATP5AI, AIGI, ASAHI, CDXBC or ABCB7 (MDR), or from a homolog, a fragment or variant of any one of these genes, preferably lacking the 5'TOP motif.

Item 35. The artificial nucleic acid according to any one of items I to 34, wherein the at least one heterologous 5'-DTR element comprises a nucleic acid sequence according to SED ID NO: 33B9I to SEO ID NO: 39G04, or a homolog, a fragment or a variant thereof.

Item 3B. The artificial nucleic acid according to any one of items I to 35 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus as described herein, preferably VPI, or a fragment or variant thereof,

c) optionally a poly(A) tail, preferably consisting of I0 to 20D, ID to IOD, 40 to 80 or 50 to 70 adenosine nucleotides,

d) optionally a poly(C) tail, preferably consisting of I0 to 200, 10 to I00, 20 to 7D, 20 to B0 or I0 to 40 cytosine nucleotides, and

e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEO ID NO: 39700 to SEQ ID NO: 397I0.

Item 37. The artificial nucleic acid according to any one of items I to 3B comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VPI as described herein, or a fragment or variant thereof,

c) a 3'-UTR Element comprising a nucleic acid sequence, which is derived from an a-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid SEquence according to SEQ ID NO: 3970I. or SEQ ID NO: 39702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of I0 to 200, 10 to I00, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of ID to 200, 10 to I00, 20 to 70, 20 to GO or I0 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ I0 NO: 39709 to SEQ ID NO: 397I0.

Item 38. The artificial nucleic acid according to any one of items I to 37, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NO: 397I3-3974B, preferably a nucleic acid sequence according to any one of SEQ ID NO: 397IB, 39721, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences.

Item 39. The artificial nucleic acid according to any one of items I to 38, comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TDP gene, preferably comprising a nucleic acid sequence according to SEQ ID NO: 39G9I, or SEQ ID NO: 39692, or a homolog, a fragment or a variant thereof,

c) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VPI as described herein, or a fragment or variant thereof,

d) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an albumin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39705, or SEQ ID NO: 39706, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of I0 to 20D, I0 to I0D, 40 to 80 or 50 to 70 adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of ID to 2DD, ID to I00, 2D to 70, 20 to 60 or ID to 40 cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequEnce according to SEQ ID NO: 39709 to SEQ ID NO: 397I0.

Item 40. The artificial nucleic acid according to any one of items I to 39, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NDs: 397I3-3974B, preferably a nucleic acid sequence according to any one of SEQ ID NOs: 397IB, 39721, 39729. 39734, 3B738, 39725, or a fragment or variant of any of these sequences.

Item 4I. The artificial nucleic acid according to any one of items I to 40, wherein the coding region comprises a modified nucleic acid sequence.

Item 42. The artificial nucleic acid according to any one of items I to 4I, wherein the at least one coding region comprises a nucleic acid sequence encoding a molecular tag and wherein the molecular tag is selected from the group consisting of a FLAB tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an Etag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

Item 43. Composition comprising at least one artificial nucleic acid as defined by any one of items 1 to 42 and a pharmaceutically acceptable carrier.

Item 44. The composition according to item 43, wherein the at least one mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycatianic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids.

Item 45. The composition according to any one of items 43 to 44. wherein the N/P ratio of the at least one mRNA to the one or more cationic or polycstionic compounds is in the range of about D.I to 2D, including a range of about D.3 to 4, of about D.5 to 2, of about D.7 to 2 and of about D.7 to I.5.

Item 46. The composition according to any one of items 43 to 45 comprising the at least one mRNA, which is complexed with one or more cationic or polycationic compounds, and at least one free mRNA.

Item 47. The composition according to any one of items 43 to 46. wherein the at least one complexed mRNA is identical to the at least one free mRNA.

Item 48. The composition according to any one of items 43 to 47, wherein the mRNA is complexed with one or more lipids, thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

Item 49. The composition according to any one of items 43 to 48, wherein the composition comprises at least one adjuvant.

Item 5D. The composition according to any one of items 43 to 49, wherein

a) the composition comprises a plurality or more than one of the mRNA sequences each defined in any one of items I to 42;

or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, ID, II, I2, 13, 14, 15, IB, I7, 18, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36. 37, 38, 39, 4D, 41. 42, 43, 44, 45, 40, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of items I to 42, wherein each of the at least 2, 3, 4, 5, 0, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 20. 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31. 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 40, 47, 48, 49, 50 or more

artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in any one of items 1 to 42, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VP1 of a different Norovirus.

Item 51. The composition according to any one of items 43 to 50, wherein

a) wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus:

and/or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of items 1 to 42, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VP1 and VP2, as defined in any one of items 1 to 42, and/or a fragment or a variant of any one of these proteins.

Item 52. The composition according to any one of items 43 to 51, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably a cationic protein or peptide.

Item 53. The composition according to any one of items 43 to 52, wherein

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w): or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier: or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby farming liposomes, lipid nanoparticles and/or lipoplexes.

Item 54. The composition according to any one nf items 43 to 53 wherein the composition comprises

(i) at least 2, 3, 4, 5, B, 7, 8. B. ID or more artificial nucleic acids as defined in items I to 42; or

(ii) at least ID, I5, 20 or 50 artificial nucleic acids as defined in items I to 42; or

(iii) 2-I0. 10-I5, 15-20, 20-50, 50-100 or I00-200 artificial nucleic acids as defined in items I to 42;

and a pharmaceutically acceptable carrier, wherein preferably the artificial nucleic acid encodes a capsid protein VPI derived from a Norovirus.

Item 55. The composition according to any one of items 43 to 54, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, B, 7, 8, 9, 10, II, I2, 13, 14, 15, IB, I7, IS, I9, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45. 4G, 47, 48, 49, 50 or more different GI Naroviruses; or

(ii) the artificial nucleic acids are derived from a single Gil Norovirus or from 2, 3, 4, 5, B, 7, 8, 9, 10, II, I2, 13, 14, 15, IB, I7, IS, I9, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50 or more different Gil Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gill Norovirus or from 2, 3, 4, 5, B, 7, 8, 9, 10, II, I2, 13, 14, 15, IB, I7, I8, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50 or more different Gill Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, G, 7, 8. 9. 10, II, I2, 13, 14, 15, IB, I7. IS, I9, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30. 31. 32, 33. 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45. 4B. 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, B, 7, 8, 9, ID, II, I2, 13, 14, 15, IB, I7, I8, 19, 20, 21, 22, 23. 24. 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34. 35, 3B, 37, 38, 39. 4D, 41, 42, 43, 44, 45, 4B, 47, 48, 49. 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single Gil Norovirus, Gill Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, G, 7, 8, 9. ID, II, I2, 13, 14, 15, IB, I7, IB, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 5D or more different GI Noroviruses and additionally from a single Gil, Gill, GIV or GV Norovirus and/or from 2, 3, 4, 5, G, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 19, 2D, 21. 22, 23, 24, 25. 2B, 27, 28, 29, 3D, 31. 32. 33. 34. 35, 3B. 37, 38, 39, 40. 41. 42. 43, 44, 45, 46, 47, 48, 49, 50 and/or more Gil, Gill, GIV or GV Noroviruses;

wherein preferably the artificial nucleic acids encode a capsid protein VPI derived from a Norovirus.

Item 5B. The composition according to any one of items 43 to 55, wherein

(i) the artificial nucleic acids are derived from a single GI.I Narovirus or from 2, 3, 4, 5, G, 7, 8, 9, ID, II. I2, I3, 14, 15, IB, I7, IS, I9, 20, 21, 22, 23, 24, 25, 2G, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D or more different GI.I Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Narovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, I2, 13, 14, 15, 16, I7, IS, ie, 20, 21, 22, 23, 24, 25. 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.I Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.I Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, I2, 13, 14, 15, 16, 17, IS, I9, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or mare different GI.I Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, IS. 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44. 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%. 76%, 77%, 78%, 79%, 80%, 81%, 82%. 83%. 84%, 85%, 86%, 87%, 88%. 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NO: 39713 to SED ID NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NO: 39713 to SED ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SED ID NO: 39713 to SED ID NO: 39746; and/or a fragment or variant of any of these sequences.

Item 57. Polypeptide encoded by the artificial nucleic acid according to any one of items I to 42.

Item 58. Polypeptide according to any one of items I to 42 comprising at least one protein selected from the group consisting of NSI/NS2, NS3, NS4, NS5, NS6, NS7, VPI, and VP2 derived from Norovirus, or a fragment or variant of any of these proteins, and at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VPI, or a variant thereof, wherein the C-terminal fragment consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Narovirus capsid protein VPI, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus nan-structural protein NSI/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 20 amino acid residues.

item 59. The polypeptide according to any one of items 57 to 58 comprising a molecular tag, wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an Etag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

Item GD. Composition comprising the polypeptide according to any one of items 57 to 59, and a pharmaceutically acceptable carrier.

Item Gl. Vaccine comprising the artificial nucleic acid according to any one of items I to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, and/or the composition according to item GD.

Item G2. The vaccine according to item Bl, wherein the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56. the polypeptide according to any one of items 57 to 59. or the composition according to item BD elicits an adaptive immune response.

Item G3. The vaccine according to item Bl to B2, wherein the vaccine further comprises a pharmaceutically acceptable carrier.

Item B4. The vaccine according to any one of items Bl to B3 further comprising an adjuvant.

Item B5. The vaccine according to any one of items Gl to 64, wherein the vaccine is multivalent and comprises

(i) at least 2, 3, 4, 5, G. 7, 8, 9, ID or more artificial nucleic acids as defined in items I to 42; or

(ii) at least 1D, I5, 2D or 5D artificial nucleic acids as defined in items 1 to 42; or

(iii) 2-ID. ID-I5, 15-2D, 2D-5D, 5D-I0D or IDD-2DD artificial nucleic acids as defined in items I to 42.

Item 6G. The vaccine according to any one of items Gl to G5, wherein

(i) the artificial nucleic acids are derived from a single Gl Norovirus or from 2, 3, 4, 5, G, 7, 8, 9, ID, II, I2, 13, 14. 15, IG, I7, I8, 19, 2D, 21, 22, 23, 24. 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3G, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4G, 47. 48, 49, 5D or more different Gl Noroviruses; or

(ii) the artificial nucleic acids are derived from a single Gil Norovirus or from 2, 3, 4, 5, G, 7, 8, 9, ID, II, I2, 13, !4, 15, 16, 17, I8, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 3l, 32, 33, 34, 35, 36, 37, 38. 39, 4D, 41, 42, 43, 44, 45, 4G, 47. 48, 49, 5D or more different Gil Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gill Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, IG, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 31, 32. 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D or more different Gill Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, ie, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39. 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses and additionally from a single GII, GIII, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII, GIII, GIV and/or GV Noroviruses.

Item B7. The vaccine according to any one of items B1 to B6, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses.

Item B8. Kit or kit of parts comprising the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 58, the polypeptide according to any one of items 57 to 59, the composition according to item B0 or the vaccine according to any one of items B1 to B7, optionally comprising a liquid vehicle for solubilising, and optionally technical instructions providing information on administration and dosage of the components.

Item B9. The kit or kit of parts according to item B8 comprising Ringer lactate solutioo.

Item 7D. The artificial nucleic acid according to any one of items I to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item BO, the vaccine according to any one of items Bl to B7, or the kit or kit of parts according to item 68 to B9 for use as a medicament.

Item 7I. The artificial nucleic acid according to any one of items I to 42, the composition according to any one of items 43 to 5B, the polypeptide according to any one of items 57 to 59, the composition according to item BO, the vaccine according to any one of items Bl to B7, or the kit or kit of parts according to item 68 to B9 for use in the treatment or prophylaxis of an infection with Norovirus or a disorder related to an infection with Norovirus.

Item 72. The artificial nucleic acid according to any one of according to any one of items I to 42, the composition according to any one of items 43 to 5B, the polypeptide according to any one of items 57 to 59, the composition according to item BD, the vaccine according to any one of items Bl to 67, or the kit or kit of parts according to item BB to B9, wherein the artificial nucleic acid, the composition, the vaccine or the active component of the kit or kit of parts is administered by injection, preferably by needle-less injection, more preferably by jet injection.

Item 73. The artificial nucleic acid according to any one of items I to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items Bl to 67, or the kit or kit of parts according to item B8 to 69 for use according to any one of items 70 to 72, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient.

Item 74. Method of treating or preventing a disorder, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 5B, the polypeptide according to any one of items 57 to 59, the composition according to item BO, the vaccine according to any one of items Bl to 67, or the kit or kit of parts according to item 68 to B9.

Item 75. The method according to item 74, wherein the disorder is an infection with Norovirus or a disorder related to an infection with Norovirus.

Brief description of the drawings:

Figure 1: shows that transfectian Of HeLa cells with mRNAs coding for Noroviros antigen VPI leads to the expression of the encoded protein. For cell transfection, mRNA cOnstroets (construct ID R2) and (construct ID R4) were used. Norovirus VPI proteins weTe stained intracellular^ with a specific anti-Norovirus GII.4 antibody and a FITC labelled secondary antibody and analyzed by FACS. A detailed description of the experiment is provided in the examples section, Example 2.

Figure 2: shows that transfection of HeLa cells with mRNAs coding fOr Norovirus antigen VPI leads to the expression of the encoded protein. For cell transfection, mRNA constructs (construct ID R2FJ), (construct ID R27), and (construct ID R28) were used. Norovirus VPI proteins were stained with a specific anti-Norovirus GII.4 antibody and a FITC labelled secondary antibody and analyzed by FACS. A detailed description of the experiment is provided in the examples section, Example 2.

Figure 3: shows that transfection of HeLa cells with mRNAs coding for Norovirus antigen VPI leads to protein expression. For cell transfection, mRNA constructs (construct ID R2) and (construct ID R4) were used. Western blot analysis was performed cell lysates of transfected cells. As a control, a commercial VLP preparation (Medigen; 50 kD) was osed. Norovirus VPI proteins were stained with a specific anti-Norovirus GII.4 antibody. M= marker lane; 1= mRNA construct R2; 2= mRNA construct R4; 3= WFI control; 4= empty control; 5= commercial VLP control. A detailed description of the experiment is provided in the examples section, Example 3.

Figure 4: shows that immunization of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VP1_X124V; construct ID R4; protamine formulated) induced binding IgGI and lgG2 antibodies, both in a homologous ELISA design (Figure 4A; coating material VLP GII.4) and in a heterologous ELISA design (Figure 4FJ; coating material VLP GII.4 2011). 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer control group. A detailed description of the experiment is provided in the examples section, Example 4.1.

Figure 5: shows that immunization of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VPIJI24V; construct ID R4; protamine formulated) induced heterologous blocking antibodies. The results of a Histo-Blood Group Antigen (HBGA) assay in serum dilution 1: 12.5 are shown. 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer control group. A detailed description of the experiment is provided in the examples section. Example 4.2.

Figure 6: shows that immunization Of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VPI_XI24V; construct ID R4; protamine formulated) induced antigen specific T-cell responses. The results of an ICS assay are shown (CD8+ T-cells). 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer cootrol group. A detailed description of the experiment is provided in the examples section. Example 4.3.

Examples:

The Examples shown in the following are merely illustrative and shall describe the present invention in a further way. These Examples shall not be construed to limit the present invention thereto.

Example 1: Preparation of mRNA for in vitro and in vivo experiments:

I.I. Preparation of DNA and mRNA constructs:

For the present examples. DNA sequences encoding *Norovirus* antigenic proteins, derived from three or more different *Norovirus* strains were prepared and used for subsequent RNA *in vitro* transcription reactions. The prepared RNA constructs (coding sequences (cds) and mRNA sequences) are listed in Table 4 below.

Most DNA sequences were prepared by modifying the wild type encoding DNA sequences by introducing a codon modified sequence or GC-optimized sequeoce for stabilization, osing three or more different *in silica* algorithms that e.g. increase the GC content of the respective coding sequence (indicated as "GC opt I", "GC opt 2". "GC opt 3", "GC opt 4". "opt 5", "opt G". "opt 7" in Table 4: further details relating to sequence modifications are provided in the specifications of the invention). Some DNA sequences were used as a wild type coding sequence, without altering the GC content and without altering the codon usage of the coding sequence (indicated as "wt" in Table 4).

DNA sequences were prepared by modifying the wild type encoding DNA sequences by introducing a GC-optimized sequence for stabilization, using an *in silica* algorithms that increase the GC content of the respective coding sequence (e.g., indicated as "opt!" in Table 4, see explanation in the paragraph above).

Moreover, sequences were introduced into a pUCI9 derived vector and modified to comprise stabilizing sequences derived from alpha-globin-3'-UTR, a stretch of 3D cytosines. a histone-stem-loop structure, and a stretch of 64 adenosines at the 3'-terminal end (poly-A-tail), indicated as "design I" in Table 4. Dther sequences were introduced into a pUCI9 derived vector to comprise stabilizing sequences derived from 32L4 5'-UTR ribosomal 5'TOP UTR and 3'-UTR derived from albumin 7, a stretch of 3D cytosines, a histone-stam-loop structure, and a stretch of G4 adenosines at the 3'-terminal end (poly-A-tail), indicated as "design 2" in Table 4. Further details are relating mRNA construct design are provided in the specifications of the invention)

The obtained plasmid DNA constructs were transformed and propagated in bacteria *{Escherichia coll)* using common protocols known in the art.

TahlE 4: VPI coding sequences, protein sequences and mRNA constructs

RNA ID		Construct description	Norovirus strain	RNA design	SEQ ID NO
R1	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 1, wt	39713
R2	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 2, wt	39714
R3	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 1, GC opt 1	39715
R4	mRNA	VP1_(X124V)	GII.4-031693-USA-2003; C1N1	design 2, GC opt 1	39716
R5	protein	VP1_(X124V)	GII.4-031693-USA-2003	Protein*	2358
R6	cds	VP1_(X124V)	GII.4-031693-USA-2003	wild type, wt	6768
R7	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 1	39717
R8	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 2	11178
R9	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 5	15588
R10	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 6	19998
R11	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 7	24408
R12	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 3	28818
R13	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 4	33228
R14	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 1	39718
R15	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 2	39719
R16	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 1, GC opt 1	39720
R17	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 2, GC opt 1	39721
R18	protein	Capsidprotein	GII.4 Farmington Hills-2002-USA	Protein*	1487
R19	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	wild type	5897
R20	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 2	10307
R21	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 5	10307
R22	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 6	19127
R23	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 7	23537
R24	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 3	27947
R25	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 4	32357
R26	mRNA	VP1	GII.4-2006b 092895-USA-2008	design 2, GC opt 1	39729
R27	mRNA	VP1	GII.4-GZ2010-L87-Guangzhou-2011	design 2, GC opt 1	39734
R28	mRNA	VP1	GII.4-USA-1997	design 2, GC opt 1	39738
R29	mRNA	VP1	GI.1-USA-1968-Capsidprotein	design 2, GC opt 1	39725

*pratein sequence is back translated into RNA according to the above paragraph "G/C content modification"

1.2. RNA *in vitro* transcription:

The DNA plasmids prepared according to paragraph 1.1 were enzymatically linearized using EcoRI and transcribed *in vitro* using DNA dependent T7 RNA polymerase in the presence of a nucleotide mixture and cap analog (m7GpppG) under suitable buffer conditions. The obtained mRNAs were purified using PureMessenger® (CureVac, Tubingen. Germany: WD 2DD8/077592 Al) and used for *in vitro* and *in vivo* experiments.

1.3. Preparation of protamine formulated RNA vaccine:

The obtained mRNA, e.g. HPLC purified RNA, was complexed with protamine by addition of protamine-trehalose solution to RNA solution at a RNA:protamine weight to weight ratio of 2:1 Then, complexed RNA was mixed with non-complexed RNA in a ratio of 50% free RNA and 50% complexed RNA to obtain formulated RNA. Formulated RNA was used for *in vivo* vaccination experiments.

1.4. Preparation of LNP formulated RNA vaccine:

RNA is encapsulated in lipid nanoparticle (LNP) using established protocols known in the art. Briefly, LNP-encapsulated RNA is prepared using an ionizable amino lipid (cationic lipid), phospholipid, cholesterol and a PEGylated lipid. Cationic lipid, DSPC, cholesterol and PEG-lipid are solubilized in ethanol. RNA is diluted to a total concentration of about 0.05 mg/mL in 50 mM citrate buffer pH 4. Syringe pumps are used to mix the ethanolic lipid solution with RNA at a ratio of about 1:3 to 1:2 (vol/vol). Ethanol is then removed and the external buffer replaced with PBS by dialysis. Lipid nanoparticles are filtered through a 0.2 µm pore sterile filter. Lipid nanoparticle particle diameter size may be determined by quasi-elastic light scattering using a Malvern Zetasizer Nano (Malvern, UK).

Example 2: Expression of Norovirus VP1 antigens in HeLa cells and analysis by FAGS:

To determine *in vitro* protein expression of the inventive Norovirus mRNA constructs, HeLa cells were transfected with mRNA constructs encoding Norovirus VP1 antigens and analyzed by intracellular FACS staining. For cell transfectinn. an mRNA comprising VP1J124V (GII.4-03I693-USA-2003) wild type coding sequence (SED ID NO: 3B7I4: construct ID R2) an mRNA comprising VP1JI24V (GII.4-D3IB33-USA-2D03) GC-optimized coding sequence (SED ID NO: 39716; construct ID R4). an mRNA comprising VP1 (GII.4-200Bb 092895-USA-2DD8) GC-optimized coding sequence (SED ID NO: 39729; construct ID R2B), an mRNA comprising VP1 (GII.4-GZ20IO-L87-Guangzhou-20ll) GC-optimized coding sequence (SEQ ID NO: 39734; construct R27) and an mRNA comprising VP1 NDV(GII.4-OSA-I997)-Capsidprotein GC-optimized coding sequence (SED ID NO: 39738; construct ID R28) were used. The detailed description of the performed experiment is provided below.

HeLa cells were seeded in a B-well plate at a density of 4DD.DDD cells/well in cell culture medium (RPMI, 10% FCS, 1% L-Glutamine, 1% Pen/Strep), 24h prior to transfection. Cells were transfected with 1 µg and 2 µg mRNA per construct using Lipofectamine 2000 (Invitrogen) as transfection reagent. As a negative control, water for injection (WFI) was used.

24 hours post transfection, transfected HeLa cells were stained with a commercial mouse anti-Norovirus GII.4 antibody [2000-G5] (Abeam; 1:500) and an anti-mouse FITC labelled secondary antibody (F52B2 from Sigma; 1:500) after Cytofix/Cytoperm (BD

Biosciences) treatment according to manufacturer's protocol. Subsequently, cells were analyzed by flow cytometry (FACS) on a BD FACS Canto II using the FACS Diva software. Quantitative analysis of the fluorescent FITC signal was performed using the FlowJo software package (Tree Star, Inc.). The results of the FACS expression analysis are shown in Figure I and Figure 2.

Results:

Figure I and Figure 2 show that the Norovirus proteins were expressed in HeLa cells transfected with the mRNA constructs R2, R4, R2FJ, R27 and R28. Overall, around 80%-90% of transfected cells showed positive FITC signal, indicating that the inventive constructs tested here were able to efficiently drive protein expression without affecting cell viability. Of note, the data suggests that analogous mRNA constructs encoding other Norovirus VPI or VP2 antigens (as defined in the specifications or listed in Table I and Table 3) may also drive protein expression in a similar manner.

Example 3: Analysis of protein expression using western blot

To determine *in vitro* protein expression upon HeLa cell transfection with the inventive mRNA constructs, HeLa cells were transiently transfected with an mRNA constructs comprising VPI_XI24V coding sequences. Cell lysates were prepared and analyzed using western blot. The detailed description of the performed experiment is provided below.

HeLa cells are transfected with 2 µg mRNA comprising wild type VPI_XI24V coding sequence (SED ID NO: 3FJ7I4; construct ID R2) and 2 pg mRNA comprising GC-optimized VPI_XI24V coding sequence (SED ID NO: 337IG; construct ID R4). As a negative control water for injection (WFI) was used. After 24 hours post transfection lysis buffer was added to the culture to prepare cellular lysates. Cellular lysates as well as a commercial Norovirus virus like particle (VLP; obtained from Medigen) were reduced by heating the samples to 95°C for ID minute. Subsequently, samples were subjected to SDS-PAGE under denaturating/reducing conditions followed by western blot detection. For the detection of Norovirus proteins, a commercial mouse anti-Norovirus GII.4 antibody [2D02-G5] (1:250: Abeam) was used as primary antibody followed by secondary goat anti mouse antibody coupled to IRDye 800CW (1:10000; Licor Biosciences). The results of the experiment are shown in Figure 3.

Results:

Figure 3 shows that the Norovirus proteins were expressed in HeLa cells transfected with the inventive mRNA constructs (SEQ ID NOs: 3971 4 and 397IFJ). Of note, the data suggests that analogous mRNA constructs encoding other Norovirus antigens (as defined in the specifications or listed in Table I and Table 3) may also drive protein expression in a similar manner.

Example 4: Immunization of mice and evaluation of Norovirus specific immune responses

Female BALB/ c mice were immunized intradermal^ (i.d.) with protamine formulated mRNA vaccine (construct ID R4) with doses, application routes and vaccination schedules as indicated in Table 5. As a negative control, one group of mice was injected with buffer (ringer lactate, RiLa). All animals were vaccinated on day 0, 21 and 35. Blood samples were collected on day 49 for the determination of binding antibody titers (using a homologous and heterologous ELISA assay), blocking antibody titers (using a

heteralogDus HGBA assay) and T-cell responses (intracellular cytokine assay). Detailed descriptions of the performed experiments are provided below.

Table 5: Vaccination regimen (Example 4)

Group	No of mice	Treatment	Dose	Route/Volume	Vaccination schedule
1	6	*Norovirus* GC-optimized VP1_X124V SEQ ID NO: 39716; R4 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35
2	6	100% RiLa Control		i.m. 1x 25 µl	d0, d21, d35

4.1. Determination of homologous and heterologous immune responses by ELISA:

ELISA was performed using synthetically produced norovirus Virus like particles (VLP) as coating material. For the analysis of homologous immune responses, plates were coated with VLP of the same strain of genotype BII.4 (GII.4 CINI). For the analysis of heterologous immune responses, plates were coated with VLPs of another strain of genotype GII.4 (GII.4 2011). Coated plates were incubated using respective serum dilutions, and binding of specific antibodies to the *Norovirus* coating material was detected using biotinylated isotype specific anti-mouse antibodies followed by streptavidin-HRP (horse radish peroxidase) with ABTS as substrate. Endpoint titers of antibodies were measured by ELISA on day 49 after three vaccinations (see Table 5). The results are shown in Figure 4A (homologous responses) and Figure 4B (heterologous responses).

4.2. Determination of blocking antibody titers using a HBGA blocking assay:

Respective sera (day 49 after three vaccinations) were pre-incubated with synthetic norovirus VLPs (VLP (GII.4 2011)) and subsequently added to HBGA coated plates. VLP binding to Histo-Blood Group Antigen (HBGA) was detected by norovirus specific antibodies. In the presence of functional blocking antibodies in serum of immunized animals, VLP binding to HBGA was blocked which results in a reduction of the detected antibody signal. The respective blocking index was calculated as commonly known in the art. The results of the assay are shown in Figure 5.

4.3. Determination of specific CD8 T-cell responses using ICS:

Splenocytes from vaccinated mice were isolated according to a standard protocol known in the art. Briefly, isolated spleens were grinded through a cell strainer and washed in PBS/I%FBS followed by red blood cell lysis. After an extensive washing step with PBS/I%FBS splenocytes were seeded into 96-well plates (2×10^6 cells per well). The cells were stimulated with ten Norovirus CD8 peptide epitopes (lpg/ml of each peptide) in the presence of 2.5 pg/ml of an anti-C028 antibody (BD Biosciences) and anti-CDI07a-PE-Cy7 antibody, after one hour at 37°C. After stimulation, cells were washed and stained and for staining of intracellular cytokines Cytofix/Cytoperm reagent (BD Biosciences) was used according to the manufacturer's instructions. The following antibodies were used for staining: C03-FITC (1:100), CD8-PE-Cy7 (1:200), TNF-PE (1:100), IFNy-APC (1:100) (eBioscience), CD4-B0 Horizon V450 (1:200) (B0 Biosciences) and incubated with Fcy-block diluted 1:100. Aqua Dye was used to distinguish live/dead

cells (Invitrogen). Cells were acquired using a Canto II flow cytometer (Beckton Dickinson). Flow cytometry data was analyzed using FlowJo software package (TreeStar, Inc.). Results for CD8+ T-cells are shown in Figure 8.

Results:

Figure 4 shows that the tested Norovirus mRNA vaccine induced Norovirus specific IgGI and IgG2 antibody titers in immunized mice. Humoral immune response was demonstrated in a homologous ELISA setting (see Figure 4A) as well as in a heterologous ELISA setting (see Figure 4B). Of note, the observed heterologous humoral immune response (against another strain of genotype GII.4) is of particular importance for a broad protection against Norovirus infections, as GII.4 strains are fast-evolving which is challenging in successful Norovirus vaccine development.

Figure 5 shows that the tested Norovirus mRNA vaccine induced Norovirus specific blocking antibody titers in immunized mice in a homologous and heterologous HGBA assay setup, showing that also functional antibodies were induced after immunization of mice with the inventive Norovirus mRNA vaccine. Of note, the induction of functional blocking antibodies also against another strain of genatype GII.4 demonstrates that the used mRNA Norovirus vaccine may also confer broad protection against different Norovirus strains of genotype GII.4.

Figure B shows that the tested Norovirus mRNA vaccine stimulated a robust CD8+ IFN-y/TNF-α and CD8+ CDI07a/IFN-y in spleen of immunized mice.

Overall, the results of the immunization experiments in mice show that the inventive Norovirus mRNA vaccine induced a broad immune response engaging both the humoral-secretory and cellular immunity effector arms. Notably, heterologous immune responses were also observed (ELISA, HGBA). The data suggests that analogous mRNA constructs encoding other Norovirus antigens (as defined in the specifications or listed in Table I or Table 3) may also induce board immune responses in a similar manner.

Example 5: Immunization of mice and further evaluation of heterologous immune responses

Female BALB/c mice are immunized intradermal^ (i.d.) and intramuscularily (i.m.) with protamine formulated or LNP formulated mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table B. As a negative control, one group of mice was injected with buffer (ringer lactate). All animals were vaccinated on day 0, 2I and 35. Blood samples are collected on day 43 for the determination of binding antibody titers (using a homologous and heterologous ELISA assay), blocking antibody titers (using a homologous and heterologous HGBA assay). Detailed descriptions of the performed experiments are provided below.

Table G: Vaccination regimen of mice (Example 5)

Group	No. of mice	Treatment	Dose	Route/Volume	Vaccination schedule
I	B	Noravirus GC-aptimized VPI GII.4-USA-IBB7 SED ID ND: 30738: R28 Protamine formulated	80 pg	i.d. 2x 50 pi	dO, dZI. d35 .
2	B	Norovirus GC-optimized VPI GII.4-2D06b 092895-DSA-2008 SEQ ID NO: 39729; R2G Protamine formulated	80 pg	i.d. 2x 50 pi	dO, dZl. d35
3	B	Norovirus GC-optimized VPI GII.4-GZ20IO-L87-Guangzhou-20ll SEQ ID NO: 39734; R27 Protamine formulated	80 pg	i.d. 2x 50 pi	dO, d2l. d35
4	B	Norovirus GC-optimized VPI_XI24V SEO ID NO: 397IB; R4 Protamine formulated	80 pg	i.d. 2x 50 pi	dO, d2l, d35
5	G	Norovirus GC-optimized VPI GII.4-USA-I997 SEQ ID NO: 39738; R28 LNP formulated	20 pg	i.m. 2x 25 pi	d0. d2l. d35
B	B	Norovirus GC-optimized VPI Gll.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 LNP formulated	20 pg	i.m. 2x 25 pi	dO. dZl, d35
7	B	Norovirus GC-optimized VPI GII.4-GZ20IO-L87-Guangzhou-20ll SEQ ID NO: 39734; R27 LNP formulated	20 pg	i.m. 2x 25 pi	dO, dZl. d35
8	B	Norovirus GC-optimized VPI_XI24V SEQ ID NO: 397IB; R4 LNP formulated	20 pg	i.m. 2x 25 pi	dO. dZl, d35
9	B	100% RiLa Control		i.m. 1x 25 pl	dO. dZl. d35

5.I. Determination of homologous and heterologous immune responses by ELISA:

ELISA is performed essentially as described in Example 4.I. Plates are coated with VLP GII.4 CINI and VLP GII.4 2DII to determine homologous and heterologous immune responses.

5.2. Determination of blocking antibody titers using a heterologous HBGA blocking assay:

The HGBA assay is performed essentially as described in Example 4.2.The respective blocking index are calculated as commonly known in the art to evaluate homologous and heterologous cross neutralizing capacities of the used mRNA vaccines.

5.3. Determination of specific CD8 T-cell responses using ICS:

Multifunctional CO8 T-cell responses are analyzed as described in Example 4.3.

Example 6: Norovirus mRNA vaccine challenge study in gnotobiotic pigs

B.I. Immunization of gnotobiotic pigs:

Gnotobiotic pigs are derived by hysterectomy from near-term sows and maintained in germ-free isolator units. Pigs are fed commercial ultra-high-temperature-treated sterile food. All pigs are confirmed as seronegative for *Norovirus* and germ-free prior to immunization experiments. Gnotobiotic pigs are immunized with protamine formulated or LNP formulated mRNA vaccines (monovalent, bivalent, or tetravalent) with doses, application routes and vaccination schedules as indicated in Table 7. Analysis of immune responses is performed essentially as described in Example 4 (ELISA, HGBA, and ICS).

Table 7: Vaccination regimen of pigs (Example B)

Group	No. of pigs	Treatment	Dose/Route	Vaccination schedule
I	B	*Monovalent vaccine;protamine formulated* GII.4-2DDBb DB2895-USA-2DD8 SED ID ND: 39729; R2B	240 pg i.d. 2x 200 µI	dO, d2l
2	B	*Bivalent vaccine;protamine formulated* GI.I-USA-l9B8-Capsidprotein SED ID ND: 39725; R29 + GII.4-GZ20ID-L87-Guangzhou-20ll SED ID ND: 39734; R27	240 pg (total) i.d. 2x 200 pl	dO, d2l
3	B	*Tetravalent vaccine;protamine formulated* GII.4-USA-I9B7 SEQ ID NO: 39738; R28 + GII.4-D3IG93-USA-2D03	240 pg (total) i.d. 2x 200 pi	d0. d2l

		SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27		
4	6	*Monovalent vaccine; LNP formulated* GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	60 µg i.m. 2x 100 µl	d0, d21
5	6	*Bivalent vaccine; LNP formulated* GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	60 µg (total) i.m. 2x 100 µl	d0, d21
6	6	*Tetravalent vaccine; LNP formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	60 µg (total) i.m. 2x 100 µl	d0, d21
7	6	100% RiLa Control	-	d0, d21

B.2. Norovirus challenge experiment:

At day 30 days post immunization, the vaccinated and buffer-injected control pigs are challenged orally with Norovirus GII.4 (isolated from human stool samples) to assess the protection against Norovirus-induced diarrhea and fecal virus shedding. After virus challenge, rectal swaps and feces samples are collected at day 1, 3, 5, 7 and ID. Norovirus loads in rectal swaps and feces samples are determined using quantitative PCR. In addition, pigs are monitored for Norovirus-associated symptoms and fecal consistence scores are recorded to assess severity of the Norovirus infection.

Example 7: Immunization of non-human primates and evaluation of immune responses

Non-human primates (NHPs) are immunized with protamine or LNP formulated mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table 8. Analysis of immune responses is performed essentially as described in Example 4 (ELISA, HGBA, and ICS).

Table 8: Vaccination regimen of NHPs (Example 7)

Group	Number of NHPs	Treatment	Dose/Route	Vaccination schedule
I	B	*Monovalent vaccine* *prntamine formulated* GH.4-200Gb DB2895-USA-2D08 SEQ ID NO: 39729; R2B	240 µg i.d. 2x 200 µl	dD, dZI
2	B	*Bivalent vaccine;* *protamine formulated* GI.I-USA-l9B8-Capsidprotein SEQ ID ND: 39725: R29 + GII.4-GZ2DI0-L87-Guangzhou-2DII SEQ ID ND: 39734: R27	240 pg (total) i.d. 2x 200 µl	dD, dZI
3	B	*fetravalent vaccine;protamine formulated* GII.4-USA-I397 SEQ ID ND: 39738: R28 + GII.4-03IB93-USA-2003 SEQ ID ND: 397IB: R4 + GII.4-2006b D92895-USA-2DD8 SEQ ID NO: 39729: R2B + GII.4-GZ20ID-L87-Guangzhou-2DII SEQ ID NO: 39734: R27	240 pg (total) i.d. 2x 200 pi	dO, dZI
4	B	*Monovalent vaccine; LNP formulated* GII.4-2006b 092895-USA-20D8 SEQ ID NO: 39729: R2B	60 pg i.m. 2x 100 pi	dO, dZI
5	B	*Bivalent vaccine; LNP formulated*	60 µg	dD, d2I

		GIJ-USA-l968-Capsidprotein SEQ ID NO: 39725: R29 + GII.4-GZ20I0-L87-GuangzhDu-20ll SEQ ID ND: 39734: R27	(total) i.m. 2x lOD pi	
B	B	*Tetravalent vaccine; LNP formulated* GII.4-DSA-l997 SEQ ID ND: 39738: R28 + GII.4-D3IB93-DSA-2DD3 SEQ ID ND: 397IB: R4 + Gll.4-2006b D92895-USA-2DD8 SED ID ND: 39729; R2B + GII.4-GZ20IO-L87-Guangzhou-2DII SEQ ID ND: 39734; R27	BO µg (total) i.m. 2x l[illegible] pl	dD. d2l
7	B	100% RiLa Control	i.m. Ix ID[illegible] pl	dD, d2l

Example 8: Development of a multivalent Norovirus mRNA vaccine

8.1. Generation of bivalent, tetravalent and multivalent Norovirus mRNA vaccines

For bivalent and tetravalent Norovirus mRNA vaccines, each mRNA construct is individually produced (as described in Example I).

Multivalent *Norovirus* vaccine compositions are produced according to procedures as disclosed in the PCT application PCT/EP20IB/D82487. In short, Norovirus DNA constructs (each of which comprising different norovirus coding sequences and a T7 promotor; e.g. synthetic DNA templates immobilized on a chip) are used as a matrix for simultaneous PCR amplification. The obtained PCR product mixture is purified and used as a template for simultaneous RNA *in* e/Tratranscription to generate a mixture of Norovirus mRNA constructs. The obtained Norovirus mRNA mixture is subjected to quantitative and qualitative measurements (e.g., RNA AGE, RT-qPCR, NGS, and Spectrometry). Following that, purification and formulation is performed (protamine formulation and LNP formulation). For the preparation of multivalent mRNA mixtures, Norovirus sequences as provided in Table 3 (see specifications) are used.

The produced bivalent, tetravalent and multivalent Norovirus mRNA vaccines are used for *in vitro* and *in vivo* experiments.

8.2. Expression analysis of multivalent Norovirus mRNA vaccines using quantitative mass spectrometry

Hela cells are transfected with bivalent, tetravalent and multivalent mRNA mixtures (see Table 9) and protein expression is analyzed using quantitative mass spectrometry to show that every mRNA comprised in the respective mRNA mixture is efficiently translated into Norovirus protein/antigen.

8.3. Immunization of mice and evaluation of Norovirus specific immune responses

Female BALB/c mice are with protamine or LNP formulated monovalent, bivalent, tetravalent or multivalent mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table 9. As a negative control, one group of mice is injected with buffer (ringer lactate, RiLa). All animals are vaccinated on day 0, 2I and 35. Blood samples are collected on day 49 for the determination of binding antibody titers (using an ELISA assay), blocking antibody titers (using a HGBA assay) and cellular immune responses (ICS) performed essentially as described in Example 4.

Table 3: Vaccination regimen of mice (Example 8)

Group	Number of mice	Treatment	Dose/Route	Vaccination schedule
I	G	*Monovalent vaccine; Protamine formulated* GII.4-D3IG93-USA-20D3 SEQ ID NO: 397I6; R4	40 µg i.d.	dO, d2l, d35
2	G	*Bivalent vaccine; Protamine formulated* R4 or R2G or R27 or R28 + R4 or R2B or R27 or R28	80 pg (40 pg each) i.d.	dO, dZI. d35
3	6	*fetravalent vaccine; Protamine formulated* GII.4-0SA-I997 SED ID ND: 39738; R28 + GII.4-03IG93-USA-2DD3 SEQ ID ND-. 397IG; R4 + GII.4-2DD6b 092895-0SA-2DD8 SEQ ID NO: 39729: R2G + GII.4-GZ2DID-L87-Guangzhou-20ll SEQ ID ND: 39734: R27	80 pg (20 pg each) i.d.	dO, dZI. d35
4	G	*Bivalent vaccine; Protamine formulated* GI.I-USA-l9G8-Capsidprotein	80 pg (40 pg each)	dD, d2l, d35

		SEQ ID NO: 39725; R29 + R4 or R2B or R27 or R28	i.d.	
5	6	*Tetravalent vaccina; Protamine formulated* GI.I-DSA-I968-Capsidpratein SEQ ID NO: 39725; R29 + GII.4-DSA-I997 SED ID ND; 39738; R28 + GII.4-D3IB93-0SA-2D03 SEQ ID NO: 39716: R4 + GII.4-2DD6b 0B2895-DSA-2DD8 SED ID NO: 39729; R2G	80 µg (20 pg each) i.d.	dD. dZI. d35
6	G	*Multivalent; Protamine formulated.* *20 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from* ***Table3).***	80 pg (total) i.d.	dD. d2l, d35
7	B	*Multivalent; Protamine formulated.* *50 constructs encoding Norovirus aotigens of several genogroups, genotypes and strains (selected from* ***Table3).***	80 pg (total) i.d.	dD. dZI. d35
8	6	*Multivalent; LNP formolated.* *20coostructs encoding Norovirus antigens of several genogroups. genotypes and strains (selected from* ***Table3).***	80 pg (total) i.m.	dO. dZI. d35
9	B	*Multivalent; LNP formulated.* *50 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from* ***Table3).***	80 pg (total) i.m.	dD, d2l, d35
10	B	100% RiLa Control	-	dO, d2l. d35

Example 3: Expression of Norpyirus proteins in HeLa cells and analysis by FACS

To determine *in vitro* protein expression of the constructs, HeLa cells are transiently transfected with mRNA encoding *Norovirus* antigens and stained using suitable customized anti Norovirus-protein antibodies (raised in mouse) and a FITC-coupled secondary antibody (F52B2 from Sigma).

HeLa cells are seeded in a 6-well plate at a density of 4D0D0D cells/well in cell culture medium (RPMI, ID% FCS. I% L-Glutamine, I% Pen/Strep), 24h prior to transfection. HeLa cells are transfected with 1 and 2 µg unformulated mRHA using Lipofectamine 2D0D (Invitrogen). The mRNA constructs are used in the experiment, including a negative control encoding an irrelevant protein. 24 hours post transfection. HeLa cells are stained with suitable anti Norovirus-protein antibodies (raised in mouse; I:50D) and anti-mouse FITC labelled secondary antibody (1:500) and subsequently analyzed by flow cytometry (FACS) on a BD FACS Canto II using the FACS Diva software. Quantitative analysis of the fluorescent FITC signal is performed using the FlowJo software package (Tree Star, Inc.).

Example ID: Expression and secretion of Norovirus proteins using western blot

For the analysis of Norovirus protein secretion, HeLa cells are transfected with 1µg and 2pg unformulated mRNA (RI - R29, see Table 4) including a negative control encoding an irrelevant protein using Lipofectamine as the transfection agent. Supernatants, harvested 24 hours post transfection, are filtered through a 0.2µm filter. Clarified supernatants are applied on top of I ml 20% sucrose cushion (in PBS) and centrifuged at I4D0D rcf (relative centrifugal force) for 2 hours at 4°C. *Norovirus* protein content is analyzed by Western Blot suitable customized anti Norovirus-protein antibodies (raised in mouse; 1:500 diluted) as primary antibody in combination with secondary anti mouse antibody coupled to IRDye 8D0CW (Licor Biosciences). The presence of α β-tubulin is also analyzed as control for cellular contamination (α β-tubulin: Cell Signalling Technology: 1:1000 diluted) in combination with secnndary anti rabbit antibody coupled to IRDye B80RD (Licor Biosciences).

For the analysis of Norovirus proteins in cell lysates, HeLa cells are transfected with 1µg and 2 µg unformulated mRNAs (RI - R29, see Table 4) including a negative control encoding an irrelevant protein using Lipofectamine as the transfection agent 24 hours post transfection, HeLa cells are detached by trypsin-free/EDTA buffer, harvested, and cell lysates are prepared. Cell lysates are subjected to SDS-PAGE under non-denaturating/non-reducting followed by western blot detection. Western Blot analysis is performed using a suitable customized anti Norovirus-protein antibodies antibody (raised in mouse; 1:500 diluted) as primary antibody in combination with secondary anti mouse antibody coupled to IRDye 80DCW (Licor Biosciences).

Example II: Preparation of Norovirus vaccine compositions

For in vivo vaccination experiments, different compositions of Norovirus mRNA vaccine are prepared using Norovirus mRNA constructs (see Table 4). One composition comprises protamine-complexed mRNA, one composition comprises mRNA that is formulated with an aluminum phosphate adjuvant.

11.1 Preparation of protamine complexed mRNA ("vaccine composition 1"; RNActive®):

Norovirus mRNA constructs are complexed with protamine prior to use in in vivo vaccination experiments. The mRNA complexation consists of a mixture of 50% free mRNA and 50% mRNA complexed with protamine at a weight ratio of 2:1. First, mRNA is complexed with protamine by addition of protamine-Ringer's lactate solution to mRNA. After incubation for 10 minutes, when the complexes are stably generated, free mRNA is added, and the final concentration of the vaccine is adjusted with Ringer's lactate solution.

11.2. Preparation of mRNA with alum phosphate ("vaccine composition 2"):

mRNA constructs are mixed with the desired amount of aluminum phosphate adjuvant in Ringer's lactate solution ("naked mRNA").

Example 12: Vaccination of mice and evaluation of Norovirus specific immune response

12.1. Immunization

Female BALB/c mice are injected intradermally (i.d.) and intramuscularly (i.m.) with respective mRNA vaccine compositions (prepared according to Example 11) with doses, application routes and vaccination schedules as indicated in Table 10. As a negative control, one group of mice is vaccinated with buffer (ringer lactate). All animals are vaccinated on day 1, 21 and 35. Blood samples are collected on day 21, 35, and 63 for the determination of binding and neutralizing antibody titers (see below).

Table 10: Vaccination regimen (Example 12)

Group	Number of mice	Vaccine composition	Route/Volume	Vaccination Schedule (day)
1	10	80 µg *Norovirus* RNActive® Composition 1	i.d. 2x 50 µl	0/21/35
2	10	40 µg *Norovirus* RNActive® Composition 1	i.d. 2x 50 µl	0/21/35
3	10	20 µg *Norovirus* RNActive® Composition 1	i.d. 2x 50 µl	0/21/35
4	10	40 µg *Norovirus* naked RNA Composition 2	i.m. 2x 25 µl	0/21/35
5	10	40 µg *Norovirus* naked RNA Composition 2	i.m. 2x 25 µl	0/21/35
B	10	40 µg *Norovirus* naked RNA Composition 2	i.m. 2x 25 µl	0/21/35
7	10	100% RiLa Control	i.d. 2x 50 µl	0/21/35

12.2. DetBrminatinn of anti-*Norovirus* protein antibodies by ELISA:

ELISA is performed using inactivated *Norovirus* infected cell lysate for coating. Coated plates are incubated using respective serum dilutions, and binding of specific antibodies to the *Norovirus* antigens are detected using biotinylated isotype specific anti-mouse antibodies followed by streptavidin-HRP (horse radish peroxidase) with ABTS as substrate. Endpoint titers of antibodies directed against the *Norovirus* antigens are measured by ELISA on day 63 after three vaccinations.

12.3. Intracellular cytokine staining

Splenocytes from vaccinated mice are isolated according to a standard protocol known in the art. Briefly, isolated spleens are grinded through a cell strainer and washed in PBS/I%FBS followed by red blood cell lysis. After an extensive washing step with PBS/I%FBS splenocytes are seeded into 96-well plates (2×10^6 cells per well). The cells are stimulated with a mixture of four *Norovirus* protein specific peptide epitopes (5pg/ml of each peptide) in the presence of 2.5 µg/ ml of an anti-CD28 antibody (BD Biosciences) for B hours at 37°C in the presence of a protein transport inhibitor. After stimulation, cells are washed and stained for intracellular cytokines using the Cytofix/Cytoperm reagent (BD Biosciences) according to the manufacturer's instructions. The following antibodies are used for staining: CD3-FITC (l:IDD), CD8-PE-Cy7 (l:2DD), TNF-PE (HDD). IFNy-APC (FIDO) (eBioscience), CD4-BD Horizon V45D (l:2DD) (BD Biosciences) and incubated with Fcy-block diluted 1:100. Aqua Dye is used to distinguish live/dead cells (Invitmgen). Cells are acquired using a Canto II flow cytometer (Beckton Dickinson). Flow cytometry data is analyzed using FlowJo software package (Tree Star, Inc.)

12.4. *Norovirus* plaque reduction neutralization test (PRNT50)

Sera are analyzed by a plaque reduction neutralization test (PRNT50), performed as commonly known in the art. Briefly, obtained serum samples of vaccinated mice are incubated with *Norovirus*. That mixture is used to infect cultured cells, and the reduction in the number of plaques is determined.

Example 13: Clinical development of a Norovirus mRNA vaccine composition

To demonstrate safety and efficiency of the *Norovirus* mRNA vaccine composition, a randomized, double blind, placebo-controlled clinical trial (phase I) is initiated.

For clinical development, GMP-grade RNA is produced using an established GMP process, implementing various quality controls on DNA level and RNA level as described in detail in WO 2DIB/I8D43DAI.

In the clinical trial, a cohort of human volunteers is intradermally or intramuscularly injected for at least two times with a monovalent, or a bivalent, or a tetravalent or a multivalent mRNA based Norovirus vaccine as specified herein.

In order to assess the safety profile of the *Norovirus* vaccine compositions according to the invention, subjects are monitored after administration (vital signs, vaccination site tolerability assessments, hematologic analysis).

The efficacy of the immunization is analysed by determination of virus neutralizing titers (VNT) or HBGA blocking titers in sera from vaccinated subjects. Blood samples are collected on day D as baseline and after completed vaccination. Sera are analyzed for virus neutralizing antibodies or HBGA blocking antibodies.

Furthermore, a subset of subjects is challenged with live GI.I Norwalk virus or placebo by oral administration. Subjects are followed post-challenge for symptoms of Norovirus associated illness, infection and immune responses. There are multiple clinical assessments and collection of blood, emesis, saliva, and stool specimens.

Table 1: Norovirus VP1 constructs (row 1 - row 44)

	column 1	column 2	column 3	column 4	column 5	column 6
Raw	**Name**	**NCBI DP Benbank Accession No.**	**A**	**B**	**C**	**Strain/Isolate**
1	VP1	ABYB535D	1	4411	8821, 13231, 17B41, Z2D51. 2B4B1, 30871, 35281	norovirus Hu/Duan/Beijing/2006/China
2	VP1	ACD55DB8	2	4412	8822, 13232, 17B42, 22052, 2B4B2, 30872, 35282	norovirus Hu/GII.4/Dijon/E872/2002/FRA
3	VP1	ADI458D8	3	4413	8823, 13233, 17B43, 22053, 2B4B3, 30873, 35283	norovirus Hu/GGII.4/Dijon/E3020/2008/FRA
4	VP1	ADI4581I	4	4414	8824, 13234, 17B44, 22054, 2B4B4, 30874, 35284	norovirus Hu/GGII.4/Dijon/E343B/2D08/FRA
5	VP1	ADI4581 2	5	4415	8825, 13235, 17B45, 22055, 2B4B5, 30875, 35285	norovirus Hu/GGII.4/Dijon/E3487/20D9/FRA
B	VP1	ADI4581 4	B	441B	882B, 1323B, 17B4B, 2205B, 2B466, 30876, 3528B	norovirus Hu/GGII.4/Dijon/E3G42/2008/FRA
7	VP1	ADI4581 5	7	4417	8827, 13237, 17647, 22057, 264B7, 30877, 35287	norovirus Hu/GGII.4/Dijon/E3743/2009/FRA
8	VP1	ADI4581B	8	4418	8828, 13238, 17B48, 22058, 26468, 30878, 35288	norovirus Hu/GGII.4/0ijon/E3808/2009/FRA
9	VP1	A0I4581 7	9	4419	8829, 13239, 17649, 22059, 264B9, 30879, 35289	norovirus Hu/GGII.4/0ijon/E3880/2009/FRA
10	VP1	ADI4581 8	10	4420	8830, 13240, 17B50, 22060, 26470, 30880, 35290	norovirus Hu/GGII.4/0ijon/E4032/2009/FRA

11	VPI	AET7B29B	!l	442I	883I. I324I, I7G5I, 220BI, 2B471, 30881, 3529I	murine naravirus
I2	VPI	AFBI802B	I2	4422	8832. I3242, I7B52, 220B2, 2B472, 30882. 35292	murine naravirus
I3	VPI	AFBI8D27	I3	4423	8833, I3243, I7B53, 220B3, 2B473, 30883, 35293	murine naravirus
I4	VPI	AFI0823I	I4	4424	8834, I3244, I7B54, 220B4, 2B474, 30884. 35294	naravirus Hu/GI/I0360/20IO/VNM
I5	VPI	AFID824D	I5	4425	8835, I3245, I7B55. 220B5, 2B475, 30885, 35295	naravirus Hu/GII/IOOI2/2009/VNM
IB	VPI	AFS33552	IB	442B	8836, I3246, I7B5B, 220BB, 2B47B, 3088B, 3529B	naravirus Hu/GII.4/M0I20-I2/I987/USA
I7	VPI	AFS33555	I7	4427	8837, I3247. I7B57, 220B7. 2B477, 30887. 35297	naravirus Hu/Bfl.I/7EK/Hawaii/197I/USA
I8	VPI	AFWI5938	I8	4428	8838. I3248, I7B58, 220B8, 2B478, 30888, 35298	narovirus Hu/GII.4/N2/20D8/HuZhou
IB	VPI	AFWI594D	I9	4429	8839, I3249, I7B59, 22069, 2B479, 30889. 35299	naravirus Hu/GII.4/N4/2008/HuZhou
2D	VPI	AFWI594I	20	4430	8840, I3250. I7BB0. 22070. 2B480. 30890, 35300	naravirus Hu/GII.4/N5/2008/HuZhou
2I	VPI	AFWI5944	2I	443I	884I. I325I, I7BBI. 2207I, 26481, 30891, 3530I	narovirus Hu/GII.4/N78/20IO/HuZhau
22	VPI	AFWI5947	22	4432	8842. I3252, I7B62, 22072, 26482, 30892, 35302	naravirus Hu/GII.4/N93/20II/HuZhau
23	VPI	AFWI5948	23	4433	8843, I3253, I7BB3, 22073, 26483. 30893, 35303	narovirus Hu/GII.4/N94/20II/HuZhau
24	VPI	AFWI594B	24	4434	8844, I3254. I7664, 22074, 26484, 30894, 35304	narovirus Hu/GII.4/N95/20II/HuZhau
25	VPI	AFWI595D	25	4435	8845, I3255, I7665, 22075, 26485, 30895, 35305	narovirus Hu/GII.4/NI00/20II/HuZhnu
2B	VPI	AFWI595I	2B	443B	8846, I3256, I7666, 22076, 26486, 30896, 35306	narovirus Hu/GII.4/NI0I/20II/HuZhou
27	VPI	AFX7IBB5	27	4437	8847, I3257, I7667, 22077, 26487, 30897, 35307	narovirus Hu/GII.6/CH0C4073/I984/0SA

28	VPI	AFX7I668	28	4438	8848. I3258, I7G68, 22078. 2G488, 30898, 35308	narovirus Hu/GII.4/NIHIC9/20II/USA
29	VPI	AFX8II2I	29	4439	8849, I3259, I7G69, 22079, 26489, 30899, 35309	narovirus Hu/Narwalk/10034/2009/VNM
30	VPI	AFX8II27	30	4440	8850, I32G0, I7G70, 22080, 2G490, 30900, 353I0	norovirus Hu/Norwalk/10054/2009/VNM
3I	VPI	AFX8II30	3I	444I	885I, I32GI, I7G7I, 2208I, 2G49I. 30901, 353II	norovirus Hu/Norwalk/10062/2009/VNM
32	VPI	AFX8II3G	32	4442	8852, I32G2, I7B72, 22082, 2G492, 30902, 353I2	narovirus Hu/Norwalk/I0075/20D9/VNM
33	VPI	AFX8II30	33	4443	8853, I32G3, I7G73, 22083, 2G493, 30903, 35313	norovirus Hu/Norwalk/10078/2009/VNM
34	VPI	AFX8II42	34	4444	8854, I32G4, 17674, 22084. 26494, 30904, 35314	noravirus Hu/Norwalk/10079/2009/VNM
35	VPI	AFX8II45	35	4445	8855, 13265, 17675, 22085. 2G495, 30905. 35315	norovirus Hu/Norwalk/IOIIO/2009/VNM
30	VPI	AFX8II48	3G	444G	8856, 13266, 17676, 22086, 26496, 30906, 353IG	norovirus Hu/Narwaik/IOII4/2009/VNM
37	VPI	AFX8II54	37	4447	8857, 13267, 17677, 22087, 26497, 30907. 35317	norovirus Hu/Norwalk/10129/2009/VNM
38	VPI	AFX8II57	38	4448	8858, 13268, I7G78. 22088, 26498. 309D8, 35318	norovirus Hu/Norwalk/IOI36/2009/VNM
39	VPI	AFX8II63	39	4449	8859, 13269, 17679, 22089, 26499, 30909, 35319	norovirus Hu/Norwalk/10145/2009/VNM
40	VPI	AFX8IIGG	40	4450	8860, 13270, 17680, 22090, 26500. 30910, 35320	narovirus Hu/Norwalk/10148/2009/VNM
4I	VPI	AFX8II69	4I	445I	8861, 13271, 17681, 22091. 2G501. 30911, 35321	norovirus Hu/Norwalk/10158/2009/VNM
42	VPI	AFX8II72	42	4452	8862, 13272. 17682, 22092, 26502, 30912, 35322	norovirus Hu/Norwalk/10160/2009/VNM
43	VPI	AFX8II78	43	4453	8863, 13273, I7G83, 22093, 2G503, 30913, 35323	norovirus Hu/Norwalk/IO!G3/2009/VNM
44	VPI	AFX8II8I	44	4454	8864, 13274, 17684, 22094, 26504, 30914, 35324	norovirus Hu/Norwalk/IOIG9/2009/VNM

45	VPI	AFX8II9D	45	4455	8865, I3275, I7685, 22095, 26505, 309I5, 35325	norovirus Hu/Norwalk/I0f77/2DOS/VNM
4G	VPI	AFX8II93	46	4456	8866, I3276, I7686, 22096, 26506, 309I6, 35326	norovirus Hu/Norwalk/IOI79/2009/VNM
47	VPI	AFX8II96	47	4457	8867, I3277, I7687, 22097, 26507, 309I7, 35327	norovirus Hu/Norwalk/IOI82/2D09/VNM
48	VPI	AFX8II9B	48	4458	8868, I3278, I7688, 22098, 26508, 30918, 35328	nDrovirus Hu/Norwalk/IOI83/2009/VNM
49	VPI	AFX8I202	49	4459	8869, I3279, I7689, 22099, 26509, 30919, 35329	norovirus Hu/Norwalk/IOI94/2009/VNM
50	VPI	AFX8I205	50	4460	8870, I3280, I7690, 22I00, 265I0, 30920, 35330	norovirus Hu/Norwalk/IOI99/2Q09/VNM
5I	VPI	AFX8I208	5!	446I	887I, I328I. I769I, 22I0I, 265II, 30B21, 3533I	norovirus Hu/Norwalk/10203/2009/VNM
52	VPI	AFX8I2II	52	4462	8872, I3282, I7692, 22ID2, 265I2, 30922, 35332	norovirus Hu/Norwalk/10204/2009/VNM
53	VPI	AFX8I2I4	53	4463	8873, I3283, I7B93, 22I03, 2B5I3. 30923, 35333	norovirus Hu/Norwalk/10222/2009/VNM
54	VPI	AFX8I226	54	4464	8874, I3284. I7694, 22I04, 265I4, 30924, 35334	norovirus Hu/Norwalk/10238/2009/VNM
55	VPI	AFX8I229	55	4465	8875, I3285, I7695, 22I05, 265I5, 30925. 35335	norovirus Hu/Norwalk/10247/2009/VNM
56	VPI	AFX8I232	56	4466	887B, I328B, I7B9B, 22I06, 265IB, 3092B, 35336	norovirus Hu/Norwalk/10255/2009/VNM
57	VPI	AFX8I238	57	4467	8877. I3287, I7697, 22I07, 265I7, 30927, 35337	norovirus Hu/Norwalk/I029G/20IO/VNM
58	VPI	AFX8I24I	58	4468	8878, I3288, I7698, 22I08, 265I8, 30928. 35338	norovirus Hu/Norwalk/10313/2010/VNM
59	VPI	AFX8I247	59	4469	8879. I3289. I7699, 22I09, 265I9, 30929, 35339	norovirus Hu/Norwalk/I0328/2D1D/VNM
60	VPI	AFX8I250	60	4470	8880, I3290, I7700, 22II0, 2652D, 30930, 35340	norovirus Hu/Norwalk/I03B8/2DIO/VNM
6I	VPI	AFX8I253	6I	447I	888I,I32BI,I770I,22III,2B52I, 30931, 3534I	norovirus Hu/Norwalk/I0378/20ID/VNM

B2	VPI	AFX8I25B	B2	4472	8882. I3292, I7702, 22II2. 2B522, 30932. 35342	norDvirus Hu/Norwalk/10386/2010/VNM
63	VPI	AFX8I2B2	B3	4473	8883. I3293, I7703, 22113. 2B523. 30933, 35343	noravirus Hu/Norwalk/200IO/2009/VNM
B4	VPI	AFX8I2B5	B4	4474	8884, 13294, 17704, 22114, 2B524, 30934, 35344	noravirus Hu/Norwalk/20014/2009/VNM
65	VPI	AFX8I2B8	B5	4475	8885, 13295, I77D5, 2215, 26525, 30935, 35345	noravirus Hu/Norwalk/200I6/2009/VNM
6B	VPI	AFX8I27I	BB	447B	888B, I329B, I770B, 22116. 2B52B. 3093B. 3534B	noravirus Hu/Norwalk/200I9/2009/VNM
B7	VPI	AFX8I274	B7	4477	8887. 13297, 17707, 22117. 26527, 30937, 35347	noravirus Hu/Norwalk/20033/2009/VNM
B8	VPI	AFX8I277	B8	4478	8888, 13298, 17708, 22118, 2G528, 30938, 35348	noravirus Hu/Norwalk/20025/2009/VNM
B9	VPI	AFX8I283	B9	4479	8889, 13299, 17709, 22119, 2G529, 30939, 35349	noravirus Hu/Norwalk/2D 047/2 009/VNM
70	VPI	AFX8I289	70	4480	8890, 13300, 17710, 22120, 26530. 30940, 35350	noravirus Hu/Norwalk/20067/2009/VNM
7I	VPI	AFX8I292	7I	448I	8891, 13301, 17711, 22121, 2B531, 30941, 35351	noravirus Hu/Norwalk/2006B/2009/VNM
72	VPI	AFX8I295	72	4482	8892, 13302, 17712. 22122, 2B532, 30942, 35352	norovirus Hu/Norwalk/20092/2009/VNM
73	VPI	AFX8I298	73	4483	8893, 13303, 17713, 22123, 26533, 30943, 35353	noravirus Hu/Norwalk/20093/2009/VNM
74	VPI	AFX8I30I	74	4484	8894, 13304, 17714, 22124, 2B534, 30944. 35354	noravirus Hu/Norwalk/20094/2009/VNM
75	VPI	AFX8I3D4	75	4485	8895, 13305, 17715, 22125, 2B535, 30945, 35355	noravirus Hu/Norwalk/20II8/2009/VNM
7B	VPI	AFX8I307	7B	448B	8896, 13306. 17716, 22I2B, 2B53B, 30946, 35356	noravirus Hu/Norwalk/20122/2009/VNM
77	VPI	AFX8I3I3	77	4487	8897, 13307, 17717, 22127, 26537, 30947, 35357	noravirus Hu/Norwalk/20128/2009/VNM
78	VPI	AFX8I3IB	78	4488	8898, 13308. 17718. 22128, 2B538, 30948, 35358	noravirus Hu/Norwalk/20I35/2009/VNM

79	VP1	AFX8I3I9	79	4489	8899, 13300, 17719, 22129, 2B533, 30949, 35359	naravirus Hu/Norwalk/20139/2009/VNM
8D	VP1	AFX8I322	8D	4490	8900, 13310, 17720, 22130, 2B540, 30950, 353B0	norovirus Hu/Norwalk/20I40/200e/VNM
8I	VPI	AFX8I325	8I	4491	8901, 13311,17721, 22131, 2B54I, 30951, 353BI	norovirus Hu/Norwalk/20142/2009/VNM
82	VPI	AGE89433	82	4492	8902, 13312, 17722. 22132, 2B542, 30352, 353B2	norovirus Hu/GII/IOIOI/2009/VNM
83	VPI	AGE8943B	83	4493	8903, 13313, 17723, 22133, 2B543, 30953, 353B3	norovirus Hu/GII/10127/2009/VNM
84	VPI	AGE89439	84	4494	8904, 13314, 17724, 22134, 2B544, 30954, 353B4	norovirus Hu/GII/10370/2010/VNM
85	VPI	AGE89442	85	4495	8905, 13315, 17725, 22135, 2B545, 30955, 353B5	norovirus Hu/GII/I0405/20I0/VNM
8B	VPI	AGE89445	8B	449B	890B, 13316. I772B. 22I3B, 2B54B, 3095G, 353BB	norovirus Hu/GII/IO4OG/2OI0/VNM
87	VPI	AGE89448	87	4497	8907, 13317, 17727, 22137, 2B547, 30957, 353B7	norovirus Hu/GII/I04II/20I0/VNM
88	VPI	AGE8945I	88	4498	8908, 13318, 17728, 22138, 2B548, 30958, 353B8	norovirus Hu/GII/10420/2010/VNM
89	VPI	AGE89454	89	4499	8909, 13319, 17729, 22139, 2B549, 30959, 353B9	norovirus Hu/GII/20048/2009/VNM
90	VPI	AGE89457	90	4500	8910, 13320, 17730, 22140, 2B550. 309BQ, 35370	norovirus Hu/GII/200B4/2009/VNM
9I	VPI	AGE894B0	91	4501	8911, 13321, 17731, 22141, 2B55I, 309BI, 35371	norovirus Hu/GII/20079/2009/VNM
92	VPI	AGE894B3	92	4502	8912, 13322, 17732, 22142, 2B552. 309B2, 35372	norovirus Hu/BII/20107/2009/VNM
93	VPI	AGE894GB	93	4503	8913. 13323, 17733, 22143, 2B553, 309B3, 35373	norovirus Hu/GII/20108/2009/VNM
94	VPI	AGE89472	94	4504	8914, 13324, 17734, 22144, 2B554, 309B4, 35374	norovirus Hu/GII/20I4B/2009/VNM
95	VPI	AGE89475	95	4505	8915, 13325. 17735, 22145, 2B555, 309B5, 35375	norovirus Hu/GII/20150/2009/VNM

9B	VPI	AGE83478	3B	450B	89IB, I332B. I773B, 22I4B. 2B55B, 3D9BB, 3537B	norovirus Hu/GII/20151/2009/VNM
97	VPI	AGE8848I	97	45D7	89I7, I3327. I7737, 22I47, 2B557. 3Q967. 35377	norovirus Hu/GII/2DI53/2009/VNM
98	VPI	AGE83490	98	4508	89I8, I3328. I7738. 22I48. 2B558. 303B8, 35378	norovirus Hu/GII/20159/2009/VNM
99	VPI	AGE89493	33	4509	899I3, I3323. I773B. 22I49. 2B559, 3D9BB. 35379	norovirus Hu/Gll/20I6I/200B/VNM
IDD	VPI	AGE8949B	I00	45I0	8323. I333D, I7740, 22I5D, 2B5B0, 30970, 35380	norovirus Hu/GII/20IB2/2009/VNM
IOI	VPI	AGE83433	IOI	45II	892I, 13331. 17741, 22151, 2B5BI, 30371, 35381	norovirus Hu/GII/20IG4/2009/VNM
I02	VPI	AGE83502	I02	45I2	8322, 13332, 17742, 22152, 2B5B2, 30372, 35382	norovirus Hu/GII/2DI7l/2009/VNM
I03	VPI	AGE895D5	ID3	45I3	8323, 13333, 17743, 22153, 2B5B3, 30973, 35383	norovirus Hu/GII/20172/2009/VNM
I04	VPI	ABE89508	I04	45I4	8324, 13334, 17744, 22154, 26564, 30974, 35384	norovirus Hu/GII/20173/2009/VNM
I05	VPI	AGE895II	I05	45I5	8325, 13335, 17745, 22155, 26565, 30375, 35385	norovirus Hu/GII/2DI76/2009/VNM
IDE	VPI	AGE835I4	10B	45IB	8326, I333B, I774B, 22I5B, 2656B, 30976, 35386	norovirus Hu/GII/20180/2009/VNM
ID7	VPI	AGE835I7	I07	45I7	8927, 13337, 17747, 22157, 26567, 30977. 35387	norovirus Hu/GII/20182/2009/VNM
IDS	VPI	AGE89520	I08	45I8	8928, 13338, 17748, 22158, 26568, 3D978. 35388	norovirus Hu/Gll/20184/2009/VNM
ID3	VPI	AGE83523	IDS	45I9	8923, 13339, 17743, 22153. 2B5B3, 3D97B, 35389	norovirus Hu/GII/2DI85/2009/VNM
HO	VPI	AGE8352B	HO	452D	893D, 13340, I775D, 22160, 26570, 30380, 35390	norovirus Hu/GII/20187/2009/VNM
1II	VPI	AGE89529	III	452I	8931, 13341, 17751, 22161, 26571, 30981. 35331	norovirus Hu/Gll/20I89/2B09/VNM
II2	VPI	AGE89532	II2	4522	8332. 13342, 17752, 22IB2, 26572, 30982, 35332	norovirus Hu/GII/20l3D/2009/VNM

II3	VPI	AGE89535	113	4523	8933, 13343, 17753, 22163, 26573. 30983, 35393	norovirus Hu/GII/20192/2009/VNM
II4	VPI	AGE89538	114	4524	8934. 13344. 17754, 22164, 26574, 30984, 35394	norovirus Hu/GII/20I9G/2D09/VNM
tI5	VPI	AGE8954I	II5	4525	8935, 13345, 17755, 221B5, 26575, 30985, 35395	norovirus Hu/GII/20198/2009/VNM
IIG	VPI	AGE89544	116	4526	8936, 13346, 17756, 22IB6, 26576, 30986, 3539B	norovirus Hu/GII/20202/2009/VNM
117	VPI	AGE89547	117	4527	8937, 13347, 17757, 22IB7, 26577, 30987, 35397	norovirus Hu/GII/20205/2009/VNM
II8	VPI	AGE8955D	118	4528	8938, 13348, 17758, 22168, 26578, 30988, 35398	norovirus Hu/GII/20206/2009/VNM
I19	VPI	AGE89553	119	4529	8939, 13349, 17759, 22IB9, 2B579, 30989, 35399	norovirus Hu/GII/20208/2009/VNM
I2D	VPI	AGE89556	120	4530	8940, 13350, 17760, 22170. 26580. 30990, 35400	norovirus Hu/GII/202I5/20D9/VNM
I21	VPI	AGE89559	121	4531	8941. 13351. 17761, 22171, 26581, 30991, 35401	norovirus Hu/GII/20217/2009/VNM
122	VPI	AGE895G2	122	4532	8942, 13352, I77B2, 22172, 26582, 30992, 35402	norovirus Hu/GII/20229/2009/VNM
123	VPI	AGE895B5	123	4533	8943, 13353, 17763, 22173, 26583, 3D993, 35403	norovirus Hu/GII/20230/2009/VNM
I24	VPI	AGE8956 8	124	4534	8944, 13354, 17764, 22174, 26584, 30994, 35404	norovirus Hu/GII/20233/2009/VNM
125	VPI	AGE8957I	125	4535	8945, 13355, 17765. 22175, 26585, 30995, 354D5	norovirus Hu/GII/20248/2009/VNM
I26	VPI	AGE89574	I2B	453B	8948. I335B, I77BB, 22I7B, 2658B, 30996, 35406	norovirus Hu/GII/20258/2009/VNM
I27	VPI	AGE89577	127	4537	8947, 13357, I77B7, 22177, 2B587, 30997, 35407	norovirus Hu/GII/20263/2009/VNM
I28	VPI	AGE8958D	128	4538	8948, 13358, I77B8, 22178, 26588, 30998, 35408	norovirus Hu/GII/2027I/2009/VNM
I29	VPI	AGE89583	129	4539	8949, 13359, I77B9, 22179, 2B589, 30999, 35409	norovirus Hu/GII/20276/2009/VNM

I3D	VPI	AGE8B58B	I3D	4540	8950, I33B0, I7770, 22I80, 2B590, 3I000, 354I0	narovirus Hu/GII/20302/2009/VNM
I3I	VPI	AGE89589	I3I	454I	895I, I33BI, I777I, 22181. 26591, 31001, 35411	norovirus Hu/GII/20344/2009/VNM
I32	VPI	AGE89592	I32	4542	8952, I33B2, 17772, 22182, 2B592, 31002, 35412	norovirus Hu/GII/20350/2009/VNM
I33	VPI	AGE89595	I33	4543	8953, I33B3, 17773, 22183, 2B593, 31003, 35413	norovirus Hu/GII/20357/2009/VNM
I34	VPI	AGE89598	I34	4544	8954, I33B4, 17774, 22184, 26594, 31004, 35414	norovirus Hu/GII/20365/2010/VNM
I35	VPI	AGE89GDI	I35	4545	8955, 13365, 17775, 22185, 2B595, 31005, 35415	norovirus Hu/GII/20373/2010/VNM
I3B	VPI	AGE89BD4	I3B	454B	8956, 13366, 17776, 22I8B, 2B596, 3I00B, 354IB	norovirus Hu/GII/20407/20ID/VNM
I37	VPI	AGE89B07	I37	4547	8957, I33B7, 17777, 22187, 26597, 31007, 35417	norovirus Hu/GII/204I3/20I0/VNM
I38	VPI	AGE89BI0	I38	4548	8958, 13368, 17778, 22188, 2B598, 31008, 35418	norovirus Hu/GII/20424/2010/VNM
139	VPI	AGE89GI3	I39	4549	8959, 13369, 17779, 22189, 2B599, 31009, 35419	norovirus Hu/GII/20448/2010/VNM
I40	VPI	AGE89BIB	I40	4550	8960, 13370, 17780, 22190, 2BB00, 31010, 35420	norovirus Hu/GII/2D457/20ID/VNM
I4I	VPI	AGE89B22	I4I	455I	8961, 13371, 17781, 22191, 26601, 31011. 35421	norovirus Hu/GII/20469/20IQ/VNM
I42	VPI	AGE89B25	I42	4552	8962, 13372, 17782, 22192, 26602, 31012, 35422	norovirus Hu/GII/2D477/20I0/VNM
I43	VPI	AGE89B28	I43	4553	8963, 13373, 17783, 22193. 26B03. 31013, 35423	norovirus Hu/GII/20478/20IQ/VNM
I44	VPI	AGE89B3I	I44	4554	8964. 13374, 17784, 22194, 26604, 31014. 35424	norovirus Hu/GII/300I7/20D9/VNM
I45	VPI	AGE89B34	I45	4555	8965. 13375, 17785, 22195, 26605, 31015, 35425	norovirus Hu/GII/3002B/2009/VNM
I4B	VPI	AGE89B37	I4B	455B	8966, 13376, 17786, 22196, 26606, 31016, 3542B	norovirus Hu/GII/30040/2009/VNM

I47	VPI	ABE8BB4D	I47	4557	89B7, I3377, I7787, 22I37, 2BB07, 3I0I7, 35427	norovirus Hu/GII/30045/2009/VNM
I48	VPI	AGE83B43	I48	4558	89B8. I3378, I7788, 22I38. 2BB08, 3I0I8, 35428	naravirus Hu/GII/30II2/2009/VNM
I49	VPI	AGE83B4B	I43	4553	8369. I3373. I7783. 22I33, 26609, 3I0I3. 35429	naravirus Hu/GII/30113/2008/VNM
I5D	VPI	AGE89B43	I50	45BD	8S70, I3380, I7730, 22200, 2BBI0, 3I020, 35430	naravirus Hu/GII/30129/2009/VNM
I5I	VPI	AGE89652	I5I	45BI	837I, I338I, 17731. 22201, 2BBII, 31021, 35431	naravirus Hu/GII/30133/2009/VNM
I5Z	VPI	AGE89655	I52	45G2	8372, 13382, 17732, 22202. 2BBI2, 3ID22, 35432	naravirus Hu/GII/3020l/2B09/VNM
I53	VPI	AGE83B58	I53	45B3	8373, 13383, 17733, 22203, 2BBI3, 31023, 35433	naravirus Hu/GII/3020G/2009/VNM
I54	VPI	AGE83BBI	I54	45B4	8374, 13384, 17794, 22204, 2BBI4, 31024. 35434	norovirus Hu/GII/30207/2003/VNM
I55	VPI	AGE83BB4	I55	45B5	8375, 13385, 17735, 22205, 2BBI5, 3ID25, 35435	naravirus Hu/GII/302tI/2009/VNM
I5B	VPI	AGE83BB7	I5B	45BB	8976. I338B. I7796, 2220B, 2BBIB, 31026, 35436	naravirus Hu/GII/30212/2009/VNM
I57	VPI	AGE83B73	I57	45B7	8377, 13387, I7797, 22207, 26BI7, 31027, 35437	naravirus Hu/GII/30266/2003/VNM
I58	VPI	AGE33BD3	I58	45B8	8978, 13388, 17798, 22208. 2BBI8, 31028, 35438	naravirus Hu/GII.4/NIHIC4.I/20II/USA
I59	VPI	AGII7592	I59	4569	8979, 13389, 17799, 22203, 26613, 31023. 35439	naravirus Hu/GII.I7/CI42/I978/GUE
IBD	VPI	AGII7534	IBO	4570	8380, I33B0. 17800, 22210, 26620, 31030, 35440	norovirus Hu/GII.3/NIHIC8.I/20II/USA
I6I	VPI	AGK3B3II	IBI	457I	8381, 13331, 17801, 22211, 26621, 31031, 35441	norovirus Hu/GII.4/20I99/2009/VNM
IBZ	VPI	AGK3636I4	IB2	4572	8382, 13392, 17802, 22212, 26622, 31032, 35442	norovirus Hu/GII.4/20406/20IO/VNM
IB3	VPI	AGM332D8	IB3	4573	8883, 13333, 17803, 22213, 26623, 31033, 35443	naravirus Hu/GI.I/CHA7A009/20IO/USA

IB4	VPI	AGM332I4	IB4	4574	8984. I3394, I7804, 222I4. 2BB24. 31034, 35444	narovirus Hu/GI.I/CHA6A003_2009I028/2QQ9/OSA
IB5	VPI	AGM332I7	IB5	4575	8985, 13395, 17805, 22215. 2BB25, 31035, 35445	norovirus Hu/GI.I/CHA2AOI4/20D8/USA
IBB	VPI	AGM3322D	IBB	457B	898B. I339G, I780B, 222IB, 2BB2B, 3I03B, 3544B	narovirus Hu/GI.I/CHABA007/2DID/USA
IB7	VPI	AGM3322G	IB7	4577	8987, 13397, 17807, 22217, 2BB27, 31037, 35447	nornvirus Hu/GI.I/CH4X0533/2009/USA
IB8	VPI	AGM3322B	IB8	4578	8988, 13398, 17808, 22218, 2BB28, 31038, 35448	norovirus Hu/GI.I/CHA5AOIO/20Q9/USA
IB9	VPI	AGM33232	IB9	4579	8989, 13399, I78D9. 22219, 2BB29, 31039, 35449	naravirus Hu/GIJ/CHA9A004_20II042B/20II/USA
I70	VPI	AGM33235	I7D	4580	8990, 13400, 17810. 22220, 2BB30, 31040, 35450	norovirus Hu/GI.I/Cr!AEAQI4/2009/USA
I7I	VPI	AGM33238	I7I	458I	8991. 13401, 17811, 22221, 2GB31, 31041, 35451	naravirus Hu/GI.I/CHA3A007/2008/USA
I72	VPI	AGM33241	I72	4582	8992, 13402, 17812, 22222, 2BB32, 31042, 35452	naravirus Hu/GI.I/CHA7A0II/20I0/USA
I73	VPI	AGM33244	I73	4583	8993, 13403, 17813, 22223. 2BB33, 31043, 35453	naravirus Hu/GI.I/CHABA003_2009II04/2009/OSA
I74	VPI	AGQ59890	I74	4584	8994, 13404, 17814, 22224, 2BB34, 31044, 35454	murine naravirus 1
I75	VPI	AGTI7782	I75	4585	8995, 13405, 17815, 22225, 2BB35, 31045, 35455	naravirus Hu/GII.4/NIHIC28.4/2OI2/0SA
I7B	VPI	AGTI7785	I7G	458B	8996, I340B, 17816. 2222B, 2BB3B. 3I04B, 3545B	narovirus Hu/GI,I/8MalllL/I972/USA
I77	VPI	AGTI7788	I77	4587	8997, 13407. 17817, 22227, 2GB37, 31047, 35457	narovirus Hu/GII.4/NIHICI7.7/ZDI2/USA
I78	VPI	AGTI7792	I78	4588	8998, 13408, 17818, 22228, 2BB38, 31048, 35458	naravirus Hu/Gi,I/8W/I9G8/USA
I79	VPI	AGTI7795	I79	4589	8999, 13409, 17819, 22229, 2B639, 31049, 35459	narovirus Hu/GII.4/NIHICI3/20II/USA
I8D	VPI	AGTI7798	ISO	4590	9000, 13410, 17820, 22230, 2BB40, 31050, 354B0	naravirus Hu/GII.4/NIHICI.I3/20I2/USA

I8I	VPI	AGTI78B3	I8I	459I	9ODI, I34II. I782I, 2223I, 2BB41, 3IO51 354BI	norovirus Hu/GI.f/8Mcill/ig73/USA
I82	VPI	AGTI780B	I82	4532	3DB2, I34I2. I7822, 22232, 2BB42, 3ID52, 354B2	norovirus Hu/GI.I/8CKIIIc/I974/USA
I83	VPI	ABTI78D9	I83	4533	30D3, I34I3, I7823, 22233, 2BB43, 3I053, 354B3	norovirus Hu/GI.I/8UIIIf /ie73/USA
I84	VPI	AGTI78I3	I84	4534	3004, I34I4, I7824, 22234, 2BB44, 3I054, 354B4	norovirus Hu/GII.4/NIHICI7.I/Z0IZ/USA
I85	VPI	AGTI78IB	I85	4535	9005, I34I5, I7825, 22235, 2BB45, 3I055, 354B5	norovirus Hu/GII.4/NIHIC27.I/20I2/USA
IBB	VPI	AGTI78IB	IBB	4596	900B, I34IB, I782B, 2223B, 2BB4B, 3ID5B, 354BB	norovirus Hu/GII.4/NIHICI8,I/20I2/0SA
I87	VPI	AGTI7823	I87	4597	9007, 13417. 17827, 22237, 2BB47, 31057, 354B7	norovirus Hu/GII.4/NIHICI.3/20IO/OSA
I88	VPI	AGTI782G	I88	4598	9008, 13418, 17828, 22238, 2BB48, 31058, 354B8	norovirus Hu/GI.I/8K/I979/USA
I89	VPI	AGTI7830	I89	4599	9009, 13413, 17823, 22233, 2BB43, 3I059, 354B9	norovirus Hu/GII.4/NIHIC28.5/2OI2/0SA
I90	VPI	AGTI7833	ISO	4B00	3010, 13420, 17830, 22240, 2BB5D, 3IDB0, 35470	norovirus Hu/GII.4/NIHIC20/20I2/0SA
IBI	VPI	AGTI783B	IBI	4BBI	3011, 13421, 17831, 22241, 2BB51, 31061. 35471	norovirus Hu/GI.I/8MC/I978/USA
I92	VPI	AGTI7842	I92	46D2	3012. 13422, 17832, 22242, 2BB52, 3I0B2, 35472	norovirus Hu/GII.4/NIHICI.5/ZDII/USA
I93	VPI	AGUB8328	I93	4BD3	3013, 13423, 17833, 22243, 2BB53, 3I0B3, 35473	norovirus PAI3/20I3/ITA
I94	VPI	AGX8588B	I94	4BB4	9014, 13424, 17834, 22244, 2BB54, 3I0B4, 35474	norovirus Hu/GII.4/NIHICI.8/20I2/USA
I95	VPI	AGX85892	I95	4GD5	9015, 13425, 17835, 22245, 2BB55, 3I0B5, 35475	norovirus Hu/GII.4/NIHICI.I0/2DI2/USA
IBB	VPI	AGX85895	I9B	4B0B	30IB, I342B, I783B, 2224B, 2BB5B, 3I0BB, 3547B	norovirus Hu/GII.4/NIHICI.7/20I2/USA
I97	VPI	AGX85904	I97	4B07	3017, 13427, 17837, 22247, 26657. 3I0B7, 35477	norovirus Hu/GII.4/NIHIC27.2/2DI2/USA

I98	VPI	AGX859I3	I98	4B08	90I8, I3428, I7838. 22248. 2BB58, 3I0B8. 35478	norovirus Hu/Gll.4/NIHICI.I4/20I2/USA
I89	VPI	AGX859IB	I99	4B09	90I9, I3429, I7839. 22249, 26659, 3I0B9, 35479	norovirus Hu/Gll.4/NIHICI7.6/20I2/USA
200	VPI	AGX8593I	200	4BI0	9020, I3430, I7840, 22250, 2BBB0, 3I07D, 3548D	norovirus Hu/GII.4/NIHICI.I2/2DI2/USA
20I	VPI	AGX85934	20I	4BII	902I, I343I, I784I, 2225I, 266BI, 3I071, 3548I	norovirus Hu/Gll.4/NIHICI.II/20I2/USA
202	VPI	AHI59I54	202	4BI2	9022, I3432, I7842, 22252, 26662, 31072. 35482	narovirus Hu/GII.6/HS245/20IO/USA
203	VPI	AHI59I57	203	4BI3	9023. 13433, 17843, 22253. 266B3, 31073. 35483	**norovirus Hu/ GII.4/HS232/2DIZ/USA**
204	VPI	AHI59I59	204	4BI4	9024, 13434. 17844. 22254, 2BBB4, 31074, 35484	narovirus Hu/GII.2/HS255/20ll/USA
205	VPI	AHK24788	205	4BI5	9025, 13435, 17845, 22255, 2BB65. 31075, 35485	murine norovirus
20B	VP!	AHX220I8	20B	4BIB	9026, 13436, 17846, 22256, 266B6. 31076, 35486	norovirus Hu/Gll/BGIC0434/20I2/BGD
207	VPI	AHX2202I	207	4BI7	9027, 13437. 17847, 22257, 26667, 31077. 35487	narovirus Hu/GII/BGIC0204/20ll/BGD
208	VPI	AHX22025	208	4BI8	9028. 13438, 17848, 22258, 2BBB8. 31078, 35488	norovirus Hu/GII/BGIC0282/20ll/BGD
209	VPI	AHX22028	2D9	4BI9	9029, 13439, 17849, 22259, 26669, 31079, 35489	norovirus Hu/Gll/BGIC039I/20I2/BGD
2I0	VPI	AHX22032	2I0	4B20	9030, 13440. 17850, 22260, 26670. 31080, 35490	narovirus Hu/GII/BGIC00B6/2DII/BG0
2II	VPI	AHX22038	2II	4B2I	9031, 13441. 17851, 22261, 26671. 31081, 35491	narovirus Hu/Gll/BGIC0398/20I2/BGD
2I2	VPI	AHX2204I	2I2	4B22	9032, 13442, 17852, 22262, 26672, 31082, 35492	norovirus Hu/Gll/BGIC0405/20I2/BG0
2I3	VPI	AHX22047	2I3	4B23	9033, 13443, 17853, 22263, 26673, 31083, 35493	norovirus Hu/GII/BGIC0004/20IO/BGD
2I4	VPI	AHX22050	2I4	4B24	9034, 13444, 17854, 22264, 26674, 31084, 35494	narovirus Hu/GII/BGIC024l-33/20ll/BGD

215	VP1	AHX22054	215	4G25	9035. 13445, 17855, 222B5, 2BB75, 31085, 35495	norovirus Hu/GII/BGIC0270/20ll/BGD
21	VP1	AIA9B988	216	4G2B	9036, I344B, I785B, 222GB, 26676, 31086, 35496	norovirus Gil
217	VP1	AII025B9	217	4B27	9037, 13447, 17857, 22267, 26677, 31087, 35497	norovirus Hu/GII/l0IIB/2009/VNM
218	VP1	AIID2572	218	4B28	9038, 13448, 17858, 22268, 2BB78, 31088, 35498	norovirus Hu/GII/10054/2009/VNM
219	VP1	AII02575	219	4B29	9039, 13449, 17859, 222B9, 26679, 31089, 35499	norovirus Hu/GII/10114/2009/VNM
220	VP1	AII02578	220	4B30	9040, 13450, 17860, 22270, 2BB80, 31090, 35500	norovirus Hu/Gll/I03I3/2DI0/VNM
221	VP1	AII0258I	221	4B3I	9041, 13451, 17861, 22271, 26681, 31091, 35501	norovirus Hu/GII/30212/2009/VNM
222	VP1	AII02584	222	4G32	9042, 13452, 17862. 22272, 26682, 31092, 35502	norovirus Hu/GII/IOI48/2009/VNM
223	VP1	AII02590	223	4633	9043, 13453, 17863, 22273, 26683, 31093, 35503	norovirus Hu/GII/IOIIO/2009/VNM
224	VP1	AII02593	224	4B34	9044, 13454, 17864, 22274, 2B684, 31094, 35504	norovirus Hu/GII/10325/2010/VNM
225	VP1	AII0259B	225	4B35	9045, 13455, 17865, 22275, 26685, 31095, 35505	norovirus Hu/GII/IOIOI/2009/VNM
229	VP1	AII02599	22B	4B3G	9046, I345B, I78B6, 22276, 2668B, 31096, 35506	norovirus Hu/GII/10002/2009/VNM
227	VP1	AII02B02	227	4B37	9047, 13457, I7867, 22277, 2BB87, 31097, 35507	norovirus Hu/GII/3035I/2009/VNM
228	VP1	AII02605	228	4G38	9048, 13458, 17868. 22278, 2B688, 31098. 35508	norovirus Hu/GII/30448/20ID/VNM
229	VP1	AII02B08	229	4B39	9049, 13459, 17869, 22279, 26689, 31099. 35509	norovirus Hu/GII/30468/20IQ/VNM
230	VP1	AII02BI4	230	4B40	9050, 13460. 17870. 22280, 2BB90, 31100, 35510	norovirus Hu/GII/IOI93/2009/VNM
231	VP1	AII02G23	231	4B4I	9051, 13461, 17871, 22281, 26B91. 31101 35511	norovirus Hu/GII/20088/2009/VNM

232	VPI	AIID2626	232	4642	9052, 13462. 17872. 22282, 26692, 31102, 35512	norovirus Hu/GII/20II8/200B/VNM
233	VPI	AIID2629	233	4G43	9053, 13463, 17873, 22283. 26693, 3110 3, 3551 3	nnrovirus Hu/GII/C2H-20/2DII/VNM
234	VPI	AII02632	234	4644	9054, 13464, 17874, 22284, 26694, 3110 4, 35514	norovirus Hu/GII/10173/2009/VNM
235	VPI	AIID2635	235	4645	9055, 13465, 17875, 22285, 26695, 31105, 35515	norovirus Hu/GII/IOI36/200a/VNM
236	VPI	AIID2638	236	4646	9056, 13466, 17876, 22286, 26696, 3110 6, 3551 6	norovirus Hu/GII/C2033/20IO/VNM
237	VPI	AII0264I	237	4647	9057, 13467, 17877, 22287, 26697, 31107, 35517	norovirus Hu/GII/20151/2000/VNM
238	VPI	AIID2644	238	4648	9058. 13468, 17878, 22288, 26698, 31108, 35518	norovirus Hu/GII/20460/2010/VNM
239	VPI	AIID2647	239	4649	9059, 13469, I787B, 22289, 26699, 31109, 3551 9	norovirus Hu/GII/10199/2009/VNM
240	VPI	AIID265D	24D	4G5D	9060, 13470, 17880, 22290, 26700, 3 1110, 35520	norovirus Hu/GII/C2007/20IO/VNM
24I	VPI	AII02653	241	4651	9061, 13471, 17881, 22291, 26701, 3IIII, 35521	norovirus Hu/GII/20066/2009/VNM
242	VPI	AIID2656	242	4652	9062, 13472, 17882, 22292, 26702, 31112, 35522	norovirus Hu/GII/20479/2010/VNM
243	VPI	AII02659	243	4653	9063, 13473, 17883, 22293, 26703. 3113, 35523	norovirus Hu/GII/10012/2009/VNM
244	VPI	AII02662	244	4654	9064, 13474. 17884, 22294, 26704, 3114, 35524	norovirus Hu/GII/C2H-24/20II/VNM
245	VPI	AII02665	245	4655	9065, 13475, 17885, 22295, 26705, 3111 5, 35525	norovirus Hu/GII/10062/2009/VNM
246	VPI	AIID2668	246	4656	9066, 13476, 17886, 22296, 26706, 3111 6, 35526	norovirus Hu/GII/20494/20ID/VNM
247	VPI	AIID267I	247	4657	9067. 13477, 17887, 22297, 26707. 3111V. 35527	norovirus Hu/GII/10079/2009/VNM
248	VPI	AII02674	248	4658	9068, 13478. 17888. 22298, 26708, 3111 8, 35528	norovirus Hu/GII/C2H-3I/20II/VNM

249	VPI	AIID2677	249	4659	9069, I3479, I7889, 22299, 26709, 3III9, 35529	naravirus Hu/GII/I0285/20IO/VNM
25D	VPI	AIID268D	250	4660	9070, I3480, I7890, 22300, 2670, 3II20, 35530	nnrovirus Hu/GII/30399/2010/VNM
25I	VPI	AII02683	25I	4BBI	907I, I348I, I789I, 2230I, 267II, 31121, 35531	norovirus Hu/GII/IOI82/20D9/VNM
252	VPI	AIID2689	252	46B2	9072, 13482, 17892, 22302, 26712, 31122, 35532	norovirus Hu/GII/IOI58/2D09/VNM
253	VPI	AII02692	253	4B63	9073. 13483, 17893, 22303, 26713, 31123, 35533	naravirus Hu/GII/10176/2009/VNM
254	VPI	AIID2695	254	4664	9074, 13484, 17894, 22304, 26714, 31124, 35534	nnrovirus Hu/GII/2DI50/2009/VNM
255	VPI	AII02G98	255	46B5	9075, 13485, 17895, 22305, 2B7I5, 31125, 35535	naravirus Hu/GII/10204/2009/VNM
25G	VPI	AII027DI	256	466B	9076, 13486. 17896, 22306, 26716, 31126, 35536	naravirus Hu/GII/10034/2009/VNM
257	VPI	AIID27D7	257	4BB7	9077, 13487. 17897, 22307, 26717, 31127, 35537	naravirus Hu/GII/I0075/20D9/VNM
258	VPI	AIID27ID	258	4BB8	9078, 13488, 17898, 22308, 26718, 31128, 35538	naravirus Hu/GII/!0074/2009/VNM
259	VPI	AII027I3	259	46B9	9079, 13489, 17899, 22309, 26719, 31129. 35539	naravirus Hu/GII/C2H-25/2DII/VNM
260	VPI	AIID27I6	260	4670	9080, 13490, 17900, 22310, 26720, 31130, 35540	norovirus Hu/GII/C2H-27/20II/VNM
2BI	VPI	AII027I9	26I	467I	9081, 13491, 17901, 22311, 26721, 31131, 35541	naravirus Hu/GII/20486/2010/VNM
262	VPI	AIID2722	262	4B72	9082, 13492, 17902, 22312, 26722, 31132, 35542	naravirus Hu/GII/3DIIG/2009/VNM
263	VPI	AIID2725	263	4B73	9083, 13493. 17003, 22313, 26723, 31133, 35543	norovirus Hu/GII/IOI08/2009/VNM
264	VPI	AIID2728	264	4B74	9084, 13494. 17904, 22314, 26724, 31134, 35544	norovirus Hu/GII/3024I/2009/VNM
265	VPI	AIID273I	265	4B75	9085, 13495, 17905, 22315, 2B725, 31135, 35545	naravirus Hu/GII/30443/2010/VNM

2GB	VPI	AII02734	2BB	4B7B	9D8B, I349B. I7906. 223IB, 26726, 31136. 35546	norovirus Hu/GII/20092/2009/VNM
2677	VPI	AIID2737	2677	4B77	9087, 13497, 17907, 22317, 26727, 31137, 35547	norovirus Hu/BII/20079/2009/VNM
2688	VPI	AIID274D	2G8	4B78	9088, 13498, 17908, 22318, 26728, 31138, 35548	naravirus Hu/GH/10137/2000/VNM
2B9	VPI	AIID2743	2B9	4B79	9089, 13499, I7909, 22319, 26729, 31139, 35549	naravirus Hu/GII/10051/2009/VNM
27D	VPI	AII0274B	270	4G80	9090, 13500, 17910, 22320, 26730, 31140, 35550	norovirus Hu/GII/C2H-36/20II/VNM
27I	VPI	AIIQ274B	27I	4G8I	9D9I, 13501, 17911, 22321. 26731, 31141, 35551	narovirus Hu/GII/20145/2009/VNM
272	VPI	AII02752	272	4B82	9092, 13502, 17912. 22322, 26732, 31142, 35552	norovirus Hu/GII/20188/2009/VNM
273	VPI	AIID2758	273	4G83	9093, 13503, 17913, 22323, 26733, 31143, 35553	norovirus Hu/GII/20357/2009/VNM
274	VPI	AIID27BI	274	4B84	9094, 13504, 17914, 22324, 2B734, 31144, 35554	norovirus Hu/GII/C24I8/20ID/VNM
275	VPI	AII027B4	275	4B85	9095, 13505, 17915, 22325, 26735, 31145, 35555	norovirus Hu/GII/IOI95/200B/VNM
27B	VPI	AII027B7	27B	4B86	9096, I350B, 17916, 22326, 2673B, 31146, 3555G	norovirus Hu/GII/20067/2009/VNM
277	VPI	AIIQ2770	277	4B87	9097, 13507, 17917, 22327, 26737, 31147, 35557	norovirus Hu/GII/C2H-47/20II/VNM
278	VPI	AII02773	278	4B88	9098, 13508, 17918, 22328, 26738, 31148, 35558	norovirus Hu/GII/20107/2009/VNM
270	VPI	AIIG277B	279	4B89	9099, 13509, 17919. 22329, 26739, 31149, 35559	norovirus Hu/GII/30473/2010/VNM
280	VPI	AIIB277B	280	4B90	9100, 13510, 17920, 22330. 26740, 31150. 35560	norovirus Hu/GII/10078/2009/VNM
28I	VPI	AIID2782	28I	4B9I	9101.13511,17921,22331,26741. 31151. 35561	norovirus Hu/GII/20108/2009/VNM
282	VPI	AII02785	282	4692	9102. 13512, 17922, 22332, 26742, 31152, 35562	norovirus Hu/GII/20154/2009/VNM

283	VP1	AIID2788	283	4693	9I03, I35I3. I7923, 22333, 26743, 31153. 35563	norovirus Hu/BII/3038l/20IO/VNM
284	VP1	AII0279I	284	4694	9104, 13514, 17924, 22334, 26744, 31154, 35564	norovirus Hu/GII/C2H-48/20ll/VNM
285	VP1	AII02794	285	4695	9105, 13515, 17925, 22335, 26745, 31155, 35565	norovirus Hu/BII/C2035/20IO/VNM
286	VP1	AII02797	286	4696	9106, 13516, 17926, 22336, 26746, 31156, 35566	norovirus Hu/GII/IOI27/2009/VNM
287	VP1	AII028DD	287	4697	9107, 13517, 17927, 22337, 26747, 31157, 35567	norovirus Hu/GII/10194/2009/VNM
288	VP1	AII028D3	288	4698	9108, 13518, 17928, 22338, 26748, 31158, 35568	norovirus Hu/GII/30257/2009/VNM
289	VP1	AIID28D6	289	4699	9109, 13519, 17929, 22339, 26749, 31159, 35569	norovirus Hu/GII/10129/2009/VNM
290	VP1	AII028D9	290	4700	9110, 13520, 17930, 22340, 26750, 31160, 35570	norovirus Hu/GII/C2H-50/20ll/VNM
29I	VP1	AII028I2	29I	470I	9111,13521,17931,22341,26751, 3116I, 3557I	norovirus Hu/GII/30303/2009/VNM
292	VP1	AIID28I5	292	4702	9112, 13522, 17932, 22342, 26752. 31162, 35572	norovirus Hu/GII/C2H-55/20ll/VNM
293	VP1	AIID28I8	293	4703	9113, 13523, 17933, 22343. 26753, 31163, 35573	norovirus Hu/GII/C2365/20IO/VNM
294	VP1	AIIQ282I	294	4704	9114, 13524, 17934, 22344, 26754, 31164, 35574	norovirus Hu/GII/C2H-44/20ll/VNM
295	VP1	AIID2824	295	4705	9115, 13525, 17935, 22345, 26755, 31165, 35575	norovirus Hu/GIl/10!B9/2D09/VNM
296	VP1	AIID2827	296	4706	9116, 13526, 17936, 22346, 26756, 31166, 35576	norovirus Hu/GII/20093/2009/VNM
297	VP1	AIID2830	297	4707	9117, 13527, 17937, 22347, 26757, 31167, 35577	norovirus Hu/GII/10255/2009/VNM
298	VP1	AIID2833	298	4708	9118, 13528, 17938, 22348, 26758. 31168, 35578	norovirus Hu/GII/C2H-62/20ll/VNM
299	VP1	AIID2836	299	4709	9119, 13529, 17939, 22349, 26759, 31169, 35579	norovirus Hu/GII/10235/2009/VNM

30Q	VP1	AII02839	300	47I0	9I20, I3530. I7940, 22350, 2G7B0, 3II70, 35580	noravirus Hu/GII/20146/2000/VNM
30I	VP1	AII02842	30I	47II	9I2I. 13531. 17941, 22351, 2B7BI, 31171, 35581	norovirus Hu/GII/20123/2009/VNM
3D2	VP1	AII02845	302	47I2	9122, 13532, 17942, 22352, 2B7B2, 31172, 35582	norovirus Hu/GII/20370/2010/VNM
3D3	VP1	AII02848	303	47I3	9123, 13533, 17943, 22353, 2B7B3, 31173, 35583	norovirus Hu/GII/C2H-45/20ll/VNM
3D4	VP!	AII0285I	304	47I4	9124, 13534, 17944, 22354, 2B7B4, 31174, 35584	norovirus Hu/GII/IOI83/2009/VNM
305	VP1	AII02854	305	47I5	9125, 13535, 17945, 22355, 2B7B5, 31175, 35585	norovirus Hu/GII/20069/2009/VNM
30B	VP1	AII02857	30B	47IB	9I2B, I353B, I794B, 2235B, 2B7BB, 3II7B, 3558B	norovirus Hu/GII/C2H-43/2DII/VNM
307	VP1	AII028B0	307	47I7	9127, 13537, 17947, 22357, 2B7B7, 31177, 35587	norovirus Hu/GII/10145/2009/VNM
308	VP1	AII028BB	308	47I8	9128, 13538, 17948, 22358, 2B7B8, 31178, 35588	norovirus Hu/Gll/I0IB0/2D09/VNM
308	VP1	AII028BB	309	47I9	9129, 13539, 17949, 22359, 2B7B9, 31179, 35589	norovirus Hu/GII/10223/2009/VNM
3I0	VP1	AII02872	3I0	4720	9130, 13540, 17950, 223B0, 2B770, 31180, 35590	norovirus Hu/GII/10003/2009/VNM
3II	VP1	AII02875	3II	472I	9131, 13541, 17951, 223BI, 2B771, 31181. 35591	norovirus Hu/GII/30192/2010/VNM
3I2	VP1	AII02878	3I2	4722	9132, 13542, 17952, 223B2. 2B772, 31182, 35592	norovirus Hu/GII/20493/2010/VNM
3I3	VP1	AII0288I	3I3	4723	9133, 13543, 17953, 223B3, 2B773, 31183, 35593	norovirus Hu/GII/IOI3l/2009/VNM
3I4	VP1	AII02884	3I4	4724	9134, 13544, 17954, 223B4, 2B774, 31184, 35594	norovirus Hu/GII/IO238/2009/VNM
3I5	VP1	AII02887	3I5	4725	9135, 13545, 17955, 223B5, 2B775, 31185, 35595	norovirus Hu/GII/30400/2010/VNM
3I6	VP1	AII02890	3IB	472B	9I3B, I354B. I795B, 223BB, 2B77B, 3II8B, 35596	norovirus Hu/GII/20153/2009/VNM

3I7	VPI	AII02893	3I7	4727	9I37, I3547. I7957, 223B7, 2B777. 3II87, 35597	norovirus Hu/GII/10037/2009/VNM
3I8	VPI	AII02896	3I8	4728	**9I3B.** I3548, I7958. 223B8, 2B778, 3II88, 35598	norovirus Hu/GII/20144/2009/VNM
3IB	VPI	AII02899	3I9	4729	9139. 13549. 17959, 223B9, 2B779, 3I189, 35599	norovirus Hu/GII/C2H-39/20II/VNM
320	VPI	AII02902	320	4730	9I4D, 13550, 17960. 22370, 2B78B, 31190, 35600	norovirus Hu/GII/20122/2009/VNM
32I	VPI	AIS24557	32I	473I	9141, 13551, **17961.** 22371, 2B781, 31191. 35B0I	norovirus Gil
322	VPI	AIY30I35	322	4732	9142, 13552, I79B2, 22372, 2B782, 31192, 35B02	murine norovirus
323	VPI	AKEQ7I00	323	4733	9143, 13553, I79B3, 22373, 2B783, 31193, 35B03	norovirus Gil
324	VPI	AKE07I03	324	4734	9144, 13554. I79B4. 22374, 2B784, 31194, 35B04	norovirus Gil
325	VPI	AKE07I0B	325	4735	9145, 13555, I79B5, 22375, 2B785, 31195, 35B05	norovirus Gil
32G	VPI	ALQI22B0	32B	473B	9I4G, I355B, I79BB, 2237G, 2B78B, **31196.** 35B06	norovirus cat/GVI.2/TE/77-I3/ITA
327	VPI	BAI49904	327	4737	9147. 13557. 17967, 22377, 26787. 31197, 35607	norovirus **Hu/GII.4 / Hiroshima/I9/200I/JPN**
328	VPI	BAI49905	328	4738	9148. 13558, 17968, 22378, 2B788, 31198, 35608	norovirus Hu/GII.4/Hiroshima/42/2004/JPN
329	VPI	BAI4990B	329	4739	9149, 13559, 17969, 22379, 26789, 31199, 35609	norovirus Hu/GII.4/Hiroshima/44/2004/JPN
330	VPI	BAI49907	330	4740	9150, 13560, 17970, 22380, 26790, 31200. 35610	norovirus Hu/GII.4/Hiroshima/48/2004/JPN
331	VPI	BAI499D9	33I	474I	9151. 13561, 17971, 22381. 26791, 31201, 35611	norovirus Hu/GII.4/Hiroshima/56/2005/JPN
332	VP!	BAI499ID	332	4742	9152, 13562, 17972, 22382, 2B792, 31202, 35BI2	norovirus Hu/GII.4/Hiroshima/57/2005/JPN
333	VPI	BAI499II	333	4743	9153, I35B3, 17973, 22383, 26793, 31203, 35613	norovirus Hu/GII.4/Hiroshima/58/2005/JPN

334	VP1	BAI499I2	334	4744	9154. I35B4, 17974, 22384, 2B734, 31204, 35BI4	norovirus Hu/GII.4/Hiroshima/59/2005/JPN
335	VP1	BAI499I4	335	4745	9155, I35B5, 17975, 22385, 2B795, 31205, 35BI5	narovirus Hu/GII,4/Hiroshima/67/2006/JPN
336	VP1	BAI499IB	33B	474B	9I5B, I35BB, I797B, 2238B, 2B79B, 3I20B, 35BIB	norovirus Hu/GII.4/Hiroshima/69/2006/JPN
337	VPI	BAI499I7	337	4747	9157, I35B7, 17977, 22387, 26797, 31207, 35BI7	norovirus Hu/GII.4/Hiroshima/74/2006/JPN
338	VPI	BAI499I8	338	4748	9158, 13568, 17378, 22388, 26738, 3I2D8, 35618	norovirus Hu/GII.4/Hiroshima/9l/200G/JPN
339	VPI	BAI49BI9	339	4749	9153, I35B9, 17373, 22389, 26739, 31203, 35BI3	norovirus Hu/GII,4/Hiroshima/92/2006/JPN
340	VPI	BAI49920	34D	4750	9160, 13570, 17380, 22390, 2B800, 31210, 35B20	norovirus Hu/Bll.4/Hiroshima/I08/2007/JPN
341	VPI	BAI4992I	341	4751	9161, 13571, 17981, 22391, 26801, 31211, 35621	norovirus Hu/Gll.4/Hiroshima/I09/2007/JPN
342	VPI	BAI49923	342	4752	9162, 13572, 17982, 22392, 26802, 31212, 35622	norovirus Hu/GII.4/Hiroshima/ll5/2007/JPN
343	VP1	BAI49924	343	4753	9163, 13573, 17983, 22393, 26803, 31213, 35623	norovirus Hu/Gll.4/Hiroshima/I29/2007/JPN
344	VPI	BAI48925	344	4754	9164, 13574. 17984, 22394, 26804, 31214, 35624	norovirus Hu/Gll.4/Hiroshima/I34/2007/JPN
345	VPI	BAI4992B	345	4755	9165, 13575, 17985. 22395. 26805, 31215. 35625	norovirus Hu/Gll.4/Hiroshima/I39/2007/JPN
34B	VPI	BAI49927	34B	475B	9I6B, I357B, I798B, 22396, 26806, 31216, 3562B	narovirus Hu/GII.4/Hirashima/l5l/2008/JPN
347	VPI	BAI49928	347	4757	9167. 13577, 17987, 22397, 26807. 31217, 35B27	narovirus Hu/Gll.4/Hiroshima/I54/2008/JPN
348	VPI	BAJ25070	348	4758	9168, 13578, 17988, 22398, 26808, 31218, 35B28	norovirus Hu/0C05024/2005/JP
349	VPI	BAJ25D72	349	4759	BIBB. 13579, 17989, 22399, 26803, 31219, 35629	narovirus Hu/OCOB060/2006/JP
350	VPI	BAJ2507B	35D	47B0	9170, 13580, 17990, 22400, 26810, 31220, 35630	norovirus Hu/0H0701l/2007/JP

35I	VPI	BANI6283	35I	47BI	9I7I, I358I, I799I, 2240I, 268II, 3I221, 3563I	narovirus Hu/GII.6/Ehirne090B46/2009/JP
352	VPI	BANI6285	352	47B2	9I72, I3582, I7992, 22402. 268I2, 3I222. 35632	narovirus Hu/GII.6/Ehime090056/2009/JP
353	VPI	BANI6287	353	4763	9I73. I3583, I7993, 22403, 268I3, 3I223, 35633	narovirus Hu/GII.6/Ehime090549/2009/JP
354	VPt	BANI6289	354	47B4	9I74, I3584, 17994. 22404, 26814, 31224, 35B34	norovirus Hu/GIIMhimel20246/20I2/JP
355	VPI	BANI629I	355	4765	9175. 13585. 17995, 22405, 2B8I5, 31225, 35B35	narovirus Hu/GII.6/Ehim E050007/2005/JP
356	VPI	BANI6293	35B	476B	9176, I358B, 17996, 22406, 2B8I6. 31226, 35636	narovirus Hu/GII.6/Ehima04I525/2004/JP
357	VPI	BANI6295	357	47B7	9177, 13587, 17997, 22407, 2B8I7, 31227, 35B37	norovirus Hu/GII.6/Ehime03H63/2003/JP
358	VPI	BANIB267	358	47B8	9178, 13588, 17998, 22408, 26818, 31228, 35638	narovirus Hu/GII.6/Ehime030769/2003/JP
356	VPI	BAR42289	359	47B9	9179, 13589, 17999, 22409, 26819, 31229, 35639	narovirus Hu/GII/JP/20I5/GII.PI7_GII.I7/Kawasaki308
36D	VPI	BAR47BI6	3BB	477D	9180, 13590, 18000, 22410, 26820, 31230, 35640	norovirus Hu/GII/JP/20I4/GII.PI7_GII.I7/Nagano7-I
36I	VPI	BAR6371I5	3BI	477I	9181, 13591, 18001, 22411, 26821, 31231 35641	norovirus Hu/GII/JP/20I3/GII.PI7_GII.I7/Saitama5203
362	VPI	BAR6371I8	3B2	4772	9182, 13592. 18002. 22412. 26822, 31232, 35642	norovirus Hu/GII/JP/20I3/GII.PI7_GII.I7/Saitama53D9
363	VPI	BAR6372I	3B3	4773	9183, 13593, 18003, 22413, 26823, 31233, 35643	norovirus Hu/GII/JP/20I4/GII.PI7_GII.I7/Nagana8-I
364	VPI	BASD2D83	3B4	4774	9184, 13594, 18004, 22414, 26824, 31234, 35644	norovirus Hu/GII/JP/20I5/GII.PB_GII.4/Dsaka/0SF78
365	VPI	CRL46952	3B5	4775	9185. 13595, 18005, 22415, 26825, 31235, 35645	norovirus GI/Hu/NL/2DII/GI,4/Groningen
366	VPI	CRL46955	3BB	477B	9186, 13596, I800B, 224IB. 2682B. 3I23B, 35B4B	norovirus GI/Hu/NL/2012/GI.B/Graningen
367	VPI	CRL46958	3B7	4777	9187, 13597, 18007, 22417, 2B827. 31237, 35647	norovirus GII/Hu/NL/20I2/GII.4/Groningen

368	VPI	CRL4B9BI	3B8	4778	3188, 13538, 18008, 22418, 2B828, 31238, 35B48	norDvirus BII/Hu/NL/20l4/GII,4/GroningBnOl
3BB	VPI	CRL4B3B4	3B3	4773	3183, I353B, 18003, 2241B, 2B823, 3I239, 35B49	**norovirus GII/Hu/NL/20f4/GII.4/BroningenD2**
37B	VPI	CRL4BBB7	370	478D	9130, I3B00, 18010, 22420, 2B830, 3I240, 35B50	norovirus GII/Hu/NL/20!4/GII.E/Groningen
371	VPI	CRL4BB7B	371	4781	9191, I36Ol, 18011, 22421, 26831, 3I241, 35B5I	norovirus Gll/Hu/NL/20l4/Gll,2l/Groningen
372	VPI	CRL4B373	372	4782	3192, I3B02, 18012, 22422, 2B832, 31242, 35B52	norovirus GII/Hu/NL/20l4/GII.2/GroningBn
373	VPI	CRL4G37B	373	4783	3133, I3B03, 18013, 22423, 2B833, 31243, 35B53	norovirus **Glf/Hu/NL/2Dl2/Gll.4/Nijmegen0t**
374	VPI	CRL4B37B	374	4784	3134, I3B04, 18014, 22424, 2B834, 31244, 35B54	norovirus GII/Hu/NL/20l2/GII.4/NijmBgen02
375	VPI	ABC3B332	375	4785	BI35, I3B05, 18015, 22425, 2B835, 31245, 35B55	norovirus Hu/Guangzhou/NVgzOI/CHN
37B	VPI	A0B27D27	37B	478B	3I3B, I3B06. 18016. 22426, 2B83B, 3I24B, 35B5B	norovirus HU/GII.4/NBW DrlBansl500/2008/0SA
377	VPI	AEEIBDD3	377	4787	9137, 13607. 18017, 22427. 26837. 31247, 35B57	murine norovirus GV/NIH-2410/2005/OSA
378	VPI	AEEIBDDB	378	4788	9188, I3B08, 18018. 22428, 2B838, 31248, 35658	murine norovirus GV/NIH-24II/2005/USA
379	VPI	AEEIBDB3	373	4783	9199, 13609, 18013, 22429, 2B839, 31249, 35659	murine norovirus GV/NIH-2747/2O05/USA
38B	VPI	AEEIBDI5	380	4790	9200, 13610. 18020, 22430, 26840, 31250, 35660	murine norovirus GV/NIH-442I/2005/0SA
381	VPI	AEEIBBI8	381	4791	9201, 13611, 18021. 22431, 26841, 31251, 35BBI	murinB norovirus GV/NIH-4428/2005/0SA
382	VPI	AEEIDB2I	382	4792	9202, 13612, 18022, 22432, 26842, 31252. 35BB2	murinB norovirus GV/NIH-443I/2005/0SA
383	VPI	AEEIDB24	383	4733	3203, 13613, 18023, 22433, 26843, 31253, 35BB3	murinB norovirus GV/NIH-AII4/2006/OSA
384	VPI	AEEIDB27	384	4734	3204, 13614, 18024, 22434, 2B844, 31254, 35664	murinB norovirus GV/NIH-D22D/2007/0SA

385	VPI	AGI9B385	385	4795	9205, I3BI5, 18025, 22435, 2B845, 31255, 35B65	norovirus Hu/GII.I/0hio/509/20IZ/USA
386	VPI	AGI9B397	38B	479B	920B, I3BIB, I802B, 2243B. 2B84B, 3I25B, 35BBB	norovirus Hu/GII.G/Ohio/490/2012/USA
387	VPI	AGI9B398	387	4797	9207, I3BI7, 18027, 22437, 2B847, 3I257, 35BB7	norovirus Hu/GII.I/Ohio/507/2012/OSA
388	VPI	AGI9B399	388	4798	9208, I3618, 18028, 22438, 2B848, 31258, 35668	norovirus Hu/GII.I/Ohio/765/2012/USA
389	VPI	AGJ52I75	389	4799	9209, 13619, 18029, 22439. 26849, 31259, 35BB9	norovirus Hu/GI/HuzhouNlf/ZDDS/CHN
39D	VPI	AGX0I092	390	4800	9210, 13620, 18030, 22440. 2B850, 31260, 35670	norovirus Hu/Gl.2/Jingzhou/20I340I/CHN
391	VPI	AGX0I095	391	4801	9211, 13621, 18031, 22441, 26851, 31261, 35B7I	norovirus Hu/Gll,3/Jingzhou/20I3402/CHN
392	VPI	AGX0I098	392	4802	9212, 13622, 18032, 22442, 26852, 3I262, 35672	norovirus Hu/Gll.4/Jingzhou/20I3403/CHN
393	VPI	AKI300B0	393	4803	9213, 13623, 18033, 22443. 26853, 31263, 35B73	norovirus Hu/GII.I7/GaithErsburg/20l4/US
394	VPI	BAQ945I4	394	4804	9214, 13624, 18034, 22444, 26854, 31264, 35674	norovirus Hu/GII.I3/D8N2045/2008/NP
395	VPI	BAQ945IB	395	4805	9215, I3B25, 18035, 22445. 26855. 3I2B5, 35675	norovirus Hu/GII,I3/08N2250/2008/NP
396	VPI	BAQ94520	39G	480B	9216, 13626. 18036, 2244B, 2B856, 312B6, 3567B	norovirus Hu/GII.I3/09N3I45/20Q9/NP
397	VPI	BAQ94524	397	4807	9217, I3B27, 18037, 22447, 26857, 31267, 35B77	norovirus Hu/GII.I3/09N320B/2009/NP
398	VPI	BAQ9452B	398	4808	9218, I3B28, I8D38, 22448, 26858, 31268, 35678	norovirus Hu/GII.I3/09N3223/2D09/NP
399	VPI	ACV89840	399	4809	9219, I3B29, I8D39, 22449, 2B859, 31269, 35B79	norovirus dog/GVI.I/HKU_Ca026F/2007/HKG
400	VPI	ACV89843	400	4810	9220, I3B30, I8D40, 22450, 2B860, 31270, 35680	norovirus dog/GVI.I/HK0_Ca035F/2007/HKG
401	VPI	AFV4804B	401	4811	9221, 13631. 18041. 22451, 26861, 31271, 35B8I	norovirus Rn/GV/HK0_CT2/HKG/20ll

402	VPI	AFV48048	402	4812	9222, I3B32, I8B42, 22452, 2G8B2, 31272, 35B82	norovirus Rn/GV/HKUJCT/HKG/2012
403	VP!	AGH06682	403	4813	9223, I3B33, 18043, 22453, 2B863, 31273, 35B83	norovirus rat/GI/KSI2/I3Q5/DNK
404	VPI	AGL984I3	404	4814	9224, I3B34, 18044, 22454, 2B8B4, 31274, 35B84	norovirus Hu/GII.4/CI27/GF/1978
405	VPI	AGL984I4	405	4815	9225, 13635, 18045, 22455, 26865, 31275, 35B85	norovirus Hu/GII/KL45/MY/I978
406	VPI	AGL984I6	40B	48IB	922B, I3B3B, I804B, 2245B, 2B8BB, 3I27B, 35B86	norovirus Hu/GII/T09I/TN/I976
407	VPI	BAL60749	407	4817	9227, 13637, 18047, 22457, 26867. 31277, 35B87	norovirus Hu/GII,2/DC05II4/2005/JP
408	VPI	BAL60753	4D8	4818	9228, 13638, 18048, 22458. 26868, 3I278, 35688	norovirus Hu/GII,2/0C05I45/2005/JP
409	VPI	BALB0755	409	4819	9229, I3B39, 18049, 22459, 26869, 3I279, 35689	norovirus Hu/GII,2/OC06005/200B/JP
410	VPI	BALB0759	410	4820	9230, 13640, 18050, 22460, 2B870, 3I280, 35B90	norovirus Hu/GII.2/0C060I4/20DB/JP
411	VPI	BALB07B7	41	4821	9231, 13641, 18051, 22461, 26871, 3I281, 35691	norovirus Hu/GII,2/0C08I24/2008/JP
412	VPI	BALB07B9	412	4822	9232, 13642, 18052, 22462, 2B872, 3I282, 35B92	norovirus Hu/GII,2/DCD8I54/2008/JP
413	VPI	BALB077I	413	4823	9233, I3B43, 18053, 224B3, 26873, 31283, 35693	norovirus Hu/GII.2/0C09044/2009/JP
414	VPI	BALB0773	414	4824	9234, 13644, 18054, 22464, 26874, 31284, 35694	norovirus Hu/GII.2/0H0G023/2006/JP
415	VPI	BALB0775	415	4825	9235, 13645, I8D55, 22465, 2B875, 31285, 35B95	norovirus Hu/GII.2/OHD700I/2007/JP
416	VPI	BAL60777	4IB	482B	9236, 13646, I805B, 224B6, 26876, 3I286, 3569B	norovirus Hu/GII.2/OH070I3/2007/JP
417	VPI	BALG0779	417	4827	9237, I3B47, 18057, 224B7, 2B877, 31287, 35B97	norovirus Hu/GII.2/0H08009/20D8/JP
418	VPI	BALB078I	418	4828	9238, I3B48. 18058, 22468, 26878, 31288, 35698	norovirus Hu/GII.2/0HD80I9/2008/JP

419	VP1	BALB0783	419	4829	3233, 13649, 18059, 224B9, 2B879, 31289, 35699	nDrDvirus HU/GII.2/OH08020/2008/JP
420	VP1	BALB0785	420	4830	924B, I3G50, I80B0, 22470, 26880, 31230, 35700	norovirus Hu/GII.2/DH08029-2/20D8/JP
421	VPI	BALB079I	421	4831	3241, 13651, 18061, 22471, 26881, 31231, 35701	norovirus Hu/GII.2/0C09I03/2009/JP
422	VPI	BALB0793	422	4832	9242, 13652, 18062, 22472, 26882, 31292, 35702	norovirus Hu/BII.2/0C09I04/2009/JP
423	VPI	BALB0795	423	4833	3243, I3B53, 18063, 22473. 26883, 31233. 35703	norovirus Hu/GII.2/0CD9ID9-2/2D03/JP
424	VPI	BALB0797	424	4834	9244, 13654, 18064, 22474, 26884, 31234, 35704	norovirus HU/GII.2/0CI0009/20ID/JP
425	VPI	BALB079B	425	4835	3245, I3B55, I80G5, 22475, 26885, 31295, 35705	norovirus Hu/GII.2/OCIOOI2-2/20IO/JP
42B	VPI	BALB080I	42B	483B	924B. I3B56. 18066, 22476, 26886. 31296, 35706	nnrovirus Hu/GII.2/OCIOOI8-2/20IO/JP
427	VPI	BALB0803	427	4837	3247, 13657. 18067. 22477, 26887, 31297, 35707	norovirus Hu/GII.2/OCIOOI9/20IO/JP
428	VPI	BALB0805	428	4838	3248, 13658, 18068, 22478, 26888, 31298, 35708	norovirus Hu/GII.2/OCI002G/20IO/JP
429	VPI	BALB0809	42B	4839	3243, I3B53, I80G9, 22473, 26883, 31233, 35703	norovirus Hu/GII.2/0H09028/2DD9/JP
430	VPI	BALB08II	430	4840	3250, I36B0, 18070, 22480, 26890, 31300, 35710	norovirus Hu/GII.2/0H09029/2009/JP
431	VPI	BALB08I3	431	4841	9251, 13661, 18071, 22481, 26891, 31301. 35711	norovirus Hu/GII,2/OH09030/2009/JP
432	VPI	BALB08I5	432	4842	9252, 13662, 18072, 22482, 26892, 31302, 35712	norovirus Hu/GII.2/DH03032/20D9/JP
433	VPI	BALB08I7	433	4843	9253, 13663, 18073. 22483. 26893, 31303, 35713	norovirus Hu/GII.2/0H03034/2OO3/JP
434	VPI	BALB08I9	434	4844	9254, 13664, 18074, 22484, 26894, 31304, 35714	norovirus Hu/GII.2/0H09035/2009/JP
435	VPI	BAL6082I	435	4845	9255, 13665, 18075, 22485, 26895, 31305, 35715	norovirus Hu/GII.2/DHIOODI/20IO/JP

436	VPI	BAL6D823	43G	484B	9256, I3BBB. 18076. 2248B, 2B896, 3I30B, 35716	naravirus Hu/GII.2/0HI0005-2/20l0/JP
437	VPI	BAL6D825	437	4847	9257, I36B7, 18077, 22487, 2B897, 31307, 35717	norovirus Hu/GII.2/0HI00O6/20IO/JP
438	VPI	BAL60827	438	4848	9258, I36G8, 18078, 22488, 26898, 31308, 35718	norovirus Hu/GII.2/0HI0007/20IO/JP
439	VPI	BALBD823	439	484B	9259, I3BBB, 18079, 22480, 26898, 31309, 35719	norovirus Hu/GII.2/QHI0008/20IO/JP
440	VPI	BALB083I	44D	4850	92B0, 13670, 18080, 22490, 26900, 31310, 35720	norovirus Hu/GII.2/OHIO0ll-2/2DIO/JP
441	VPI	BALB0833	441	4851	92BI, 13671, 18081, 22491. 2B901, 31311, 35721	norovirus Hu/GII.2/OHIOOI2/20IO/JP
442	VPI	BALBD835	442	4852	9262, 13672, 18082, 22492, 26902, 31312. 35722	norovirus Hu/GII.2/OHIOOI3/20IO/JP
443	VPI	BALBD837	443	4853	9263, 13673. 18083. 22493, 26903, 31313, 35723	norovirus Hu/GII.2/OHIOOI5-2/20IO/JP
444	VPI	BAL60839	444	4854	9264, I3B74, 18084, 22494, 26904, 31314, 35724	norovirus Hu/GII.2/0HI0020/20ID/JP
445	VPI	BAL6084I	445	4855	92B5, 13675, 18085, 22495. 2B905, 31315, 35725	norovirus Hu/GII.2/OHI002l/20IO/JP
446	VPI	BALBD843	446	485B	926B, 13676, 18086, 22496, 26906, 31316, 3572B	norovirus Hu/GII.2/DHID024/20IO/JP
447	VPI	BALBD845	447	4857	9267, 13677, 18087, 22497, 26907, 31317, 35727	norovirus Hu/GII.2/OHI0025/20IO/JP
448	VPI	BALBD847	448	4858	92B8, 13678, 18088, 22498, 26908, 31318, 35728	norovirus Hu/GII.2/0HI002B/2OIO/JP
44B	VPI	BAL6084B	443	4859	9269, 13679, 18089, 22499, 26909, 31319, 35729	norovirus Hu/GII.2/DHI0029/20IO/JP
45D	VPI	BAL6D85I	450	4860	9270. 13680, 18090, 22500, 26910, 31320. 35730	norovirus Hu/GII.2/OHI003l/20IO/JP
451	VPI	AATD0378	451	4861	9271, 13681, 18091, 22501, 26911, 31321, 35731	norovirus Sydney 2212
452	VPI	AB095934	452	4862	9272, 13682, 18092, 22502, 26912, 31322, 35732	norovirus Gil

453	VP1	A6G495D9	453	48B3	9273, I3B83, I8D93, 22503, 2B9I3, 31323, 35733	norovirus Hu/GII.4/MD-2004/2004/US
454	VP1	ABP88833	454	48B4	9274, 13684, I8D94, 22504, 26914, 31324, 35734	norovirus Hu/Guangzhou/NV-VPI/2006/China
455	VPI	ABY2756D	455	4865	9275. 13685, 18095, 22505, 26915, 31325, 35735	norovirus Hu/Houston/TCHI8B/2002/0S
456	VPI	ACT76I39	456	486B	9276, I3B8B, 18096, 22506. 2B9IB, 31326, 3573B	norovirus Hu/GII.4/CH0C5l9l/l974/US
457	VPI	ACT7BI42	457	4867	9277, 13687, 18097, 22507, 26917. 31327, 35737	norovirus Hu/GII.4/CHDC2094/l974/US
458	VPI	ACT76I45	458	4868	9278, 13688, 18098, 22508, 26918, 31328, 35738	norovirus Hu/Gll.4/CHDC39B7/I988/0S
45B	VPI	ACT76I48	459	48B9	9279, 13689, 18099. 225D9. 26919, 3I329, 35739	norovirus Hu/GII.4/CHOC4IOB/l987/US
460	VPI	ACT76I5I	46D	487D	9280, 13690, 18100, 22510, 26920, 31330, 35740	norovirus Hu/GII.4/CHDC487l/l977/US
461	VPI	ACX3I82I	461	4871	9281. 13691. 18101. 22511, 26921, 31331, 3574!	norovirus Hu/GII.4/Rivieral53D/Z0D8/US
462	VPI	ACX3I837	462	4872	9282, 13692, 18102, 22512, 26922, 31332. 35742	norovirus Hu/GII.4/NSW5l5L/2007/AU
463	VPI	ACX3I84I	4B3	4873	9283, 13693, 18103. 22513, 26923, 31333, 35743	norovirus Hu/GII.4/VIC3863/20D7/AU
464	VPI	ACX3I85I	4B4	4874	9284, 13694, 18104, 22514, 26924, 31334, 35744	norovirus Hu/GII.4/NSW6l8P/2008/AU
465	VPI	ACX3I856	4B5	4875	9285, I3B95, 18105, 22515, 2B925, 31335. 35745	norovirus Hu/GII.4/NSW536S/ZDD8/AU
466	VPI	ACX3I8BD	46B	487B	928B. 13696. 18106, 22516. 2692B. 31336, 35746	norovirus Hu/GII.4/NSW587V/ZDD7/AU
467	VPI	ACX3I8B4	4B7	4877	9287, 13697, 18107, 22517, 26927, 31337, 35747	norovirus Hu/GII.4/NSW8D6J/ZDD8/AU
468	VPI	ACX3I889	468	4878	9288. I3G98, 18108, 22518, 2B928, 31338, 35748	norovirus Hu/GII.4/0range/NSWOOIP/20O8/AU
469	VPI	ACX3I893	4B9	487B	9289, 13699. 18109, 22519, 26929, 31339, 35749	norovirus Hu/Gll.g-GII.I2/StGBorge/NSWI99U/2D08/AU

47D	VPI	ACXG9259	470	4880	9290, 13700, 18110. 22520, 26930, 31340, 35750	nQrovirus dog/GVI.I/Bari/91/2007/ITA
471	VPI	ADF47I3I	471	4881	9291. 13701, IBM. 22521, 2G931, 31341, 35751	norovirus Hu/Shanghai/SH3I2/2D09/CHN
472	VPI	A0R788G9	472	4882	9292, I37D2, 18112, 22522, 26932, 31342, 35752	norovirus Hu/GII.4/Hong Kong/CUQG0027/200G/CHN
473	VPI	ADR78872	473	4883	9293, 13703, 18113. 22523, 26933, 31343, 35753	norovirus Hu/GII.4/Hong Kong/CU0600I2/2006/CHN
474	VPI	A0R78875	474	4884	9294, 13704, 18114, 22524, 26834, 31344, 35754	norovirus Hu/GII.4/Hong Kong/CU0G0036/2006/CHN
475	VPI	ADR78878	475	4885	9295, 13705, 18115, 22525, 26935, 31345, 35755	norovirus Hu/GII.4/Hong Kong/C00600D9/2006/CHN
47G	VPI	ADR7888I	476	4886	9296, 13706, 18116, 2252G, 26936, 31346, 35756	norovirus Hu/GII.4/Hong Kong/C0060028/2006/CHN
477	VPI	ADR78884	477	4887	9297, 13707, 1811V. 22527, 2B937. 31347, 35757	norovirus Hu/GII.4/Hong Kong/C0060026/2006/CHN
478	VPI	ADR78887	478	4888	9298, 13708, 18118. 22528, 2G938, 31348, 35758	norovirus Hu/GII.4/Hong Kong/C0060D30/2006/CHN
479	VPI	ADR7889Q	479	4880	92[illegible], 13709, 18119, 22529, 2B339. 31349, 35759	norovirus Hu/GII.4/Hong Kong/C0060037/2006/CHN
48D	VPI	ADR78893	480	4890	9300, 13710, 18120, 22530, 2B940, 31350, 357B0	norovirus Hu/GII.4/Hong Kong/C006003I/2006/CHN
481	VPI	ADR7889G	481	4891	9301, 13711, 18121, 22531, 26941, 31351, 35761	norovirus Hu/GII.4/Hong Kang/CU06000I/200G/CHN
482	VPI	ADR788[illegible]	482	4802	9302, 13712, 18122, 22532, 26942, 31352, 35762	norovirus Hu/GII.4/Hong Kong/C0060039/2006/CHN
483	VPI	A0R789D2	483	4893	9303, 13713, 18123, 22533, 2G943, 31353, 35763	norovirus Hu/GII,4/Hnng Kong/CU0600I4/2D06/CHN
484	VPI	ADR78905	484	4894	93D4, 13714, 18124, 22534, 26044, 31354, 35764	norovirus Hu/GII.4/Hong Kong/C0060024/2006/CHN
485	VPI	ADR789Q8	485	4895	9305, 13715, 18125, 22535, 26945, 31355, 35765	norovirus Hu/GII.4/Hong Kong/C0060025/200G/CHN
48G	VPI	ADR789II	486	4896	93D6, 13716, 18126, 22536, 26946, 31356, 3576B	norovirus Hu/GII.4/Hong Kong/CU050I4I/2005/CHN

487	VPI	ADR7894	487	4897	9307, 13717, 18127, 22537, 2B947, 31357, 357B7	norovirus Hu/GII.4/Hong Kong/C004I2I3/2004/CHN
488	VPI	ADR7891 7	488	4898	9308, 13718, 18128, 22538, 2B948, 31358, 357B8	norovirus Hu/GII.4/Hong Kong/CU05Di40/2DD5/CHN
489	VPI	ADR78920	489	4899	9309, 13719, 18129, 22539, 2B949, 31359, 357B9	norovirus Hu/GII.4/Hong Kong/C0050IOB/2005/CHN
490	VPI	ADR78923	490	4900	9310, 13720, 18130, 22540, 2B950, 3I3B0, 35770	norovirus Hu/GII.4/Hong Kong/GU05II4G/2005/CHN
491	VPI	ADR78929	491	4901	9311, 13721, 18131, 22541, 2B951, 31361. 35771	norovirus Hu/GII.4/Hung Kong/C004I206/2004/CHN
492	VPI	ADR78932	492	4902	9312, 13722, 18132, 22542, 26952, 3I3B2, 35772	norovirus Hu/GII.4/Hong Kong/C004I225/2004/CHN
493	VPI	ADR78938	493	49D3	9313, 13723, 18133, 22543, 2B953, 3I363, 35773	norovirus Hu/GII.4/Hong Kong/CU050I36/2005/CHN
494	VPI	ADR7894I	494	4904	9314, 13724, 18134, 22544, 26954, 31364, 35774	norovirus Hu/GII.4/Hong Kong/C0050I52/2005/CHN
495	VPI	A0R78944	495	4905	9315, 13725, 18135, 22545, 26955, 31365, 35775	norovirus Hu/GII.4/Hong Kong/C004I222/2004/CHN
49B	VPI	ADR78947	496	49DB	9316, 13726, 18136, 22546, 26956, 31366, 35776	norovirus Hu/GII.4/Hang Kong/C005D852/2005/CHN
497	VPI	ADR78950	497	4907	9317, 13727, 18137, 22547, 26957. 31367, 35777	norovirus Hu/GII.4/Hong Kong/C005IOI3/2005/CHN
498	VPI	A0R78956	498	4908	9318, 13728. 18138. 22548. 26958, 31368. 35778	norovirus Hu/GII.4/Hong Kong/CU050I30/2005/CHN
499	VPI	AEA02I24	499	4909	9319, 13729, 18139, 22540, 26959, 31369, 35779	norovirus Hu/GI/Vancouver730/2004/CAN
500	VPI	AED02033	500	4910	9320, 13730, 18140. 22550. 26960. 31370. 35780	norovirus Hu/GII.3/CHDC5365/I99I/0S
501	VPI	AED02034	501	4911	9321, 13731, 18141, 22551, 26961. 3I371. 35781	norovirus Hu/GII.3/CHDC52GI/I900/OS
502	VPI	AEDD2035	502	4912	9322, 13732, 18142, 22552, 26962, 31372, 35782	norovirus Hu/GII.3/CHDC467I/I979/0S
503	VPI	AE0D2037	503	4913	9323. 13733, 18143, 22553, 26963, 31373, 35783	norovirus Hu/GII.3/CHDC403I/I988/US

504	VPI	AED02038	504	4914	9324. 13734, 18144, 22554, 2B9G4, 31374, 35784	norovirus Hu/GII.3/CHDC2DD5/IE75/US
505	VPI	AED0203B	505	4915	9325, 13735, 18145, 22555, 2B9B5, 31375, 35785	norovirus Hu/GII.3/CHDC32/I97B/US
50B	VPI	AEG7B290	SOB	491B	932B, I373B. 18146. 2255B. 2B9BB, 3I37B, 3578B	norovirus Hu/GII.4/Hong Kong/COBDOI/2010/CHN
507	VPI	AEI2958B	507	4917	9327. 13737, 18147, 22557, 2B9B7, 31377, 35787	norovirus Hu/BII.I2/HS20B/20ID/USA
508	VPI	AEJ82B4B	508	4918	9328. 13738, 18148, 22558, 2B9B8, 31378, 35788	nornvirus Hu/GII.4/Houston/TCH492/2005/0S
509	VPI	AERII308	509	4919	9329, 13739, 18149, 22559, 2B9B9, 31379, 35789	norovirus Hu/GII.4/04R-2/2004/TW
5I0	VPI	AERII3I0	510	4920	9330, 13740, 18150, 225B0, 2B970, 31380, 35790	norovirus Hu/GII.4/05R-2/2005/TW
5II	VPI	AERII3I2	511	4921	9331, 13741, 18151. 225BI. 2B971. 31381, 35791	norovirus Hu/GII.4/06-AM-2/200B/TW
5I2	VPI	AERII3I4	512	4922	9332, 13742, 18152, 225B2, 2B972, 31382, 35792	norovirus Hu/GII,4/0G-CK-2/2006/TW
5I3	VPI	AERII3IB	513	4923	9333, 13743, 18153, 225B3, 26973, 31383, 35793	norovirus Hu/GII.4/06-T-2/2006/TW
514	VPI	AERII3I8	514	4924	9334, 13744, 18154, 22564, 26974, 31384, 35794	norovirus Hu/GII.4/0B-BQ-G/200B/TW
5I5	VPI	AER1I320	515	4925	9335, 13745. 18155, 225B5, 2B975, 31385, 35795	norovirus Hu/GII.4/0B-CJ-I/2006/TW
SIB	VPI	AERII324	5IB	492B	9336, 13746, 18156, 22566, 2697B, 31386, 35796	norovirus Hu/GII.4/06-CI-I/200B/TW
517	VPI	AERII32B	517	4927	9337, 13747, 18157, 22567, 2B977, 31387, 35797	norovirus Hu/GII.4/07-B-I/200G/TW
5I8	VPI	AERII328	518	4928	9338. 13748. 18158. 22568, 26978. 31388, 35798	norovirus Hu/GII.4/07-AG-I/20D6/TW
5IB	VPI	AERII330	519	4929	9339, 13749, 18159, 22569, 26979, 31389, 35799	norovirus Hu/GII.4/07-H-3/2006/TW
520	VPI	AERII332	520	4930	9340, 13750, 18160, 22570, 26980, 31390, 35800	norovirus Hu/GII.4/08-E/2006/TW

521	VP1	AERII334	521	4931	9341, 13751, 18161, 22571, 26981, 31391, 35801	narovirus Hu/GII.4/08-P-1(2006b)/2008/TW
522	VP1	AERII336	522	4932	9342, 13752, 18162, 22572, 26982, 31392, 35802	naravirus Hu/GII.4/08-D-1(2008a)/2008/TW
523	VP1	AERII34D	523	4933	9343, 13753, 18163, 22573, 26983, 31393, 35803	naravirus Hu/GII.4/08-H-1(2D08a)/2008/TW
524	VP1	AERII342	524	4934	9344, 13754, 18164, 22574, 26984, 31394. 35804	naravirus Hu/GII.4/08-K-1(2008a)/2008/TW
525	VP1	AERII344	525	4935	9345, 13755, 18165, 22575, 26985, 31395, 35805	naravirus Hu/GII.4/08-N-1(2D08a)/2008/TW
526	VP1	AERII346	526	4936	9346, 13756, 18166, 22576, 26986, 31396, 35806	norovirus Hu/GII.4/08-0-2(2008a)/2008/TW
527	VP1	AERII348	527	4937	9347, 13757, 18167, 22577, 26987, 31307, 35807	noravirus Hu/GII.4/08-U-2(2D08a)/2008/TW
528	VP1	AERII35D	528	4938	0348, 13758, 18168, 22578, 26088, 31308, 35808	norovirus Hu/GII.4/08-W-1(2008b)/2008/TW
52B	VP1	AERII352	520	4939	93491, 13759, 18160, 22570, 26080, 31390, 35809	norovirus Hu/GII.4/08-AA(2008b)/2008/TW
53D	VP1	AERII354	53D	494D	0350. 13760, 18170. 22580. 26000. 31400. 35810	narovirus Hu/GII.4/09-L-4(2009a)/2000/TW
531	VP1	AERH356	531	4941	0351, 13761, **18171.** 22581. 26901, 31401. 35811	naravirus HU/GII .4/OG-N-1(2000B)/200G/TW
532	VP1	AERII358	532	4942	0352, 13762, 18172, 22582, 26092, 31402. 35812	norovirus Hu/GH.4/IO-A-1(20D9b)/20IO/TW
533	VP1	AERII36D	533	4943	9353. 13763, 18173, 22583, 26093, 31403, 35813	naravirus Hu/GII.4/00-BI-2-1(2000b)/2D09/TW
534	VP1	AEXI0549	534	4944	0354, 13764, 18174, 22584, 26904, 31404, 35814	narovirus Hu/GII.3/MilwaukBB009/20ID/USA
535	VP1	AEX91eiO	535	4945	0355, 13765. 18175, 22585. 26005, 31405, 35815	narovirus **Hu/ GII.4/New** Orleans/2010/USA
536	VP1	AFD3D97D	536	4946	9356, 13766, 18176, 22586, 26896, 31406, 35816	norovirus cat/GIV.2/C008I2IOE/USA/20IO
537	VP1	AFH88383	537	4947	0357. 13767. 18177, 22587, 26907, 31407, 35817	norovirus Hu/GI.G/Kingston/ACTIGOD/ZDIO/AU

538	VPI	AFJ2I37G	538	4948	9358, I37B8, I8I78, 22588, 2B338, 3I4B8, 358I8	norovirus Hu/GIV.I/LakeMacquarie/NSW2680/20IO/AU
539	VPI	AFJ2I379	539	4949	3353, I37B3, I8179, 22589, 26999, 3I409, 35819	norovirus **Hu/GII.g-GII.I2/Gunnedah/NSW895P/20IO/AU**
540	VPI	AFJ2I382	540	4350	93B0, I3770, I8I80, 22590, 27000, 3I4I0, 35820	norovirus Hu/GII.g-GII.I2/Wahraonga/NSW004P/2009/AU
54I	VPI	AFJ2I387	54I	495I	93BI, 13771, **18181.** 22591, 27B01, 31411, 35821	norovirus Hu/GII.4/HSW375L/2OO7/A0
542	VPI	AFJ2I388	542	4952	33B2, 13772. 18182, 22592, 27002, 31412, 35822	norovirus Hu/GII.4/NSW72II/2007/AU
543	VPI	AFJ2I389	543	4953	9363, 13773, 18183, 22533, 27003, 31413, 35823	norovirus Hu/GII,4/WAI45H/2007/AU
544	VPI	AFJ2I390	544	4954	93B4, 13774, 18184, 22594. 27004, 31414, 35824	norovirus Hu/GII.4/NSW833M/2007/A0
545	VPI	AFJ2I39I	545	4955	93B5, 13775, 18185, 22595, 27D05. 31415, 35825	norovirus Hu/GII.4/WA223N/2007/AU
54B	VPI	AFJ2I392	54B	495B	93BB. I377B, 18186, 2259B, 27D0B, **3141**6. 35826	norovirus Hu/GII.4/WAI45Y/2007/AU
547	VPI	AFJ2I393	547	4957	93B7, 13777, 18187, 22597, 27007, 31417. 35827	norovirus Hu/GII.4/NSW050D/2007/AU
548	VPI	AFJ2I394	548	4958	93B8, 13778, 18188, 22598, 27008, 31418, 35828	norovirus Hu/GII.4/NSWII5M/2007/AU
549	VPI	AFJ2I395	549	4959	33B9, 13779, 18189, 22599, 27009, 31419, 35829	**norovirus Hu/GII.4/NSW358W/2007/AU**
550	VPI	AFJ2I39B	550	49B0	9370. 13780, 18190, 22B00, 27010. 31420, 35830	norovirus Hu/GII.4/NSW3B0P/2OO7/A0
55I	VPI	AFJ2I397	55I	49BI	3371, 13781, 18191, 22B0I. 27011, 31421, 35831	norovirus Hu/GII.4/WA2IOZ/2007/AU
552	VPI	AFJ2I398	552	43B2	9372. 13782, 18192, 22B02, 27012, 31422, 35832	norovirus Hu/GII.4/NSWI800/2008/AO
553	VPI	AFJ2I3B3	553	43B3	9373, 13783, 18193, 22B03, 27013, 31423, 35833	norovirus Hu/GII.4/NSW39I2/20O8/AU
554	VPI	AFJ2I4B0	554	43B4	9374, 13784, 18194, 22604, 27014, 31424. 35834	norovirus Hu/GII,4/NSW04IG/2008/A0

555	VPI	AFJ2I4QI	555	49G5	9375, I3785, 18195. 226D5, 27015, 31425, 35835	norovirus Hu/GII,4/NSW3IIO/2008/AO
556	VPI	AFJ2I4Q2	556	4966	9376, 13786, 18196, 22606, 27016, 31426, 35836	norovirus Hu/GII.4/NSW764Q/2008/AU
557	VPI	AFJ2I403	557	4967	9377, 13787, 18197, 22607, 27017. 31427, 35837	norovirus Hu/GII.4/NSW863B/2008/AU
558	VPI	AFJ2I404	558	4968	9378, 13788, 18198, 22608, 27018, 31428, 35838	norovirus Hu/GII.4/NSW8B8H/2OO8/A0
559	VPI	AFJ2I4D5	559	4969	9379, 13789, 18199, 22609, 27019. 31429, 35839	norovirus **Hu/BII.4/NSW8I9D/2DD9/AU**
5GD	VPI	AFJ2I4D6	56D	4970	9380, 13790, 18200, 226ID, 27020. 31430, 35840	norovirus Hu/GII.4/NSW89IU/2009/AU
SGI	VPI	AFJ2I4D7	5GI	4B71	9381, 13791, 18201, 22611, 27021, 31431, 35841	norovirus Hu/GII.4/NSW82IJ/200B/A0
562	VPI	AFJ2I4Q9	562	4972	9382, 13792, 18202, 22612, 27022, 31432, 35842	norovirus Hu/GII.4/NSW963U/2009/A0
563	VPI	AFJ2I4IQ	563	4973	0383, 13793, 18203, 22613, 27023, 31433, 35843	norovirus Hu/GII.4/NSW957X/2009/A0
564	VPI	AFJ2I4II	564	4974	9384, 13794, 18204, 22614, 27024, 31434, 35844	norovirus Hu/GII.4/NSW972V/2009/AU
5G5	VPI	AFJ2I4I3	565	4975	9385, 13795, 18205, 22615, 27025, 31435, 35845	norovirus Hu/GII.4/NSW4240/20D9/A0
566	VPI	AFJ2I4I4	56G	4976	9386, 13796, 18206. 22616. 27026, 31436, 35846	norovirus **Hu/GII.4/NSWB74U/2D0B/AU**
567	VPI	AFJ2I4I5	567	4977	0387, 13797, 18207. 22617, 27027. 31437, 35847	norovirus Hu/GII.4/NSW5I4M/2009/AU
568	VPI	AFJ2I4I6	568	4978	9388, 13798, 18208, 22618, 27028, 31438. 35848	norovirus Hu/GII.4/NSW88B4/2009/A0
560	VPI	AFJ2I4I7	569	4979	9389, 13799, 18209, 22619, 27029, 31439, 35849	norovirus Hu/GII.4/NSW399Z/20D9/AU
57G	VPI	AFJ2I4I8	570	4980	9390, 13800, 18210, 22620, 27030. 31440, 35850	norovirus Hu/GII.4/NSW452P/2009/A0
571	VPI	AFJ2I4I0	57!	498I	9391, 13801, 18211, 22621, 27031. 31441, 35851	norovirus Hu/GII.4/NSW447T/2009/AU

572	VPI	AFJ2I42D	572	4382	9392. 13802. 18212, 22B22, 27032, 31442, 35852	**norovirus** Hu/GII.4/NSW58IT/2009/AO
573	VPI	AFJ2I42I	573	4B83	9393. 13803, 18213, 22B23. 27033, 31443, 35853	norovirus Hu/GII.4/NSWI3IL/2009/AU
574	VPI	AFJ2I422	574	4984	9394, 13804, 18214, 22B24, 27034, 31444, 35854	norovirus **Hu/GII.4/NSW006P/2009/AU**
575	VPI	AFJ2I423	575	4385	9395, 13805, 18215, 22B25, 27035, 31445, 35855	norovirus Hu/GII.4/NSWOI59/20ID/AU
57G	VPI	AFJ2I424	57B	438B	9336, I380B, 18216, 22B2B, 2703B, 31446, 35856	**norovirus Hu/BII.4/NSW827P/2DID/AU**
577	VPI	AFJ2I425	577	4987	9397, 13807, 18217, 22B27, 27037, 31447, 35857	norovirus Hu/GII.4/NSW673P/20IO/AU
578	VPI	AFJ2I42B	578	4388	9398, 13808, 18218, 22628, 27038. 31448. 35858	**norovirus Hu/GII.4/NSWD75J/2DI0/AU**
57B	VPI	AFJ2I428	579	4383	9399, 13809, 18219, 22629, 27039, 31449, 35859	norovirus Hu/GII.4/NSW0396/20IO/AU
580	VPI	AFJ2I429	580	4330	9400, 13810. 18220, 22630, 27040, 31450, 35860	**norovirus Hu/GII.4/NSWI443/2DID/AU**
581	VPI	AFJ2I43D	581	4331	9401, 13811, 18221, 22631. 27041, 31451, 35861	**norovirus Hu/GII.4/NSW3D44/2DID/AU**
582	VPI	AFJ2I43I	582	4932	9402. 13812, 18222, 22632. 27042. 31452, 35862	norovirus Hu/GII.4/NSWG73H/20I0/A0
583	VPI	AFJ2I432	583	4993	9403, 13813. 18223. 22B33, 27043, 31453, 35863	norovirus Hu/GII.4/NSWI23B/20IO/AU
584	VPI	AFJ2I433	584	4994	9404. 13814, 18224, 22634, 27044, 31454, 358B4	norovirus Hu/GII.4/NSWI86M/2DI0/A0
585	VPI	AFJ2I434	585	4995	9405, 13815, 18225, 22B35, 27045, 31455. 35865	norovirus Hu/GII.4/NSW2I8E/20IO/AU
58B	VPI	AFJ2I43B	58B	4996	9406, 13816, 18226. 22636, 2704B, 31456, 358BB	**norovirus Hu/GII.4/NSWD75G/2DI0/AU**
587	VPI	AFJ2I437	587	4997	9407, 13817, 18227. 22637. 27D47, 31457, 35867	norovirus Hu/GII.4/NSW688R/20I0/A0
588	VPI	AFJ2I438	588	4998	9408, 13818, 18228, 22638, 27048. 31458, 35868	norovirus Hu/GII.4/NSW68II/20IO/AU

589	VPI	AFJ2I433	589	4993	3403, I38I9, I8223, 22B33, 27049, 3I453, 358B9	**norovirus Hu/GII.4/NSW2004/20IO/AU**
590	VPI	AFJ2I440	590	5000	34I0, I3820, I8230, 22B40, 27050, 3I4B0, 35870	narovirus Hu/GII.4/NSW445E/20IO/AU
59I	VPI	AFJ2I44I	59I	500I	34II, **13821.** 18231, 22B4I, 27051, 3I461, 35871	narovirus Hu/BII.4/NSW2340/20IO/AU
592	VPI	AFJ2I442	592	5002	9412, 13822, 18232, 22642, 27052, 31462, 35872	norovirus **Hu/GII.4/NSW827D/ZDID/AU**
593	VPI	AFJ2I443	593	5003	9413, 13823, 18233, 22B43, 27053, 3I4B3, 35873	noravirus Hu/GII.4/NSWB039/2QI0/AU
594	VPI	AFJ2I444	534	5004	3414, 13824, 18234, 22644, 27D54, 31464, 35874	**norovirus Hu/GII.4/NSW944J/20ID/AU**
595	VPI	AFJ2I445	595	5005	3415, 13825, 18235, 22B45, 27055, 3I4B5, 35875	norovirus Hu/GII.4/NSW057J/20IO/AU
59B	VPI	AFJ2I44B	59B	5D0B	941B, I382B, 18236, 22B4B, 27056, 3I46B, 35876	norovirus **Hu/GII.4/NSW5G7H/2DI0/AU**
597	VPI	AFJ2I448	537	5007	9417, 13827, 18237, 22B47, 27057, 3I4B7, 35877	norovirus **Hu/GII.4/Miranda/NSWBI7L/2DI0/AU**
598	VPI	AFJ2I45I	538	5008	3418, 13828, 18238, 22648, 27058, 3I4B8, 35878	norovirus Hu/GII.4/StVincents/NSW2I7I/2DI0/AU
599	VPI	AFJ2I454	599	5009	9419, 13829, 18239, 22649, 27059, 31469, 35879	norovirus Hu/GII.4/Helensburgh/NSW295E/20IO/AU
BOO	VPI	AFL70023	BOB	50I0	9420, 13830, 18240, 22650, 27D60, 31470, 35880	norovirus Hu/GII.4/5M/USA/2004
BDI	VPI	AFN0B724	BOI	50II	9421, 13831, 18241, 22651, 27061, 31471, 35881	norovirus Hu/GII.B/S9c/SN/I976
BD2	VPI	AFN0B725	B02	50I2	9422, 13832, 18242, 22652, 27062, 31472, 35882	norovirus Hu/GII.6/S7e/SN/I976
B03	VPI	AFN06726	B03	50I3	0423, 13833, 18243, 22653, 27063, 31473, 35883	norovirus Hu/GII.2/KLI09/MY/I978
B04	VPI	AFN0B727	B04	50I4	9424, 13834, 18244, 22654, 27064, 31474, 35884	norovirus Hu/GIU4/HK74/CN/I978
BOS	VPI	AFN0B728	B05	50I5	9425, 13835, 18245, 22655, 27065, 31475, 35885	norovirus Hu/GII.3/HK7I/CN/I978

6DB	VPI	AFNDB729	BDB	5DIB	942B, I383G, I824B, 22B5B, 270BB, 3I47B. 3588B	norovirus Hu/GII.3/HK54/CN/I977
BD7	VPI	AFN06730	B07	5DI7	9427, I3837, I8247, 22B57, 270B7. 3I477. 35887	norovirus **Hu/GII.G/HK28/CN/I977**
BDB	VPI	AFNDB73I	BDB	5DI8	9428, I3838, I8248, 22B58, 270B8, 3I478, 35888	norovirus **Hu/GII.7/HK4/CN/I976**
BDB	VPI	AFNDB732	BD9	5DI9	9429, I3839, I8249, 22B59, 27DBB, 3I479, 35889	norovirus Hu/GII.I7/CI42/GF/I978
BID	VPI	AFNDB733	BID	5D2D	9430, I3840, I825D. 22BB0, 27070, 31480, 3589D	norovirus Hu/GII.5/CI5/GF/I978
BII	VPI	AFN06734	BII	5D2I	943I, I384I, I825I, 22BBI, 27071, 3I48I, 35891	norovirus **Hu/GI.G/HKBD/CN/1977**
BI2	VPI	AFNDB735	BI2	5022	9432, I3842, I8252, 22BB2, 27D72, 3I482, 35892	**norovirus** Hu/BI.5/E57/UG/I975
6I3	VPI	AFN06736	BI3	5023	9433, I3843, I8253, 22663. 27D73, 3I483, 35893	norovirus Hu/GI/E8/UG/I97G
BI4	VPI	AFN0B738	BI4	5D24	9434, I3844, I8254, 22664, 27D74, 31484, 35894	norovirus Hu/GI.3/C9/GF/I978
BI5	VPI	AFN0B739	BIS	5025	9435, 13845, 18255, 226B5, 27D75, 31485, 35895	norovirus Hu/GI.3/B8/CF/I977
BIB	VPI	AFVD877I	BIB	5D2B	9436, 13846, 18256, 22BB6, 27076, 31486, 35896	norovirus Hu/GII.4/Randwick/NSW882J/20II/A0
BI7	VPI	AFVD8774	BI7	5D27	9437, 13847, 18257, 226B7, 27077, 31487, 35897	norovirus **Hu/GII.4/Caringbah/NSW4D3G/ZDII/AU**
BI8	VPI	AFV08777	BI8	5D28	9438, 13848, 18258, 22BB8, 27078, 31488, 35898	norovirus **Hu/GII.4/Berowra/NSW767L/20I2/AU**
BIB	VPI	AFVD878D	BI9	5D29	943B, 13849, 18259, 22B69, 27079, 3I489, 35899	norovirus Hu/GII.4/Jannali/NSW774M/2DII/AU
B2D	VPI	AFVD8783	B2D	5030	9440, I385D, I82B0, 22670, 27080, 31490, 3590D	norovirus Hu/GII.4/Doonsid_/NSW536I/20II/AU
B2I	VPI	AFVD878B	B2I	503I	9441, 13851, 18261, 22671, 27081, 31491, 35901	norovirus **Hu/GII.4/Randwick/NSW938K/2DII/AU**
B22	VPI	AFV08789	B22	5032	9442, 13852, 18262, 22G72, 27082, 31492, 35902	norovirus **Hu/GII.4/Miranda/NSW85BK/ZBII/AU**

623	VPI	AFV087B2	623	5033	9443, I3853, I82B3, 22B73, 27083, 31493. 35903	norovirus Hu/GII,4 / WUHAN/NSW330B/20I2/A0
G24	VPI	AFVB8795	624	5034	9444, 13854, 18264, 22B74, 27084, 31494, 35904	norovirus Hu/GII.4/Sydney/NSW05I4/20I2/A0
B25	VPI	AFX95941D	625	5035	9445, 13855, I82B5, 22B75, 27085, 31495, 35905	norovirus Hu/GII.4/Hong Kong/ CUHK3630/ 20I2/ CHN
B2B	VPI	AFZ84663	B26	503B	9446, 13856, 18266, 22B76, 27086, 31496, 35906	norovirus Hu/GII.4/HSI9I/2004/USA
B27	VPI	AGG3787I	B27	5037	9447, 13857. 18267, 22677, 27087, 31497, 35907	norovirus Hu/GII.4/Taichung/I2-BA-I/20I2/TW
628	VPI	AGI9B383	628	5038	9448, 13858, 18268, 22B78, 27088, 3I498, 35908	norovirus Hu/GII.4/0hio/684/USA
629	VPI	AGI99552	629	5039	9449, 13859, 18269, 22679, 27089, 31499, 35909	norovirus Hu/GII.4/VPII72/Shanghai/20I2/CHN
B3D	VPI	AGIB9553	630	5040	9450, I38B0, 18270, 22680, 27090, 31500, 35910	norovirus Hu/GII.4/VPI2I4/Shanghai/20I2/CHN
63I	VPI	AGIS9554	63I	504I	9451, 13861, 18271. 22B81, 27091, 3I501. 35911	norovirus Hu/GII.4/VP!28I/Shanghai/20I2/CHN
632	VPI	AGI99555	632	5042	9452, 13862. 18272, 22682, 27092, 31502, 35912	norovirus Hu/GII.4/VPI45I/Shanghai/20I2/CHN
B33	VPI	AGK25882	B33	5043	9453, 13863, 18273, 22683, 27093, 31503, 35913	norovirus Hu/GII-4/New Taipei/CGMH49/20II/TW
634	VPI	AGK25884	B34	5044	9454, I38B4, 18274. 22684. 27094, 31504, 35914	norovirus Hu/GII-4/New Taipei/CGMH50/20II/TW
635	VPI	AGK25887	635	5045	9455, I38B5, 18275, 22685, 27095, 31505, 35915	norovirus Hu/GII-4/Taoyuan/CGMH5I/20I2/TW
63B	VPI	AGK25890	636	504B	9456, 13866, 18276, 22686, 27096, 31506, 35916	norovirus Hu/GII-4/Taoyuao/CGMH52/20I2/TW
B37	VPI	AGK25892	637	5047	9457, I38G7, 18277, 22B87, 27097, 31507, 35917	norovirus Hu/GII-4/New Taipei/CGMH53/20I2/TW
B38	VPI	AGK25898	B38	5048	9458, 13868, 18278, 22688, 27098, 31508, 35918	norovirus Hu/GII-4/Taoyuan/CGMH55/20I2/TW
63B	VPI	AGK2590D	B39	5049	9459, 13869, 18279, 22B89, 27099. 31509, 35919	norovirus Hu/GII-4/New Taipei/CGMH56/20I2/TW

B40	VPI	AGK25BD2	B4D	5050	9460, I3870, I8280, 22B90. 27I00, 31510. 35920	norovirus Hu/GII-4/Ta oyuan/CGMH57/20l2/TW
B4I	VPI	AGK25905	B4I	505I	9461, 13871, 18281, 22691, 27101, 31511, 35921	norovirus HU/GII-4/ NEW Taipei/CGMH58/20l2/TW
B42	VPI	AGK25908	B42	5D52	9462, 13872, 18282, 22692, 27102, 31512, 35922	norovirus Hu/GII-4/TaDyuan/CGMH59/20l2/TW
B43	VPI	AGK259I0	B43	5053	9463, 13873, 18283, 22B93, 27103, 31513, 35923	norovirus Hu/GII-4/Taoyuan/CGMH60/20l2/TW
B44	VPI	AGK259I2	B44	5D54	9464, 13874, 18284, 22694, 27104, 31514, 35924	nnrovirus Hu/GII-4/New Taipei/CGMHGI/20l2/TW
B45	VPI	AGK259I5	B45	5D55	94B5, 13875, 18285, 22B95, 27105, 31515, 35925	norovirus Hu/GII-4/New TaipBi/CGMH62/20l2/TW
B4B	VPI	AGK259I7	B4B	5D5B	946B, 13876, I828B, 22B9B, 27106, 31516, 35926	norovirus Hu/GII-4/Taoyuan/CGMH63/20l2/TW
B47	VPI	AGK259I9	B47	5057	94B7, 13877. 18287, 22697. 27107, 31517. 35927	norovirus Hu/GII-4/Taoyuan/CGMH64/20l2/TW
B48	VPI	AGK2592I	B48	5058	9468, 13878, 18288, 22698, 27108, 31518, 35928	norovirus Hu/GII-4/Taoyuan/CGMHB5/20l2/TW
B49	VPI	AGK25924	B49	5059	9469. 13879, 18289, 22699, 27109, 31519, 35929	norovirus Hu/GII-4/Taoyuan/GGMH66/20l2/TW
B5D	VPI	AGK25927	B5D	50B0	9470, 13880, 18290, 22700, 27110, 31520, 35930	norovirus Hu/GII-4/Taoyuan/CGMH67/20l2/TW
B5I	VPI	AGK2593Q	B5I	50BI	9471,13881,18291,22701,27111, 31521, 35931	norovirus Hu/GII-4/New TaipEi/CGMHB8/20l2/TW
B52	VPI	AGS08025	B52	50B2	9472, 13882, 18292. 22702, 27112, 31522, 35932	norovirus Hu/Gll.4/ACT0675/20I2/A0
653	VPI	AGSD8D2B	B53	50B3	9473, 13883, 18293, 22703, 27113. 31523, 35933	norovirus Hu/GII.4/NSW0025/2DII/AU
B54	VPI	AGSD8D27	B54	50B4	9474, 13884, 18294, 22704, 27114, 31524, 35934	norovirus Hu/GII.4/NSW00BB/2DI2/A0
B55	VPI	AGSD8D28	B55	50B5	9475, 13885, 18295, 22705, 27115, 31525, 35935	norovirus Hu/GII.4/NSW007P/20l2/AU
B5B	VPI	AGS08Q29	B5B	50BB	947B, 13886, 18296, 22706, 27116, 3I52B, 3593B	norovirus Hu/GII.4/NSW0287/20l2/A0

657	VP1	AGS08D3D	G57	5DB7	9477, I3887, I8297. 22707, 27II7. 3I527, 35937	noravirus Hu/GII.4/NSW035H/20l2/AU
G58	VP1	AGSD8D3I	G58	5DB8	9478, I3888, I8298, 22708, 27II8, 3I528, 35938	noravirus Hu/GII.4/NSW052l/20l2/AU
B59	VPI	AGSD8032	659	5GB9	9479, 13889, 18299. 22709, 27119, 31529, 35939	noravirus Hu/GII,4/NSWD7B J/2011/AU
BBO	VPI	AGS08033	GGD	5D7D	9480, 13890, 18300, 22710, 27120, 31530, 35940	noravirus Hu/GII,4/NSW078G/20l2/AU
BBI	VPI	AGS08035	BBI	5G7I	9481, 13891, 18301, 22711, 27121, 31531, 35941	noravirus Hu/GII.4/NSW097K/20l2/AU
BB2	VPI	AGSD8Q36	BB2	5D72	9482, 13892, 18302, 22712, 27122, 31532, 35942	noravirus Hu/GII,4/NSW0988/20l2/AU
BB3	VPI	AGSD8D37	BB3	5073	9483. 13893, 18303, 22713, 27123, 31533, 35943	noravirus Hu/GII.4/NSWI0BI/20l2/AU
BB4	VPI	AGS08038	BB4	5074	9484, 13894, 18304, 22714, 27124, 31534, 35944	noravirus Hu/GII.4/NSWII4H/2DI2/AU
BB5	VPI	AGSD8040	GB5	5075	9485. 13895, 18305, 22715, 27125, 31535. 35945	noravirus Hu/GII.4/NSWI50E/20ll/AU
BBG	VPI	AGSQ8Q4I	BBG	507B	948B, 13896. I830B, 227IB, 27126. 31536, 3594B	noravirus Hu/GII.4/NSWI523/20l2/AU
BB7	VPI	AGSD8Q42	BB7	5077	9487. I38B7. 18307, 22717, 27127, 31537, 35947	noravirus Hu/GII.4/NSWI5BD/2DII/AU
BB8	VPI	AGSQ8Q43	BB8	5078	9488. 13898. 18308. 22718, 27128, 31538. 35948	noravirus Hu/GII.4/NSWIG27/2DI2/AU
BB9	VPI	AGSD8044	BB9	507B	9489, 13899, 18309, 22719, 27129, 31539, 35949	noravirus Hu/GII.4/NSWI652/20l2/AU
B70	VPI	AGSD8Q45	B7D	5080	9490, 13900, 18310, 22720, 27I3D, 31540, 35950	noravirus Hu/GII.4/HSWI749/20ll/AU
B7I	VPI	AGSD8D47	B7I	508I	9491,13901,18311,22721,27131. 31541, 35951	noravirus Hu/GII.4/NSW2D24/2DI2/AU
B72	VPI	AGS08048	B72	5082	9492, 13902, 18312, 22722, 27132, 31542, 35952	noravirus Hu/GII.4/NSW209B/20l2/AU
B73	VPI	AGSD8Q50	B73	5083	9493, 13903, 18313, 22723, 27133, 31543, 35953	noravirus Hu/GII.4/NSW230B/2012/AU

674	VPI	AGSD8G5I	674	5084	9494, 13904, 18314, 22724, 27134, 31544, 35954	norovirus Hu/GII.4/NSW23I7/2DII/AU
G75	VPI	AGS08052	G75	5085	9495, 13905. 18315, 22725, 27135, 31545, 35955	norovirus **Hu/GII.4/NSW25BB/2DI2/AU**
G7G	VPI	AGS08G54	676	5086	9496, 13906, 18316, 22726, 27I3G, 31546, 35956	norovirus **Hu/GII.4/NSW27DF/2DI2/AU**
G77	VPI	AGS08D5G	G77	5087	9497, 13907, 18317, 22727. 27137, 31547, 35957	norovirus Hu/GII.4/NSW2949/20I2/AU
G78	VPI	AGSD8D57	G78	5088	9498, 13908, 18318, 22728, 27138. 31548, 35958	norovirus **Hu/GII.4/NSW295G/20I2/AU**
G79	VPI	AGS08058	679	5089	9499, 13909, 18319. 22729, 27139, 31549, 35959	norovirus **Hu/GII.4/NSW3IDB/2DI2/AU**
G80	VPI	AGSQ8G59	680	5090	95D0, 13910, 18320, 22730, 27140, 31550, 35960	norovirus Hu/GIL4/Sutherlano7NSW3IIA/20I2/A0
G8I	VPI	AGSD8D6Q	681	5091	9501,13911,18321,22731,27141, 31551, 35961	norovirus **Hu/GII.4/Randwick/NSW3IIA/20I2/AU**
G82	VPI	AGSD8D6I	G82	5092	9502, 13912, 18322, 22732, 27142, 31552, 35962	norovirus Hu/GII.4/NSW3I3C/20II/A0
683	VPI	AGSD8DG2	G83	5093	9503, 13913, 18323, 22733, 27143, 31553, 35963	norovirus **Hu/GII.4/NSW3I92/20I2/AU**
G84	VPI	AGS08063	684	5094	9504, 13914, 18324, 22734, 27144, 31554, 35964	norovirus Hu/GII.4/NSW323I/20I2/AU
G85	VPI	AGSD8064	685	5095	9505, 13915, 18325, 22735, 27145, 31555, 35965	norovirus **Hu/GII.4/NSW33BH/20II/AU**
G8G	VPI	AGSQ80G5	686	5096	9506, 13916, 18326, 22736, 27146, 31556. 35966	norovirus Hu/GII.4/NSW3440/20I2/AU
G87	VPI	AGSD8066	687	5097	9507, 13917, 18327, 22737, 27147, 31557, 35967	norovirus **Hu/GII.4/NSW348I/20I2/AU**
G88	VPI	AGS08067	688	5098	9508, 13918, 18328, 22738, 27148, 31558, 35968	norovirus **Hu/GII.4/NSW349B/20I2/AU**
G89	VPI	AGSD8D68	689	5099	9509, 13919, 18329, 22739, 27149, 31559, 35969	norovirus **Hu/GII.4/NSW3522/20I2/AU**
69Q	VPI	AGSD8D69	690	5100	9510, 13920, 18330, 22740. 27150, 31560, 35970	norovirus **Hu/GII.4/NSW3B4K/2DII/AU**

B9I	VPI	AGS08070	691	5I0I	9511,13921,18331,22741,27151, 31561, 35971	norovirus **Hu/GII.4/NSW3G9N/ZDIZ/AU**
B9Z	VPI	AGS0807I	692	5I02	9512, 13922, 18332, 22742, 27152, 31562, 35972	norovirus Hu/GII.4/NSW389W/20I2/A0
693	VPI	AGS08072	B93	5I03	9513, 13923, 18333, 22743, 27153, 31563, 35973	norovirus Hu/GII.4/NSW39II/20II/AU
694	VPI	AGS08073	694	5I04	9514, 13924, 18334, 22744, 27154, 31564, 35974	norovirus Hu/GII.4/NSW392G/20II/A0
B95	VPI	AGS08074	695	5I05	9515, 13925, 18335, 22745, 27155, 31565, 35975	norovirus Hu/GII.4/NSW4II8/20I2/AU
B9B	VPI	AGS08076	B9B	5ID6	9516, 13926, 18336, 22746, 27156, 3I5B6, 35976	norovirus Hu/GII.4/NSW426H/2DII/AU
B97	VPI	AGS08079	B97	5I07	9517, 13927, 18337, 22747, 27157, 3I5B7, 35977	norovirus Hu/GII.4/NSW4379/20II/AU
B98	VPI	AGS08080	698	5I08	9518, 13928, 18338, 22748, 27158, 3I5B8, 35978	norovirus Hu/GII.4/NSW4483/20I2/AU
699	VPI	AGS0808I	699	5I09	9519, 13929, 18339, 22749, 27159, 31569, 35979	norovirus Hu/GII.4/NSW45I2/20I2/AU
7DQ	VPI	AGS08082	70D	5II0	9520, 13930, 18340, 22750, 27160, 31570, 35980	norovirus Hu/GII.4/NSW457G/20I2/A0
7DI	VPI	AGS08083	70I	**5III**	9521, 13931, 18341, 22751, 27161, 31571, 35981	norovirus Hu/GII.4/NSW465J/2DII/AU
7D2	VPI	AGS08084	702	**5II2**	9522, 13932, 18342, 22752, 27162, 31572, 35982	norovirus Hu/GII.4/NSW468J/20II/AU
703	VPI	AGS08085	703	5113	9523, 13933, 18343, 22753, 27163, 31573, 35983	norovirus **Hu/GII.4/NSW489T/ZDI2/AU**
7D4	VPI	AGS08086	704	5114	9524, 13934, 18344, 22754, 27IB4, 31574, 35984	norovirus Hu/GII.4/NSW5000/2QI2/AU
705	VPI	AGS08087	705	5115	9525, 13935, 18345, 22755, 27IB5, 31575, 35985	norovirus Hu/GII.4/NSW5047/20II/AU
7D6	VPI	AGS08088	706	5116	9526. 13936, 18346, 22756, 27IB6, 31576, 35986	norovirus **Hu/GII.4/NSW5I2D/ZDI2/AU**
707	VPI	AGS08089	707	5117	9527, 13937, 18347, 22757, 27167, 31577, 35987	norovirus **Hu/GII.4/NSW52G3/2DII/AU**

708	VPI	AGS08090	708	5118	9528. 13938, 18348, 22758, 27IG8, 31578, 35988	narovirus Hu/GII.4/NSW550F/2DI2/A0
709	VPI	AGS0809I	709	5119	9529, 13939, 18349, 22759, 27IB9, 31579, 35989	**narovirus Hu/GII.4/NSW5S8V/2DI2/AU**
710	VPI	AGS08092	710	5120	9530, 13940, 18350, 227B0, 27170, 31580, 35990	narovirus Hu/GII.4/NSW5599/20If/AU
711	VPI	AGS08093	711	5121	9531, 13941, 18351, 227BI, 27171, 31581, 35991	narovirus Hu/GII.4/NSW563F/20I2/AU
712	VPI	AGS08094	712	5122	9532, 13942, 18352, 227G2, 27172, 31582, 35992	noravirus **Hu/GII.4/NSW57IK/ZDII/AU**
713	VPI	AGS08095	713	5123	9533, 13943, 18353, 227B3, 27173, 31583, 35993	narovirus Hu/GII.4/NSW574H/20I2/AU
714	VPI	AGS0809G	714	5124	9534, 13944, 18354, 227B4, 27174, 31584, 35994	narovirus Hu/GII.4/NSW57BT/20I2/A0
715	VPI	AGS08097	715	5125	9535, 13945, 18355, 227G5, 27175, 31585, 35995	narovirus Hu/GII.4/NSW580G/20II/AO
7IB	VPI	AGS08098	7IB	5I2B	953B, I394B, I835B, 227GB, 27I7G, 3I58B. 3599G	noravirus Hu/GII.4/NSW584J/20II/A0
717	VPI	AGS08099	717	5127	9537, 13947, 18357, 227B7, 27177, 31587, 35997	narovirus Hu/GII.4/NSW58G8/20I2/AU
718	VPI	AGS08I00	718	5128	9538, 13948, 18358, 227B8, 27178, 31588, 35998	noravirus Hu/GII,4/HSW590J/20I2/AU
719	VPI	AGS08I0I	719	5129	9539, 13949, 18359, 227B9, 27179, 31589, 35999	noravirus Hu/GII.4/NSW59GM/20II/A0
720	VPI	AGS08I02	720	5130	9540, 13950, I83B0, 22770, 27180, 31590, 3B000	**noravirus Hu/GII.4/NSW5BB0/20I2/AU**
721	VPI	AGS08I03	721	5131	9541, 13951, **18361.** 22771, 27181, 31591, 3B001	noravirus Hu/GII.4/NSWG027/20I2/A0
722	VPI	AGS08I04	722	5132	9542, 13952, I83B2, 22772, 27182, 31592, 3B002	narovirus Hu/GII.4/NSWBI42/20II/AU
723	VPI	AGS08I05	723	5133	9543, 13953, I83B3, 22773, 27183, 31593, 3B003	noravirus Hu/GII.4/NSWBI5H/20I2/AU
724	VPI	AGS08I0G	724	5134	9544, 13954, I83B4, 22774, 27184, 31594, 3B004	noravirus Hu/GII.4/NSWBI68/20I2/AU

725	VPI	AGSD8IQ7	725	5135	9545, 13955, I83G5, 22775, 27185, 31595, 3GD05	norovirus Hu/GII.4/NSW6I9D/20I2/AU
72G	VPt	AGSD8ID8	72G	5I3G	954G, **13956.** I83BG, 22776, 27186, 3I59B, 360G6	**norovirus Hu/GII.4/NSWG23B/20II/AU**
727	VPI	AGSG8I09	727	5137	9547, 13957, 18367, 22777, 27187, 31597, 36GG7	norovirus Hu/GII.4/NSW628G/20I2/AU
728	VPI	AGSD8IID	728	5138	9548, 13958, 18368, 22778, 27188, 31598, 36008	norovirus **Hu/GII.4/NSWBZBT/2012/AU**
729	VPI	AGSD8III	729	5139	9549, 13959, 18369, 22779. 27189, 3I599, 36009	norovirus Hu/GII.4/NSWB3BQ/20I2/A0
73D	VPI	AGS08II2	73D	5I4G	9550, I39B0, 18370, 22780, 27190, 3I600, 36010	norovirus Hu/GII.4/NSW65IH/20II/AU
731	VPI	AGSD8II3	731	5141	9551, 13961, 18371, 22781, **27131.** 31601, 36011	norovirus Hu/GII.4/NSW660C/20II/AU
732	VPI	AGS08II4	732	5142	9552, 13962, 18372. 22782, 27192, 31602, 3B0I2	norovirus Hu/GII.4/NSW6698/20I2/A0
733	VPI	AGSD8II5	733	5143	9553, 13963, 18373, 22783, 27193, 31603, 3B0I3	norovirus **Hu/GII.4/NSWG75N/2DI2/AU**
734	VPI	AGSD8IIG	734	5144	9554, 13964. 18374, 22784, 27194. 3IB04, 3B0I4	**norovirus Hu/GII.4/NSW67GP/20I2/AU**
735	VPI	AGSG8II7	735	5145	9555, 13965, 18375, 22785, 27195, 31605, 3B0I5	norovirus Hu/GII.4/NSWB79Q/20I!/AU
73B	VPI	AGSD8II9	736	5I4G	9556, 13966, 18376. 22786, 27I9B, 31606, 36016	norovirus Hu/GII.4/NSW6982/20I2/A0
737	VPI	AGS08I20	737	5147	9557, I39B7, 18377, 22787, 27197, 31607, 36017	norovirus Hu/GII.4/NSW707P/20II/AU
738	VPI	AGSD8I2I	738	5148	9558, I3BB8, 18378, 22788, 27198, 31608, 36018	norovirus **Hu/GII.4/NSW7I07/20I2/AU**
739	VPI	AGSD8I22	739	5149	9559, 13969, 18379, 22789, 27199, 31609, 36019	norovirus **Hu/GII.4/NSW7II7/20I2/AU**
74D	VPI	AGS08I24	74D	5I5D	9560, 13970, 18380, 22790. 2720D, 31610. 36020	norovirus Hu/GII.4/NSW7I88/20I2/AU
741	VPI	AGSD8I25	741	5151	9561, 13971, 18381, 22791, 27201, **31611.** 36021	norovirus **Hu/GII.4/NSW74GS/2DI2/AU**

742	VPI	AGSD8I2B	742	5152	35B2, 13372, 18382, 22732, 27202, 3IBI2, 3BD22	**norovirus Hu/GII.4/NSW748N/20I2/AU**
743	VPI	AGSD8I27	743	5153	35B3, 13973. 18383, 22733, 272D3, **31613. 36023**	norovirus **Hu/GII.4/NSW767N/20II/AU**
744	VPI	AGSD8I28	744	5154	9564, 13374, 18384, 22734, 27204, 31614. **3B024**	norovirus Hu/GII.4/NSW783I/20II/AU
745	VPI	AGSD8I2B	745	5155	35B5, 13375, 18385, 22735, 27205. 31615. **36D25**	norovirus **Hu/GII.4/NSW783R/20II/AU**
74B	VPI	AGS08I30	746	5156	3566. 13376, I838B, 2273B, 27206, 31616, 36026	norovirus Hu/GII,4/NSW797K/20I2/A0
747	VPI	AGS08I3I	747	5157	9567, 13377, 18387, 22797, 27207, 31617, 3B027	norovirus Hu/GII.4/NSW8IIC/20I2/AU
748	VPI	AGSD8I32	748	5158	3568, 13378, 18388, 22738, 27208, 31618, 36028	norovirus Hu/GII.4/NSW8IIG/20II/AU
74B	VPI	AGS08I33	74B	5159	9563, 13373, 18389, 22799, 27209, **31619. 36029**	norovirus Hu/GII.4/NSW820J/20II/AU
75D	VPI	AGSD8I34	75D	5160	9570, 13980, 18390, 22800. 27210, 31620, 36030	norovirus **Hu/GII.4/NSW824F/20I2/AU**
751	VPI	AGSD8I35	751	5IBI	3571, 13981, 18391, 22801, 27211, 31621, 36031	norovirus Hu/GII.4/NSW82GF/20II/AU
752	VPI	AGSD8I3G	752	5IB2	9572, 13982, 18392, 22802, 27212, 31622, 36032	norovirus **Hu/GII.4/NSW8347/20I2/AU**
753	VPI	AGS08I37	753	5IB3	9573, I3983, I8393, 22803, 27213, 31623, 3B033	norovirus **Hu/GII.4/NSW83BI/2DI2/AU**
754	VPI	AGSB8I38	754	5IB4	9574, 13984, 18394, 22804, 27214, 3IB24, 36034	**norovirus Hu/GII.4/NSW840H/20I2/AU**
755	VPI	AGSG8I33	755	5IB5	9575, 13985, 18395, 22805, 27215, 31625, 36035	norovirus Hu/GII.4/NSW8482/2DI2/AU
75B	VPI	AGSG8I4D	75B	5IBB	9576, 13986, I839B, 2280B, 27216, 31626, 36036	norovirus **Hu/GII.4/NSW8G2G/20I2/AU**
757	VPI	AGS08I4I	757	5167	3577, I3987. 18337. 22807, 27217, 3IB27, 3B037	norovirus **Hu/GII.4/NSW8G32/2DI2/AU**
758	VPI	AGSB8I42	758	5IB8	3578, 13988. 18398, 22808, 27218, 3IB28, 3B038	norovirus **Hu/GII.4/NSW868I/20I2/AU**

759	VPI	AGS08I43	759	5169	9579, 13989, 18399, 22809, 27210, 31629, 36039	norovirus Hu/GII.4/NSW893I/20II/AU
7BD	VPI	AGS08I44	760	5170	9580, 13990, 18400, 22810, 27220, 31630, 36040	norovirus Hu/GII.4/NSW906P/2DI2/A0
761	VPI	AGS08I45	761	5171	9581, 13991, 18401, 22811, 27221, 31631, 36041	norovirus Hu/GII.4/NSW9I6G/20I2/AU
762	VPI	AGS08I46	762	5172	9582, 13902, 18402, 22812, 27222, 31632, 36042	norovirus Hu/GII.4/NSW9I7I/20I2/AU
763	VPI	AGS08I47	763	5173	9583, 13993, 18403, 22813, 27223, 31633, 36043	norovirus Hu/GII.4/NSW9334/20I2/A0
764	VPI	AGS08I48	764	5174	9584, 13994, I84D4, 22814, 27224, 31634, 36044	norovirus Hu/GII.4/NSW9393/20I2/AU
765	VPI	AGS0BI49	765	5175	9585, 13995, 18405, 22815, 27225, 31635, 36045	norovirus Hu/GII,4/NSW959S/20I2/A0
766	VPI	AGS08I50	766	5176	9586, 13996, 18406, 22816, 27226, 31636, 36046	norovirus Hu/GII.4/NSW982P/20II/A0
767	VPI	AGS08I52	767	5177	9587, 13997, 18407, 22817, 27227, 31637, 36047	norovirus Hu/GII.4/NLV-IO-6I4/20IO/NZ
768	VPI	AGS08I53	768	5178	9588, 13998, I84D8, 2Z8I8, 27228, 31638, 36048	norovirus Hu/GII.4/NLV-IO-640/20IO/NZ
769	VPI	AGS08I54	769	5179	9589, 13999, 18409, 22819, 27229, 31639, 36049	norovirus Hu/GII.4/NLV-I2-I034/20IZ/NZ
770	VPI	AGS08I57	77D	5180	9590, 14000, 18410. 22820. 27230, 31640, 36050	norovirus Hu/GII.4/NLV-I2-I072/20I2/NZ
771	VPI	AGS08I58	771	5181	9591, 14001, 18411, 22821, 27231, 31641, 36051	norovirus Hu/GII.4/NLV-I2-308/2OI2/NZ
772	VPI	AGS08I60	772	5182	9592, 14002. 18412, 22822. 27232, 31642, 36052	norovirus Hu/GII.4/NLV-I2-50I/20I2/NZ
773	VPI	AGS08I6I	773	5183	9593, 14003, 18413, 22823, 27233, 31643, 36053	norovirus Hu/GII.4/NLV-I2-5I4/2DI2/NZ
774	VPI	AGS08I62	774	5184	9594. 14004, 18414, 22824, 27234. 31644, 36054	norovirus Hu/GII,4/NLV-I2-548/20I2/NZ
775	VPI	AGS08I63	775	5185	9595, 14005, 18415, 22825, 27235, 31645, 36055	norovirus Hu/GII.4/NLV-I2-583/20I2/NZ

776	VPI	AGS08I64	776	5186	9596, 14006, 18416, 22826, 27236, 31646, 36056	nnrnvirus **Hu/GII.4/NLV-IZ-BD7/2DI2/NZ**
777	VPI	AGS08I65	777	5187	9597, 14007, 18417, 22827, 27237, 31647, 36057	nornvirus **Hu/GII.4/NLV-IZ-GI5/20I2/NZ**
778	VPI	AGS08I66	778	5188	9598. 14008, 18418, 22828, 27238, 31648, 36058	**nornvirus Hu/GH.4/NLV-12-BZB/2DI2/NZ**
779	VPI	AGS08I67	779	5189	9599, 14009, 18419, 22829, 27239, 31649, 36059	norovirus **Hu/GII.4/NLV-IZ-B5/Z0IZ/NZ**
780	VPI	AGS08IG8	780	5190	9600, 14010, 18420, 22830, 27240, 31650, 36060	nornvirus Hu/GII.4/NLV-IZ-G7I/Z0IZ/NZ
781	VPI	AGS08IG9	781	5191	9601, 14011, 18421, 22831, 27241, 31651, 36061	norovirus **Hu/BII.4/NLV-IZ-B72/ZDI2/NZ**
782	VPI	AGS08I70	782	5192	9602, 14012, 18422, 22832, 27242, 31652, 36062	norovirus **Hu/GII.4/NLV-IZ-7I3/ZDI2/NZ**
783	VPI	AGS08I7I	783	5193	9603, 14013, 18423, 22833, 27243, 31653, 36063	norovirus **Hu/GII.4/NLV-I2-7Z3/ZDIZ/NZ**
784	VPI	AGS08I72	784	5194	9604, 14014, 18424, 22834, 27244, 31654, 36064	norovirus **Hu/GII.4/NLV-IZ-73/2DIZ/NZ**
785	VPI	AGS08I73	785	5195	9605, 14015, 18425, 22835, 27245. 31655, 36065	norovirus **Hu/GII.4/NLV-IZ-734/2DI2/NZ**
786	VPI	AGS08I74	786	5196	96D6, I4DI6, 18426, 22836. 27246. 31656, 36066	norovirus Hu/GII.4/NLV-IZ-758/Z01Z/NZ
787	VPI	AGS08I75	787	5197	9607, 14017. 18427, 22837, 27247, 31657, 36067	norovirus Hu/GII.4/NLV-IZ-7B3/Z0IZ/NZ
788	VPI	AGS08I7G	788	5198	9608, 14018, 18428. 22838, 27248, 31658, 36068	norovirus **Hu/GII.4/NLV-IZ-787/ZDIZ/NZ**
789	VPI	AGS08I77	789	5I9B	9609, 14019, 18429, 22839, 27249. 31659, 36069	norovirus **Hu/GII.4/NLV-IZ-8D3/Z0IZ/NZ**
790	VPI	AGS08I78	790	5200	9610, 14020, 18430, 22840, 27250, 31660, 36070	norovirus Hu/GII.4/NLV-IZ-809/ZOIZ/NZ
791	VPI	AGS08I79	791	5201	9611, 14021, 18431. 22841. 27251, 31661, 36071	**norovirus Hu/GII.4/HLV-IZ-83I/ZDIZ/NZ**
792	VPI	AGS08I80	792	5202	9612, 14022, 18432, 22842, 27252. 31662, 36072	norovirus Hu/GII.4/NLV-IZ-90Z/ZOIZ/NZ

793	VPI	AGS08I8I	793	5203	9GI3. I4D23. 18433, 22843, 27253, 3IGG3, 3G073	norovirus Hu/GII,4/NLV-I2-932/20I2/NZ
794	VPI	AGS08I82	794	5204	9GI4, 14024, 18434, 22844, 27254, 3I664, 36074	norovirus HU/GII.4/NLV-I2-934/20I2/NZ
705	VPI	AGT39I8I	795	5205	9615, 14025, 18435, 22845, 27255, 31665, 36075	norovirus Hu/GII.3/CGMH36/20IO/TW
796	VPI	AGT39I9I	79G	520B	9616, 14026, 18436, 22846, 27256, 31666. 36076	norovirus Hu/GII.I2/CGMH38/20ID/TW
797	VPI	AGT39I94	797	5207	9617, 14027, 18437, 22847, 27257, 31667, 36077	norovirus Hu/GII.I2/CGMH39/20IO/TW
798	VPI	AGT39I97	798	5208	9618, 14028, 18438, 22848, 27258, 31668. 36078	norovirus Hu/GII.I2/CGMH4D/20IO/TW
799	VPI	AGT39200	799	5209	9619, 14029, 18439, 22849, 27259, 31669, 36079	norovirus Hu/GII.I2/CGMH4I/20IO/TW
800	VPI	AGT39203	800	5210	9620, 14030, 18440, 22850, 27260, 3I670, 36080	norovirus Hu/GII.I2/CGMH42/20IO/TW
801	VPI	AGT3920G	801	5211	9621, 14031, 18441, 22851, 27261, 31671, 36081	norovirus Hu/GII.2/CGMH47/20II/TW
802	VPI	AHF4599I	802	5212	9622, 14032, 18442. 22852. 27262, 3I672, 36082	norovirus Hu/GII.4/Taipei/06-AM-II/2006/TW
803	VPI	AHF45993	803	5213	9623, 14033, 18443, 22853, 27263, 31673. 36083	norovirus Hu/GII.4/kaohsiung/I2-AY-I/20I0/TW
804	VPI	AHP45997	804	5214	9624. 14034, 18444, 22854, 27264, 31674, 36084	noravirus Hu/GII.4/Penghu/I2-BQ-I/20I2/TW
805	VPI	AHF45999	805	5215	9625, 14035, 18445, 22855, 27265, 31675, 36085	norovirus Hu/GII.4/Tainan/I2-CD-2-4/2012/TW
SOB	VPI	AHF4G00I	80G	52IG	9626, 14036, 18446, 22856, 27266, 31676, 36086	norovirus Hu/GII.4/Changhua/I2-CG-2-4/2012/TW
807	VPI	AHH4487G	807	5217	9627, 14037, 18447, 22857, 27267, 3I677, 36087	norovirus Hu/GII.4/patient_A/20IO/USA
808	VPI	AHH44877	808	5218	9628, 14038, 18448, 22858, 27268, 31678, 36088	norovirus Hu/GII.4/patient_A/20IO/OSA
809	VPI	AHH44878	809	5219	9629, 14039, 18449, 22859, 27269, 31679, 36089	norovirus Hu/GII.4/patient_A/20fO/USA

SID	VPI	AHH44879	810	522D	963D, 14040. 18450, 22860, 27270, 31680, 36090	norovirus Hu/GII.4 / patiEnt _A/20IO/USA
e11	VPI	AHH44880	811	5221	9631, 14041, 18451, 22861, 27271, 31681, 36091	norovirus Hu/ GII.4/patient _A/2DfO / USA
812	VPI	AHH44881	812	5222	9632, I4D42, 18452, 22862, 27272, 31682, 36092	norovirus Hu/GII.4 / patiEnt _A/20IO/USA
813	VPI	AHH44884	813	5223	9633, 14043, 18453, 22863, 27273, 31683, 36093	norovirus Hu/GII.4 / patient _A/20IO/USA
814	VPI	AHH44886	814	5224	9634, 14044, 18454, 22864, 27274, 31684, 36094	norovirus Hu/GII.4/patient_C/20IO/USA
815	VPI	AHH44888	815	5225	9635, 14045, 18455, 22865, 27275, 31685, 36095	norovirus Hu/GII.4/patient_C/20IO/USA
816	VPI	AHH44889	816	5226	9636, 14046, 18456, 22866. 27276, 31686, 36096	norovirus Hu/GII.4 / patient _C/20IO/USA
817	VPI	AHH44890	817	5227	9637, 14047, 18457, 22867, 27277, 31687, 36097	norovirus Hu/GII.4/patient_C/2DfD/USA
818	VPI	AHH44891	818	5228	9638. 14048. 18458, 22868, 27278, 31688, 36098	noravirus Hu/GII.4 / patient _C/20ID/USA
819	VPI	AHH44893	819	5229	9639, I4D49, 18459, 22869, 27279, 31689, 36099	norovirus Hu/GII.4 / patiant _C/2DID/USA
820	VPI	AHH44894	820	5230	9640, 14050, 18460. 22870. 27280. 31690, 36100	norovirus Hu/GII.4 / patient _C/2DID/USA
821	VPI	AHH44895	821	5231	9641, 14051, 18461, 22871, 27281, 31691, 36101	norovirus Hu/GII.4 / patient _C/2QI0/USA
822	VPI	AHH44896	822	5232	9642, I4D52, 18462, 22872, 27282, 31692, 36102	norovirus Hu/GII.4 / patiEnt _A+5mo/20IO/USA
823	VPI	AHH44897	823	5233	9643, 14053, 18463, 22873. 27283, 31693, 36103	norovirus Hu/GII.4 / patient _A+5mo/ 20I0/ USA
824	VPI	AHH44899	824	5234	9644, 14054, 18464, 22874. 27284. 31694, 36104	norovirus Hu/GII.4/patient>5mo/20IO/OSA
825	VPI	AHH44900	825	5235	9645. 14055, 18465, 22875, 27285, 31695, 36105	norovirus Hu/GII.4 / patient >5mo/20IO/USA
826	VPI	AHH44902	826	5236	9646, 14056, 18466, 22876, 27286, 31696, 36106	norovirus Hu/GII.4 / patiBnt _A+5mn/20ID/USA

827	VP1	AHH44BD4	827	5237	9B47. 14057, I84B7, 22877, 27287, 3IB97, 3BI07	narovirus Hu/GII.4/patient>5mo/2010/USA
828	VP1	AHH449D5	828	5238	9B48, 14058, I84B8, 22878, 27288, 3IB98, 3B108	norovirus Hu/GII.4/patient>5rno/20IO/USA
829	VPI	AHH449DB	829	5230	9B49, 14059, I84B0. 22879, 27289, 31699, 3BI09	narnvirus Hu/GII.4/patient_B/20IQ/USA
830	VPI	AHH449D7	830	5240	9650, 14060, 18470, 22880, 27290, 31700, 36110	narovirus Hu/GII.4/patient_B/20IO/USA
831	VPI	AHH449D8	831	5241	9651, 14061, 18471, 22881, 27291, 31701, 3BIII	norovirus Hu/GII.4/patient_B/20ID/USA
832	VPI	AHH449D9	832	5242	9652. 14062, 18472, 22882, 27292, 31702, 36112	narovirus Hu/GII.4 /patiEnt_B/20IO/USA
833	VPI	AHH449II	833	5243	9653. I40B3, 18473, 22883, 27293, 31703, 36113	narovirus Hu/GII.4/patient_B/2DI0/USA
834	VPI	AHH44912	834	5244	9654, 14064, 18474, 22884. 27294. 31704, 36114	norovirus Hu/GII.4/patient_B/20IO/USA
835	VPI	AHH449I3	835	5245	9655, 14065, 18475, 22885, 27295, 31705, 36115	norovirus Hu/GII.4/patient_B/Z0ID/USA
83G	VPI	AHH449I4	83B	524B	9B56. I40B6, I847B, 22886, 2729B, 31706, 36116	norovirus Hu/GII.4/patient_B/2DID/USA
837	VPI	AHH449I5	837	5247	9657, 14067, 18477, 22887, 27297, 31707, 36117	norovirus Hu/GII.4/patient_B/20l0/0SA
838	VPI	AI0B0853	838	5248	9658. 14068, 18478, 22888, 27298, 31708, 36118	norovirus Hu/GII.4/Beijing/PK0PH-02-Ot/inpatiBnt/2012/CHN
839	VPI	AIDBD855	839	5240	9659, 14069, 18479, 22889, 27299, 31709, 36119	norovirus Hu/GII.4/Beijing/PKUPH-02-02/inpatient/20l2/CHN
84D	VPI	AIDB0857	840	5250	9660. 14070. 18480, 22890, 27300, 31710, 36120	norovirus Hu/GII.4/Beijing/PKUPH-02-03/inpatient/20l2/CHN
841	VPI	AIDBD859	841	5251	9661 14071, 18481, 22891, 273DI, 31711. 36121	norovirus Hu/GII.4/B ɐijing/PK0PH-02-D4/inpatiBnt/20l3/CHN
842	VPI	AIDBD8BI	842	5252	9662. 14072, 18482, 22892, 27302, 31712, 36122	norovirus Hu/GII.4/Beijing/PK0PH-02-05/inpatient/2OI3/CHN
843	VPI	AIDBD8B3	843	5253	9663, 14073. 18483, 22893, 27303. 31713, 36123	norovirus Hu/GII.4/Baijing/PKUPH-D2-OB/inpatient/2013/CHN

844	VPI	AID60865	844	5254	9664, I4D74, 18484. 22894, 27304, 3171 4, 36124	norovirus Hu/GII.4/Beijing/PKUPH-02-Q7/inpatient/20l3/CHN
845	VPI	AID6086B	845	5255	9665. 14075, 18485. 22895, 27305, 31715, 36125	norovirus Hu/GII.4/Beijing/PKUPH-02-09/inpatiBnt/20l3/CHN
846	VPI	AID6087I	846	5256	9666, 14076, 18486, 22896, 27306, 3171 6. 36126	norovirus Hu/GII.4/Beijing/PKUPH-05-OI/inpatiEnt/2013/GHN
847	VPt	AID60875	847	5257	9667, 14077, 18487, 22897, 27307, 31717, 36127	norovirus Hu/GII.4/Beijing/PKUPH-DS-03/inpatiEnt/20l3/CHN
848	VPI	AID60877	848	5258	9668, 14078, 18488. 22898, 27308, 31718, 3612 8	norovirus Hu/GII.4/Beijing/PKUPH-05-04/inpatient/20l3/CHN
849	VPI	AID60879	849	5259	9669, 14079, 18489, 22899, 27309, 31719, 3612 9	norovirus Hu/GII.4/Beijing/PKUPH-05-05/inpatient/20l3/CHN
850	VPI	AID6088I	850	5260	967D, I408D, 18490, 22900, 27310, 31720, 36130	norovirus Hu/GII.4/Beijing/PKUPH-D5-OG/inpatient/2013/CHN
851	VPI	AID60883	851	5261	9671, 14081, 18491, 22901, 27311, 31721, 36131	norovirus Hu/GII.4/Beijing/PKUPH-05-07/inpatient/20l3/CHN
852	VPI	AI060885	852	5262	9672, 14082, 18492, 22902, 27312, 31722, 3GI32	norovirus Hu/GII.4/Beijing/PKUPH-07-01/inpatient/2013/CHN
853	VPI	AID60887	853	5263	9673, 14083, 18493, 22903, 27313, 31723, 36133	norovirus Hu/BII.4/Beijing/PKUPH-07-02/inpatiBnt/20l3/CHN
854	VPI	AI060889	854	5264	9674, 14084. 18494, 22904, 27314, 31724, 3613 4	norovirus Hu/GII.4/Beijing/PKUPH-07-03/inpatient/20l3/CHN
855	VPI	AID60893	855	5265	9675, 14085, 18495, 22905, 27315, 31725, 3613 5	norovirus Hu/GII.4/Beijing/PKUPH-B7-05/inpati_nt/20l3/CHN
856	VPI	AID68577	856	5266	9676, 14086, 18486, 22906, 27316, 31726, 36136	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-244
857	VPI	AID68578	857	5267	9677, 14087, 18497, 22907, 27317, 31727, 36137	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-246
858	VPI	AID68579	858	5268	9678, 14088, 18498, 22908, 27318. 31728, 36138	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-250
859	VPI	AID6858I	859	5269	9679, 14089, 18499, 22909, 27319. 31729, 3613 9	norovirus GII/Hu/HKG/20l3/GII.4/CUHK-NS-141
860	VPI	AID69I74	860	5270	9680, 14090, 18500, 22910, 27320, 31730, 36140	bat norovirus

8BI	VPI	AIB5B994	8BI	527I	9B8I, I409I, I850I, 229II, 27321, 3I731, 3BI4I	norovirus Hu/GII.4/Beijing
8B2	VPI	AIG5999B	8B2	5272	9B82, I4092, I8502. 229I2, 27322. 3I732. 3BI42	norovirus Hu/GII.4/Beijing
8B3	VPI	AIG59998	8B3	5273	9B83, I4093, I8503. 229I3, 27323, 3I733, 3BI43	nomvirus Hu/GII.4/Beijing
8B4	VPI	AIGBDDDD	8B4	5274	9B84, I4094, I8504, 229I4, 27324, 3I734, 3BI44	norovirus Hu/GII.4/Beijing
8B5	VPI	AIGBQQD2	8B5	5275	9B85, I4095, I8505, 229I5, 27325, 3I735. 3BI45	nomvirus Hu/GII.4/Beijing
8BB	VPI	AIGBDDD4	8BB	527B	9B8B, I409B. I850B, 229IB, 2732B, 3I73G, 3BI4B	norovirus Hu/GII.4/Beijing
8B7	VPI	AIGBDODB	8B7	5277	9B87, I4097, I8507, 229I7, 27327, 3I737, 3BI47	norovirus Hu/GII.4/Beijing
8B8	VPI	AIGBD0D8	8B8	5278	9B88. I4098. I8508. 229I8, 27328, 3I738, 3BI48	norovirus Hu/GII.4/BBijing
8BB	VPI	AIGBDDIO	8B9	5279	9B89, I4099, I85D9, 229I9, 27329, 3I739, 3BI49	norovirus Hu/GII.4/Beijing
87D	VPI	AIGBDDI2	87D	5280	9B9Q, I4IDD, I85I0, 22920, 27330, 3I740, 3BI50	norovirus Hu/GII.4/Beijing
87I	VPI	AIGBQ0I4	87I	528I	9B9I, I4I0I, I85II. 2292I. 27331, 3I741, 3BI5I	norovirus Hu/GII.4/Beijing
872	VPI	AIGBDDIB	872	5282	9BB2, 14102. 18512, 22922, 27332. 31742. 3BI52	norovirus Hu/GII.4/Beijing
873	VPI	AIGBDDI8	873	5283	9B93. 14103, 18513, 22923, 27333, 31743, 3BI53	norovirus Hu/GII.4/Beijing
874	VPI	AIGB0G2G	874	5284	9B94, 14104, 18514, 22924, 27334. 31744, 3BI54	norovirus Hu/GII.4/BBijing
875	VPI	AIGB0022	875	5285	9B95, 14105, 18515, 22925, 27335, 31745, 3BI55	norovirus Hu/GII.4/Beijing
87B	VPI	AIGBD024	87B	528B	9B9B, I4I0B, I85IB, 2292B, 27336. 3I74B, 3BI5B	norovirus Hu/GII.4/Beijing
877	VPI	AII737I7	877	5287	9B97, 14107. 18517, 22927, 27337, 31747, 3BI57	norovirus GII/Hu/JP/2002/GII.PI2_GII.I3/Saitama/T80

878	VPI	AII7372D	878	5288	9B98, 14108, 18518, 22928, 27338, 31748, 3BI58	norovirus GII/Hu/JP/200l/GII.P22_GII,5/Saitama/T49
873	VPI	AII73723	879	5289	9699, 14109, 18519, 22929, 27339, 31749, 3BI59	norovirus GII/Hu/JP/2007/GII.P7_GII.I4 /SBndai/YG99
88D	VPI	AII7372B	880	5290	9700, 14110. 18520, 22930, 27340, 31750, 3BIB0	norovirus GII/Hu/JP/20!2/GII.Pe_GII.4_ Sydney2DI2/Fukuyama/3
881	VPI	AII73729	881	5291	9701, 14111, 18521, 22931, 27341, 31751, 3BIBI	norovirus GII/HU/JP/20l2/GII.PB_GII.4_ Sydney20l2/Fukuyama/2
882	VPI	AII73732	882	5292	9702, 14112, 18522, 22932, 27342, 31752, 3BIB2	norovirus GII/Hu/JP/20l2/GII.Pe_GII.4_ Sydn_y20l2/Fukuyama/5
883	VPI	AII73735	883	5293	9703, 14113. 18523, 22933, 27343, 31753, 3BIB3	norovirus GII/Hu/JP/200l/GII.PI2_GII.I2/Saitama/TI5
884	VPI	AII73738	884	5294	3704. 14114. 18524, 22934, 27344. 31754, 3BIB4	norovirus GII/Hu/TW/2012/GII.Pe_GII.4_ Sydney20l2/Taipei/I06
885	VPI	AII7374I	885	5295	9705, 14115, 18525, 22335, 27345, 31755, 3BIB5	norovirus GII/Hu/JP/2007/GII.P2l_GII.2l/Kawasaki/Y02 84
88B	VPI	AII73744	88B	529B	9708, I4IIG. I852B, 2293B, 27346, 31756, 3BIB6	norovirus GII/Hu/TW/20l2/GII.Pe_GII.4_ Sydney20l2/Tai pei/I08
887	VPI	AII73747	887	5297	9707, 14117. 18527, 22937. 27347, 31757, 36IB7	norovirus GII/Hu/JP/2002/GII.PIG_GII.I7/Saitama/T87
888	VPI	AII7375D	888	5298	9708, 14118. 18528. 22938, 27348, 31758, 3BIB8	norovirus GII/Hu/JP/20IO/GII.P4_GII.4/Shimada/ASC9G
889	VPI	AII73753	889	5299	9709, 14119, 18529, 22939, 27349, 31759, 36169	norovirus GII/Hu/JP/2002/GII.P5_GII.5/Saitama/T52
89D	VPI	AII7375B	89D	5300	9710, 14120. 18530, 22940, 27350, 31760, 36170	norovirus GII/Hu/TW/20l2/GII.Pe_GII.4_ Sydney20l2/Taipei/I09
891	VPI	AII73753	891	5301	9711, 14121, 18531, 22941, 27351, 31761, 36171	norovirus GII/Hu/JP/2007/GII.PI5_GII.I5/Sapporo/HK2 99
892	VPI	AII737B2	892	5302	9712, 14122, 18532, 22942, 27352, 31762, 36172	norovirus GII/Hu/JP/20ll/GII/Yuzawa/Gira2HS

893	VPI	AII737G5	893	5303	9713. 14123, 18533. 22943, 27353, 31763, 36173	norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866
894	VPI	AII737G8	894	5304	9714, 14124, 18534. 22944, 27354, 31764, 36174	narovirus GII/HU/JP/2D12/GII.PB_GII.4_ SydnBy2DI2/Fukuyama/I
895	VPI	AII7377I	895	5305	9715. 14125, 18535, 22945, 27355, 31765, 36175	narovirus GII/Hu/JP/2000/GII.PI2_GII.I2/Saitama/KUIG
896	VPI	AII73774	89G	530G	9716, 14126, 18536, 22946, 27356, 31766, 36176	narovirus 6II/Hu/JP/20IO/GII.P7_GII.7/ Musashimurayama/TAKAsanKimchi
897	VPI	AII73777	897	5307	9717, 14127, 18537, 22947, 27357, 31767, 36177	narovirus GII/HU/TW/20I2/GII.PB_GII.4_ SydnEy20l2/Taipei/I05
898	VPI	AII73780	898	5308	9718, 14128, 18538, 22948. 27358. 31768, 36178	narovirus GII/Hu/JP/2007/GII.P7_GII.I4/Fukuoka/KK28 2
899	VPI	AII73783	899	5309	9719, 14129, 18539, 22949, 27359. 31769, 36179	norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY53I
9D0	VPI	AII7378G	900	5310	9720. 14130, 18540, 22950, 27360, 31770, 36180	narovirus GII/Hu/JP/200l/GII.PI2_GII.I2/Saitama/TI8
301	VPI	AIS400I9	901	5311	9721, 14131, 18541, 22951, 27361, 31771. 36181	norovirus Hu/Gli.4/S JTUHI/CHN/2014
902	VPI	AIV43I47	902	5312	9722, 14132, 18542, 22952. 27362, 31772, 36182	norovirus GII.4
903	VPI	AIV43I48	903	5313	9723, 14133, 18543, 22953, 27363, 31773, 36183	narovirus GII.4
904	VPI	AIV43I49	904	5314	9724, 14134, 18544, 22954, 27364, 31774, 36184	narovirus GII.4
905	VPI	AIV43I50	905	5315	9725, 14135, 18545, 22955, 27365, 31775, 36185	norovirus GII.4
90G	VPI	AIV43I5I	90G	5316	9726, 14136, 18546, 22956, 27366, 31776, 36186	narovirus GII.4
907	VPI	AIV43I52	907	5317	9727, 14137, 18547, 22957, 27367, 31777, 36187	norovirus GII.4
908	VPI	AIV43I53	908	5318	9728, 14138, 18548, 22958, 27368, 31778, 36188	norovirus GII.4

9D9	VP1	AIV43I54	909	5319	9729. 14139. 18549, 22959, 273B9, 31779, 36189	norovirus GII.4
9ID	VP1	AIV43I55	910	5320	9730, 14140, 18550, 22960, 27370, 31780, 3BI90	norovirus GII.4
911	VPI	AIV43156	911	5321	9731, 14141, 18551, 229GI, 27371, 31781, 3GI9I	norovirus Gil.4
912	VPI	AIV43I59	912	5322	9732. 14142, 18552, 229G2, 27372, 31782. 36192	norovirus GII.4
913	VPI	AIV43IG0	913	5323	9733. 14143. 18553, 22963. 27373, 31783, 36193	nnrovirus GII.4
914	VPI	AIV43IBI	914	5324	9734, 14144, 18554, 229G4, 27374, 31784, 36194	norovirus GII.4
915	VPI	AIV43IG2	915	5325	9735, 14145, 18555, 22965, 27375, 31785, 36195	norovirus GII.4
916	VPI	AIV43IB3	9IB	532B	973B, I4I4B, I855G, 229G6, 27376, 31786, 3BI9B	norovirus GII.4
917	VPI	AIV43IB4	917	5327	9737. 14147, 18557, 22967, 27377, 31787, 36197	norovirus GII.4
918	VPI	AIV43IB5	918	5328	9738, 14148. 18558, 22968, 27378. 31788, 36198	norovirus GII.4
919	VPI	A1V43IBB	919	5329	9739, 14149, 18559, 22969, 27379, 31789, 3BI99	norovirus GII.4
920	VPI	AIV43IB7	920	5330	9740, 14150, I85G0, 22970, 27380, 31790, 36200	norovirus GII.4
921	VPI	AIV43I7I	921	5331	9741, 14151, 18561, 22971, 27381, 31791. 36201	norovirus GII.4
922	VPI	AIV43I72	922	5332	9742, 14152, 18562, 22972, 27382, 31792, 3G202	norovirus GII.4
923	VPI	AIV43I73	923	5333	9743, 14153, 18563, 22973, 27383, 31793, 3G2D3	norovirus GII.4
924	VPI	AIV43I74	924	5334	9744, 14154, 18564, 22974, 27384, 31794, 36204	norovirus GII.4
925	VPI	AIV43I75	925	5335	9745, 14155, 18565, 22975, 27385, 31795, 36205	norovirus GII.4

926	VPI	AIV43I7B	926	5336	9746, 14156. 18566, 22976, 27386, 31796, 36206	narovirus GII.4
927	VPI	AIV43I77	927	5337	9747, 14157, 18567, 22977, 27387, 31797, 36207	norovirus GII.4
928	VPI	AIV43I78	928	5338	9748, 14158, 18568, 22978, 27388, 31798, 36208	norovirus GII.4
929	VPI	AIV43I7B	929	5339	9749, 14159, 18569, 22979, 27389, 31799, 36209	norovirus GII.4
930	VPI	AIY27747	93D	5340	9750, 14160, 18570, 22980, 27390, 31800, 36210	naravipus Hu/GII.4/variant Sydney 2012/FRA
931	VPI	AJA7I387	931	5341	9751, 14161, 18571, 22981, 27391, 31801, 36211	narovirus GII/Hu/HKG/2014/GIIMUHK-NS-337
932	VPI	AJA7I388	932	5342	9752, 14162. 18572, 22982, 27392, 31802, 36212	narovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-340
933	VPI	AJA7I389	933	5343	9753, 14163, 18573, 22983. 27393, 31803, 36213	norovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-342
934	VPI	AJA7I390	934	5344	9754, 14164, 18574, 22984, 27394. 31804, 36214	narovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-345
935	VPI	AJA7I392	935	5345	9755, 14165, 18575. 22985, 27395, 31805, 36215	norovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-348
93B	VPI	AJA7I393	936	5346	9756, 14166, 18576, 22986, 27396. 31806. 36216	norovirus GII/Hu/HKG/20I4/GII.4/C0HK-NS-349
937	VPI	AJA7I394	937	5347	9757. 14167, 18577, 22987, 27397, 31807, 36217	narovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-350
938	VPI	AJA7I395	938	5348	9758, 14168, 18578, 22988, 27398, 31808, 36218	norovirus GII/Hu/HKG/20I4/GII.4/C0HK-NS-351
939	VPI	AJA7I39G	939	5349	9759, 14169, 18579, 22989, 27399, 31809, 36219	norovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-354
940	VPI	AJA7I399	940	5350	9760. 14170, 18580, 22990, 27400, 31810, 36220	narovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-358
941	VPI	AJA7I400	941	5351	9761, 14171, 18581, 22991, 27401, 31811. 36221	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-359
942	VPI	AJA7I40I	942	5352	9762. 14172, 18582, 22992, 27402, 31812, 36222	norovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-361

943	VPI	AJA7I4D2	943	5353	3763, 14173. 18583, 22993, 274D3, 31813, 36223	norovirus GII/Hu/HKG/2DI4/GII.4/C0HK-NS-362
944	VPI	AJA7I4D3	944	5354	9764, 14174, 18584. 22994, 27404, 31814, 36224	norovirus Gli/Hu/HKG/2DI4/Gl 1.4/CUHK-NS-363
945	VPI	AJA7I4D4	945	5355	9765, 14175, 18585, 22995, 274D5, 31815, 36225	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-364
94G	VPI	AJA7I405	94G	5356	9766, 14176, 18586, 22996, 274D6, 31816, 36226	norovirus GII/Hu/HKG/2014/GIIMUHK-NS-365
947	VPI	AJA7I4DB	947	5357	9767, 14177, 18587, 22997, 274D7. 31817, 36227	norovirus GII/Hu/HKG/20l4/GII.4/C0HK-NS-3G7
948	VPI	AJA7I4D7	948	5358	9768, 14178, 18588, 22998, 27408, 31818, 36228	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-369
949	VPI	AJA7I408	949	5353	9769, 14179. 18589, 22999, 27409. 31819. 36229	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-370
950	VPI	AJA7I409	95D	53G0	9770, 14180, 18590, 23000, 27410. 31820, 36230	norovirus Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-368
951	VPI	AJA7I4I0	951	53GI	9771,14181,18591,23001.27411, 31821, 36231	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-372
952	VPI	AJA7I4II	952	53G2	9772, 14182, 18592, 23002, 27412, 31822, 36232	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-374
953	VPI	AJA7I4I2	953	53G3	9773, 14183, 18593, 23003, 27413, 31823, 36233	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-377
954	VPI	AJA7I4I3	954	53G4	9774, 14184, 18594, 23004, 27414, 31824, 36234	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-378
955	VPI	AJA7I4IB	955	53G5	9775, 14185. 18595, 23005, 27415, 31825, 36235	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-384
95E	VPI	AJA7I4I7	95B	5366	9776, 14186, 18596, 23006, 27416, 31826, 36236	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-385
957	VPI	AJA7I4I8	957	5367	9777, 14187, 18597, 23007, 27417, 31827, 36237	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-386
958	VPI	AJA7I4I9	958	5368	9778. 14188. 18598, 23008, 27418, 31828, 36238	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-387
959	VPI	AJA7I420	959	5369	9779, 14189, 18599, 23009, 27419, 31829, 36239	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-389

960	VPI	AJA7I42I	960	5370	9780. 14190. 18600, 23010, 27420. 31830. 36240	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-393
961	VPI	AJA7I422	961	5371	9781, 14191,18001, 23DII, 27421, 31831, 36241	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-394
962	VPI	AJA7I423	962	5372	9782, 14192, 18602, 23012, 27422, 31832, 36242	norovirus Hu/GII/HKG/ZDI4/GII.4/CUHK-NS-395
963	VPI	AJA7I424	963	5373	9783, 14193. 18603, 23013, 27423, 31833, 36243	norovirus Hu/GII/HKG/20I4/GII.4/C0HK-NS-396
964	VPI	AJA7I425	964	5374	9784, 14194, 18604, 23014, 27424, 31834, 36244	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-397
965	VPI	AJA7I426	965	5375	9785, 14195, 18605, 23015, 27425, 31835. 36245	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-398
966	VPI	AJA7I427	966	5376	9786, 14196, 18606, 23016, 27426, 31836, 36246	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-399
967	VPI	AJA7I428	967	5377	9787, 14197, 18607, 23017, 27427, 31837, 36247	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-402
968	VPI	AJA7I429	968	5378	9788, 14198, 18608, 23018, 27428, 31838, 36248	norovirus Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-404
969	VPI	AJA7I430	969	5379	9789, 14199, 18609, 23010, 27429, 31839, 36249	norovirus Hu/GII/HKG/2014/GI.4/CUHK-NS-406
970	VPI	AJA7I456	970	5380	9790. 14200. 18610. 23D20, 27430, 31840. 36250	norovirus Hu/GII/HKG/20I4/GII.4/C0HK-NS-426
971	VPI	AJA7I457	971	5381	9791, 14201, 18611, 23021, 27431, 31841, 36251	norovirus Hu/GII/HKG/20I4/GII.4/C0HK-NS-341
972	VPI	AJA7I458	972	5382	9792, 14202, 18612, 23022, 27432, 31842, 36252	norovirus Hu/GII/HKG/ZDI4/GII.4/CUHK-NS-346
973	VPI	AJA7I459	973	5383	9793, 14203, 18613, 23023, 27433, 31843, 36253	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-352
974	VPI	AJA7I460	974	5384	9794, 14204, 18614, 23024, 27434, 31844, 36254	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-356
975	VPI	AJA7I46I	975	5385	9795, 14205, 18615, 23025, 27435, 31845, 36255	norovirus Hu/GII/HKG/20I4/GII.4/CU HK-Ns-371
976	VPI	AJA7I462	976	5386	9796, 14206, 18616, 23026, 27436, 31846, 36256	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-376

977	VPI	AJA7I4B3	977	5387	9797. 14207, I8617, 23027, 27437, 31847, 3B257	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-379
978	VPI	AJA7I4B4	978	5388	9798, I42D8, I8GI8, 23028, 27438, 31848, 3B258	norovirus HU/GII/HKG/ZDI4/GII.4/CUHK-NS-407
979	VPI	AJA7I4B5	979	5389	9799, 14209, I8BI9, 23029, 27439, 31849, 3B259	norovirus Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-412
98D	VP!	AJA7I4BB	980	5390	9800, I421O, I8B20, 23030, 27440, 31850, 3B2B0	noravirus Hu/GII/HKG/ZDI4/GII.4/CUHK-NS-415
981	VPI	AJA7I4G7	981	5391	9801, 14211, I8B2I, 23031, 27441, 31851, 3B2BI	norovirus Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-416
982	VPI	AJA7I470	982	5392	9802, 14212, I8622, 23032, 27442, 31852, 3B2B2	norovirus Hu/GII/HKG/ZDI4/GII.4/CUHK-NS-420
983	VPI	AJA7I47I	983	5393	9803, 14213, I8B23, 23033, 27443, 31853, 3B2B3	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-421
984	VPI	AJA7I472	984	5394	9804, 14214, I8B24, 23D34. 27444, 31854, 3B2B4	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-429
985	VPI	AJA7I473	985	5395	9805, 14215, I8B25, 23035, 27445, 31855, 3B2B5	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-430
98B	VPI	AJA7I474	98B	539B	980B, I42IB, I8B2B, 2303B, 2744B, 3I85B, 3B2BB	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-431
987	VPI	AJA7I475	987	5397	9807, 14217, I8B27, 23037, 27447, 31857, 3B2B7	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-433
988	VPI	AJA7I47B	988	5398	9808, 14218, I8B28, 23038, 27448, 31858, 3B2B8	norovirus Hu/GII/HKB/2014/GI I.4/CUHK-NS-435
989	VPI	AJF2I974	989	5399	9809, 14219, I8B29, 23039, 27449, 31859, 3B2B9	norovirus GII.4
990	VPI	AJF2I975	990	5400	9810, 14220, I8B30, 23040, 27450, 3I8B0. 3B270	norovirus GII.4
991	VPI	AJF2I97B	991	5401	9811, 14221, **18631.** 23041, 27451, 31861, 36271	norovirus GII.4
992	VPI	AJF2I977	992	5402	9812, 14222, 18632, 23042, 27452. 31862. 36272	norovirus GII.4
993	VPI	AJF2I978	993	5403	9813, 14223, 18633, 23043, 27453. 31863. 36273	norovirus GII.4

B94	VPI	AJF2I979	994	54D4	9814, 14224, I8B34, 23D44, 27454, 3I86 4, 3B274	norovirus GII.4
995	VPI	AJF2I980	995	5405	9815, 14225, I8B35, 23045, 27455, 3I8B5, 3B275	norovirus GII.4
99B	VPI	AJF2I98I	99B	540B	98IB, I422B, I8B3B, 2304B, 2745B, 3I8BB, 3B27B	norovirus GII.4
997	VPI	AJF2I982	997	5407	9817, 14227, I8B37, 23D47, 27457, 3I8B7, 3B277	noravirus GII.4
998	VPI	AJF2I983	998	5408	9818, 14228, I8B38, 23048, 27458, 3I8B8, 3B278	narovirus GII.4
999	VPI	AJF2I984	999	5409	9819, 14229, I8B39, 23D49, 27459, 3I8B9, 3B279	norovirus GII.4
IDDO	VPI	AKE37037	IODO	5410	9820, 14230, I8B40, 23050, 274BD, 31870. 3B28D	noravirus Hu/GII.I7/4IB2I/Guangzhou/20I4/CHN
1001	VPI	AKM2D8I5	1001	5411	9821, 14231, I8641. 23051, 274BI, 31871. 3B28I	norovirus GI
1002	VPI	AKM20818	1002	5412	9822, 14232, I8B42, 23052, 274B2, 31872, 3B282	norovirus GI
1003	VPI	ALD83748	1003	5413	9823, 14233, I8B43, 23053, 274B3, 31873, 3B283	norovirus GII/Hu/HKG/20I5/GII.Pe_GII.I7/CUHK-NS-B82
1004	VPI	ALFI2528	1004	5414	9824, 14234. I8B44, 23054. 274B4, 31874. 3B284	norovirus Gil
1005	VPI	ALFI2529	1005	5415	9825, 14235, I8B45, 23055, 274B5, 31875, 3B285	norovirus Gil
I00B	VPI	ALFI2530	IOOB	54IB	982B, I423B, I8B4B. 23D5B, 274BB, 3I87B. 3B28G	norovirus Gil
1007	VPI	ALFI253I	1007	5417	9827, 14237, I8B47, 23057, 274B7, 31877, 3B287	norovirus Gil
1008	VPI	ALFI2532	ID08	5418	9828, 14238, I8B48, 23D58, 274B8, 31878, 3B288	norovirus Gil
1009	VPI	ALFI2533	1009	5419	9829, 14239, I8B49, 23059, 274B9, 3I879, 3B289	norovirus Gil
1010	VPI	ALFI2534	1010	5420	9830, 14240, I8B50. 230B0, 27470, 31880, 3B290	noravirus Gil

1011	VP1	ALFI2535	1011	5421	9831, 14241, 18651, 230GI, 27471. 31881, 36291	norovirus GII
1012	VP1	ALFI253B	1012	5422	9832, 14242, 18652, 23062, 27472. 31882, 36292	norovirus GII
1013	VP1	ALFI2537	1013	5423	9833, 14243, 18653, 23063. 27473, 31883, 36293	norovirus GII
1014	VP1	ALFI2538	1014	5424	9834, 14244, 18654, 230B4, 27474, 31884, 3B294	norovirus GII
1015	VP1	ALFI2539	1015	5425	9835, 14245, 18655, 230B5, 27475, 31885, 36295	norovirus GII
1016	VP1	ALFI254I	1016	5426	9836, 14246, 18656, 230B6, 27476, 31886. 36296	norovirus GII
1017	VP1	ALFI2542	1017	5427	9837, 14247. 18657, 23067, 27477, 31887, 36297	norovirus GII
1018	VP1	ALFI2543	1018	5428	9838. 14248, 18658, 23068, 27478, 31888, 36298	norovirus GII
1019	VP1	ALFI254B	1019	5429	9839, 14249, 18659, 23069, 27479, 31889, 36299	norovirus GII
1020	VP1	ALFI2547	1020	5430	9840, 14250, 18660, 23070, 27480, 31890, 36300	norovirus GII
1021	VP1	ALFI25B0	1021	5431	9841, 14251, 18661, 23071, 27481, 31891, 36301	norovirus GII
1022	VP1	ALFI25B2	1022	5432	9842. 14252. 18662, 23072, 27482, 31892, 36302	norovirus GII
ID23	VP1	ALFI25B4	1023	5433	9843, 14253, 18663, 23073, 27483, 31893. 36303	norovirus GII
1024	VP1	ALFI25BB	1024	5434	9844, 14254, 18664, 23074, 27484, 31894, 3B304	norovirus GII
1025	VP1	ALFI25G9	1025	5435	9845, 14255, 18665, 23075. 27485, 31895, 36305	norovirus GII
I02B	VP1	ALQ287B2	I02B	5436	9846, 14256, 18666, 2307B. 27486. 3I89B, 3B306	norovirus GII.17
1027	VP1	ALS03883	1027	5437	9847, 14257, I8BB7, 23077, 27487, 31897, 36307	norovirus GII

1D28	VPI	ALT0B54B	I028	5438	9848, I4258, I8BB8, 23078, 27488, 3I838, 3B3D8	norovirus Hu/GII,PI7_BII.I7/NSWB0!B/20l4/AU
ID2B	VPI	BAG3D93B	ID29	5439	9843, I4259, I8BB9, 23073, 27483, 3I899, 36309	norovirus Hu/Texas/TCH04-577/2004/0S
I030	VPI	BAG70428	I030	5440	3850, I42B0, I8B70, 2308D, 2749O. 3I900, 3B3I0	norovirus Hu/GII-4/Hokksidol/ZDOB/JP
I03I	VPI	BAG7D43I	I03I	544I	985I, I42BI, I8B7I, 2308I, 27491, 3I901, 3B3II	norovirus Hu/GII-4/Hokkaido2/2006/JP
I032	VPI	BAG7D434	ID32	5442	3852, I42B2, I8B72, 23082, 27432, 3I902. 3B3I2	norovirus Hu/GII-4/Hokkaido3/200B/JP
I033	VPI	BAG7D437	ID33	5443	3853, I42B3, I8B73, 23083, 27433, 3I903, 3B3I3	norovirus Hu/GII-4/HDkkaido4/200B/JP
ID34	VPI	BAG7B44D	ID34	5444	3854, I42B4, I8B74, 23084, 27494, 3I904. 363I4	norovirus Hu/GII-4/Hokkaido5/20DB/JP
ID35	VPI	BAG7D44B	ID35	5445	3855, I42G5, I8B75, 23085, 27495, 3I905, 3B3I5	norovirus Hu/GII-4/ADmori2/200G/JP
ID3B	VPI	BAG70449	I03B	544B	985B, I42BB, I8B7B, 2308B, 2749B, 3I90B, 3B3IB	norovirus Hu/GII-4/Aomori4/200G/JP
ID37	VPI	BAG7D452	ID37	5447	9857, I42B7, I8B77. 23087, 27497, 3I907, 3B3I7	norovirus Hu/GII-4/Aomori5/2006/JP
I038	VPI	BAB70458	I038	5448	3858, I42B8. I8B78, 23088, 27438, 3I908, 3B3I8	norovirus Hu/GII-4/Akita2/2006/JP
I03B	VPI	BAB704BI	I03B	5449	9859, I42B9, I8B79, 23089, 27499, 3I909, 3B3I9	norovirus Hu/GII-4/Akita4/200B/JP
ID4D	VPI	BAG7B4G4	I040	5450	98BD, I4270, I8B80, 23030, 27500, 31910, 3B320	norovirus Hu/GII-4/Akita5/200B/JP
I04!	VPI	BAB704B7	I04I	545I	38BI, 14271, I8G8I, 23D3I, 27501, 3I91I, 3B32I	norovirus Hu/GII-4/Miyagi2/2006/JP
ID42	VPI	BAG70470	I042	5452	38B2, 14272, I8B82, 23032, 27502, 31912, 3B322	norovirus Hu/GII-4/Miyagi4/2006/JP
I043	VPI	BAG70473	I043	5453	98B3, 14273, I8B83, 23D93, 27503, 31913, 3B323	norovirus Hu/GII-4/Miyagi5/2006/JP
ID44	VPI	BAG7047B	I044	5454	98B4, 14274, I86B4, 23094, 27504, 3I914, 36324	norovirus Hu/GII-4/Toyamal/2006/JP

ID45	VPI	BAG70482	1045	5455	98B5, 14275. I8B85, 23095, 27505. 31915, 3B325	noravirus Hu/GII-4/Tnyama5/2006/JP
1046	VPI	BAG70485	I04G	545B	9866. 14276. 18686, 23096, 2750B, 31916, 36326	narovirus Hu/GII-4/Aichi3/2Q06/JP
1047	VPI	BAG70488	1047	5457	9867, 14277, 18687, 23D97, 27507, 31917, 36327	narovirus Hu/GII-4/Aichi4/2006/JP
1048	VPI	BAG7049I	1048	5458	9868, 14278, 18688, 23098, 27508, 31918. 36328	narovirus Hu/GII-4/Sakai2/2006/JP
1049	VPI	BAG70494	1049	5459	9869, 14279, 18689. 23099, 27509, 31919, 3B329	narovirus Hu/GII-4/Sakai3/2006/JP
1050	VPI	BAG70497	1050	54G0	9870, 14280, 18690, 23100, 27510, 31920, 36330	narovirus Hu/GII-4/Sakai4/2006/JP
I05I	VPI	BAG70503	I05I	54GI	9871, I428I, 18691, 23101, 27511, 31921, 36331	norovirus Hu/GII-4/Hiroshima2/20D6/JP
1052	VPI	BAG7B50B	1052	54B2	9872, 14282, 18692, 23102, 27512, 31922, 3B332	norovirus Hu/GII-4/Ehimel/200G/JP
1053	VPI	BAG70509	I053	54B3	9873, 14283, 18693, 23103, 27513, 31923, 36333	narovirus Hu/GII-4/Ehime2/2006/JP
1054	VPI	BAG705I2	1054	5464	9874. 14284, 18694, 23104, 27514, 31924, 36334	noravirus Hu/GII-4/Ehim e5/2006/JP
1055	VPI	BAG705I5	1055	54B5	9875, 14285, 18695, 23105, 27515, 31925, 36335	norovirus Hu/GII-4/Sagal/2Q06/JP
I05G	VPI	BAG705I8	I05G	5466	9876, 14286, 18696, 23106, 27516, 31926, 3633B	norovirus Hu/GII-4/Saga4/2006/JP
1057	VPI	BAG7052I	1057	5467	9877, 14287, 18697, 23ID7, 27517, 31927, 36337	noravirus Hu/GII-4/Saga5/200G/JP
I058	VPI	BAG70524	1058	5468	B878, 14288, 18698, 23108, 27518, 31928, 36338	norovirus Hu/GII-4/Kumamotol/200G/JP
1059	VPI	BAG70527	1059	5469	9879, 14289, 18699, 23109, 27519, 31929, 36339	norovirus Hu/GII-4/Kumamoto2/2006/JP
I0G0	VPI	BAG7D530	IOGO	5470	9880, 14290. 18700. 23110, 27520, 31930, 36340	narovirus Hu/GII-4/Kumamata3/2006/JP
I0GI	VPI	BAG70533	IOGI	5471	9881,14291,18701,23111,27521, 31931, 36341	norovirus Hu/GII-4/Kumamoto4/200G/JP

IDB2	VP1	BAG70536	I0B2	5472	9882, 14292, 18702, 23112, 27522, 31932, 3B342	norovirus Hu/GII-4/Kumamoto5/2006/JP
I0B3	VP1	BAI705I8	I0B3	5473	9883, 14293, 18703, 23113, 27523, 31933, 3B343	norovirus Hu/GII-4/FUMI/20IO/JP
IDB4	VP1	BAJI3508	I064	5474	9884, 14294, 18704, 23114, 27524, 3B34, 3B344	norovirus Hu/GII-4/2007a_0RF2-3/JP
I0B5	VPI	BAJI35I3	IQ65	5475	9885, 14295, 18705, 23115, 27525, 31935, 3B345	norovirus Hu/GII-4/2007b_DRF2-3/JP
I0B6	VPI	BAJI3520	IOBG	547B	988B, I429B, I870B, 23116, 2752B, 3I93B, 3B34B	norovirus Hu/GII-4/2008a_0RF2-3/JP
I0B7	VPI	BAJI3534	I0B7	5477	9887, 14297, 18707, 23117, 27527, 31937, 3G347	norovirus Hu/GII-4/Aichil/2007/JP
I0BB	VPI	BAJI3537	I0B8	5478	9888, 14298, 18708, 23118. 27528, 31938, 36348	norovirus Hu/GII-4/Aichil/2008/JP
IDB9	VPI	BAJI3540	I069	5479	9889, 14299, 18709, 23119, 27529, 3I939, 3B349	norovirus Hu/GII-4/Aichi2/2007/JP
I07D	VPI	BAJI3543	1070	5480	9890, 14300, 18710, 23120, 27530, 31940, 36350	norovirus Hu/GII-4/Aichi2/2008/JP
ID7I	VPI	BAJI354B	1071	5481	9891, 14301, 18711. 23121, 27531, 31941, 36351	norovirus Hu/GII-4/Aichi3/2008/JP
ID72	VPI	BAJI3552	1072	5482	9892, 14302, 18712. 23122, 27532, 31942, 36352	norovirus Hu/GII-4/Aichi4/2007/JP
ID73	VPI	BAJI3555	1073	5483	9893, 14303, 18713, 23123, 27533, 31943. 36353	norovirus Hu/GII-4/Aichi4/2D08/JP
ID74	VPI	BAJI3558	1074	5484	9894, 14304. 18714, 23124, 27534, 3I944, 3B354	norovirus Hu/GII-4/Aichi5/2007/JP
1075	VPI	BAJI35BI	1075	5485	9895. 14305. 18715. 23125, 27535, 3B45, 36355	norovirus Hu/GII-4/Aichi5/2008/JP
ID7B	VPI	BAJI35B4	I07B	548G	9896, I430B, 18716. 23126. 27536. 3IB4B, 36356	norovirus Hu/GII-4/Akital/2007/JP
1077	VPI	BAJI35B7	1077	5487	9897, 14307, 18717, 23127, 27537, 31947, 36357	norovirus Hu/GII-4/Akital/2008/JP
1078	VPI	BAJI3573	I07B	5488	9898. 14308, 18718, 23128. 27538, 3B48, 3B358	norovirus Hu/GII-4/Akita3/2007/JP

ID79	VPI	BAJI357B	1079	5489	98B9. 14309, 18719, 23129, 27539, 31949, 3B359	nornvirus Hu/GII-4/Akita3/2008/JP
1080	VPI	BAJI3579	1080	5490	9900, 14310, 18720, 23130, 27540, 31950, 3B3B0	nornvirus Hu/GII-4/Akita4/2008/JP
1081	VPI	BAJI3582	1081	5491	3901,14311,18721,23131,27541, 31951, 3B3BI	nornvirus Hu/GII-4/Akita5/2007/JP
1082	VPI	BAJI3585	1082	5492	9902, 14312, 18722, 23132, 27542, 31952, 3B3B2	norovirus Hu/GII-4/Aomoril/2007/JP
1083	VPI	BAJI359I	1083	5493	9903, 14313, 18723, 23133, 27543, 31953, 3B3B3	nDrovirus Hu/GII-4/ADmori2/2007/JP
1084	VPI	BAJI3594	1084	5494	9904, 14314, 18724, 23134, 27544, 31954, 3B3B4	nornvirus Hu/GII-4/Anmnri2/2008/JP
1085	VPI	BAJI3597	1085	5495	9905, 14315, 18725, 23135, 27545, 31955, 3B3B5	nornvirus Hu/GII-4/Aomori3/2007/JP
I08G	VPI	BAJI3B03	I08G	549B	990B, 14316, I872B, 23136, 27546, 31956, 363BB	nnrnvirus Hu/GII-4/Anmori4/2007/JP
1087	VPI	BAJI3B0B	1087	5497	9907, 14317, 18727, 23137, 27547, 31957, 36367	nnrnvirus Hu/GII-4/AnmDri4/2008/JP
1088	VPI	BAJI3B09	1088	5498	9908, 14318, 18728, 23138, 27548, 31958, 36368	nnrnvirus Hu/GII-4/Aomnri5/2007/JP
1089	VPI	BAJI3BI2	1089	5499	9909. 14319, 18729, 23139, 27549, 31959, 36369	nnrnvirus Hu/GII-4/Anmnri5/2008/JP
1090	VPI	BAJI3BI5	1090	5500	9910, 14320, 18730, 23140. 27550, 31960, 3B370	nnrnvirus Hu/GII-4/Chibal/2Q07/JP
1091	VPI	BAJI3BI8	1091	5501	9911,14321.18731,23141.27551, 31961, 36371	nnrnvirus Hu/GII-4/Chibal/2008/JP
ID92	VPI	BAJI3621	1092	5502	9912, 14322, 18732, 23142, 27552, 3I9G2, 36372	nornvirus Hu/GII-4/Chiba2/2007/JP
1093	VPI	BAJI3B24	1093	5503	9913, 14323, 18733, 23143, 27553, 31963, 36373	norovirus Hu/GII-4/Chiba2/2008/JP
1094	VPI	BAJI3B27	1094	5504	9914, 14324, 18734, 23144, 27554, 31964, 36374	norovirus Hu/GII-4/Chiba4/2007/JP
1095	VPI	8AJI3B30	1095	5505	9915, 14325, 18735, 23145, 27555, 31965, 36375	norovirus Hu/GII-4/Chiba4/2008/JP

I09B	VPI	BAJI3B33	I03B	550B	99IB, I432B, I873B, 23I4B, 2755B, 3I9BB, 3B37B	norovirus Hu/GII-4/Chiba5/2DD7/JP
ID97	VPI	BAJI3B3B	I0B7	5507	9917. 14327. 18737, 23147, 27557, 3I9B7, 3B377	narovirus Hu/GII-4/Chiba5/2008/JP
IDB8	VPI	BAJI3B39	1098	5508	9918, 14328, 18738, 23148, 27558, 3I9B8, 3B378	norovirus Hu/GH-4/Ehimel/2D07/JP
IDB9	VPI	BAJI3B42	1099	5509	9919, 14329, 18739, 23149, 27559, 3I9B9, 3B37S	narovirus Hu/GII-4/Ehimel/2008/JP
1100	VPI	BAJI3B48	1100	5510	9920, 14330, 18740, 23150, 275B0. 31970, 3B380	norovirus Hu/Gli-4/Ehim e3/2007/JP
1101	VPI	BAJI365I	1101	5511	9921, 14331, 18741, 23151, 275BI, 31971, 3B381	norovirus Hu/GII-4/Ehime3/2008/JP
1102	VPI	BAJI3654	1102	5512	3922, 14332, 18742, 23152, 275B2, 31372, 3B382	norovirus Hu/GII-4/Ehime4/2007/JP
1103	VPI	BAJI3657	1103	5513	3823, 14333, 18743, 23153, 275B3, 31973, 3B383	norovirus Hu/GII-4/Ehime4/2008/JP
1104	VPI	BAJI3GB0	1104	5514	9324, 14334. 18744, 23154, 275B4, 31974, 3B384	narovirus Hu/GII-4/Ehime5/2008/JP
1105	VPI	BAJI3BB3	1105	5515	3325, 14335, 18745, 23155, 275B5. 31375, 3B385	norovirus Hu/GII-4/Fukuil/2008/JP
110G	VPI	BAJI3BBB	H0B	55IB	392B, I433B, I874B, 23I5B. 275BB, 3I97B, 3B38B	norovirus Hu/GII-4/Fukui2/2007/JP
1107	VPI	BAJI3BBB	1107	5517	3827, 14337, 18747. 23157, 275B7, 31977, 3B387	norovirus Hu/GII-4/Fukui2/2008/JP
1108	VPI	BAJI3B72	1108	5518	9928, 14338, 18748, 23158, 275B8, 31378, 3B388	norovirus Hu/GII-4/Fukui4/2007/JP
H0B	VPI	BAJI3B75	1109	5519	3923. 14333, 18749, 23159. 275B9, 31979, 3B389	norovirus Hu/GII-4/Fukui4/2008/JP
1110	VPI	BAJI3B78	1110	5520	9930. 14340, 18750. 23IB0. 27570, 31980, 3B390	narovirus Hu/GII-4/Fukui5/2007/JP
1111	VPI	BAJI3B8I	1111	5521	9931, 14341, 18751, 23161, 27571. 31981, 3B39I	norovirus Hu/GII-4/Fukui5/2008/JP
1112	VPI	BAJI3B84	1112	5522	9332, 14342. 18752. 23IB2, 27572, 31982, 36392	narovirus Hu/GII-4/Hiroshimal/2007/JP

1113	VPI	BAJI3B87	1113	5523	9933. 14343. 18753, 23IB3. 27573, 31983, 3B393	noPDvirus Hu/BII-4/Hirashimal/2008/JP
1114	VPI	BAJI3B9B	1114	5524	9934, 14344, 18754, 23IB4, 27574, 31984, 3B394	norovirus Hu/GII-4/Hiroshima2/2007/JP
1115	VPI	BAJI3B93	1115	5525	9935, 14345, 18755, 23IB5, 27575, 31985, 3B395	norovirus Hu/BII4/Hiroshima2/2008/JP
1iiG	VPI	BAJI3B9G	1KB	552B	99936, 14346, 18756, 23IB6, 2757B, 3I98B. 3B39B	norovirus Hu/Gii-4/HiroshimaS/2007/JP
1117	VPI	BAJI3B99	1117	5527	9937. 14347, 18757, 23IB7, 27577, 31987, 3B397	norovirus Hu/GII-4/Hiroshima3/2008/JP
11IS	VPI	BAJI37D2	1118	5528	9938, 14348, 18758, 23IB8, 27578, 31988, 3B398	norovirus Hu/GIi-4/Hirashima4/2007/JP
1119	VPI	BAJI37II	1119	55299	99399, 14349, 18759, 23IB9, 27579, 31989, 36399	norovirus Hu/GII-4/Hokkaidol/2007/JP
II2D	VPI	BAJI37I4	1120	5530	99400, 14350. I87B0, 23170, 27580, 31990, 3B4B0	norovirus Hu/GII-4/Hokkaidol/2008/JP
1121	VPI	BAJI37I7	1121	5531	9941, 14351, 18761, 23171, 27581, 31991, 36401	norovirus Hu/BII-4/Hokkaido2/2007/JP
1122	VPI	BAJI372D	1122	5532	9942, 14352, 18762, 23172, 27582, 31992, 36402	norovirus Hu/GII-4/Hokkaido2/2D08/JP
1123	VPI	BAJI3723	1123	5533	99943, 14353, 18763, 23173, 27583, 31993, 36403	norovirus Hu/GII-4/Hokkaido3/2008/JP
1124	VPI	BAJI372B	1124	5534	9944, 14354, 18764, 23174. 27584, 31994. 3B404	norovirus Hu/BII-4/Hakkaido4/2D07/JP
1125	VPI	BAJI3723	1125	5535	9945, 14355, 18765, 23175, 27585, 31995, 36405	norovirus Hu/GII-4/Hokkaido4/2008/JP
II2B	VPI	BAJI3732	1126	553B	9946, 14356, I876B, 23I7B. 27586, 31996, 36406	norovirus Hu/GII-4/Hokkaido5/2007/JP
1127	VPI	BAJI3738	1127	5537	9947, 14357, 18767, 23177, 27587, 31997, 36407	norovirus Hu/GII-4/lwatEl/2DD8/JP
1128	VPI	BAJI374I	1128	5538	9948, 14358, I87B8. 23178, 27588, 31998, 36408	norovirus Hu/GII-4/lwatE2/2007/JP
1129	VPI	BAJI3744	1129	5539	9949, 14359, 18769, 23179. 27589, 31999, 36409	norovirus Hu/GII-4/lwate3/2007/JP

1130	VPf	BAJI3747	1130	5540	9950. 14360. 18770, 23180. 27590. 32000, 3B4I0	norovirus Hu/GII-4/Iwate3/2008/JP
1131	VPI	BAJI375D	1131	5541	BB5I, 14361. 18771, 23181. 27531, 32001, 3B4II	norovirus Hu/GII-4/Iwate4/2G07/JP
1132	VPI	BAJI3753	1132	5542	9952. I43B2, 18772, 23182, 27592. 32002, 3B4I2	norovirus Hu/GII-4/Iwate4/2008/JP
1133	VPI	BAJI375B	1133	5543	9953, 14363, 18773, 23183, 27593, 32003, 3B4I3	norovirus Hu/GII-4/IwatB5/2007/JP
1134	VPI	BAJI375B	1134	5544	9954, I43B4, 18774, 23184, 27594. 32004. 36414	norovirus Hu/GII-4/IwatE5/2008/JP
1135	VPI	BAJI37B2	1135	5545	9955. 14365, 18775, 23185. 27595, 32005, 36415	norovirus Hu/GII-4/Kumamotol/2007/JP
1136	VPI	BAJI37B5	II3B	554B	9956. 14366, 18776, 23186, 27596, 32006. 36416	norovirus Hu/GII-4/KumamotD2/2007/JP
1137	VPI	BAJI37B8	1137	5547	9957, 14367, 18777, 23187, 27597, 32007, 36417	norovirus Hu/GII-4/Kumamota3/2007/JP
1138	VPI	BAJI377I	1138	5548	9958. 14368, 18778, 23188, 27598, 32008, 36418	norovirus Hu/GII-4/Kumamoto4/2007/JP
1138	VPI	BAJI3774	1139	5549	9959, 14369, 18779, 23189. 27599, 32009, 36419	norovirus Hu/GII-4/Miyagil/2007/JP
1140	VPI	BAJI3777	1140	5550	9960, 14370, 18780, 23190, 27600, 32010, 36420	norovirus Hu/GII-4/Miyagi2/2007/JP
1141	VPI	BAJI378D	1141	5551	9961, 14371, 18781, 23191, 27601, 32011, 36421	norovirus Hu/GII-4/Miyagi3/2007/JP
1142	VPI	BAJI3783	1142	5552	9962, 14372, 18782, 23192, 27602, 32012, 36422	norovirus Hu/GII-4/Miyagi5/2008/JP
1143	VPI	BAJI378B	1143	5553	9963, 14373, 18783, 23193, 27603, 32013, 36423	norovirus Hu/GII-4/MiyazakilO/2D08/JP
1144	VPI	BAJI37B2	1144	5554	9964, 14374, 18784, 23194, 27BB4. 32014. 36424	norovirus Hu/GII-4/Miyazakil3/2D08/JP
1145	VPI	BAJI3735	1145	5555	9965, 14375, 18785, 23195, 27B05, 32015, 36425	norovirus Hu/GII-4/Miyazakil/2007/JP
1KB	VPI	BAJI380I	1146	5556	9966, 14376, 18786, 23196, 27606, 32016, 36426	norovirus Hu/GII-4/Miyazaki2/2007/JP

1147	VPI	BAJI38Q4	1147	5557	9967, 14377. 18787, 23197, 27607, 32017, 36427	norovirus Hu/GII-4/Miyazaki2/2008/JP
1148	VPI	BAJI38D7	1148	5558	9968, 14378, 18788, 23108, 27608, 32018, 36428	norovirus Hu/GII-4/Miyazaki3/20D7/JP
1149	VPI	BAJI38I0	1149	5559	9969, 14379, 18789. 23199, 27609, 32019, 36429	norovirus Hu/GII-4/Miyazaki3/2008/JP
1150	VPI	BAJI38IG	II5D	5560	9970, 14380, 18790, 23200, 27610, 32020, 36430	norovirus Hu/GII-4/Miyazaki4/2008/JP
1151	VPI	BAJI38I9	1151	5561	9971, 14381, 18791, 23201, 27611, 32021, 36431	norovirus Hu/GII-4/Miyazaki5/2Q07/JP
1152	VPI	BAJI3822	1152	5562	9972, 14382, 18792, 23202, 27612, 32022, 36432	norovirus Hu/GII-4/Miyazaki6/2008/JP
1153	VPI	BAJI3825	1153	5563	B973, 14383, 18793, 23203, 27613, 32023, 36433	norovirus Hu/GII-4/Miyazaki7/2008/JP
1154	VPI	BAJI3828	1154	5564	9974, 14384, 18794, 232D4, 27614, 32024. 36434	norovirus Hu/GII-4/Miyazaki8/2008/JP
1155	VPI	BAJI383I	1155	5565	9075, 14385. 18795, 23205, 27615, 32025. 36435	norovirus Hu/GII-4/Miyazaki9/2008/JP
MSB	VPI	8AJI3834	1156	5566	9976, 14386, 18796, 23206, 27BI6, 32026, 36436	norovirus Hu/GII-4/Naganol/20D7/JP
1157	VPI	BAJI3837	1157	5567	9977, 14387, 18797, 23207, 27617, 32027, 3B437	norovirus Hu/GII-4/Naganol/2008/JP
1158	VPI	BAJI384D	1158	5568	9978, 14388, 18798, 23208, 27618, 32028, 36438	norovirus Hu/GII-4/Nagano2/2007/JP
1159	VPI	BAJI3843	1159	5569	9979, 14389, 18799, 23209, 27BIB, 32029, 36439	norovirus Hu/GII-4/Nagano2/2008/JP
1160	VPI	BAJI3846	1160	5570	9980, 14390, 18800, 23210, 27B20, 32030, 3B440	norovirus Hu/GII-4/Nagano3/2007/JP
net	VPI	BAJI3849	1161	5571	9981, 14391, 18801, 23211, 27621, 32031, 36441	norovirus Hu/GII-4/Nagano3/2Q08/JP
IIGZ	VPI	BAJI3852	1162	5572	9982, 14392, I88D2, 23212, 27622, 32032, 36442	norovirus Hu/GII-4/Nagano4/2008/JP
1163	VPI	BAJI3855	1163	5573	9983. 14393, 18803, 23213, 27623, 32033, 36443	norovirus Hu/GII-4/Nagano5/2D07/JP

1164	VPI	BAJI3858	1164	5574	9984, 14394, 18804, 23214, 27624. 32034, 36444	norovirus Hu/GII-4/Niigatal/2007/JP
1165	VPI	BAJI386I	1165	5575	9985, 14395, 18805. 23215, 27625, 32035. 36445	narovirus Hu/GII-4/Hiigatal/20D8/JP
1166	VPI	BAJI3864	1166	5576	9986, 14396, 18806, 23216, 27B26, 32036, 36446	norovirus Hu/GII-4/Niigata2/2007/JP
1167	VPI	BAJI3867	1167	5577	9987, 14397, 18807, 23217, 27627, 32037, 36447	norovirus Hu/GII-4/Niigata2/2008/JP
1168	VPI	BAJI3873	1168	5578	9988, 14398, 18808, 23218, 27628, 32038, 36448	narovirus Hu/GII-4/Niigata3/2008/JP
1168	VPI	BAJI3876	1168	5578	9989, 14399, 18809, 23219, 27G29, 32039, 36449	norovirus Hu/GII-4/Niigata4/2007/JP
1170	VPI	BAJI387B	1170	5580	9990, 14400, 18810, 23220. 27630. 32040, 3B450	narovirus Hu/GII-4/Niigata4/20D8/JP
1171	VPI	BAJI3882	1171	5581	9991, 14401. 18811, 2322!, 27B31, 32041, 36451	norovirus Hu/GII-4/Niigata5/2Q07/JP
1172	VPI	BAJI3885	1172	5582	9992. 14402, 18812, 23222, 27632, 32042, 36452	narovirus Hu/GII-4/Niigata5/2008/JP
1173	VPI	BAJI389I	1173	5583	9993, 14403, 18813, 23223, 27633, 32043, 36453	norovirus Hu/GII-4/0sakal/2008/JP
1174	VPI	BAJI3894	1174	5584	9994, 14404, 18814, 23224, 27634, 32044, 36454	norovirus Hu/GII-4/0saka2/2007/JP
1175	VPI	BAJI3897	1175	5585	9995, 14405, 18815, 23225, 27635, 32045, 36455	norovirus Hu/GII-4/0saka2/2008/JP
1176	VPI	BAJI3900	1176	5586	999B, 14406, 18816, 23226, 27B3B, 32046, 36456	norovirus Hu/GII-4/0saka3/2007/JP
1177	VPI	BAJI3903	1177	5587	9997, 14407, 18817, 23227. 27637, 32047, 36457	narovirus Hu/GII-4/Dsaka3/2008/JP
1178	VPI	BAJI3B06	1178	5588	9998, 14408, 18818, 23228, 27638, 32048, 36458	narovirus Hu/GII-4/0saka4/2007/JP
1178	VPI	BAJI390B	1179	5589	9999, 14409, 18819, 23229, 27639, 32049, 3B459	narovirus Hu/GII-4/0saka4/2008/JP
1180	VPI	BAJI39I2	1180	5590	10000, 14410, 18820, 23230, 27640, 32050, 364B0	narovirus Hu/GII-4/Dsaka5/2007/JP

1181	VP1	8AJI39I8	1181	5591	10001, 14411. 18821. 23231, 27641. 32051, 36461	norovirus Hu/GII-4/0saka6/2008/JP
1182	VP1	BAJI3924	1182	5592	ID002. 14412, 18822, 23232, 27B42, 32052, 364B2	norovirus Hu/GII-4/Sagal/2008/JP
1183	VP1	BAJI3927	1183	5593	10003. 14413, 18823, 23233, 27643, 32053, 36463	norovirus Hu/GII-4/Saga2/2007/JP
1184	VP1	BAJI393D	1184	5594	I00D4, 14414, 18824, 23234, 27644, 32054, 36464	norovirus Hu/GII-4/Saga2/2008/JP
1185	VP1	BAJI3933	1185	5595	10005, 14415, 18825, 23235, 27645, 32055, 36465	narovirus Hu/GII-4/Saga3/2008/JP
1186	VP1	BAJI3936	1186	559B	I000B, 14416. 18826, 23236, 27646, 32056, 36466	nnrovirus Hu/GII-4/Saga4/2007/JP
1187	VP1	BAJI3939	1187	5597	10007, 14417, 18827, 23237, 27647, 32057, 36467	narovirus Hu/GII-4/Saga4/2008/JP
1188	VP1	BAJI3942	1188	5598	10008, 14418, 18828, 23238, 27648, 32058, 36468	norovirus Hu/GII-4/Saga5/2007/JP
1188	VP1	BAJI3945	1189	5599	10009, 14419, 18829, 23239, 27649, 32059, 36469	norovirus Hu/GII-4/Saga5/2008/JP
1180	VP1	BAJI3948	1190	5B00	IDDIO, 14420, 18830, 23240, 27B50, 320B0, 36470	norovirus Hu/GII-4/Sakail/2007/JP
1191	VP1	BAJI395I	1191	5601	tOOII, 14421, 18831, 23241. 27B51, 32061. 36471	norovirus Hu/GII-4/Sakail/2008/JP
1192	VP1	BAJI3954	1192	5602	10012. 14422, 18832, 23242, 27652, 32062, 36472	norovirus Hu/GII-4/Sakai2/2007/JP
1193	VP1	BAJI3957	1193	5603	10013, 14423, 18833, 23243, 27653, 320B3, 36473	norovirus Hu/GII-4/Sakai3/2007/JP
1194	VP1	BAJI396D	1194	5604	10014, 14424, 18834, 23244, 27654, 32064, 36474	norovirus Hu/GII-4/Sakai3/20Q8/JP
1195	VP1	BAJI39B3	1195	5605	10015, 14425. 18835, 23245, 27655, 32065, 36475	norovirus Hu/GII-4/Sakai4/2007/JP
1196	VP1	6AJI3966	1196	560B	ID0I6, 14426, 18836, 23246, 27656, 32066, 36476	norovirus Hu/GII-4/Sakai4/2008/JP
1197	VP1	BAJI39B9	1197	5607	10017, 14427. 18837, 23247, 27657, 32067, 36477	norovirus Hu/Gil-4/Shimanef/2007/JP

Ila s	VPI	BAJI3972	1198	5B08	10018. 14428. 18838, 23248, 27B58, 320B8. 3B478	norovirus Hu/GII-4/Shimane2/2007/JP
Ile e	VPI	BAJI3975	1199	5B09	10019. 14429, 18839. 23249, 27B59, 320B9, 36479	norovirus Hu/GII-4/Shimane2/2D08/JP
I2DQ	VPI	BAJI3978	1200	5BI0	10020, 14430, 18840, 23250, 27B60, 32070, 36480	norovirus Hu/GII-4/ShimanE3/2007/JP
I2DI	VPI	BAJI398I	I2DI	5BII	ID02I. 14431, 18841, 23251, 27BBI, 32071, 36481	norovirus Hu/GII-4/Shimane3/2008/JP
I2D2	VPI	BAJI3984	1202	5BI2	10022, 14432, 18842, 23252, 27662, 32072, 3B482	norovirus Hu/GII-4/Shiman_4/2007/JP
1203	VPI	BAJI3987	1203	5BI3	10023, 14433, 18843, 23253, 27663, 32073. 36483	norovirus Hu/GII-4/ShimanB5/2007/JP
I2D4	VPI	BAJI3990	1204	5BI4	10024. 14434, 18844, 23254, 27664, 32074, 36484	norovirus Hu/GII-4/ShimanB5/2008/JP
1205	VPI	BAJI3993	1205	5BI5	10025, 14435, 18845, 23255, 276B5, 32075, 36485	norovirus Hu/GII-4/Toyamal/2007/JP
I20B	VPI	BAJI399B	I20B	5BIB	10026, 14436, 18846, 23256, 27BBB, 32076, 3G486	norovirus Hu/GII-4/Toyama2/2007/JP
1207	VPI	BAJI3999	I207	5BI7	10027, 14437, 18847, 23257, 27667, 32077, 36487	norovirus Hu/GII-4/Toyama2/2008/JP
1208	VPI	BAJI4002	I208	5BI8	10028, 14438. 18848. 23258, 276B8, 32078, 3B488	norovirus Hu/GII-4/Toyama3/2007/JP
1209	VPI	BAJI4005	1209	5BI9	10029, 14439, 18849. 23259. 27669, 32079, 36489	norovirus Hu/GII-4/Toyama3/2008/JP
I210	VPI	BAJI4008	1210	5B20	I003D, 14440, 18850, 23260, 27B70, 32080, 36490	norovirus Hu/GII-4/Toyama4/2007/JP
I211	VPI	BAJI40II	1211	5621	10031, 14441, 18851, 232BI, 27B71, 32081, 36491	norovirus Hu/GII-4/Toyama4/2008/JP
I212	VPI	BAJI40I4	1212	5B22	10032, 14442, 18852, 232B2, 27672, 32082, 36492	norovirus Hu/GII-4/Toyama5/2007/JP
I213	VPI	BAK432B9	I213	5B23	10033, 14443, 18853, 23263, 27B73, 32083, 36493	norovirus Hu/Tokyo/I0-I4/20IO/JPN
I214	VPI	BAK43272	I214	5B24	10034, 14444, 18854, 23264, 27674, 32084, 36494	norovirus Hu/Tokyo/IO-20/2010/JPN

1215	VP1	BAK43275	1215	5B25	10035, 14445, 18855, 232B5, 27B75, 32085, 3B495	norovirus Hu/Tokyo/I0-H05/20IO/JPN
1216	VP1	BAK43278	I2IB	5G2B	I0D3B, I444B, I885B, 232BB, 27B7B, 32B8B, 3B49B	norovirus Hu/Tokyo/IO-1443/2010/JPN
1217	VPI	BAK43284	1217	5B27	10037, 14447, 18857, 232B7, 27B77, 32087, 3B497	norovirus Hu/Tokyo/I0-4320/20II/JPN
1218	VPI	BALI4785	1218	5B28	I0D38, 14448, 18858, 232B8, 27B78, 32088. 3B498	norovirus Hu/GIIMhime09037l/20DB/JP
I219	VPI	BAR88I57	1219	5B29	10039, 14449, 18859, 232B9, 27B79, 32089, 3B499	norovirus GVI.I/Ca/JPN/2DI2/M49-l
I22D	VP1	BAS29993	1220	5B3B	IBB40, 14450, 188B0, 23270, 27B80, 32090, 3B500	norovirus Hu/GII.4/Toyamal/2009/JP
1221	VPI	BAS2999G	1221	5B31	10041, 14451, 18861. 23271, 27B81, 320BI, 3B50I	norovirus Hu/GII.4/Toyama4/20D9/JP
1222	VPI	BAS29999	1222	5B32	IDD42, 14452, 18862, 23272, 27B82, 32092, 3B502	norovirus Hu/GII.4 /ShimanBl/2009/JP
1223	VPI	BAS30005	1223	5B33	10043, 14453, 18863, 23273. 27683, 32093, 3B503	norovirus Hu/GII.4/Aomnri2/2009/JP
1224	VPI	BAS30008	1224	5B34	I0D44, 14454, 18864, 23274, 27684. 32094, 36504	norovirus Hu/GII.4/Hiroshimacity3/2D09/JP
1225	VPI	BAS300II	1225	5B35	10045, 14455, 18865, 23275, 27685, 32095, 36505	norovirus Hu/GII.4 /HiroshimBcity4 /2009/JP
I226	VPI	BAS300I4	I22B	5B3B	10046, 14456, I88BB, 23276, 27686, 32096, 36506	norovirus Hu/GII.4/Hiroshimacity5/2009/JP
1227	VPI	BAS3D0I7	1227	5B37	10047, 14457, 18867, 23277, 27687, 32097, 3B507	norovirus Hu/GII.4/lwate2/2DD9/JP
1228	VPI	BAS30023	1228	5B38	10048, 14458, 18868, 23278, 27688, 32098, 36508	norovirus Hu/GII.4/Aichi4/2009/JP
1229	VPI	8AS3002G	I22B	5B39	10049, 14459, 18869, 23279, 27689, 32099, 36509	norovirus Hu/GII.4/Shimane2/2009/JP
1230	VPI	BAS30029	I230	5B40	10050, 144B0, 18870, 23280, 27690, 32100, 36510	norovirus Hu/GII.4/Miyazakil/2009/JP
1231	VPI	BAS30D35	1231	5B4I	10051, 14461, 18871, 23281, 27691, 32101, 36511	norovirus Hu/GII.4/Aomori4/2QI0/JP

1232	VPI	BAS3DD38	1232	5B42	IGB52, I44B2, 18872, 23282, 27692, 32IB2, 3B5I2	norovirus Hu/GII.4/Iwate5/20IO/JP
1233	VPI	BAS3004I	1233	5B43	I0D53, I44B3, 18873, 23283, 27B93, 32IB3, 3B5I3	norovirus Hu/GII.4/Toyama5/20IO/JP
1234	VPI	BAS3DD44	1234	5B44	10054, I44B4, 18874, 23284, 27B94, 32104, 3B5I4	norovirus Hu/GII.4/Chibal/20IO/JP
1235	VPI	BAS3DB47	1235	5B45	ID055, I44B5, 18875, 23285, 27B95, 32105, 3B5I5	norovirus Hu/GII.4/Chiba3/ZDID/JP
1236	VPI	BAS3BB5D	1236	5B4B	I005B, I44BB, I887B, 2328B, 27BBB, 32106, 36518	norovirus Hu/GII.4/Chiba5/20IO/JP
1237	VPI	BAS3QD53	1237	5B47	10057, 14467, 18877, 23287, 27B97, 32107, 3B5I7	norovirus Hu/GII.4/Naganol/20IO/JP
1238	VPI	BAS30056	1238	5G48	10058, 144B8, 18878, 23288, 27B98, 32108, 3B5I8	norovirus Hu/GII.4/Aichi5/20IO/JP
1239	VPI	BAS3DD59	1239	5B49	I0D59, 14469, 18879, 23289, 27B99, 32109, 36519	norovirus Hu/GII.4/Osaka2/20IO/JP
I24D	VPI	BAS3DDB2	I24D	5B5D	IOOGO, 14470, 18880, 23290, 27700, 32110, 36520	norovirus Hu/GII.4/Osaka3/20IO/JP
1241	VPI	BAS3DDB5	1241	5B5I	10061. 14471. 18881. 23291, 27701, 32111. 3B52I	norovirus Hu/GII.4/Osaka4/20IO/JP
1242	VPI	BAS3DBG8	1242	5B52	10062. 14472, 18882, 23292, 27702, 32112, 36522	norovirus Hu/GII.4/Sakail/20IO/JP
1243	VPI	BAS3BB7I	1243	5B53	10063, 14473, 18883, 23293, 27703, 32113, 36523	norovirus Hu/GII.4/Sakai2/20IO/JP
1244	VPI	BAS3DB74	1244	5B54	10064. 14474, 18884, 23294, 27704, 32114, 3B524	norovirus Hu/GII.4/Hiroshima3/20IQ/JP
1245	VPI	BAS3DB77	1245	5B55	10065, 14475, 18885, 23295, 27705, 32115, 36525	norovirus Hu/GII.4/Hiroshima4/20IO/JP
I24B	VPI	BAS3BD8D	I24B	5B5B	IOOBB, 14476, 18886, 23296, 27706, 32116, 36526	norovirus Hu/Bli.4/Miyazaki2/2Df D/JP
1247	VPI	BAS3BD83	1247	5B57	I00B7, 14477, 18887, 23297, 27707, 32117, 36527	norovirus Hu/GII.4/Miyazaki3/20IO/JP
1248	VPI	BAS30086	1248	5B58	10068, 14478, 18888, 23298. 27708, 32118, 3B528	norovirus Hu/GII.4/Hokkaido4/20IO/JP

1249	VP1	BAS30089	1249	5B59	10089, 14479, 18889. 23299. 27709, 32119. 36529	norovirus Hu/GII.4/NiigataZ/ZOIO/JP
1250	VP1	BAS30092	1250	5BB0	10070, 14480, 18890, 23300, 27710, 32120, 3B530	narovirus Hu/GII.4/Niigata3/20IO/JP
1251	VPI	BAS30D95	1251	5BBI	10071, 14481, 18891, 23301, 27711, 32121, 3B53I	norovirus Hu/GII.4/Niigata4/20IO/JP
1252	VPI	BAS30098	1252	5BB2	10072, 14482, 18892, 23302, 27712, 32122, 3B532	norovirus Hu/GII.4/Fukui2/20IO/JP
1253	VPI	BAS3DI0I	1253	5BB3	10073, 14483, 18893, 23303, 27713, 32123, 3B533	norovirus Hu/GII.4/Fukui3/20IO/JP
1254	VPI	BAS3DI04	1254	5BB4	10074, 14484, 18804, 23304, 27714, 32124, 3B534	norovirus Hu/GII.4/Fukui4/20IO/JP
1255	VPI	BAS3DID7	1255	5BB5	10075, 14485, 18895, 23305, 27715, 32125, 3B535	norovirus Hu/GII.4/Nagano3/20IO/JP
1256	VPI	BAS30IID	I25B	5BBB	I007B, I448B, 18896, 2330B, 27716, 32126, 36536	norovirus Hu/GII,4/Sakai3/20IO/JP
1257	VPI	BAS3DII3	1257	5BB7	10077, 14487, 18897, 23307, 27717, 32127, 36537	norovirus Hu/GII.4/Sakai4/20ID/JP
1258	VPI	BAS3DIIB	1258	5BB8	10078, 14488, 18808, 23308, 27718, 32128, 36538	norovirus Hu/GII.4/Ehime3/20IO/JP
1259	VPI	BAS30II9	1259	5BB9	10079, 14489, 18899, 23309, 27719, 32129, 36539	norovirus Hu/GII.4/Ehime5/20IO/JP
I2BD	VPI	BAS3DI25	I260	5B70	10080, 14490, I890D, 23310, 27720, 32130, 36540	norovirus Hu/GII.4/Shiman_5/20ID/JP
I2BI	VPI	BAS30I28	I2BI	5B7I	10081, 14491, 18901, 23311, 27721, 32131, 36541	norovirus Hu/GII.4/Saga5/20IO/JP
I2B2	VPI	BAS3DI34	I2B2	5B72	10082, 14492, 18902, 23312, 27722, 32132, 36542	norovirus Hu/GII.4/Miyazaki5/20IO/JP
I2B3	VPI	BAS3DI37	I2B3	5B73	10083, 14493, I89D3, 23313, 27723, 32133, 36543	norovirus Hu/GII.4/Nagano5/20II/JP
I2B4	VPI	BAS30I40	I2B4	5B74	10084, 14494, 18904, 23314, 27724, 32134, 36544	norovirus Hu/GII.4/Sakai7/2DII/JP
I2B5	VPI	BAS30I4B	I2B5	5B75	10085, 14495, 18905, 23315, 27725, 32135, 36545	norovirus Hu/GII.4/SakaiIO/20II/JP

1266	VP1	8AS30I49	I2BB	5676	10086, I449G, 18906, 23316, 27726, 32I3B, 36546	noravirus Hu/GII.4/Shimanel/20ll/JP
1267	VP1	BAS30I52	1267	5677	ID087, 14497, 18907, 23317, 27727, 32137, 36547	noravirus Hu/GII.4/Shimane2/20ll/JP
1268	VPI	BAS3DI55	1268	5678	10088, 14498, 18908, 23318, 27728, 32138, 36548	noravirus Hu/GII.4/Hirnshimacity2/20ll/ JP
I269	VPI	BAS30I58	1269	5679	10089, 14499, 18909, 23319, 27729, 32139, 3B549	noravirus Hu/GII.4/Akita2/20ll/JP
I27D	VPI	BAS30I64	I27D	568D	I009D, 14500, 18910, 23320, 27730, 32140, 36550	norovirus Hu/Gi!.4/AkitB3/2DI1/JP
1271	VPI	BAS3DI67	1271	5681	10091, 14501, 18911. 23321, 27731, 32141, 36551	noravirus Hu/GII.4/0saka3/2DII/JP
1272	VPI	BAS30I70	1272	5682	10092, 14502, 18912, 23322, 27732, 32142, 36552	norovirus Hu/GII.4/Shimane4/20ll/JP
1273	VPI	BAS3DI73	1273	5683	10093, I45D3, 18913, 23323, 27733, 32143, 36553	norovirus Hu/GII.4/Ehime!/20ll/JP
1274	VPI	BAS3DI76	1274	5684	10094, 14504, 18914, 23324, 27734, 32144, 3B554	norovirus Hu/GII.4/Ehime2/20ll/JP
1275	VPI	BAS3DI79	1275	5685	10095, 14505, 18915, 23325, 27735, 32145, 36555	norovirus Hu/GII.4/Sagal/2DII/JP
1276	VPI	BAS30I82	1276	5686	10096, 14506, 18916, 23326, 27736, 32146. 36556	norovirus Hu/GII.4/Saga2/20ll/JP
1277	VPI	BAS3DI85	1277	5687	10097, I45D7, 18917, 23327, 27737, 32147, 36557	norovirus Hu/GII.4/Hiroshimacity3/20ll/JP
1278	VPI	BAS30I88	1278	5688	10098, 14508, 18918, 23328, 27738, 32148, 36558	norovirus Hu/GII.4/Hokkaidol/2DII/JP
1279	VPI	BAS3DI9I	1279	5689	10099, 14509, 18919, 23329, 27739, 32149, 36559	norovirus Hu/GII.4/Aomori4/20ll/JP
1280	VPI	BAS3DI94	1280	5690	10100, 14510, I892D, 23330, 27740, 32150, 36560	noroviros Hu/GII.4/Aomori5/20tl/JP
1281	VPI	BAS3DI97	1281	5691	10101, 14511, 18921, 23331, 27741, 32151, 365BI	norovirus Hu/GII.4/Aomori6/20ll/JP
1282	VPI	BAS3Q20D	1282	5692	10102, 14512, 18922, 23332, 27742, 32152, 36562	norovirus Hu/GII.4/Aomori7/20ll/JP

1283	VPI	BAS3D2D3	1283	5693	10103. 14513, 18923, 23333, 27743, 32153, 3B563	norovirus Hu/GII.4/Iwate2/20II/JP
1284	VPI	BAS302D6	1284	5694	10104, 14514, I8B24, 23334, 27744, 32154, 36564	norovirus Hu/GII.4/Iwate4/20II/JP
1285	VPI	BAS3D209	1285	5B95	10105, 14515, 18925, 23335, 27745, 32155, 36565	norovirus Hu/GII.4/Iw3te5/20tI/JP
1286	VPI	BAS3D2I2	I28B	5696	10106, 14516, 18926, 23336, 27746, 32156, 36566	norovirus Hu/GII.4/Toyama5/20II/JP
1287	VPI	BAS3B2I5	1287	5B97	10107, 14517, 18927, 23337. 27747, 32157, 36567	norovirus Hu/GII.4/Aichil/20II/JP
1288	VPI	BAS3B2I8	1288	5698	10108, 14518, 18928, 23338, 27748, 32158. 3B65B8	narovirus Hu/GII.4/Hiroshimal/20fl/ JP
1289	VPI	BAS3022I	1289	5699	10109, 14519, 18929, 23339. 27749, 32159, 3B65B9	norovirus Hu/GII.4/Hiroshima2/20II/JP
I29D	VPI	BAS30224	1290	57DD	10110. 14520, I893D, 23340, 27750. 32160, 36570	norovirus Hu/GII.4/Hiroshima4/20II/JP
1291	VPI	BAS30227	1291	5701	IOIII, 14521, 18931. 23341. 27751, 32161, 36571	norovirus Hu/GII.4/Ehime3/20II/JP
1292	VPI	BAS3B23B	1292	5702	10112, 14522, 18932, 23342, 27752. 32162. 3B572	norovirus Hu/GII.4/Saga3/2DII/JP
1293	VPI	BAS30233	1293	5703	10113. 14523. 18933, 23343, 27753, 32IB3, 36573	narovirus Hu/GII.4/Aichi3/20II/JP
1294	VPI	BAS3D23B	1294	57D4	IDI14, 14524. 18934, 23344, 27754, 32IB4, 3B574	narovirus Hu/GII.4/ShimaneG/ZDII/JP
1295	VPI	BAS30239	1295	5705	10115, 14525, 18935, 23345, 27755, 32165, 36575	norovirus Hu/GII.4/Ehime4/20II/JP
1296	VPI	BAS30242	1296	5706	10116, 14526, 18936. 2334B, 27756, 32IB6, 36576	norovirus Hu/BII.4/ChibalO/ZDII/JP
1297	VPI	BAS30245	1297	5707	10117, 14527, 18937, 23347, 27757. 32IB7, 36577	norovirus Hu/GII.4/Akita5/2009/JP
1298	VPI	BAS30248	1298	5708	10118, 14528, 18938, 23348, 27758, 32168, 36578	norovirus Hu/GII.4/Fukui5/2009/JP
1299	VPI	BAS3025I	1299	5709	10119, 14529, 18939, 23349, 27759, 32169, 36579	norovirus Hu/GII.4/Ehimel/2B09/JP

1300	VPI	BAS30254	1300	5710	10120. 14530. 18940, 23350, 277B0, 32170. 36580	norovirus Hu/GII.4/Hokkaidol/2009/JP
1301	VPI	BAS30257	1301	571	10121, 14531. 18941, 23351, 27761, 32171, 36581	norovirus Hu/GII.4/Hokkaido2/20D9/JP
1302	VPI	BAS30260	1302	5712	10122, 14532, 18942, 23352, 277B2, 32172, 3B582	norovirus Hu/GII.4/Hokkaido5/200B/JP
1303	VPI	BAS302B3	1303	5713	10123, 14533, 18943, 23353. 277B3, 32173, 36583	norovirus Hu/GII.4/Aomori5/2009/JP
1304	VPI	BAS302BB	1304	5714	10124, 14534. 18944. 23354, 27764, 32174, 3B584	norovirus Hu/GII.4/Iwate4/2009/JP
1305	VPI	BAS302B9	1305	5715	10125, 14535, I8B45, 23355, 27765, 32175, 36585	norovirus Hu/GII.4/Aichi2/2D09/JP
1306	VPI	BAS30272	I30B	57IB	10126. 14536, 18946, 23356, 27766, 32I7B. 36586	norovirus Hu/GII.4/Aichi3/2009/JP
1307	VPI	BAS30275	1307	5717	10127, 14537, 18947, 23357, 27767, 32177, 36587	norovirus Hu/GII.4/Niigata5/2009/JP
1308	VPI	BAS30278	I30B	5718	10128, 14538, 18948, 23358, 27768, 32178, 36588	norovirus Hu/GII.4/Fukuil/2009/JP
1309	VPI	BAS30284	1309	5719	IDI29, 14539, 18949, 23359, 27769, 32179, 36589	norovirus Hu/GII.4/Chiba4/200B/JP
1310	VPI	BAS30287	1310	5720	10130, 14540, 18950, 23360, 27770, 32180, 3B590	norovirus Hu/GII.4/Nagano2/2009/JP
1311	VPI	BAS3D290	1311	5721	10131. 14541, 18951, 23361, 27771. 32181, 36591	norovirus Hu/GII.4/Nagano4/2009/JP
1312	VPI	BAS30293	1312	5722	10132, 14542, 18952, 23362, 27772, 32182, 36592	norovirus Hu/GII.4/Nagano5/2009/JP
1313	VPI	BAS3029B	1313	5723	10133, 14543, 18953, 23363, 27773, 32183, 3B593	norovirus Hu/GII.4/Aichi3/20IO/JP
1314	VPI	BAS30299	1314	5724	10134, 14544, 18954, 23364, 27774. 32184, 3B594	norovirus Hu/GII.4/Osakal/2009/JP
1315	VPI	BAS30302	1315	5725	10135, 14545, 18955, 233B5, 27775, 32185, 3B595	norovirus Hu/GII.4/0saka5/2009/JP
1316	VPI	BAS3B305	1316	572B	10136, 14546, I895B, 23366, 2777B, 32I8B, 36596	norovirus Hu/GII.4/Ehime5/20ll/JP

I3I7	VP!	BAS30308	I3I7	5727	10137. 14547. 18957, 23367, 27777, 32187, 36597	norovirus Hu/GII.4/Sakai5/2009/JP
I3I8	VPI	BAS3D3II	I318	5728	10138, 14548, 18958, 23368, 27778, 32188, 36598	noravirus Hu/GII.4/Hiroshimal/2009/JP
I3I9	VPI	BAS303I4	I3I9	5729	I0139, 14549, 18959, 23369, 27779, 32189, 36599	norovirus Hu/GII.4/Hirnshima5/2009/JP
I32D	VPI	BAS3B3I7	I32D	573B	10140, 14550, 18960, 23370, 27780, 32190, 36600	norovirus Hu/GII.4/Ehime2/20D9/JP
I321	VPI	BAS3D320	I321	5731	10141, 14551, 18961, 23371, 27781, 32191, 3B601	norovirus Hu/GII.4/Ehime4/2009/JP
1322	VPI	BAS3D323	1322	5732	10142, 14552, 18962, 23372, 27782, 32192, 36602	norovirus Hu/GII.4/Sagal/2009/JP
1323	VPI	BAS3D32B	1323	5733	10143, 14553, 18963, 23373, 27783, 32193, 36603	norovirus Hu/GII.4/Saga2/2009/JP
I324	VPI	BAS3D329	1324	5734	10144, 14554, 18964, 23374, 27784, 32194, 36604	norovirus Hu/GII.4/Saga3/2009/JP
I325	VPI	BAS3D332	1325	5735	10145, 14555, 18965, 23375, 27785, 32195, 36605	norovirus Hu/GII.4/Saga4/2009/JP
1326	VPI	BAS3D335	I32B	573B	10146. 14556, 18966, 23376, 27786, 32196, 36606	norovirus Hu/GII.4/Chiba6/20II/JP
1327	VPI	BAS3B338	1327	5737	10147, 14557, 18967, 23377. 27787, 32197, 36607	norovirus Hu/GII.4/Nagano26/20II/JP
1328	VPI	BAS3B34I	I328	5738	I0148, 14558, 18968, 23378, 27788, 32198. 36608	norovirus Hu/GII.4/Hirashima5/20II/JP
I329	VPI	BAS3D344	1329	5739	I0149. 14559, I8969, 23379, 27789, 32199, 36609	norovirus Hu/GII,4/0saka4/20II/JP
I33D	VPI	BAS3B347	I33B	574B	I0150, 14560, 18970, 23380, 27790, 32200, 36610	noravirus Hu/GII.4/Hokkaido4/20II/JP
I331	VPI	BAS3B35B	I331	5741	I0151, 14561, 18971, 23381, 27791, 32201, 36611	norovirus Hu/GII.4/0saka2/20II/JP
1332	VP!	BAS3D353	1332	5742	I0152, 14562, 18972, 23382, 27792, 32202, 36612	norovirus Hu/GII.4/0saka!/20II/JP
1333	VP!	BAS3B35B	1333	5743	I0153, 14563, 18973, 23383, 27793, 32203. 36BI3	norovirus Hu/GII.4/Aichi5/20II/JP

1334	VPl	BAS30359	1334	5744	10154, l45B4. 18974, 23384, 27704, 32204, 3BBl4	norovirus Hu/GII.4/Aichi4/20ll/JP
1335	VPl	BAS303B2	1335	5745	10155, l45B5. 18975, 23385, 27795, 32205, 3BBl5	nnravirus **Hu/GII.4/Hokkaido3/20ll/JP**
l33B	VPI	BAS303B5	l33B	574B	**10156.** l45BB, l897B. 2338B. 2779B, 3220B, 3BBIB	**nOrOvirus Hu/GII.4/Nagano7/2Dll/JP**
1337	VPI	BAS303B8	1337	5747	10157, l45B7, 18977, 23387, 27797, 32207, 3BBI7	nOROviRUs **Hu/GII.4/Nagano4/20ll/JP**
l338	VPI	BAS3D37I	1338	5748	10158, l45B8, 18978, 23388, 27798, 32208, 3BBI8	**norovirus Hu/BII.4/Niigata3/20li/JP**
l339	VPI	BAS30374	1339	5749	10159, l45B9. 18979, 23389, 27799, 322D9, 3BBI9	norovirus Hu/GII.4/Hiroshimacityl/20ll **/JP**
l34D	VPI	BAUIB297	1340	5750	IOIBO, 14570. 18980, 23390, 27800, 32210, 3BB20	norovirus GII/Hu/Jp/20l2/GII.4/sl20l53
l34l	VPI	BAUIB299	1341	5751	**10161.** 14571. 18981, 23391, 27801, 32211, 3BB2I	norovirus GII/Hu/Jp/20l5/GII.I7/MIY2
l342	VPI	BAUIB3DI	1342	5752	**10162.** 14572, 18982, 23392. 27802, 32212. 3B622	norovirus GI/Hu/Jp/20l3/GI.4/sl30l49
1343	VPI	BAUIB303	1343	5753	10163, 14573, l89B3, 23393, 27803, 32213. 3BB23	norovirus GI/Hu/Jp/20l3/GI.B/sl30l47
1344	VPI	BAUIB305	1344	5754	**10164.** 14574, 18984, 23394. 27804, 32214, 3BB24	norovirus GII/Hu/Jp/2007/GII.3/Kodl
l345	VPI	BAUIB30B	1345	5755	10165, 14575, 18985, 23395, 27805, 32215, 36625	norovirus GIV/Hu/Jp/200l/GIV.I/OCOIOI7023
l34B	VPI	BAUIB307	l34B	575B	10166, 14576, l898B, 2339B, 27806, 32216, 36626	norovirus GI/Hu/Jp/2002/GI.5/OC020l80
1347	VPI	BAU2483I	1347	5757	10167, 14577, 18987, 23397, 27807, 32217, 36627	norovirus Hu/GII.4/Hokkaido4/2DI2/JP
1348	VPI	BAU24834	1348	5758	10168, 14578, 18988, 23398, 27808. 32218, 36628	norovirus Hu/GII.4/Aomori2/20l2/JP
1349	VPI	BAU24837	l349	5759	10169, 14579, 18989, 23399, 2780B, 32219, 36629	norovirus Hu/GII.4/Aomori3/20l2/JP
1350	VPl	BAU2484D	1350	57B0	10170, 14580, 18990, 23400. 27810, 32220, 36630	norovirus Hu/GII.4/Aomori5/20l2/JP

1351	VPI	BAU24843	1351	5761	10171. 14581. 18931. 23401, 27811, 32221, 36631	norovirus Hu/GII.4/Akita4/2012/JP
1352	VPI	BAU24846	1352	5762	10172. 14582. 18992, 23402, 27812. 32222, 36632	norovirus Hu/GII.4/Akita5/2012/JP
1353	VPI	BAU24849	1353	5763	10173, 14583. 18993, 23403, 27813, 32223. 36633	norovirus Hu/GII.4/Iwate4/2012/JP
1354	VPI	BAU24852	1354	5764	10174, 14584, 18994, 23404. 27814. 32224, 36634	norovirus Hu/GII.4/Iwate5/2012/JP
1355	VPI	BAU24855	1355	57G5	10175, 14585, 18995, 23405, 27815, 32225, 36635	norovirus Hu/GII.4/Miyagi3/2DI2/JP
I35G	VPI	BAU24858	I35B	5766	10176, 14586, I8B96, 23406. 27816. 32226, 36636	norovirus Hu/GII.4/SaitamaZ/2012/JP
1357	VPI	BAU2486I	1357	5767	10177. 14587, 18937, 23407, 27817, 32227, 36637	norovirus Hu/GII.4/Toyama2/2012/JP
1358	VPI	BAU248B4	1358	5768	10178, 14588, 18398, 23408. 27818. 32228, 36638	norovirus Hu/GII.4/Niigata4/2012/JP
1359	VPI	BAU248B7	I35B	5769	10179, 14589, 18999, 23409, 27819, 32229, 36639	norovirus Hu/GII.4/Fukui3/20IZ/JP
I3GD	VPI	BAU2487D	1360	5770	10180, 14590, 19000, 23410, 27820, 32230. 36640	norovirus Hu/GII.4/Fukui4/2012/JP
I3GI	VPI	BAU24873	I3GI	5771	10181. 14591, 19001, 23411, 27821, 32231, 36641	norovirus Hu/GII.4/Fukui6/2DI2/JP
I3G2	VPI	BAU2487B	1362	5772	10182, 14592, 19002. 23412, 27822, 32232, 36642	norovirus Hu/GII.4/Fukui7/2012/JP
1363	VPI	BAU2487B	1363	5773	10183, 14593, 19003, 23413, 27823, 32233, 36643	norovirus Hu/GII.4/Fukui8/2012/JP
1364	VPI	BAU24882	I3G4	5774	10184. 14594, 19004, 23414, 27824, 32234, 36644	norovirus Hu/GII.4/Ehime 5/2012/JP
1365	VPI	BAU24885	I3G5	5775	10185, 14595, 13005, 23415, 27825, 32235, 36645	norovirus Hu/GII.4/0sakaCityI/2012/JP
1366	VPI	BAU24888	I36G	5776	10186, 14536, 19006, 23416, 27826, 32236. 36646	norovirus Hu/GII.4/0sakaCity2/2DI2/JP
1367	VPI	BAU2489I	I3G7	5777	10187, 14597, 19007, 23417, 27827, 32237, 3B647	norovirus Hu/GII.4/0sakaCity4/2OI2/JP

I3B8	VP1	BAU24894	I3B8	5778	I0I88, I4598, I9DD8. 234I8, 27828, 32238. 3BB48	narovirus Hu/GII.4/Sakail/20l2/JP
I3B9	VP1	BAU24897	I3B9	5779	IDI89. I4599, I9DD9, 234I9. 27829, 32239, 3BB49	norovirus Hu/GII.4/SakaiZ/ZDI2/JP
I37D	VPI	BAU249DD	I37D	578D	IDI9D, I4BDD, I90ID, 2342D, 27830, 32240, 3BB5B	norovirus Hu/GII.4/Sakai3/20l2/JP
I37I	VPI	BAU249D3	I37I	578I	IDI9I, I4B0I, I90II, 2342I, 27831, 32241, 36B5I	norovirus Hu/GII.4/Sakai4/20l2/JP
I37Z	VP I	BAU249DB	I372	5782	I0I92, I4B02, I9012. 23422, 27832, 32242. 3BB52	norovirus Hu/GII.4/Sakai5/20IZ/JP
I373	VPI	BAU249D9	I373	5783	10193, I4B03. 19013, 23423, 27833, 32243, 36B53	norovirus Hu/GII.4/Shimane3/2DI2/JP
I374	VPI	BAU249I2	I374	5784	I0194, I4G04, I9014, 23424, 27834, 32244, 3BB54	norovirus Hu/GII.4/Shimane5/ZDIZ/JP
I375	VPI	BAU249I5	I375	5785	10195, I4B05, 19015, 23425, 27835, 32245, 36B55	norovirus Hu/GII.4/Hiroshima4/20l2/JP
I37B	VPI	BAU249I8	I37B	578B	I0I9B. I4B0B, 19016. 2342B, 27836, 32246, 36656	norovirus Hu/GII.4/Hiroshima5/20l2/JP
I377	VPI	BAU2492I	I377	5787	10197, I4B07, 19017, 23427, 27837, 32247, 3BB57	norovirus Hu/GII.4/HiroshimaCity3/20l2/JP
I378	VPI	BAU24924	I378	5788	10198, I4B08, 19018, 23428, 27838, 32248. 3BB58	norovirus Hu/GII.4/HiroshimaCity4/20l2/JP
I379	VPI	BAU24927	I379	5789	I0199, 14609, I9019, 23429, 27839, 32249. 36659	norovirus Hu/GII.4/Ehime3/20l2/JP
I380	VPI	BAU2493D	I38D	579D	10200, I461O. 19020. 23430, 27840, 32250, 36660	norovirus Hu/GII.4/GII4-HK0l/20ll/JP
I38I	VPI	BAU24933	I38I	579I	10201, I461I, I90ZI. 23431, 27841, 32251, 36661	norovirus Hu/GII.4/GII4-HK02/20ll/JP
I382	VPI	BAU2493G	I382	5792	10202, 14612. 19022. 23432. 27842. 32252, 36662	norovirus Hu/GII.4/GII4-HK03/20ll/JP
I383	VPI	BAU24942	I383	5793	I02D3, I4613, 19023, 23433, 27843, 32253, 36B63	norovirus Hu/GII.4/GII4-NGI3l5/20ll/JP
I384	VPI	BAU24945	I384	5794	10204. 14614. 19024. 23434, 27844. 32254, 36664	norovirus Hu/GII.4/GII4-NGI343/2DII/JP

1385	VPI	BAU24948	1385	5795	10205, 14615, 19025, 23435, 27845, 32255, 36665	naravirus Hu/GII.4/GII4-NGI3B5/ZDII/JP
1386	VPI	BAU2495D	I38B	579B	10206, 14616, I9D26, 2343B, 2784B, 32256, 36666	naravirus Hu/GII.4/Hakkaido2/20I2/JP
1387	VPI	BA024952	1387	5797	10207, 14617, 19027, 23437, 27847, 32257. 36667	norovirus Hu/GII.4/Hokkaida3/20I2/JP
1388	VPI	BAU24954	1388	5798	10208, 14618, 10028, 23438, 27848, 32258, 3668B	naravirus Hu/GII.4/Hokkaido5/20I2/JP
1389	VPI	BAU24958	1389	5799	10209, 14619, 19029, 23439, 27849, 32259, 36669	norovirus Hu/GII,4/Anmori4/20I2/JP
I39D	VPI	BAU249BD	1390	5800	10210, 14620, 19030, 23440. 27850, 32260, 36670	naravirus Hu/GII.4/Akital/20I2/JP
1391	VPI	BAU24962	1391	5801	10211, 14621, 19031. 23441, 27851, 32261, 3B67I	norovirus Hu/BH.4/Akita2/2DI2/JP
1392	VPI	BAU24964	1392	5802	10212, 14622, 19032, 23442, 27852. 32262, 36672	naravirus Hu/GII.4/Akita3/20I2/JP
1393	VPI	BAU249BB	1393	5803	10213. I4B23, 19033, 23443. 27853. 322B3, 36673	norovirus Hu/GII.4/Iwatel/20I2/JP
1394	VPI	BAU24968	1394	5804	10214, 14624, 19034, 23444, 27854, 32264, 36674	norovirus Hu/GII.4/Iwate2/20I2/JP
1395	VPI	BAU24972	1395	5805	10215, I4B25, 13035, 23445, 27855, 32265, 3BB75	norovirus Hu/GII.4/Aichi3/ZDI2/JP
1396	VPI	BAU24B74	1396	5806	10216. 14626, 19036, 23446, 27856, 32266. 3B676	naravirus Hu/GII.4/Aichi4/20I2/JP
1397	VPI	BAU2497B	1397	5807	10217, I4B27, 19037, 23447, 27857, 32267, 3BB77	naravirus Hu/GII.4/Aichi5/20I2/JP
1398	VPI	BAU24978	1398	5808	10218, 14628, I9D38, 23448, 27858, 32268, 36678	norovirus Hu/GII.4/Aichi6/20I2/JP
1399	VPI	BAU24980	1399	5809	10219, 14629, 19039, 23449, 27859, 32269, 36679	narovirus Hu/GII.4/Ehime4/20I2/JP
I4DD	VPI	BAU24982	1400	5810	I022D, 14630, 19040, 23450, 278B0, 32270, 3BB80	naravirus Hu/GII.4/Niigata2/2DI2/JP
1401	VPI	BAU24984	1401	5811	10221, 14631, 19041, 23451, 27861, 32271, 36B8I	narovirus Hu/GII.4/Tayamal/20I2/JP

1402	VP1	BA02498G	1402	5812	10222. 14632, 19042, 23452, 27862, 32272, 36682	norovirus Hu/GII.4/Toyama3/2DI2/JP
1403	VP1	BA024988	1403	5813	10223, 14633, 19043, 23453, 27863, 32273, 36683	nnrovirus Hu/GII.4/Toyama4/20l2/JP
1404	VPI	BA024990	1404	5814	10224, 14634, 19044, 23454, 27864, 32274, 36684	norovirus Hu/GII.4/Fukui5/20l2/JP
1405	VPI	BAU24992	1405	5815	10225, 14635, 19045, 23455, 27865, 32275, 36685	norovirus Hu/GII.4/0sakaCity3/20l2/JP
I40G	VPI	BAU24994	I40B	5816	ID226, 14636, I904B, 23456, 278B6, 32276, 36686	norovipus Hu/GII.4/Hiroshimal/2DI2/JP
1407	VPI	BAU2499B	1407	5817	10227, 14637, 19047, 23457, 27867, 32277, 36B87	norovirus Hu/GII.4/Hiroshima2/20l2/JP
1408	VPI	BA024998	1408	5818	10228, I4B38, 19048, 23458, 27868, 32278, 36688	norQvirus Hu/GII.4/Hirashima3/20l2/JP
1409	VPI	BA025002	1409	5819	10229, I4B39, 19049, 23459, 278B9, 32279, 36689	norovirus Hu/GII.4/Shimane2/20l2/JP
1410	VPI	BA025004	1410	5820	IB230, 14640, I9050, 23460, 27870, 32280, 36690	norovirus Hu/GII.4/Shimane4/2DI2/JP
1411	VPI	ADN84676	1411	5821	10231, 14641, 19051, 23461, 27871, 32281, 36691	norovirus pig/0035/2007/K0R
1412	VPI	BAKB8870	1412	5822	10232, 14642, 19052, 234B2, 27872, 32282, 36692	norovirus sewage/GII/lnfluent/Nov2006/JPN
1413	VPI	AAC54893	1413	5823	10233, I4B43, 19053, 234B3, 27873, 32283, 36693	norovirus isolates
1414	VPI	AAW30I95	1414	5824	ID234, 14644, 19054, 23464, 27874, 32284, 36694	norovirus Hu/CI4/20D2/AU
1415	VPI	ABD3G49I	1415	5825	ID235, 14645, 19055, 23465, 27875, 32285, 36695	norovirus Hu/GII/Goulburn Valley G5I75 A/I983/AUS
1416	VPI	ABD3B494	1416	5826	10236, I4B4B, 19056, 23466, 27876, 32286, 36696	norovirus Hu/GII/Gnulburn Valley G5I75 B/I983/AUS
1417	VPI	ABD3G497	1417	5827	10237, 14647, 19057, 23467, 27877, 32287, 36697	norovirus Hu/GII/Goulburn **VallEy** G5I75 C/I983/A0S
1418	VPI	ABL74387	1418	5828	10238, 14648, 19058, 23468, 27878, 32288, 36698	norovirus Hu/GII.4/Dongen4B/2D0G/NL

1419	VPI	ABL74389	1419	5820	10239, 14B49. 19D59, 234B9, 27879, 32289, 3BB99	norovirus Hu/GII.4/0enHaag54/200B/NL
1420	VPI	ABL74397	I42D	5830	10240, 14B50, 190B0, 23470, 27880, 32290, 3B70D	norovirus Hu/GII.4/Nijmegenll5/200G/NL
1421	VPI	AB0445B2	1421	5831	10241, 14651. 19061. 23471, 27881, 32291, 36701	norovirus Hu/Maizuru/0305l2/2003/JP/4B56
1422	VPI	ABQ445B3	1422	5832	10242, 14652, 19062, 23472, 27882, 32292, 36702	norovirus Hu/0saka/0l03l4/200l/JP/3B34
1423	VPI	AB0445B4	1423	5833	10243. 14653, I9D63, 23473, 27883, 32293, 36703	norovirus Hu/Saga/0003l3/2000/JP/2876
1424	VPI	AB0445B5	1424	5834	10244, 14654, I9DB4, 23474, 27884, 32294, 36704	norovirus Hu/0saka/00032l/2000/JP/300B
1425	VPI	ABQ445BB	1425	5835	ID245, I4B55, 19065, 23475, 27885, 32295, 3B705	norovirus Hu/**AkabanE** /99ll30/l9B9/JP/2258
1426	VPI	ABQ445B7	I42B	583B	I024B, I4B5B, I90B6, 2347B, 2788B, 32296, 3B706	norovirus Hu/Saga/OOI2l5/2000/JP/3IOI
1427	VPI	ABQ445B8	1427	5837	10247, 14657, 19067, 23477, 27887, 32297, 3B707	norovirus Hu/Maizuru/000602/2000/JP/2840
1428	VPI	ABQ445B9	1428	5838	10248, 14658, 19D68, 23478, 27888, 32298, 36708	norovirus Hu/Maizuru/0I0524/200l/JP/3229
1429	VPI	ABQ44570	1429	5830	10249, 14659, 19D69, 23479, 27889, 32299. 36709	norovirus Hu/Osaka/OI0203/200l/JP/3BII
1430	VPI	AB04457I	1430	584D	ID250, 146B0. 19070. 23480, 27890, 323D0, 36710	norovirus Hu/Osaka/OI0203/20DI/JP/3BI2
1431	VPI	ABD44572	1431	5841	10251, 14661. 19071, 23481, 27891, 32301, 36711	norovirus Hu/ Kurume/**a5l22B**/f995/JP/4IB
1432	VPI	AB044573	1432	5842	10252, 14662, 19072, 23482, 27892. 32302, 3B7I2	norovirus Hu/AkabanE/99020B/l999/JP/2087
1433	VPI	ABQ44574	1433	5843	10253, 14BB3, 19073. 23483. 27893, 32303, 36713	norovirus Hu/Maizuru/OI0426/200l/JP/3385
1434	VPI	AB044575	1434	5844	10254, 14664, 19074, 23484, 27894, 32304, 36714	norovirus Hu/Maizuru/000324/2000/JP/2468
1435	VPI	ABQ4457B	1435	5845	10255, I4BB5, 19075, 23485, 27895, 32305, 3B7I5	norovirus Hu/Dsaka/OI0228/200l/JP/3B25

1436	VP!	ACJ04900	1436	5846	10256, 14666, 19076, 23486, 27896, 32306, 36716	norovirus Bo/GIII/BVI5/2007/BEL
1437	VP!	ACJ04B03	1437	5847	10257, 14667, 19077, 23487, 27897, 32307, 36717	norovirus BD/BIII/BV24/2007/ BEL
1438	VPI	ACJ04906	1438	5848	10258, 14668, 19078, 23488, 27898, 32308, 36718	norovirus Bo/BIII/B309/2003/BEL
1439	VP!	ACY00565	1439	5849	10259, 14669, 19079, 23489, 27899, 32309, 36719	norovirus Hu/GII.4/Beijing/53952/2007/CHN
I44D	VPI	ACYD0568	1440	5850	10260, 14670, 19080, 23490, 27900, 32310, 36720	norovirus Hu/GII.4/Beijing/54023/2007/CHN
1441	VP!	ACY0057I	1441	5851	10261, 14671, 19081, 23491, 27901, 32311, 36721	norovirus Hu/BII.4/Beijing/54091/2007/CHN
1442	VPI	ACY00573	1442	5852	10262, 14672, 19082, 23492, 27902, 32312, 36722	norovirus Hu/BII.4/Beijing/54IIB/2007/CHN
1443	VPI	ACY00576	1443	5853	10263, 14673, 19083, 23493, 27903, 32313, 36723	norovirus Hu/Gll.4/Beijing/54I25/20D7/CHN
1444	VP!	ACY00579	1444	5854	10264. 14674, 19084, 23494, 27904, 32314, 36724	norovirus Hu/GII.4/Beijing/54l35/2007/CHN
1445	VPI	ACY00582	1445	5855	10265, 14675, 19085, 23495, 27905, 32315, 36725	norovirus Hu/GII.4/B Eijing/54B5l/2007/CHN
1446	VPI	ACY0D588	1446	5856	10266, 14676, 19086, 23496, 27906, 32316, 36726	norovirus Hu/GII.4/BBijing/55047/2007/CHN
1447	VPI	ACY00594	1447	5857	10267, 14677, 19087. 23497, 27907, 32317, 36727	norovirus Hu/GII.4/Beijing/55058/2007/CHN
1448	VPI	ACY00597	1448	5858	10268, 14678, 19088. 23498. 27908, 32318. 36728	norovirus Hu/GII.4/8eijing/55D65/2007/CHN
1449	VPI	ACY00600	1449	5859	10269, 14679, 19089, 23499, 27009, 32319, 36729	norovirus Hu/GII.4/BEijing/55l50/2008/CHN
1450	VPI	ACYD0603	1450	5860	10270, 14680, 19090, 23500, 27910, 32320, 36730	norovirus Hu/GII.4/B Eijing/55l62/2008/CHN
1451	VPI	ACY006D6	1451	5861	10271, 14681, 19091, 23501, 27911, 32321, 36731	norovirus Hu/Gll.4/Beijing/55l76/2008/CHN
1452	VPI	ACY00609	1452	5862	10272, 14682, 19092, 23502, 27912, 32322, 36732	norovirus Hu/GII.4/Beijing/55l84/2008/CHN

1453	VP1	ACYD06I2	1453	5863	10273, 14G83, 19093, 23503, 27913, 32323, 36733	norovirus Hu/GII.4/Beijing/54667/2007/CHN
1454	VP1	ACYDD6I5	1454	5864	10274, 14684, 19094, 23504, 27914, 32324, 36734	norovirus Hu/GII.4/Beijing/5367l/2007/CHN
1455	VP1	ACYDD6I8	1455	5865	10275, 14685, 19095, 23505, 27915, 32325, 36735	narovirus Hu/GII.4/BBijing/53937/2D07/CHN
1456	VPI	ACY0D62I	1456	5866	10276, 14686, 19096, 23506, 27916, 32326, 36736	norovirus Hu/GII.4/Beijing/55063/2DD7/CHN
1457	VP1	ACYD0623	1457	5867	10277, 14687, 19097, 23507, 27917, 32327, 36737	norovirus Hu/GII.4/Beijing/55028/2007/CHN
1458	VP1	ACY0D629	1458	5868	10278, 14688, 19098, 23508, 27918, 32328, 36738	narovirus Hu/GII.4/Beijing/5504D/2007/CHN
1459	VPI	ACYDD632	1459	5869	10279, 14689, 19099, 23509, 27919, 32329, 36739	norovirus Hu/GII.4/Beijing/55!85/2G08/CHN
1460	VPI	ACYDD635	I46D	587D	10280, 14690, 19100, 23510, 27920, 32330, 36740	norovirus Hu/GII.4/Beijing/5393l/2007/CHN
1461	VPI	ACY00638	1461	5871	10281, 14691, 19101. 23511, 27921, 32331, 36741	norovirus Hu/GII.4/Beijing/54l08/2007/CHN
1462	VPI	ACYDD64I	1462	5872	10282, 14692, 19102, 23512, 27922, 32332, 36742	norovirus Hu/GII.4/Beijing/54H4/2DD7/CHN
1463	VPI	ACYDD645	1463	5873	10283, 14693, 19103, 23513, 27923, 32333, 36743	narovirus Hu/GII.4/BBijing/54GGD/20D7/CHN
1464	VPI	ACYDD647	1464	5874	10284, 14694. 19104, 23514, 27924. 32334, 36744	norovirus Hu/GII.4/Beijing/55042/2007/CHN
1465	VPI	ACYDD650	1465	5875	10285, 14695, 19105, 23515, 27925, 32335, 36745	norovirus Hu/GII.4/B eijing/55IBI/2008/CHN
1466	VPI	ACYDD656	1466	5876	10286, 14696, 19106, 23516, 27926, 32336, 36746	narovirus Hu/GII.4/Beijing/55l7l/2008/CHN
1467	VPI	ADK47I70	1467	5877	10287, 14697, 19107, 23517, 27927, 32337, 36747	norovirus Hu/ll.4/220D66l/HK/2DI0
1468	VPI	A0R3D5I4	1468	5878	10288, 14698, 19108, 23518, 27928, 32338, 36748	norovirus Hu/BII.B/89l3/Shizuoka/2DD8/JPN
1469	VPI	A0R78255	1469	5879	10289, 14699, 19109, 23519, 27929, 32339, 36749	norovirus Hu/Il.4/222I223/HK/2D09

I47D	VPI	ADR78259	I47B	5880	ID290, 14700, I3I10. 23520, 27930, 32340. 3B75B	norovirus Hu/ll.4/2845694/HK/2009
I47I	VPI	ADR782G2	I47I	588I	10291. 14701, I9III, 23521, 27931, 32341, 3B75I	norovirus Hu/H.4/2856357/HK/2009
I472	VPI	ADR782BB	1472	5882	IB292, 14702. I9II2. 23522, 27932, 32342, 3B752	norovirus Hu/ll.4/2849738/HK/2009
1473	VPI	ADR782B8	1473	5883	10293, 14703, 19113. 23523, 27933, 32343, 3B753	norovirus Hu/Il.4/220I480/HK/20I0
1474	VPI	AFO00Q93	1474	5884	10294, 14704, I9II4. 23524, 27934, 32344, 3B754	norovirus Gill
1475	VPI	BAI52939	1475	5885	10295, 14705, I9II5, 23525, 27935, 32345, 3B755	norovirus Hu/GII.2/OC08030B/2008/JPN
I47B	VPI	BAI5294D	I47B	588B	I029B, I470B. I9IIB, 2352B, 27936, 3234B, 3B75B	norovirus Hu/GII.4/0C090053/2009/JPN
I477	VPI	BAQ2D80I	1477	5887	10297, 14707, I9II7, 23527. 27337, 32347. 3B757	norovirus Hu/Gll.4/Aichi368-I4/20I4
1478	VPI	BAQ2D803	1478	5888	10238, 14708, I9II8. 23528, 27938, 32348, 3B758	norovirus Hu/GII.4/AichiNishiol-!4/20l4
1479	VPI	BAQ20805	1479	5889	10299, 14709. 19119, 23529, 27939, 32349, 3B759	norovirus Hu/Gll.4/Aichi35l-I4/20I4
1480	VPI	AABBB27I	I48B	5890	10300, 14710, 19120, 23530. 27940, 32350, 3B7B0	norovirus isolates
I48I	VPI	AAK9B2I8	I48I	5891	10301. 14711, 1912!. 23531. 27941, 32351, 3B7BI	norovirus Gil
1482	VPI	AAR97B48	1482	5892	10302, 14712, 19122, 23532, 27942, 32352, 3B7B2	norovirus Gil
1483	VPI	AAR97B5I	1483	5893	10303, 14713, 19123, 23533, 27943, 32353, 3B763	norovirus Gil
1484	VPI	AAR97B54	1484	5894	ID304, 14714, I9I24, 23534, 27344, 32354, 3B7B4	norovirus Gil
1485	VPI	AAR97B57	1485	5895	10305, 14715, 13125, 23535, 27345, 32355, 3B765	norovirus Gil
I486	VPI	AAR37BBB	I48B	589B	IB30B, 14716. 13126, 23536, 27946, 32356, 36766	norovirus Gil

1487	VPI	AAR97BB3	1487	5897	10307, 14717, 19127, 23537. 27947, 32357. 36767	norovirus 611
1488	VPI	AAS8B774	1488	5898	10308, 14718, 19128, 23538. 27948, 32358, 3B7B8	norovirus Gil
1489	VPI	AAS86777	1489	5899	10309, 14719, 19129. 23539, 27949, 32359, 3B7B9	norovirus Gil
1490	VPI	AAS8B780	1490	5900	10310, 14720, 19130, 23540. 27950, 323B0, 36770	norovirus GI
1491	VPI	AAS8B783	1491	5901	10311, 14721, 19131, 23541, 27951, 32361, 3B771	norovirus GI
1492	VPI	AAS8B78B	1492	5902	10312, 14722, 19132, 23542, 27952, 32362, 36772	norovirus Gil
1493	VPI	AAS8B792	1493	5903	10313, 14723, 19133, 23543. 27953, 32363, 36773	norovirus Gil
1494	VPI	AAS86795	1494	5904	10314, 14724, 19134, 23544, 27954, 32364, 36774	norovirus Gil
1495	VPI	AAS8B798	1495	5905	10315, 14725, 19135, 23545, 27955, 32365, 36775	norovirus Gil
1496	VPI	AAS8B80I	I49B	5906	10316, 14726, 19136, 2354B, 27956, 32366, 36776	norovirus Gil
1497	VPI	AAS8B804	1497	5907	10317, 14727, 19137, 23547. 27957. 32367, 36777	norovirus Gil
1498	VPI	AAS8B807	1498	5908	10318, 14728, 19138, 23548, 27958, 32368, 36778	norovirus GI
1499	VPI	AAT00237	1499	5909	10319, 14729, 19139, 23549, 27959. 32369, 36779	norovirus Hu/NLV/0xfard/B4S5/2002/UK
I5DD	VPI	AAT00240	1500	5910	10320, 14730. 19140, 23550, 27960. 32370, 36780	norovirus Hu/NLV/0xford/B4SG/2002/0K
I5DI	VPI	AATD0243	1501	5911	10321, 14731, 19141 23551. 27961. 32371, 36781	norovirus Hu/NLV/0xford/B4S4/2D02/UK
1502	VPI	AAT0D24G	1502	5912	10322, 14732, 19142, 23552, 27962, 32372, 36782	norovirus Hu/NLV/0xford/B4S7/2002/UK
1503	VPI	AAT00249	1503	5913	10323, 14733, 19143, 23553, 27963, 32373, 36783	norovirus Hu/NLV/0xford/B4SI/2002/0K

1504	VP1	AAT00255	1504	5914	10324, 14734, 19144, 23554, 27064, 32374, 36784	norovirus Hu/NLV/Oxford/BISI/2002/OK
I5D5	VP1	AAT00258	1505	5915	10325, 14735, 19145, 23555, 27965, 32375, 36785	norovirus Hu/NLV/0xford/BIS2/2002/0K
I5DB	VP1	AATD02GI	I50G	5916	10326, 14736, 19146, 23556, 27966, 32376, 36786	norovirus Hu/NLV/0xford/B!S4/2DDZ/UK
1507	VPI	AAT002B4	1507	5917	10327, 14737, 19147, 23557, 27967, 32377, 36787	norovirus Hu/NLV/0xford/BISII/2002/UK
I5D8	VPI	AAT002B7	1508	5918	10328. 14738, 19148, 23558, 27968, 32378, 36788	norovirus Hu/NLV/0xford/BISI2/2002/0K
I50B	VP1	AAT00270	1503	5919	10329, 14739, 19149, 23559, 27969, 32379, 36789	norovirus Hu/NLV/0xford/BISI6/2002/0K
1510	VPI	AAT00273	1510	5920	10330, 14740, 19150, 23560, 27970, 32380, 36790	norovirus Hu/NLV/0xford/BIS2l/2002/UK
1511	VPI	AATD027G	1511	5921	10331, 14741, 19151, 23561, 27971. 32381, 36791	norovirus Hu/NLV/0xford/B2SI0/2B02/0K
1512	VPI	AAT00279	1512	5922	10332, 14742, 19152, 23562, 27972, 32382, 36792	norovirus Hu/NLV/0xford/B2SII/2002/0K
1513	VPI	AAT00282	1513	5923	10333, 14743, 19153, 23563, 27973, 32383, 36793	norovirus Hu/NLV/0xford/B2SI4/20B2/0K
1514	VPI	AAT00285	1514	5924	10334, 14744, 19154, 23564, 27974, 32384, 36794	norovirus Hu/NLV/0xford/B2SI5/2002/UK
1515	VPI	AAT00288	1515	5925	10335, 14745, 19155, 23565, 27975, 32385, 36795	norovirus Hu/NLV/0xford/B2SI7/2002/UK
1516	VPI	AAT002BI	1516	5926	10336, 14746, 19156, 2356B, 2797B, 32386, 3679B	norovirus Hu/NLV/0xford/B2SI8/2002/UK
1517	VPI	AAT00294	1517	5927	10337. 14747, 19157, 23567, 27977, 32387, 36797	norovirus Hu/NLV/0xford/B2S20/2002/UK
1518	VPI	AAT002B7	1518	5928	10338. 14748. 19158, 23568, 27978, 32388, 36798	norovirus Hu/NLV/0xford/BZS23/2002/0K
1519	VPI	AAT00300	1519	5929	10339, 14749, 19159, 23569, 27979, 32389, 36799	norovirus Hu/NLV/0xford/B2S24/2002/0K
1520	VPI	AAT00303	1520	5930	10340, 14750, 19160, 23570, 27980, 32390, 36800	norovirus Hu/NLV/Dxford/B2S25/2002/0K

1521	VP1	AATDD3DB	1521	5931	10341. 14751, 19IBI. 23571, 27981, 32391, 3B80I	norovirus Hu/NLV/Dxfard/BZS2B/2DD2/UK
1522	VPi	AATD03DB	1522	5B32	10342, 14752, 19162. 23572, 27982, 32392, 3B802	narovirus Hu/NLV/0xford/B3S4/2003/0K
1523	VPI	AATD03I2	1523	5933	10343. 14753, 19163, 23573. 27983. 32393, 36803	narovirus Hu/NLV/Dxf Ord/B3SIB/2DD3/UK
1524	VPI	AATDD3I5	1524	5934	10344, 14754, 19164, 23574, 27984, 32394. 36804	norovirus Hu/NLV/0xford/B3SI8/2Q03/0K
1525	VPI	AAT003I8	1525	5B35	10345. 14755, 19165, 23575, 27985, 32395, 36805	norovirus Hu/NLV/0xford/B3SI9/2003/UK
I52B	VPI	AATD032I	I52B	533B	10346, 14756, 19166, 23576, 27986, 32396, 3B80B	narovirus Hu/NLV/0xford/B3S20/2003/0K
1527	VPI	AATDD324	1527	5B37	10347, 14757, 19167, 23577, 27987, 32397, 3G807	norovirus Hu/NLV/0xford/B5SI/22002/0K
1528	VPI	AATDD330	1528	5938	10348, 14758, 19168. 23578. 27988, 32398, 368D8	norovirus Hu/NLV/0xford/B5S8/2002/UK
I52B	VPI	AATDD333	1523	5939	10349, 14759, 19169, 23579, 27989, 32399, 36809	naravirus Hu/NLV/0xford/B5S9/2002/UK
1530	VPI	AATDD33B	I53D	5940	10350, 14760, 19170, 23580, 279B0. 32400, 36810	narovirus Hu/NLV/0xford/B5SI0/2002/0K
1531	VPI	AATDD342	1531	5941	10351. 14761, 19171, 23581. 27991, 32401, 36811	norovirus Hu/NLV/0xford/B5SI9/2002/UK
1532	VPI	AAT0D345	1532	5942	10352, 14762. 19172, 23582, 27992, 32402. 36812	norovirus Hu/NLV/Oxfard/B6S3/2003/UK
1533	VPI	AATBD348	1533	5B43	10353. 14763. 19173, 23583. 27993, 32403, 36813	norovirus Hu/NLV/0xford/BGS6/2003/UK
1534	VPI	AAT0035I	1534	5944	10354, 14764, 19174, 23584, 27994, 32404, 3B8I4	norovirus Hu/NLV/0xford/B6S2/2003/0K
1535	VPI	AAT00354	1535	5945	10355, I47B5, 19175. 23585, 27995, 32405, 36815	norovirus Hu/NLV/0xfard/B5S23/2D03/UK
I53B	VPI	AAT00357	I53B	594B	10356. 14766, 19176, 23586, 2799B, 32406, 3B8I6	norovirus Hu/NLV/0xford/BBS5/2003/UK
1537	VPI	AAT003BB	1537	5947	10357, 14767, 13177, 23587, 27997, 32407. 3B8I7	norovirus Hu/NLV/0xford/BBS4/2003/0K

I538	VPI	AATDD3B3	I538	5948	I0358, I47B8, I9I78, 23588, 27998, 32408, 3B8I8	norovirus Hu/NLV/0xford/88S5/2002/UK
I539	VPI	AAT003BB	I539	5949	ID359, I47B9, I9I79, 23589, 27999, 32409, 36819	norovirus Hu/NLV/Didcat/B9S2/2003/0K
I540	VPI	AATDD3B9	I540	5950	I03B0, I477D. 19180, 23590, 28000, 32410, 3B820	norovirus Hu/NLV/ChippingNorton/2003/OK
I54I	VPI	AAT0D372	I54I	595I	I03BI, 14771, 19181. 23591, 28001, 32411, 3B82I	norovirus Hu/NLV/Banbury/B9S23/2003/UK
I542	VPI	AAT00375	I542	5952	ID3B2, 14772, 19182, 23592, 28002, 32412, 3B822	norovirus Hu/NLV/Witney/B7S2/2Q03/UK
I543	VPI	AAT70II0	I543	5953	I03B3, 14773, 19183, 23593. 28003, 32413, 3B823	norovirus NLV/Paris Island/2003/0SA
I544	VPI	AAT735B2	I544	5954	I03B4, 14774, 19184, 23594, 28004, 32414, 3B824	norovirus NLV/B0DS/2002/USA
I545	VPI	AAT7848D	I545	5955	I03B5, 14775, 13185, 23595, 28005, 32415, 3B825	norovirus NLV/IFI998/2003/Iraq
I54B	VPI	AAT7848I	I54B	595B	I03BB, I477B. 19186. 2359B, 28006, 32416. 36826	norovirus NLV/IF203B/2D03/Iraq
I547	VPI	AAU9577B	I547	5957	I03B7, 14777, 19187, 23597, 28007, 32417, 3B827	norovirus Hu/NLV/Dresdenl74/pUS-Norll/1997/GE
I548	VPI	AAX32874	I548	5958	I03B8, 14778, 19188, 23598, 28008. 32418, 36828	norovirus swine/GII/MI-BW48/02/0S
I549	VPI	AAX32877	I549	5959	I03B9, 14779, 19189, 23599, 28009, 32419, 3B829	norovirus swine/GII/0H-QWIBI/03/0S
I55D	VPI	AAX32880	I55B	59B0	10370, 14780, 19190, 23B00, 28010, 32420, 3B830	norovirus swine/GII/0H-QWI25/03/0S
I55I	VPI	AAX3288B	I55I	59BI	10371, 14781, 19191, 23B0I, 28011, 32421, 3B83I	norovirus swine/GII/DH-QW2I8/D3/US
I552	VPI	AAZ3I37B	I552	59B2	10372, 14782. 19192, 23B02, 28012, 32422, 3B832	norovirus Hu/GIU/Hunter 284E/O40/A0
I553	VPI	AAZ3I39B	I553	59B3	10373, 14783, 19193. 23603. 28013. 32423, 3B833	norovirus Hu/GII.4/Hunter504D/D40/AU
I554	VPI	AAZ3I4D2	I554	59B4	10374, 14784, 19194, 23B04, 28014, 32424, 3B834	norovirus Hu/GII.4/Sydney9I7J/020/AU

1555	VPI	AAZ3I4II	1555	59B5	10375. 14785, 19195. 23605, 28015. 32425. 36835	norovirus Hu/GII.4/Sydney348/970/AU
1556	VPI	AAZ3I423	1556	5966	10376, I478B, 19196. 23606. 28016, 32426, 36836	**norovirus Hu/BEf.4/Sydney7I5D/04S/AU**
1557	VPI	AAZ3I428	1557	59G7	10377, 14787, 19197, 236D7, 28017, 32427, 36837	**norovirus Hu/GII.4/Sydney4477/DZS/AU**
1558	VPI	ABBD242D	1558	59B8	10378, 14788, 19198, 23608, 28018, 32428, 36838	murine norovirus 3
1558	VPI	ABBD2423	1559	59G9	10379, 14789, 19199. 23609, 28019, 32429. 36839	murine norovirus 4
156D	VPI	ABC9B74G	15GB	5370	10380, 14790, I920D, 23GI0, 28020, 32430, 3B840	norovirus Gil
1561	VPI	ABD77588	1561	5971	10381, 14791, 19201, 23611, 28021, 32431, 36841	norovirus Hu/Beijing/CR2905/2DD4/CHN
1562	VPI	ABD77589	1562	5972	10382, 14792, 19202, 23BI2, 28022, 32432, 36842	norovirus Hu/Beijing/CR2932/2004/CHN
1563	VPI	ABD7759B	I5B3	5973	10383, 14793, 19203, 23613, 28023, 32433, 3B843	norovirus Hu/Beijing/CR2987/2004/CHN
1564	VPI	ABG45845	I5G4	5974	10384, 14794, 19204, 23614, 28024, 32434, 36844	murine norovirus
1565	VPI	ABG45847	1565	5975	10385, 14795, 19205, 23GI5, 28025, 32435, 3B845	murine norovirus
1566	VPI	ABG45849	1566	5976	10386, I479G, I92DB, 23BI6, 28026, 3243G, 36846	murine norovirus
1567	VPI	ABG4585I	1567	5977	10387. 14797. 19207. 23617, 28027. 32437. 36847	murine norovirus
1568	VPI	ABI95835	1568	5978	10388, 14798, I92D8, 23618, 28028, 32438, 36848	murine norovirus
1569	VPI	ABI9798I	1569	5979	10389, 14799, 19209, 23GI9, 28D29, 32439, 36849	norovirus Hu/GII-4/0saka/I998/JPN
I57D	VPI	ABP99D38	I57D	5980	10390, I48D0, 19210, 23B20, 2803D, 32440, 36850	murine norovirus
1571	VPI	A8P9904I	1571	5981	10391, 14801, 19211, 23B2I, 28031, 32441, 3G85I	murine norovirus

1572	VP1	ABBI2784	1572	5B82	10392. 14802. 19212, 23B22. 28B32, 32442, 3B852	norovirus Hu/GII/TorontD/SK/2005/CAN
1573	VP1	ABRI5783	1573	5983	10333, 14803, 19213, 23B23, 28033, 32443, 3B853	norovirus lion/GIV,2/Pistoia/387/0B/ITA
1574	VP1	ABR24I3B	1574	5B84	10394, 14804, 19214, 23B24, 28B34, 32444, 3B854	norovirus Hu/Euangzhou/NV-VP2/2B06/China
1575	VPI	ABSI2I73	1575	5385	10395, 14805, 19215, 23B25. 28035, 32445, 3B855	norovirus Hu/Hebet/4858D/2DDG/CHN
I57B	VPI	ABSI2I75	I57B	598B	10396, I480B, 19216. 23B26, 28036, 32446, 36856	norovirus Hu/Shanxi/50106/2006/CHN
1577	VPI	ABS29273	1577	5387	10337. 14807, 13217, 23B27, 28037, 32447, 36857	murine norovirus 5
1578	VPI	ABS29275	1578	5388	10398, 14808, 19218, 23B28, 28D38, 32448, 36858	murine norovirus 6
I579	VPI	ABU5554I	1579	5383	10399, 14809, 19219. 23629. 28039, 32449, 36859	murine norovirus 1
1580	VPI	ABU55544	1580	539B	10400. 14810. 13220, 23630, 28040, 32450, 36860	murine norovirus 1
1581	VPI	ABU55547	1581	5931	10401, 14811, 13221, 23B3I, 28041, 32451, 3B86I	murine norovirus 1
1582	VPI	ABU55550	1582	5992	10402, 14812. 19222, 23632, 28B42, 32452, 3B862	murine norovirus 1
1583	VPI	ABU55553	1583	5933	10403, 14813, 19223, 23633, 28043, 32453, 36863	murine norovirus 1
1584	VPI	ABU5555B	1584	5394	10404, 14814, 19224, 23634, 28044, 32454, 36864	murine norovirus 1
1585	VPI	ABU5555B	1585	5335	10405, 14815, 19225, 23635, 28045, 32455, 3B865	murine norovirus 1
I58B	VPI	ABU555B2	I586	539B	I040B, 14816, 19226, 23636, 28046, 32456, 36866	murine norovirus 1
1587	VPI	ABU555B5	1587	5997	10407, 14817, 19227, 23637, 28047, 32457, 36867	murine norovirus 1
1588	VPI	ABU555B8	1588	5998	10408, 14818, 19228, 23638. 28048, 32458, 36868	murine norovirus GV/WUII/2005/USA

1589	VP1	ABU5557I	1589	5999	10409, 14819, 19229, 23B39, 28049. 32459, 3B8B9	murine norovirus GV/WUI2/2G05/0SA
I59D	VP1	AB055577	1590	BOOO	10410, 14820, 19230, 23B4D, 28050, 324B0, 3B870	murine norovirus GV/W02I/2005/USA
1591	VP1	ABU55580	1591	BOOI	10411, 14821. 19231, 23B4I, 28051, 324GI, 3B87I	murine norovirus GV/W022/2005/0SA
1592	VP1	AB05558B	1592	B002	10412. 14822, 19232, 23B42, 28D52, 324G2, 3B872	murine norovirus GV/WU24/20D5/0SA
1593	VP1	ABU55589	1593	B003	10413, 14823, 19233, 23B43, 28053, 324B3, 3B873	murine norovirus GV/WU25/2005/USA
1594	VPI	ABU55598	1594	B004	10414, 14824, 19234, 23B44, 28054, 324B4. 3G874	murine norovirus GV/CR3/2005/USA
1595	VPI	ABU55B0I	1595	B005	10415. 14825, 19235, 23G45, 28055, 324B5, 3B875	murine norovirus GV/CR4/2005/USA
159G	VPI	ABU55B04	I59B	BOOB	10416. 14826, 19236, 23B4B. 2805B, 324BB. 36876	murine norovirus GV/CR5/2D05/USA
1597	VPI	ABU55B07	1597	B007	10417, 14827, 19237, 23647, 28057, 32467, 36877	murine norovirus GV/CRG/2005/USA
1598	VPI	AB055BID	1598	B008	ID4I8, 14828, 19238, 23B48, 28058, 324B8, 36878	murine norovirus GV/CR7/2D05/0SA
1599	VPI	AB0556I3	1599	B009	10419, 14829, 19239, 23649, 28059, 32469, 3B879	murine norovirus GV/CRI0/2005/USA
1600	VPI	AB055BIB	IBOO	BOIO	10420, 14830, 19240, 23650, 28060, 32470, 36880	murine norovirus GV/CRII/2005/USA
16OI	VPI	ABU55BI9	IBOI	BOH	10421, 14831, 19241, 23B5I. 28D61, 32471. 3B88I	murine norovirus GV/CRI3/2005/USA
IB02	VPI	ABU55B22	IB02	B0I2	10422, 14832, 19242. 23B52. 28062, 32472, 36882	murine norovirus GV/CRI5/2005/USA
1603	VPI	ABU55B28	IB03	B0I3	10423, 14833, 19243, 23653, 28063, 32473, 36883	murine norovirus GV/CRI8/2005/DEU
IB04	VPI	ABW74I2I	IG04	B0I4	10424. 14834, 19244, 23B54. 28064, 32474, 36884	norovirus Hu/GU/Mussels/MI0nov2004/Foto/Sweden
IB05	VPI	ABW74I23	IB05	B0I5	10425, 14835, 19245, 23655, 28065, 32475, 3B885	norovirus Hu/GI.I/Mussels/M8nov2004/Foto/Sweden

IBOB	VPI	ABW74I24	1606	6016	10426, 14836, 19246, 2365B, 280B6, 32476, 36886	norovirus **Hu/GI.I/P738.DBIsjoZ0D4/GothBnburg/SwBdB** n
IB07	VPI	ABW74I25	IB07	B0I7	10427, 14837, 19247, 23657, 28067, 32477, 36887	norovirus **Hu/ GI,I/MussEls / MI27nnv2004/FatD/SwEden**
IBD8	VPI	ABW74I2B	IB08	B0I8	10428, 14838, 19248, 23658, 280B8, 32478, 36888	norovirus Hu/GU/P725.DBlsjo20D4/GothBnbijrg **/SwEdE** n
IBD9	VPI	ABW74I27	IB09	6019	10429, 14839, 19249, 23659, 28069, 32479, 36889	norovirus **Hu/GI.I/P7I5.0eisjo2DD4/Biithenburg/Sweden**
1610	VPI	ABW74I28	1610	602D	10430, 14840, 19250, 23660, 28070, 32480, 36890	norovirus **Hu/BI.I/P774.DeIsjD2D04/Gothenburg/Swede n**
1611	VPI	ABW74532	IBII	6021	10431, 14841, 19251, 23661, 28071, 32481, 36891	norovirus Hu/Richmond/1994/OSA
1612	VPI	ABW74533	1612	6022	10432, 14842, 19252, 23662, 28072, 32482, 36892	norovirus Hu/ HOustON/I995/USA
1613	VPI	ABW74534	1613	6023	10433, 14843, 19253, 23B63, 28073, 32483, 36893	norovirus Hu/Lonacaning/2001/USA
1614	VPI	ABW74535	1614	6024	10434, 14844, 19254, 23664, 28074, 32484, 36894	norovirus Hu/WarrBn/2002/USA
1615	VPI	ABW74536	1615	6025	10435, 14845, 19255, 23665, 28075, 32485, 36895	norovirus Hu/GCanyon/2002/USA
1616	VPI	ABW74537	1616	6026	10436, 14846, 10256, 2366B, 2807B, 32486, 36896	norovirus Hu/QM2-CS/2004/0SA
1617	VPI	ABW74538	1617	6D27	10437, 14847, 19257, 236B7, 28077, 32487, 36897	norovirus Hu/FL04/2004/USA
1618	VPI	ABW74539	1618	6028	10438, 14848, 19258, 23B68, 28078, 32488, 36898	norovirus Hu/GA04/2004/USA
1619	VPI	ABW7454B	1619	6029	10439, 14849, 19259, 23669, 28079, 32489, 36899	norovirus Hu/CumbBrland/2DG4/0SA
I62D	VPI	ABW7454I	1620	6030	10440, 14850, 19260, 23670, 28080, 32490, 36900	norovirus Hu/Ryndam/2005/USA
1621	VPI	ABW74542	1621	6031	10441, 14851, 19261, 23671, 28081, 32491, 36901	norovirus Hu/Billings/200G/USA

1622	VP1	ABW74544	IB22	BB32	10442, 14852, I92B2, 23B72, 28B82, 32492, 36902	norovirus Hu/Mississip/2006/USA
IB23	VP1	ABW74545	1623	6033	10443, 14853, 19263, 23673. 28083, 32493, 36903	norovirus Hu/CL-CS/2006/USA
IB24	VP1	ABW7454B	IB24	BB34	10444, 14854, I92B4, 23674, 28084, 32494, 36904	norovirus Hu/MT0I/20DG/0SA
IB25	VP1	ABW75843	IB25	BG35	10445, 14855, 19265, 23675, 28085, 32495, 3B9B5	norovirus sheep/NDrsEWQod30/20D7/NZL
IG2B	VP1	ABX7I0B2	IB2B	BB3B	I044B, I485B, I92BB, 23676, 28086, 32496, 36906	norovirus dog/170/07/lta
IB27	VP1	ABY77754	IB27	B037	10447, 14857, I92B7, 23677, 28087, 32497, 36907	norovirus Hu/GII/LuckBnwaldE59l/2002/DE
IB28	VP1	ABZ8B549	IB28	BB38	10448, 14858. 19268, 23678, 28088, 32498. 36908	norovirus Hu/GII/LevErkusBn267/2005/DE
1629	VP1	ACC68023	I62B	BD33	10449, 14859, 19269, 23B79, 28089, 32498. 369D9	norovirus pig/GIUi/FI8-IO/2005/CAN
1630	VP1	ACC69D2B	IB30	BD4D	10450, 1486D, 19270. 23B80, 28090, 32500, 36910	norovirus pig/GII.II/FI2-8/20D5/CAN
IB3I	VP1	ACC69D28	IB3I	B04I	10451, 14861. 19271. 23B8I, 28091, 32501, 36911	norovirus pig/GII-l8/FI5-IOnv/CAN
IB32	VP1	ACC9B732	1632	B042	10452, 14862, 19272, 23682, 28092, 32502. 36912	norovirus mouse/TW2006/TWN
1633	VP1	ACC9B735	IB33	B043	10453, 14863, 19273, 23683, 28093, 32503, 36913	norovirus mousE/TW2007/TWN
IB34	VP1	ACF4II77	IB34	B044	10454, 14864, 19274, 23684, 28084, 32504, 36814	narovirus Hu/GII/BEijing/30/2004/CHN
1635	VP1	ACF4II8B	1635	BD45	10455, 14865, 19275, 23685. 28095, 32505, 36915	norovirus Hu/BII/BEijing/22l/2005/CHN
I63B	VP1	ACF4II8I	IB3B	BQ4B	10456, 14866, 19276, 23686, 28096, 325D6, 36916	norovirus Hu/GII/BEijing/274/2005/CHN
IB37	VP1	ACF4II82	IB37	B047	10457, I48B7, 19277, 23B87, 28097, 32507, 36917	norovirus Hu/GII/Beijing/484/2005/CHN
IB38	VP1	ACF4II83	IB38	BB48	ID458, 14868, 19278, 23688, 28098, 32508, 36918	norovirus Hu/GII/BEijing/493/2005/CHN

1639	VPI	ACF4II84	1639	6D49	10459. 14869, 19279, 23689, 28099, 32509, 36919	norovirus Hu/GII/BBijing/07/2006/CHN
I640	VPI	ACF4II85	I64D	6D50	10460, 14870, I928O, 23690, 28100, 32510, 36920	norovirus Hu/GII/Beijing/34/2006/CHN
IG4I	VPI	ACF4II86	1641	6Q5I	10461, 14871, 19281, 23691, 28101, 32511, 36921	norovirus Hu/GII/Beijing/IIG/2007/CHH
IG42	VPI	ACF4II87	1642	6D52	10462. 14872, 19282. 23692, 28102, 32512, 36922	norovirus Hu/GII/Beijing/125/2007/CHN
1643	VPI	ACF4II88	1643	6D53	10463. 14873, 19283, 23693, 28103, 32513, 36923	norovirus Hu/GII/Beijing/127/2007/CHN
1644	VPI	ACF4II9Q	1644	6D54	10464. 14874, 19284, 23694, 28104. 32514, 36924	norovirus Hu/GII/BBijing/3BI/2007/CHN
1645	VPI	ACF4II9I	1645	6Q55	10465, 14875, 19285, 23695, 28105. 32515. 36925	norovirus Hu/GII/Beijing/3G2/2007/CHN
1646	VPI	ACF60293	1646	GD56	10466, 14876, 19286, 23696, 28I0G, 32516, 36926	norovirus Hu/Beijing/OB/2005/CHN
I647	VPI	ACF6D294	1647	G057	10467, 14877. 19287, 23697, 28107, 32517, 36927	norovirus Hu/Beijing/48/2005/CHN
1648	VPI	ACF6Q295	1648	6D58	I0468, 14878, 19288, 23698, 28108, 32518, 36928	norovirus Hu/BEijing/148/2005/CHN
1649	VPI	ACFGD29G	1649	6059	I04G9, 14879, 19289, 23699, 28109, 32519, 36929	norovirus Hu/Beijing/169/2005/CHN
I65Q	VPI	ACFGD297	I65D	6060	10470, 14880. 19290, 23700, 28110, 32520, 36930	norovirus Hu/BEijing/375/2005/CHN
I65I	VPI	ACF72688	1651	6061	10471, 14881, 19291. 23701, 28111, 32521, 3G93I	norovirus **mousE**/HannovErl /2007/DE0
1652	VPI	ACH42093	1652	6062	10472, 14882, 19292, 23702, 28112, 32522, 36932	norovirus Hu/Monastir 8B55/20D7/TUN
I653	VPI	ACH42094	1653	6063	10473, 14883. 19293, 23703, 28113, 32523, 36933	norovirus Hu/Monastir 127/2003/TUN
1654	VPI	ACH42Q96	1654	6064	10474, 14884, 19294, 23704, 28114, 32524, 36934	norovirus Hu/Monastir 529/2003/TON
I655	VPI	ACH42097	1655	6065	10475, 14885, 19295, 23705, 28115, 32525. 36935	norovirus Hu/Monastir 493/2003/TUN

IB5B	VPI	ACH42D98	1656	B066	I047B, I488B, 19296, 23706, 28116, 3252B, 36936	norovirus Hu/Monastir 715/ 2003/ TUN
IB57	VPI	ACJ6G263	1657	6067	10477, 14887, 19297, 23707, 28117, 32527, 36937	norovirus Hu/GGII,4/Cairo2/2006/EGY
IB58	VPI	ACJB6265	1658	60B8	10478, 14888, 19298, 23708, 28118, 32528, 36938	norovirus Hu/GGII.4/Cairo3/20DG/EGY
1659	VPI	ACJBB2B7	1659	6069	10479, 14889, 19299, 23709, 28119, 32529, 36939	norovirus Hu/GGII.4/Caira4/2006/EGY
IBBO	VPI	ACJB6269	1660	6070	10480, 14890, 19300, 23710, 28120, 32530, 36940	norovirus Hu/GGII.4/Cairo5/2006/EGY
IBBI	VPI	ACJBB27I	1661	6071	10481, 14891, 19301, 23711, 28121, 32531, 36941	norovirus Hu/GGII.4/Cairo6/2D06/EGY
1662	VPI	ACJ66273	1662	6072	10482, 14892, 19302, 23712, 28122, 32532, 36942	norovirus Hu/GGII.4/Cairo7/2007/EGY
IBG3	VPI	ACJ66275	1663	6073	10483, 14893, 19303, 23713. 28123, 32533, 36943	norovirus Hu/GGII,4/Cairo8/2007/EGY
IBB4	VPI	ACJBB279	IB64	B074	10484, 14894, I93D4, 23714, 28124, 32534, 3B944	norovirus Hu/GGII.4/Dijon-EI057/2D02/FRA
IBB5	VPI	ACJBB28I	1665	6075	10485, 14895, 1930S, 23715, 28125. 32535, 36945	norovirus Hu/GGII.4/Dijon-E2703/2008/FRA
IGBG	VPI	ACJB6283	1666	6076	10486, 14896, 19306, 23716, 28126, 32536, 36946	norovirus Hu/GGII.4/Cairol/20DB/EGY
IBB7	VPI	ACJ66285	1667	6077	10487, 14897, 19307, 23717, 28127, 32537, 36947	norovirus Hu/GGII.4/0ijon-EI50l/2006/FRA
1668	VPI	ACJ66286	1668	6078	10488, 14898, 19308, 23718, 28128, 32538, 36948	norovirus Hu/GGII.4/0ijon-EI267/200B/FRA
1669	VPI	ACJ722I6	1669	6079	10489, 14899, 19309, 23719, 28129, 32539, 3B949	murine norovirus 4
1670	VPI	ACL27297	1670	6080	10490, 14900, 19310, 23720, 28130, 32540, 36950	norovirus Hu/GII.4/Wellington/l995/USA
1671	VPI	ACL27298	1671	6081	10491, 14901, 19311, 23721, 28131, 32541, 36951	norovirus Hu/GII.4/Henry/2000/USA
IB72	VPI	ACL27299	IB72	6082	10492, 14902, 19312, 23722, 28132, 32542, 3B952	norovirus Hu/GII.4/SSCS/20D5/USA

1673	VPI	ACL273DD	IB73	BD83	I049 3, 14903, 19313, 23723. 28133, 32543, 36953	norovirus Hu/GII.4/RIS/200B/0SA
1674	VPI	AGL3I3I2	IB74	B084	10494, 14904, 19314, 23724, 28134, 32544, 36954	norovirus GII/Hu/IN/200G/GII.P4_GII.4_ Yerseke2006a/Pune-PCII
IB75	VPI	ACL3I3I3	I675	GD85	10495, 14905, 19315, 23725, 28135, 32545, 36955	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Hunter2D04/Pune-PCI2
IB7B	VPI	ACL3I3IB	IB7B	BD8B	I049B, 14906, 19316. 23726. 28136, 3254B, 3B95B	norovirus Hu/Pune/PCI5/2006/India
IB77	VPI	ACL3I3I7	IB77	B087	10497, 14907, 19317, 23727, 28137, 32547, 36B57	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PCIG
IB78	VPI	ACL3I3I3	IB78	BQ88	10498, 14908, 19318, 23728, 28138, 32548, 36958	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PCI8
IB79	VPI	ACL3I32D	IB7B	BD8B	I049 , 14909, 19319, 23729, 28139, 32549, 36959	norovirus **BII/Hu/IN/ZDDB/GII.P4_GII.4**_ YBrsekB2006a/Pune-PCI9
I88D	VPI	ACL3I322	IB8Q	GD9D	10500, 14910, 19320, 23730, 28140, 32550, 36960	norovirus GII/Hu/IN/200G/GII.P4_GII.4_ YersEke200Ga/Pune-PC2l
IB8I	VPI	ACL3I324	IB8I	BD I	10501, I4SII, 19321, 23731, 28141, 32551, 36961	norovirus GII/Hu/IN/200B/GII.P4_GII.4_ YBrseke2006a/Pune-PC23
IB82	VPI	ACL3I325	IB82	BD32	10502, 14912, 19322, 23732, 28142, 32552, 3B962	norovirus Hu/Pune/PC24/2D0B/India
I683	VPI	AGL3I32B	IB83	6093	10503, 14913, 19323, 23733, 28143, 32553, 36963	norovirus Hu/PunE/PG25/2DD6/India
IB84	VPI	ACL3I34D	IB84	BD 4	10504, 14914, 19324, 23734. 28144, 32554, 36964	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ Hunter2004/Pune-PC3l
IB85	VPI	ACL3I354	I685	6095	10505, I4915, 19325, 23735. 28145, 32555, 36965	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/Pune-PC45
IB8B	VPI	ACL3I355	IB8B	6096	10506, **14916.** 19326, 2373B, 28146, 32556, 3696B	norovirus **GII/Hu / IN/ 2DD7/ GII.P4_GII.4**_ DenHaag200Bb/Pune-PC46
IB87	VPI	ACL3I35B	IB87	6097	10507, I4917, 19327, 23737, 28147, 32557, 36967	norovirus **GII/Hu / IN/2DD7 / GII.P4_GII.4**_ DenHaag2006b/Pune-PC47
IB88	VPI	AGL3I358	IB88	6098	10508, 14918, 19328, 23738, 28148, 32558, 36968	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag200Gb/PunE-PC49

1680	VPI	ACL3I36I	1689	6099	10509. 14919. 19329, 23739, 28149, 32559, 36969	norovirus Hu/Pune/PC52/2007/India
I69D	VPI	ACL3I365	I69D	6100	10510, 14920, 19330. 23740. 28150. 32560. 36970	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/PunB-PC56
1691	VPI	ACL36375	1691	6101	10511. 14921, 19331, 23741, 28151, 32561, 36971	norovirus Hu/GII-4/C0K-3/2008/KR
1692	VPI	ACN3227D	1692	6102	10512, 14922, 19332. 23742. 28152. 32562, 36972	norovirus Hu/GI.I/P7-587/2007/Stromstad/Sweden
1693	VPI	ACT524D3	1693	6103	10513, 14923, 19333, 23743, 28153, 32563. 36973	norovirus Hu/CHN42973/CZ05
1694	VPI	ACT524D5	1694	6104	10514, 14924. 19334, 23744, 28154, 32564, 36974	norovirus Hu/CHN39I86/CC04
1695	VPI	ACT52407	1695	6105	10515, 14925, 19335, 23745, 28155, 32565, 36975	norovirus Hu/CHN39246/CCD4
1696	VPI	ACT524D9	1696	6106	10516, 14926, 19336, 23746, 28156, 32566, 36976	norovirus Hu/CHN4I808/LL04
1697	VPI	ACT78459	1697	6107	10517, 14927, 19337, 23747, 28157, 32567, 36977	norovirus Hu/Mannheiml3l/2009/DE
1698	VPI	ACU56258	1698	6108	10518, 14928, 19338, 23748, 28158, 32568, 36978	norovirus Hu/GI.2/Leuven/2003/BEL
1699	VPI	ACX33982	1699	6109	10519. 14929, 19339, 23749, Z8I59, 32569, 36979	norovirus Hu/GI.3/JKPG_88l/SWE/2007
I7DD	VPI	ACX33983	I7D0	6110	ID520, 14930, 19340, 23750, 28160, 32570, 36980	norovirus Hu/GI.3/JKPG_883/SWE/2007
1701	VPI	ACX8I34I	1701	6111	10521. 14931, 19341, 23751, 28161, 32571, 36981	norovirus Hu/GII.I4/8533/Maizuru/2008/JPN
I7D2	VPI	ACX8I343	1702	6112	10522, 14932, 19342, 23752, 28162, 32572, 36982	norovirus Hu/GII.I4/8542/Maizuru/2008/JPN
I7D3	VPI	ACX8I345	1703	6113	10523, 14933, 19343, 23753, 28163, 32573, 36983	norovirus Hu/GII.I4/8533/Maizuru/2008/JPN
I7D4	VPI	ACX8I347	1704	6114	10524, 14934, 19344, 23754, 28164, 32574, 36984	norovirus Hu/GII.I4/8559/Maizuru/2008/JPN
I7D5	VPI	ACX8I349	1705	6115	10525, 14935, 19345, 23755, 28165, 32575, 36985	norovirus Hu/GII.I4/8560/Maizuru/20D8/JPN

I7DB	VPI	ACX8I35I	I7QB	6116	I052B, 14936, 19346, 23756, 28166, 32576, 36986	narovirus Hu/GII.I4/859I/Maizuru/2008/JPN
I7D7	VPI	ACX8I353	I7D7	6117	10527, 14937, 19347, 23757, 28167, 32577, 36987	norovirus Hu/GII.I4/8594/Maizuru/2008/JPN
I7D8	VPI	ACX8I355	I7D8	6118	10528, 14938. 19348, 23758, 28168, 32578, 36988	norovirus Hu/GII.I4/8599/Maizuru/2008/JPN
I7D9	VPI	ACX858DB	1709	6119	10529, 14939, 19349, 23759, 28169, 32579, 36989	norovirus Hu/GII.4/NSW023C/2008/AOS
I7ID	VPI	ACX85807	1710	BI20	10530, 14940, 19350, 23760, 28170. 32580, 36990	norovirus Hu/GII.b-GII.3/Sydney740C/2007/AUS
I7II	VPI	ACX858D9	1711	BI2I	10531, 14941, 19351, 23761. 28171, 32581, 36991	norovirus Hu/GII.7/NSWD88L/2007/A0S
I7I2	VPI	ACX858ID	1712	BI22	10532, 14942, 19352, 23762, 28172, 32582, 36992	norovirus Hu/GII.7/NSW743L/2008/AUS
I7I3	VPI	ACY4II55	1713	6123	10533, 14943, 19353, 23763, 28173, 32583, 36993	norovirus cattle/BV4I6/2008/BEL
I7I4	VPI	ADA77528	1714	6124	10534, 14944, 19354, 23764, 28174, 32584, 36994	norovirus Hu/GII-4/Beijing/hl/2005/CHN
I7I5	VPI	ADB225I2	1715	6125	10535, 14945, 19355, 23765, 28175, 32585. 36995	norovirus Hu/Ahm/PC03/2006/India
I7IB	VPI	ADC9I993	1716	6126	10536, 14946, 19356, 23766, 28176, 32586, 36996	norovirus Hu/GII.4/Chungnam(II-94)/2008/Kor
I7I7	VPI	ADC0I904	1717	6127	10537, 14947, 19357, 23767, 28177, 32587, 36997	norovirus Hu/GII.4/Chungnam(I2-I07)/20D8/Kor
I7I8	VPI	ADE287DI	1718	6128	10538, 14948, 19358. 23768, 28178, 32588, 36998	norovirus Hu/GII.I4/86IO/Saga/2008/JPN
171a	VPI	ADE2872I	1719	6129	10539, 14949, 19359. 23769, 28179, 32589, 36999	norovirus Hu/GII.B/89I5/Maizuru/2008/JPN
172D	VPI	ADE28722	1720	6130	10540, 14950, 19360, 23770, 28180, 32590, 37000	norovirus Hu/GII.6/8920/Maizuru/2008/JPN
1721	VPI	ADE28723	1721	6131	10541, 14951, 19361, 23771. 28181, 32591, 37001	norovirus Hu/GII.G/8966/Maizuru/2008/JPN
1722	VPI	ADE28724	1722	6132	10542, 14952, 19362, 23772, 28182, 32592, 37002	norovirus Hu/GII.6/9088/Maizuru/2D08/JPN

1723	VPI	ADK23787	1723	BI33	10543, 14953. I93B3, 23773, 28183, 32593, 37D03	norovirus Hu/Gi!.3/GBNUt/2DDB/KDR
1724	VPI	ADM52743	1724	BI34	10544, 14954, 19364, 23774, 28184, 32594, 37004	norovirus Hu/GII.4/JB-I5/KOR/2008
1725	VPI	ADR57234	1725	BI35	10545, 14955, I93G5, 23775, 28185, 32595, 37005	norovirus Hu/GII.4/8483/2008/ZAF
1726	VPI	AEA077I2	I72B	BI3B	I054B, I495B, 19366, 2377B. 28I8B, 32596, 37006	murine norovirus
1727	VPI	AEK053II	1727	BI37	10547, 14957, 19367, 23777. 28187, 32597, 37007	norovirus Hu/GII.4/TH-S597/THA/2006
1728	VPI	AEPIB505	1728	BI38	10548, 14958, 19368, 23778, 28188, 32598, 37008	norovirus Hu/Gllg-GII!/Kazincbarcika/HUN4593/20IO/HUN
1729	VPI	AEY773I8	1729	BI39	10549, 14959. 19369, 23779, 28189, 32599, 37009	norovirus Hu/GI.3/S29/2008/Lilla Edst/Sweden
1730	VPI	AEY83583	1730	BI4D	10550, 149B0, 19370, 23780, 28190, 32600, 37010	murine norovirus GV/CR6/2005/USA
1731	VPI	AFBI80I0	1731	BI4I	10551, 14961, 19371, 23781, 28191, 32601. 37011	norovirus Hu/GII.2/NF2002/USA/2002
1732	VPI	AFBI8DI3	1732	BI42	10552, 14962, 19372, 23782, 28192. 32602, 37012	norovirus Hu/GII.4/NF2003/USA/2003
1733	VPI	AFJ05B24	1733	BI43	10553. 14963, 19373, 23783, 28193, 32603, 37013	norovirus dog/F053/2007/lta
1734	VPI	AFJ05G28	1734	BI44	10554, 14964. 19374, 23784. 28194. 32604, 37014	noruvirus dog/FD2IO/2D07/lta
1735	VPI	AFJ24945	1735	BI45	10555, I49B5, 19375, 23785. 28195, 32B05, 37015	norovirus Hu/Gli-4/CBNU2/2DD7/KR
I73B	VPI	AFK7585I	I73B	BI4B	I055B, I49BB, I937B, 2378B, 28196, 3260B, 370IB	norovirus Hu/GI.3/1999
1737	VPI	AFK75852	1737	BI47	10557. I49B7. 19377, 23787. 28197, 32B07. 37017	norovirus Hu/GI.4/2000
1738	VPI	AFK75853	1738	BI48	ID558, 14968, 19378, 23788, 28198, 32B08, 37018	norovirus Hu/GI.2/1999
1739	VPI	AFK75854	1739	BI49	10559, 14969. 19379, 23789, 28199, 32609, 37019	norovirus Hu/GII.3/1989

I74D	VPI	AFNBI3I5	I74B	BI5B	ID56B. I497D, I938B, 23790, 2820D, 326ID. 37020	norovirus **Hu**/BIV.I/AhrEnshoap24B/0E0/2BI2
1741	VPI	AFD005II	1741	GI5I	10561, 14971, 19381. 23791, 28201, 32611, 37021	norovirus Hu/GII.4/Xi'an/PI9/20IO/CHN
1742	VPI	AFQ005I2	1742	BI52	10562, 14972, 19382, 23792, 28202, 32BI2, 37022	norovirus **Hu**/BII.4/Xi'an/P4B/20I0/CHN
1743	VPI	AFQDD5I3	1743	BI53	I05B3, 14973, 19383. 23793, 28203, 32613. 37023	norovirus Hu/GII.4/Xi'an/P49/20IO/CHN
1744	VPI	AFQ005I6	1744	BI54	10564. 14974, 19384, 23794, 28204, 32614, 37024	norovirus Hu/GII.4/Xi'an/PI43/20IO **/CHN**
1745	VPI	AFBBB5I7	1745	BI55	10565, 14975, 19385, 23705, 28205. 32615, 37025	norovirus Hu/GII.4 **/Xi**'an/PI52/20IO/CHN
1746	VPI	AF0BB5I8	I74B	BI5B	10566, 14976, 19386, 23796, 28206, 32616, 37026	norovirus Hu/GII.4/Xi'an/PI54/2OI0/CHN
1747	VPI	AFBBB5I9	1747	BI57	10567, 14977, 19387, 23797, 28207, 32617, 37027	norovirus **Hu**/GII.4/Xi'an/PI58/20IO/CHN
1748	VPI	AFQBB52D	1748	BI58	10568, 14978, 19388, 23798, 28208, 32618, 37028	norovirus Hu/GII.4/Xi'an/PI85/2OI0/CHN
1749	VPI	AFBBB52I	I74B	BI59	10569, 14979, 19389, 23799, 28209, 32BI9, 37029	norovirus **Hu/GII.4 / Xi'an/CG/Z0IO/CHN**
I75D	VPI	AFQD0522	I75B	BIBB	I057D, 14980, 19390, 23800, 28210, 32620, 37030	norovirus Hu/GII.4/Xi'an/CI2/20ID/CHN
1751	VPI	AFQDD523	1751	BIBI	10571, 14981, 19391, 23801, 28211, 32621, 37031	norovirus **Hu/GII.4 /Xi'an/CI5/2DID/CHN**
1752	VPI	AFBD0524	1752	6162	10572, 14982, 19392, 23802, 28212, 32622. 37032	norovirus Hu/GII.4/Xi'an/C2I/20I0/CHN
1753	VPI	AFBGD525	1753	BIBS	10573, 14983, 19393, 23803, 28213, 32623, 37033	norovirus Hu/GII.4/Xi'an/C3D/20ID/CHN
1754	VPI	AFBDD52B	1754	BIB4	10574, 14984, 19394, 23804, 28214, 32624, 37034	norovirus Hu/GII.4/Xi'an/C3I/2DI0 **/CHN**
1755	VPI	AFQDD527	1755	6165	10575, 14985, 19395, 23805, 28215, 32625, 37035	norovirus Hu/GII.4/Xi'an/C4I/20IO/CHN
I75B	VPI	AFQD0528	I75B	6166	10576, 14986, 19396, 23806, 28216, 32626. 37036	norovirus Hu/GII.4/Xi'an/C45/2DI0/CHN

1757	VPI	AGCBB782	1757	6167	ID577. 14987, 19397. 238D7, 28217, 32627, 37037	norovirus Hu/GII.6/GZ20IO-Li/Guangzhou/CHN/2010
1758	VPt	AGCBB784	1758	6IB8	10578, 14988, 19398, 23808, 28218, 32628, 37038	norovirus Hu/GII.4/GZ20IO-L32/Guangzhou/CHN/20IO
I75B	VPI	AGCBB785	1759	6IB9	10579, 14989, 19399, 23809, 28219, 32629, 37039	norovirus Hu/GII.3/GZ20IO-LG3/Guangzhou/CHN/20IO
I7B0	VPI	AGCBB78B	I7BD	BI7D	10580, 14990, 19400, 23810, 28220, 32630, 37Q40	norovirus Hu/GII.B/GZ20IO-L72/Guangzhou/CHN/20IO
I7BI	VPI	AGCBB788	I7BI	6171	10581. 14991, 19401. 23811, 28221, 32631, 37041	norovirus Hu/GII.4/GZ20IO-LBS/Guangzhou/CHN/ZDIf
1762	VPI	AGLBB587	I7B2	6172	10582, 14992, 19402, 23812, 28222, 32B32, 37042	norovirus Hu/GII/Hy-7I8/K0R
I7B3	VPI	AGO57036	I7B3	6173	10583. 14993, 19403, 23813, 28223, 32633. 37043	norovirus Hu/GII.7/VLP 05G954/2005/DE
I7B4	VPI	AGT9592B	I7B4	6174	10584. 14994. 19404, 23814, 28224, 32634, 37044	norovirus Hu/GH.4/ variant Sydney 2012/FRA
I7B5	VPI	AGTB5327	1765	6175	10585, 14995, 19405, 23815, 28225, 32635, 37045	norovirus Hu/GII.4/ variant Sydney 2012/FRA
I7BB	VPI	AGT95928	I7B6	6176	I058B, 14996, 19406, 23816, 2822B, 32B3B, 3704B	norovirus Hu/GII.4/variant Sydney 2012/FRA
I7B7	VPI	AGT95929	1767	6177	10587, 14907. 19407, 23817, 28227, 32637, 37047	norovirus Hu/GII.4/variant Sydney 2012/FRA
I7B8	VPI	AGT95930	1768	6178	10588, 14998. 19408, 23818. 28228, 32638, 37048	norovirus Hu/GII.4/ variant Sydney 2012/FRA
I7B9	VPI	AGT9593I	1769	6179	10589, 14999, I940B, 23819, 28229, 32639, 37049	norovirus Hu/GII.4/ Variant Sydney 2012/FRA
I77D	VPI	AHCI2B55	I77D	6180	10590, 15000, 19410, 23820. 28230, 32640, 37050	norovirus Hu/GII.4/PA3B3/20II/ITA
1771	VPI	AHCI2B58	1771	6181	10591, 15001, 19411. 23821, 28231, 32641, 37051	norovirus Hu/GII.4/PA48/20I2/ITA
1772	VPI	AHW99832	1772	6182	10592, 15002, 19412, 23822, 28232, 32642, 37052	norovirus Hu/GI.5/Siklos-H0N5407/20I3/H0N
1773	VPI	AHZI2735	1773	6183	10593, 15003, 19413. 23823, 28233, 32B43, 37053	norovirus GII.3

1774	VP1	AHZI273B	1774	BI84	10594, 15004, 19414, 23824, 28234, 32644, 37054	noravirus GII.3
1775	VP1	AHZI2737	1775	BI85	10595, 15005, 19415, 23825, 28235, 32645, 37055	norovirus GII.3
I77G	VP1	AHZI2738	I776	BI8B	10596, I5006, 19416, 2382B, 28236, 32646, 37056	nDTDvirus GII.3
1777	VP1	AHZI2739	1777	BI87	10597, 15007, 19417, 23827, 28237, 32647, 37057	noravirus GII.3
1778	VP1	AHZI29I2	1778	BI88	10598, 15008, 19418, 23828, 28238, 32648, 37058	noravirus Hu/GII.4/P3/20I2/GDthenburg/Sweden
1778	VP1	AHZI29I3	1779	6189	10599. 15009, 19419, 23829, 28238, 32649, 37059	noravirus Hu/GII.4/P4/20I2/GDthenburg/Sweden
1780	VP1	AHZI2998	I78D	BI90	10600, 15010, I942D, 23830, 28240, 32650, 37060	noravirus Hu/GII.4/P54/20I2/Goth nburg/SwedBn
1781	VP1	AHZI300I	1781	BI9I	10601, 15011, 19421, 23831, 28241, 32651, 37061	noravirus Hu/GII.4/P55/20I2/Gothenburg/SwedBn
1782	VP1	AHZI3Q04	1782	BI92	10602, 15012, 19422, 23832, 28242, 32652, 37062	noravirus Hu/GII.4/P56/20I2/GothBnburg/SwBdBn
1783	VP1	AHZI30I0	1783	6193	I0B03. 15013, 19423, 23833, 28243, 32B53, 370B3	noravirus Hu/GII.4/P58/20I2/GathBnburg/SwedBn
1784	VP1	AHZI3DI5	1784	BI94	10604. 15014, 19424, 23834, 28244, 32654, 37DB4	noravirus Hu/GII.4/P60/20I2/Gothenburg/SwedBn
1785	VP1	AHZI3D2D	1785	6195	10605, 15015, 19425, 23835, 28245, 32655, 37065	noravirus Hu/GII.4/P62/20I2/GathBnburg/SwBdBn
I78G	VP1	AHZI3D23	I78B	6196	10606, 15016, 19426, 23836, 28246, 32656, 37066	noravirus Hu/GII.4/P63/20I2/Gathenburg/SwEdBn
1787	VP1	AIC32559	1787	6197	10607, 15017, 19427, 23837, 28247, 32657, 37067	norovirus Hu/GII.4/TangEr/TMB87/2011/MAR
1788	VP1	AID5I474	1788	6198	I0BD8, 15018, 19428, 23838, 28248, 32658, 37068	noravirus I2-AA-I/20I2/GII.P22/GII.5
1789	VP1	AID5I477	1789	6199	I0G09, 15019, 19429, 23839, 2824B, 32659, 37069	noravirus I2-C-I/20I2/GII.P22/GII.5
I79D	VP1	AID5I480	1790	B200	10610, 15020, 19430, 23840, 28250, 32660, 37070	noravirus I2-E-I/20I2/GII.P22/GII.5

1791	VP1	AID51483	1791	6201	10611, 15021, 19431, 23841, 28251, 32661, 37071	norovirus 12-F-1/2012/GII.P22/GII.5
1792	VP1	AID51486	1792	6202	10612, 15022, 19432, 23842, 28252, 32662, 37072	norovirus 12-K-2/2012/GII.P22/GII.5
1793	VP1	AID51489	1793	6203	10613, 15023, 19433, 23843, 28253, 32663, 37073	norovirus 12-X-2/2012/GII.P22/GII.5
1794	VP1	AID51492	1794	6204	10614, 15024, 19434, 23844, 28254, 32664, 37074	norovirus 12-AG-2/2012/GII.P22/GII.5
1795	VP1	AID51495	1795	6205	10615, 15025, 19435, 23845, 28255, 32665, 37075	norovirus 12-AD-1/2012/GII.P22/GII.5
1796	VP1	AIE40036	1796	6206	10616, 15026, 19436, 23846, 28256, 32666, 37076	norovirus GII/Hu/ZA/2012/GII.Pe_GII.4 Sydney 2012/Johannesburg9814
1797	VP1	AJW87644	1797	6207	10617, 15027, 19437, 23847, 28257, 32667, 37077	norovirus Hu/GII.3/SW4/2012/TN
1798	VP1	ALG05457	1798	6208	10618, 15028, 19438, 23848, 28258, 32668, 37078	norovirus Hu/GII.17/CGMH69/2015/TW
1799	VP1	ALG05460	1799	6209	10619, 15029, 19439, 23849, 28259, 32669, 37079	norovirus Hu/GII.17/CGMH70/2015/TW
1800	VP1	ALL73873	1800	6210	10620, 15030, 19440, 23850, 28260, 32670, 37080	norovirus Hu/JSZJ14003/CHN
1801	VP1	ALL73876	1801	6211	10621, 15031, 19441, 23851, 28261, 32671, 37081	norovirus Hu/JSCZ14010/CHN
1802	VP1	ALL73879	1802	6212	10622, 15032, 19442, 23852, 28262, 32672, 37082	norovirus Hu/JSWX14012/CHN
1803	VP1	ALL73882	1803	6213	10623, 15033, 19443, 23853, 28263, 32673, 37083	norovirus Hu/JSSZ15080/CHN
1804	VP1	ALL73888	1804	6214	10624, 15034, 19444, 23854, 28264, 32674, 37084	norovirus Hu/JSWX15027/CHN
1805	VP1	ALQ43927	1805	6215	10625, 15035, 19445, 23855, 28265, 32675, 37085	norovirus GII.4
1806	VP1	ALQ43928	1806	6216	10626, 15036, 19446, 23856, 28266, 32676, 37086	norovirus GII.4
1807	VP1	ALQ44123	1807	6217	10627, 15037, 19447, 23857, 28267, 32677, 37087	norovirus GII.17

I8D8	VP1	ALQ44I24	1808	B2IB	10628, 15038. 13448. 23858, 282B8, 32B78, 37088	norovirus GIIJ7
1808	VPI	ALQ44I25	1809	6219	10623, 1503B, 13443, 23859, 2826B. 32679. 37089	norovirus GII.I7
1810	VPI	BAB835I4	1810	B220	I0B30, 1504D, I345B, 2386D, 28270. 32680, 37090	swine norovirus
1811	VPI	BAB835I6	1811	6221	10631, 15041, 19451, 23861, 28271, 32681, 37091	SWIPE norovirus
1812	VPI	BAD727B7	1812	6222	10632, 15042, 19452, 23862, 28272, 32682, 37092	norovirus Hu/GII/lna/02/JP
1813	VPI	BAD72798	1813	B223	10633, 15043, 19453, 23863, 28273, 32683, 37093	norovirus Hu/BII/Sinsiro/97/JP
1814	VPI	BAD7279B	1814	B224	I0B34, 15044. 13454. 23864, 28274, 32684, 37094	norovirus Hu/GII/Hakushin/03/JP
1815	VPI	BAD728Q0	1815	6225	I0B35, 15045, 19455, 23865, 28275, 32685, 37035	norovirus Hu/GII/Kamo/03/JP
1816	VPI	BAD88558	1816	6226	10636, 15046, 13456, 238B6, 2827B, 3268B, 37036	norovirus Hu/OC02202/2002/JP
1817	VPI	BAD98240	1817	6227	10637, 15047, 13457, 23867, 28277, 32B87, 37097	norovirus Hu/Hokkaido/133/2003/JP
1818	VPI	BAE43833	1818	6228	10638, 15048, 19458, 23868, 28278, 32B88, 37098	norovirus Hu/GI/OtofukE/1979/JP
1819	VPI	BAE48588	1819	6223	10639, 15049, 19459, 23863, 28273, 32683, 37093	norovirus Hu/Saga/5424/03/JP
1820	VPI	BAE4858B	1820	6230	10640, 15050, 1946D, 23870, 28280, 32690, 37100	norovirus Hu/Maizuru/5017/04/JP
1821	VPI	BAE48590	1821	6231	10641. 15051. 19461, 23871, 28281, 32691, 37101	norovirus Hu/78/04/Ru
1822	VPI	BAE92970	1822	6232	I0B42, 15052, I94B2, 23872, 28282, 32B92, 37102	norovirus swina/KS/JP
1823	VPI	BAE98I9I	1823	6233	I0B43, 15053, 19463, 23873, 28283, 32B33, 37IB3	norovirus Hu/Chiba/04-l050/20D5/JP
1824	VPI	BAE98IB4	1824	6234	I0B44, 15054, 13464, 23874, 28284, 32634, 37104	norovirus Hu/Sakai/04-l79/20Q5/JP

1825	VP1	8AE98197	1825	B235	IBB45, 15055, 13465, 23875, 28285, 32635, 37105	norovirus Hu/Ehime/05-30/2005/JP
1826	VP1	BAF4586I	I82B	B23B	I064B, 15056, 13466, 23876, 28286, 32696, 37106	norovirus **Hu/GII.4/KobeD34/2Q06/JP**
1827	VP1	BAF745B8	1827	B237	I0B47, 15057, 13467, 23877, 28287, 32697, 37107	norovirus Hu/GBII.4/TiElOOI/I995/NL
1828	VP1	BAF745B9	1828	6238	10648, 15058, 13468, 23878, 28288, 32698, 37108	norovirus Hu/GGII.4/DenHaagOI5/2000/NL
1823	VPI	BAF745I0	1823	6233	10649, 15053. 19469, 23873, 28289, 32699, 37103	norovirus Hu/GGII.4/WaddinxvEenOI6/2000/NL
1830	VPI	BAF745II	1830	6240	10650, 15060, 13470, 23880, 28290, 32700. 37110	norovirus Hu/GGII.4/LBBuwarden043/2000/NL
1831	VPI	BAF745I2	1831	6241	10651, I50BI, 13471, 23881, 28291, 32701, 37111	norovirus **Hu/GGII.4/SchiedamOI8/200I/NL**
1832	VPI	BAF745I3	1832	6242	I0B52, 15062, 13472, 23882, 28292, 32702, 37112	norovirus **Hu/GGII.4/UtrechtD58/200I/NL**
1833	VPI	BAF745I4	1833	6243	10653, 15063, 13473, 23883, 28233, 32703, 37113	norovirus **Hu/GGII.4/WeertED22/Z002/NL**
1834	VPI	BAF745I5	1834	6244	10654, 15064, 13474, 23884, 28234, 32704, 37114	norovirus **Hu/GGII.4/EmmenE006/2002/NL**
1835	VPI	BAF745IB	1835	B245	I0B55, 150B5. 13475, 23885, 28235, 32705, 37115	**norovirus Hu/BGII.4/HeerlenOD3/Z003/NL**
1836	VPI	BAF745I7	1836	B24B	I0B5B, I506B, I347B, 2388B, 28296, 3270B. **37116**	norovirus Hu/GGII.4/Apeldoorn023/2003/NL
1837	VPI	BAF745I8	1837	6247	IQ657, 15067, 19477, 23887, 28237, 32707, 37117	norovirus Hu/GGII.4/DBnHa8g00I/2003/NL
1838	VPI	BAF745I3	1838	6248	I0B58, 150B8, 13478, 23888, 28298, 32708, 37118	norovirus **Hu/GGII.4/Haarlem457/2003/NL**
1839	VPI	BAF7452D	1839	6243	I0B59. 15069, 13479, 23889, 28293, 32703, 37113	norovirus Hu/GGII.4/DBnHBldBr003/2004/NL
1840	VPI	BAF7452I	I84B	6250	I0B60. 15070, 19480, 23890, 28300, 32710, 37120	norovirus **Hu/GGII.4/MiddelburgQ07/2D04/NL**
1841	VPI	BAF74522	1841	B25I	**10661.** 15071, 19481, 23891, 28301, 32711, 37121	norovirus Hu/GGI1.4/ElslooOI2/20D4/NL

1842	VP1	BAF74523	1842	B252	I0BB2, 15072. 19482, 23892, 28302, 32712, 37122	norovirus Hu/BGII.4/0enBasch0Z8/2DD4/NL
1843	VP1	BAF74524	1843	B253	IDBB3, 15073, 19483, 23893, 28303, 32713, 37123	norovirus Hu/GGII.4/Almelo03B/2004/NL
1844	VP1	BAF74525	1844	B254	I0BB4, 15074, 19484, 23894, 28304, 32714, 37124	narovirus Hu/ GGII.4 /LiBmpdED48/ Z0D4 /NL
1845	VP1	BAF7452B	1845	B255	I0BB5, 15075, 19485, 23895, 28305, 32715, 37125	norovirus Hu/GGII.4/TilbupgD59/2004/NL
I84G	VP1	BAF74527	I84B	B25B	IOBBB, I507B, I948B, 2389B, 2830B, 327IB, 37I2B	nnrovirus Hu/GGII.4/Nijmegen083/2004/NL
1847	VP1	BAF85490	1847	B257	I0BB7, 15077, 19487, 23897, 28307, 32717, 37127	norovirus Hu/GII-4/Matsudo/02l07l/2002/JP
1848	VP1	BAF9550I	1848	B258	I0BB8, 15078, 19488, 23898, 28308, 32718, 37128	norovirus Hu/GII-4/Kaiso/03055B/2003/JP
1849	VP1	BAF95503	1849	B259	I0BB9, 15079, 19489, 23899, 28309, 32719, 37129	norovirus Hu/GII-4/Chiba/040095/20D3/JP
1850	VP1	BAF955D5	1850	B2BD	I0B70, 15080, 19490, 23900, 28310, 32720, 37130	norovirus Hu/GII-4/Awa/040354/2004/JP
1851	VP1	BAF95507	1851	B2BI	I0B7I, 15081, 19491, 23901, 28311, 32721, 37131	norovirus Hu/GII-4/Chiba/040974/2004/JP
1852	VP1	BAF955D9	1852	B2B2	I0B72, 15082. 10492, 23902, 28312, 32722, 37132	norovirus Hu/GII-4/Katori/D4l008/2004/JP
1853	VP1	BAF955II	1853	B2B3	I0B73, 15083, 194B3, 23903, 28313, 32723, 37133	norovirus Hu/GII-4/Kimitsu/04l440/2005/JP
1854	VP1	BAF955I3	1854	B2B4	I0B74, 15084, 19494, 23904, 28314, 32724, 37134	norovirus Hu/GII-4/lnba/05059D/2005/JP
1855	VP1	BAF955I5	1855	B2B5	I0B75, 15085, 1940S, 23905, 28315, 32725, 37135	norovirus Hu/GII-4/Funabashi/050B0l/2005/JP
1856	VP1	BAF955I7	I85B	B2BB	I0B7B, I508B, I949B, 2390B, 283IB, 3272B, 37I3B	norovirus Hu/GII-4/lchikawa/05070l/2005/JP
1857	VP1	BAF955I9	1857	B2B7	I0B77, 15087, 19497, 23907, 28317, 32727, 37137	norovirus Hu/GII-4/Sanbu/050878/200B/JP
1858	VP1	BAF9552I	1858	B2B8	I0B78, 15088, 19498, 23908, 28318, 32728, 37138	norovirus Hu/GII-4/Kashiwa/0B08D2/200B/JP

1859	VP1	BAF95523	1859	62G9	10670, 15080, 10400, 23909, 28319, 32729, 37139	narovirus Hu/GII-4/lsumi/0B0936/Z00B/JP
I860	VP1	BAF95525	I860	G270	I0G80, 15090, 10500, 23010, 28320, 32730, 37140	norovirus Hu/GII-4/lnba/0BIDB9/200B/JP
1861	VP1	BAF95527	1861	B27I	10681. 15001, 19501. 23911, 28321, 32731, 37141	norovirus Hu/GII-4/Kimitsu/06H46/2006/JP
1862	VPI	BAF95529	1862	6272	10682, 15002, 10502, 23012, 28322, 32732, 37142	norovirus Hu/GII-4/Kashiwa/06l256/2Q06/JP
1863	VPI	BAF9553I	1863	6273	10683, 15093, 19503, 23913, 28323, 32733. 37143	norovirus Hu/GII-4/Narashino/06l28l/2006/JP
1864	VPI	BAG3D923	1864	6274	I0B84, 15004, 19504, 23914, 28324, 32734. 37144	norovirus Hu/0C07l38/07/JP
1865	VPI	BAG3463D	1865	6275	I0B85. 15095, 10505. 23915. 28325, 32735, 37145	norovirus Hu/0C07049/l997/JP
1866	VPI	BAG34632	1866	6276	I068B, I509B, 10506. 239IB, 2832B, 32736. 37146	norovirus Hu/OCOI243/200l/JP
1867	VPI	BAG34634	1867	B277	10687, 15097, 10507, 23017, 28327, 32737, 37147	norovirus Hu/0C020l2/2002/JP
1868	VPI	BAG34G36	1868	B278	10688, I5D98. 10508, 23018, 28328, 32738, 37148	norovirus Hu/0C02022/2002/JP
1869	VPI	BAG34638	1869	B279	10689, 15099. 19500. 23910. 28320, 32739, 37140	norovirus Hu/0C04038/2004/JP
I87D	VPI	BAG3464D	1870	B28D	10690, 15100, 19510, 23020, 28330, 32740, 37150	norovirus Hu/0C04042/2004/JP
1871	VPI	BAG34642	1871	6281	10601, 15101, 19511. 23921, 28331, 32741, 37151	norovirus Hu/OC04043/2004/JP
1872	VPI	BAG34644	1872	6282	10602. 15102. 19512, 23022, 28332, 32742, 37152	norovirus Hu/OC0405B-l/2004/JP
1873	VPI	BAG34B4B	1873	G283	I0B93, 15103, 19513, 23923, 28333, 32743, 37153	norovirus Hu/0CQ4056-2/2004/JP
1874	VPI	BAG34B48	1874	6284	10604, 15104, 19514, 23924, 28334, 32744, 37154	norovirus Hu/OC04059/2004/JP
1875	VPI	BAG34G5Q	1875	6285	10695, 15105, 19515, 23925, 28335, 32745, 37155	norovirus Hu/OC04067/2004/JP

I87G	VPI	BAG34652	I87B	G28B	IQB96, I5IQB, I95IB. 23926. 2833B, 3274B, 37I5B	norovirus Hu/0C0407I/2004/JP
I877	VPI	BAG34654	I877	B287	I0B97, I5I07. I95I7, 23927, 28337, 32747, 37I57	norovirus Hu/DC04073/2004/JP
I878	VPI	BAG34B5B	I878	G288	I0B98, I5IQ8, 19518. 23928, 28338, 32748, 37158	naravirus Hu/OC04075/2D04/JP
I878	VPI	BAG34B58	I879	G289	I0699. 15109, 19510, 23929, 28339, 32749. 37159	norovirus Hu/0C04076/2004/JP
I88D	VPI	BAG34BB2	I88D	B29B	10700. **15110.** I952D. 23930, 28340, 32750. 37IBD	norovirus Hu/OC05QID/2005/JP
I88I	VPI	BAG34GB4	I88I	B29I	**10701.** I5III, 19521, 23931. 28341, 32751, 37161	norovirus Hu/0CSD2D289/2002/JP
I882	VPI	BAG34BBB	I882	B2B2	10702, 15112, 19522, 23932, 28342. 32752, 37162	norovirus Hu/0CS030697/2D04/JP
I883	VPI	BAG34BB8	I883	G2B3	10703, 15113, 19523, 23933, 28343, 32753, 37163	norovirus Hu/0CS040035/2004/JP
I884	VPI	BAG34B7D	I884	B294	10704, 15114, 19524. 23934, 28344. 32754, 37164	norovirus Hu/OCS040IOO/2004/JP
I885	VPI	BAG55289	I885	G295	10705, 15115, 19525, 23935, 28345, 32755, 37IB5	norovirus **Hu/GII.4/Apeldoorn3I7/2007/NL**
I886	VPI	BAGB87D7	I88B	G296	10706, I5IIB, 19526, 23936, 28346, 3275B, 37166	norovirus Hu/GII.2/CoBvordenl9IS/I999/NL
I887	VPI	BAGB8708	I887	6297	10707, 15117, 19527, 23937, 28347, 32757, 37167	norovirus Hu/GII.2/DenHaag37/2000/Nl
I888	VPI	BAGB870B	I888	6298	10708, 15118, 19528, 23938, 28348, 32758, 37IB8	norovirus Hu/GII.2/Delft48M/2000/NL
I889	VPI	BAGB87II	I889	6299	10709, 15119, 19529, 23939, 28349, 32759, 37169	**norovirus Hu/GII.2/Zwolle25E/200I/NL**
I89D	VPI	BAGG87I2	I83D	63BB	10710. 15120. 19530. 23940, 28350, 32760, 37170	**norovirus Hu/GII.2/Heerlen7E/2D02/NL**
i8el	VPI	BAGB87I3	I89I	63BI	**10711.** 15121. 19531. 23941, 28351, 32761, 37171	norovirus Hu/GII.2/Rotterdam39E/2002/NL
I882	VPI	BAGB87I4	I892	6302	10712, 15122, 19532, 23942, 28352, 32762, 37172	norovirus Hu/GII.2/leeuwardEn7I/2Q03/NL

1893	VPI	BAG68715	1893	6303	10713, 15123, 13533, 23943, 28353, 32763, 37173	**noravirus Hu/BII.2/Boes28/2D05/NL**
1894	VPI	BAG68716	1894	6304	10714, 15124, 19534, 23944, 28354, 32764, 37174	**noravirus Hu/GII.2/Vaals87/2005/NL**
1895	VPI	BABB8799	1895	6305	10715, 15125, 19535, 23945, 28355, 32765, 37175	noravirus Hu/GII.3/RotterdamPID0/200G/NL
1896	VPI	BABG8800	I89B	B306	10716, 15126, 19536, 23946, 28356, 32766, 37176	noravirus Hu/GII.3/RotterdamPID88/200G/NL
1897	VPI	BABB880I	1897	B307	10717, 15127, 19537, 23947, 28357, 32767, 37177	noravirus **Hu/GII.4/RDtterdamPZDO/2005/NL**
1898	VPI	BABB8802	1898	B308	10718, 15128, 19538, 23948, 28358, 32768, 37178	noravirus Hu/GII.4/RotterdamP2DI82/2005/NL
1899	VPI	BABB8803	1899	B309	10719. 15129, 19539, 23949, 28359, 32769, 37179	noravirus Hu/GII.4/RotterdamP3D0/2006/NL
1900	VPI	BABB8804	1900	6310	10720, 15130, 19540, 23950, 283B0. 32770, 37180	norovirus Hu/GII.4/RottErdamP3D2l/2006/NL
1901	VPI	BAGB8805	1901	6311	10721, 15131. 19541, 23951, 283BI. 32771, 37181	noravirus Hu/Bli.4/RotterdamP4DD/2D0B/NL
1902	VPI	BAGB8806	1902	6312	10722, 15132, 19542, 23952, 28362, 32772, 37182	noravirus Hu/GII.4/RottErdamP4D33/200G/NL
1903	VPI	BAGB8807	1903	6313	10723, 15133, 19543, 23953, 28363, 32773, 37183	noravirus Hu/GII,3/RotterdamP5D0/2005/NL
1904	VPI	BAGB8808	1904	6314	10724, 15134, 19544, 23954, 28364, 32774, 37184	noravirus Hu/GII.4/RottErdamP5D36/2005/NL
1905	VPI	BAGB8809	1905	6315	10725, 15135, 19545, 23955, 28365, 32775, 37185	noravirus Hu/GII.4/RotterdamP5D5l/2005/NL
1906	VPI	BAGB88I0	I90B	6316	10726, 15136, 19546, 23956, 28366, 32776, 37I8B	noravirus Hu/GII.4/RotterdamP6D0/2D06/NL
1907	VPI	BAGB881I	1907	6317	10727, 15137, 19547, 23957, 283B7, 32777. 37187	noravirus Hu/GII.4/RottBrdamP6D33/200B/NL
1908	VPI	BAGB88I2	1908	B3I8	10728, 15138. 19548. 23958, 28368. 32778, 37188	noravirus Hu/GII.4/RottErdamP7D0/200B/NL
1909	VPI	BAGB88I3	1909	6319	10729, 15139, 19549, 23959, 28369, 32779, 37189	noravirus Hu/GII.4/RDtterdamP7DII9/2007/NL

1910	VPI	BAGG88I4	1910	B320	10730, 15140, 19550, 239B0, 28370, 32780, 37190	norovirus Hu/GII.3/RotterdamP8D0/200G/NL
1911	VPI	BAGG88I5	1911	G32I	10731, 15141, 19551, 239BI, 28371, 32781, 37191	norovirus Hu/GII.3/RotterdamP8D3I/2006/NL
1912	VPI	BAG688IG	1912	B322	10732, 15142, 19552, 23962, 28372, 32782, 37192	norovirus Hu/GII.4/RotterdamP8D65/2006/NL
1913	VPI	BAH04374	1913	B323	10733, 15143, 19553, 23963, 28373, 32783, 37193	murine norovirus
1914	VPI	BAH04377	1914	B324	10734, 15144, 19554, 23964, 28374, 32784, 37194	murine norovirus
1915	VPI	BAH2978B	1915	B325	10735, 15145, 19555, 239B5, 28375, 32785, 37195	norovirus Hu/0C08086/08/JP
I91G	VPI	BAH30707	1916	B32B	I073B, 15146, I955B, 23966, 28376, 32786, 3719B	norovirus Hu/GII.4/Stockholm/I98G5/2008/SE
1917	VPI	BAL408B9	1917	B327	10737, 15147, 19557, 23967, 28377, 32787, 37197	norovirus Hu/GII.B/0CD8025VLP/2008/JP
1918	VPI	BAL40870	1918	B328	10738, 15148, 19558, 23968, 28378. 32788, 37198	norovirus Hu/GII.6/0H090I4VLP/2009/JP
1919	VPI	BAL4087I	1919	B329	10739, 15149, 19559, 23969, 28379, 32789, 37199	norovirus Hu/GII.6/0C090I5VLP/2D09/JP
1920	VPI	BAL40872	1920	B330	10740, 15150, 19560, 23970. 28380. 32790, 37200	norovirus Hu/GII.6/0H050I0VLP/2005/JP
1921	VPI	BAL40873	1921	B33I	10741, 15151, 19561, 23971, 28381, 32791, 37201	norovirus Hu/GII.G/0C04062VLP/2004/JP
1922	VPI	BALB0900	1922	B332	10742, 15152, 19562, 23972, 28382, 32792, 37202	murine norovirus
1923	VPI	BAB552II	1923	B333	ID743, 15153, 19563, 23973, 28383, 32793, 37203	norovirus Hu/JP/2004/GII.4/Sakai/0I-inpatient6-26d
1924	VPI	BAQ552I2	1924	B334	10744, 15154, 19564, 23974. 28384. 32794, 37204	norovirus Hu/JP/2004/GII.4/Sakai/0I-inpatient8-Id
1925	VPI	BAQ552I3	1925	B335	10745, 15155, I95B5, 23975, 28385, 32795. 37205	norovirus Hu/JP/2004/GII.4/Sakai/0I-inpatient8-29d-I
192G	VPI	BA0552I4	I92B	B33B	I074B, 15156, 19566, 23976, 28386, 32796, 37206	norovirus Hu/JP/2004/GII.4/Sakai/0I-inpatient8-29d-2

1927	VP1	BAQ552I5	1927	B337	10747, 15157, I95B7, 23977, 28387, 32797, 37207	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpatient8-29d-3
1928	VP1	BA0552I6	1928	B338	10748. 15158, I95B8, 23978, 28388, 32798, 37208	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpatient8-29d-4
1929	VPI	BAQ552I7	1929	B339	10749, 15159, 19569, 23979, 28389, 32799, 37209	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpat(Bnt8-54d-l
1930	VP1	BAQ552I8	1930	B34D	10750, 15160, 19570, 23980, 28390, 32800, 37210	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpatient8-54d-2
1931	VPI	BAR4739B	1931	B34I	10751, I5IBI. 19571, 23981, 28391, 32801, 37211	norovirus GII/Hu/JP/2007/GII.4/y0B-VII0-5
1932	VP!	BAR47397	1932	B342	10752, 15162, 19572, 23982, 28392, 32802, 37212	norovirus GII/Hu/JP/2008/GII.4/y07-VI79-l
1933	VPI	BAR47398	1933	B343	10753, 15163. 19573, 23983, 28393, 32803, 37213	norovirus GII/Hu/JP/2008/GII.4/y07-V203-l
1934	VPI	BAR474DD	1934	B344	10754, 15164, 19574, 23984, 28394, 328D4, 37214	norovirus GII/Hu/JP/2008/GII.4/y08-V290-2
1935	VPI	BAR474DI	1935	B345	10755, 15165, 19575, 23985, 28395, 32805, 37215	norovirus GII/Hu/JP/2009/GII.4/y08-238-2
1936	VPI	BAR474B3	I93B	B34B	10756, I5IB6, 19576, 23986, 28396, 32806, 372IB	norovirus **GII/Hu/JP/20IO/GII.4/y09-205-l**
1937	VPI	BAR474B4	1937	B347	10757, 15167, 19577, 23987. 28397, 32807, 37217	norovirus GII/Hu/JP/20IO/GII.4/ylO-V475-l
1938	VPI	BAR474B5	1938	B348	10758, 15168, 19578, 23988, 28398, 32808, 37218	norovirus GII/Hu/JP/20ll/GII.4/ylO-V52B-8
1939	VPI	BAR474DB	1939	B349	10759, 15169, 19579, 23989, 28399, 32809, 37219	norovirus GII/Hu/JP/20ll/GII.4/yll-l88-l
I94D	VPI	BAR474B7	1940	B350	I07B0, 15170, 19580, 23990, 28400, 32810, 37220	norovirus GII/Hu/JP/20l2/GII.4/yll-VB64-l
1941	VPI	BAR474D8	1941	B35I	107B1, 15171, 19581, 23991, 28401, 32811, 37221	norovirus GII/Hu/JP/20l2/GII.4/yll-V689-2
1942	VPI	BAR474ID	1942	B352	I07B2, 15172, 19582, 23992, 28402, 32812, 37222	norovirus GII/Hu/JP/20l2/GII.4/yl2-V836-3
1943	VPI	BAR474I2	1943	B353	I07B3, 15173, 19583, 23993, 284D3, 32813, 37223	norovirus GII/Hu/JP/20ll/GII.4/yll-V627-3

1944	VP1	BAR474I3	1944	B354	I07B4, 15174. 19584. 23994, 284B4, 32814, 37224	norovirus BII/Hu/JP/20II/GII.4/yII-VB33-3
1945	VP1	BAR474I4	1945	B355	ID7B5, 15175, 19585, 23995, 284B5. 32815, 37225	**noPDvirus GII/Hu/JP/20II/GII.4/yII-V645-Z7**
I94B	VP1	BAR474I5	I94B	B35B	ID7BB, 15176. I958B, 23998B, 284BB, 328IB, 3722B	norovirus GII/Hu/JP/2D11/G!i.4/ylf-VB4S-I
1947	VPI	BAR474I7	1947	B357	ID7B7, 15177, 19587, 23997, 284B7, 32817, 37227	norovirus GH/Hu/JP/2D12/GII.4/yI2-V7B2-f
1948	VPI	BAR474I8	1948	B358	IB7B8, 15178, 19588, 23998, 28408, 32818, 37228	noravirus GII/Hu/JP/20I2/GII.4/yI2-V780-I
1949	VPI	BAR4742I	1949	B359	I07B9, 15179. 19589. 23999. 284D9. 32819. 37229	noravirus GII/Hu/JP/20I3/GII.4/yI2-V849-2
I95D	VPI	BAR47422	I95D	B3BD	ID770, 15180, 19590, 24000, 28410, 3282D, 37230	norovirus GII/Hu/JP/20I3/GII.4/yI3-I40-I
1951	VPI	BAR47423	1951	B3BI	10771, 15181, 19591, 24001, 28411, 32821, 37231	norovirus GII/Hu/JP/20I3/GII.4/yI3-V938-3
1952	VPI	BAR47424	1952	B3B2	10772, 15182, 19592, 24002, 28412, 32822, 37232	norovirus GII/Hu/JP/20I3/GII.4/yI3-IBB-I
1953	VPI	BAR4742B	1953	B3B3	10773, 15183, 19593, 24003, 28413, 32823, 37233	norovirus GII/Hu/JP/20I4/GII.4/yI3-VIOIO-I
1954	VPI	BAS5373I	1954	B3B4	10774, 15184, 19594, 24004, 28414, 32824, 37234	noravirus Hu/GII.4/Wakayama/TI58/20IO/JP
1955	VPI	BAS53732	1955	B3B5	10775, 15185, 19595, 24005, 28415, 32825, 37235	norovirus Hu/GII.4/Wakayama/TI62/20IO/JP
I95B	VPI	BAS53733	195B	B3BB	I077B, **15186.** I959B, 2400B. 284IB. 3282B, 3723B	noravirus Hu/GII.4/Wakayama/TIB4/20IO/JP
1957	VPI	BAS53734	1957	B3B7	10777, 15187, 19597, 24007, 28417, 32827, 37237	noravirus Hu/GII.4/Wakayama/TI69/20IO/JP
1958	VPI	BAS53945	1958	B3B8	10778, 15188, 19598, 24008, 28418, 32828, 37238	norovirus **Hu/GII.4/T272/clade** 2006b
1959	VPI	CAK222BI	1959	B3B9	10779, 15189, 19599, 24009, 28419, 32829, 37239	noravirus Hu/GI/Babbacomb_/I996/GBR
I9B0	VPI	CAR9587G	I9BB	B370	10780, 15190, 19600. 24010, 28420, 32830. 37240	norovirus Hu/GIV.I/Italy/980/2D07/ITA

1961	VPI	ADB279I4	1961	6371	10781. I5191, 19601, 24011, 28421. 32831, 37241	norovirus **Hu/GII.4/HSI94/2DD9/US**
1962	VPI	ADI458D0	1962	6372	10782, I5192, 19602, 24012, 28422, 32832, 37242	norovirus Hu/GGII.4/Dijon/E3I65/2008/FRA
1963	VPI	ADI458I0	1963	6373	10783. I5193, 19603, 24013, 28423, 32833, 37243	norovirus Hu/GGI!.4/Dijan/E337B/20QS/FRA
1964	VPI	ADI458I3	1964	6374	10784, I5194, 19604, 24014, 28424, 32834, 37244	noravirus Hu/GGII.4/Dijan/E3550/2009/FRA
1965	VPI	ADT70684	1965	6375	10785. 15195, 19605, 24015, 28425, 32835, 37245	**norovirus Hu/GII.I2/HS2IO/20IO/USA**
1966	VPI	ADZ24DD3	1966	6376	10786, 15196, 19606. 24016. 28426, 32836, 37246	**norovirus Hu/GII.I2/HS2D7/20IO/USA**
1967	VPI	AFID8234	1967	6377	10787. I5197. 19607, 24017, 28427, 32837, 37247	norovirus Hu/GII/10002/2009/VNM
1968	VPI	AFID8237	1968	6378	10788, I5198, 19608, 24018, 28428, 32838, 37248	norovirus Hu/GII/I0003/2009/VNM
1969	VPI	AFID8243	1969	6379	10789, 15199, 19609, 24DI9, 28429, 32839, 37249	norovirus Hu/GII/I0037/200B/VNM
1970	VPI	AFJ385I6	1970	6380	I079D, 15200, I9610, 24020, 28430, 32840, 37250	norovirus HU/GI.I **/ 8**FIIB/I **968/** USA
1971	VPI	AFJ385I9	1971	B38I	10791, 15201, 19611, 24021, 28431, 32841, 37251	norovirus Hu/GII.4/CH0C5I9I/I974/USA
1972	VPI	AFWI5937	1972	B382	10792, 15202, I9612, 24022, 28432, 32842, 37252	norovirus **Hu/GII.4/N8/2DDB/HuZhou**
1973	VPI	AFWI5939	1973	6383	10793, 15203, I9613, 24023, 28433, 32843, 37253	norovirus Hu/GII.4/N3/2008/HuZhou
1974	VPI	AFWI5942	1974	6384	10794, 15204, 19614, 24024, 28434, 32844, 37254	norovirus **Hu/GII.4/NI3/2009/HuZhou**
1975	VPI	AFWI5943	1975	6385	10795, 15205, I9615, 24025, 28435, 32845, 37255	norovirus **Hu/GII.4/N76/2DID/HuZhou**
1976	VPI	AFWI5946	1976	6386	10796, 15206, I9616, 2402B, 2843B, 32846, 37256	norovirus **Hu/GII.4/N9I/20II/HuZhou**
1977	VPI	AFX7I656	1977	6387	10797, 15207, **19617.** 24027. 28437. 32847. 37257	norovirus Hu/GII.3/HK7I/I978/CHN

1978	VPI	AFX7I659	1978	B388	10798, 15208, 19618. 24028, 28438, 32848, 37258	norovirus Hu/GII.2/KLI09/I978/MYS
1979	VPI	AFX8II24	1979	B389	10799, 15209, 19619, 24029, 28439, 32849, 37259	norovirus Hu/Norwalk/10051/2009/VNM
1880	VPI	AFX8II33	1980	B390	10800, 15210, 19620, 24030, 28440, 32850, 372B0	norovirus Hu/Norwalk/10074/2009/VNM
1981	VPI	AFX8II5I	1981	B39I	10801, 15211, 19621, 24031, 28441, 32851, 372BI	norovirus Hu/Norwalk/IOII6/2Q09/VNM
1982	VPI	AFX8IIB0	1982	B392	ID802, 15212, 19622, 24032, 28442, 32852, 37262	norovirus Hu/Norwalk/IOI37/20D9/VNM
1983	VPI	AFX8II75	1983	B393	10803, 15213, I9B23, 24033, 28443, 32853, 37263	norovirus Hu/Norwalk/10162/2009/VNM
1984	VPI	AFX8II84	1984	B334	10804, 15214, 19624, 24034, 28444, 32854, 372B4	norovirus Hu/Norwalk/10173/2009/VNM
1985	VPI	AFX8II87	1985	B395	10805, 15215, 19625, 24035, 28445, 32855, 372B5	norovirus Hu/Norwalk/IOI7B/2009/VNM
I98B	VPI	AFX8I2I7	I98B	B39B	10806, 15216, 19626, 24036, 28446, 32856, 37266	norovirus Hu/Norwalk/I0223/2009/VNM
1987	VPI	AFX8I220	1987	B397	10807, 15217, 19627, 24037, 28447, 32857, 37267	norovirus Hu/Norwalk/I0235/2009/VNM
1988	VPI	AFX8I223	1988	6398	10808, 15218, I9B28, 24038, 28448, 32858, 37268	norovirus Hu/Norwalk/I023B/2009/VNM
1989	VPI	AFX8I235	1989	B399	10809, 15219, I9B29, 24039, 28449, 32859, 372B9	norovirus Hu/Norwalk/10285/2010/VNM
1990	VPI	AFX8I259	1990	B400	10810, 15220, I9B30, 24040. 28450. 32860, 37270	norovirus Hu/Norwalk/20008/2009/VNM
1991	VPI	AFX8I280	1991	B40I	10811, 15221, 19631, 24041, 28451, 328BI, 37271	norovirus Hu/Norwalk/20044/2009/VNM
1992	VPI	AFX8I28B	1992	B402	10812, 15222, 19632, 24042, 28452, 32862, 37272	norovirus Hu/Norwalk/20066/2009/VNM
1993	VPI	AFX8I3I0	1993	B403	10813, 15223, 19633, 24043, 28453, 328B3. 37273	norovirus Hu/Norwalk/20123/2009/VNM
1994	VPI	AGE894B9	1994	B404	10814, 15224, I9B34, 24044, 28454, 328B4, 37274	norovirus Hu/GII/20I44/2D09/VNM

1995	VPI	AGE89484	1995	6405	10815, 15225, 19635, 24045, 28455, 32865, 37275	norovirus Hu/GII/20154/2009/VNM
1996	VPI	AGE89487	1996	6406	10816, 15226, 19636, 24046, 28456, 32866, 37276	norovirus Hu/GII/20156/2009/VNM
1997	VPI	AGE89GI9	1997	6407	10817. 15227, IB637, 24047, 28457, 32867, 37277	norovirus Hu/GII/20460/2010/VNM
1998	VPI	AGE89G70	1998	6408	10818, 15228, 19638, 24048, 28458, 32868, 37278	noruvirus Hu/GII/30257/2009/VNM
1999	VPI	AGE9959G	1999	6409	10819, 15229, 19639, 24049, 28459, 32869, 37279	norovirus Hu/GII.4/NIHIC4.2/20ll/USA
ZODD	VPI	AGE99599	2000	6410	10820, 15230, 19640, 24050, 28460, 32870, 37280	norovirus Hu/Gll.6/S9c/I976/SEN
2DDI	VPI	AGE99GI2	2D0I	6411	10821, 15231, 19641, 24051, 28461, 32871, 37281	norovirus Hu/Gll.4/KL45/I978/MYS
2002	VPI	AGII7G09	2002	6412	10822, 15232, 19642, 24052, 28462, 32872, 37282	norovirus Hu/Gll.3/HK46/I977/CHN
2003	VPI	AGM332II	2003	6413	10823. 15233, 19643, 24053, 28463, 32873, 37283	norovirus Hu/GI.I/CHA6A003_2009I03I/2009/0SA
2004	VPI	AGM33223	2004	6414	10824, 15234, 19644, 24054, 28464, 32874, 37284	norovirus Hu/GI.I/CHA9A004_20II04I9/20II/0SA
20D5	VPI	AGTI7839	2005	6415	10825, 15235, 19645, 24055, 28465, 32875, 37285	norovirus Hu/GII.4/NIHICI7.5/ZDIZ/USA
200B	VPI	AGX859I0	2006	6416	10826, 15236, 19646, 24056, 28466, 32876, 37286	norovirus Hu/Gll.4/NIHICI.I6/20I2/USA
2007	VPI	AHI59IG2	2007	6417	I08Z7, 15237, 19647, 24057, 28467, 32877, 37287	norovirus Hu/GII.4/HS288/20I2/USA
2008	VPI	AHI59IB5	2008	6418	10828, 15238, 19648, 24058. 28468, 32878, 37288	norovirus Hu/GII.4/HS66/200I/USA
2009	VPI	AHX22044	2009	6419	10829, 15239, 19649, 24059, 28469, 32879, 37289	norovirus Hu/Gll/BGIC03I7/20II/BGD
2010	VPI	AII02587	2010	6420	10830, 15240, 19650, 24060, 28470, 32880, 37290	norovirus Hu/Gll/C2H-I8/20II/VNM
2011	VPI	AII02BI7	2011	6421	10831, 15241, 19651, 24061. 28471. 32881. 37291	norovirus Hu/ GII/ 20419/ 2010/ VNM

2012	VPI	AIS24556	2012	B422	10832, 15242, I3B52, 240B2, 28472, 32882, 37232	noravirus Gil
2013	VPI	BAI49B08	2013	B423	10833, 15243, 13B53, 240B3, 28473, 32883, 37293	narovirus Hu/GII.4/Hiposhima/55/2DD5/JPN
2DI4	VPI	BAI4BBI3	2014	B424	10834, 15244, I9B54, 240B4, 28474, 32884, 37234	norovirus Hu/GII.4/Hiroshima/B3/ZDDB/JPN
2QI5	VPI	BAI43322	2015	B425	10835, 15245, 19655, 240B5, 28475, 32885, 372B5	narovirus Hu/Gll.4/Hirashima/I10/2007/JPN
2DIB	VPI	BAJ25074	20IB	B42B	I083B, I524B, I3B5B, 240BB, 2847G, 3288B, 3723B	narovirus Hu/0C07ll8/2007/JP
2017	VPI	BAP33334	2DI7	B427	10837, 15247, I3B57, 240B7, 28477, 32887, 37237	narovirus Hu/GII/JP/20l4/GII.PI7_GII.I7/Kawasaki323
20l8	VPI	ABQB3283	2018	B428	10838, 15248, 13B58, 240B8, 28478, 32888, 37298	norovirus Hu/GIIMEnepuru/NZ327/200G/NZ I
2019	VPI	ABV55634	20IB	B423	10833, 15243, 19B53, 240B8, 28479, 32883, 37239	norovirus Hu/GII.4/Shellharbour/NSW69GT/2006/A0S
2020	VPI	ACV4I093	2020	B430	10840, 15250, 13BB0, 24070, 28480, 32890, 37300	narovirus Hu/GII.4/RiviBral635/2008/US
2021	VPI	ACV4I0BB	2021	B43I	10841, 15251, I3BBI, 24071, 28481, 32891, 37301	narovirus Hu/GI.4/l643/2008/US
2022	VPI	ACV88I30	2022	B432	10842, 15252, I3BB2, 24072, 28482, 32832. 37302	noravirus dag/C33/Viseu/2007/PRT
2023	VPI	ACWI3927	2023	B433	10843, 15253, 13BB3, 24073, 28483, 32833, 37303	norovirus Hu/GII.4/RathminEs/NSW2B7R/2DD7/AUS
2024	VPI	ACX3I885	2024	B434	10844, 15254, I9BB4, 24074, 28484, 32894, 37304	noravirus Hu/GII.4/Armidale/NSW390l/20D8/AU
2025	VPI	ACX3I887	2025	B435	10845, 15255, I9BB5, 24075, 28485, 32895, 37305	noravirus Hu/GII.4/Westmead/NSW3639/2008/A0S
202G	VPI	ACX3I8BI	202B	B43G	I084B, I525B, I9BBB, 2407B, 28486, 3289B, 3730B	noravirus Hu/GII.4/Sutherland/NSW505G/2007/AOS
2027	VPI	ACZ37232	2027	B437	10847, 15257. 19667, 24077, 28487, 32897, 37307	noravirus Hu/GII.7/l738/2009/USA
2028	VPI	AD0I0375	2028	B438	10848, 15258, 19668, 24078, 28488, 32898, 37308	norovirus HU/GII .4/NEW 0rleansl805/2009/0SA

2D2S	VPI	AD085552	2029	B439	10849, 15259, I9BB9, 24079, 28489, 32899, 37309	**norovirus HU/GII .4/PECS/HUN4322/20ID/HUN**
2030	VPI	ADQ4377B	2030	B440	10850, 152B0, 19B70, 24080, 2849D, 32900, 37310	norovirus Hu/GII.4/B gBcroft /NSW305P/2003/AUS
2031	VPI	ADQ4378I	2031	B44I	10851, **15261. 19671.** 24081, 28491, 32901, 37311	norovirus Hu/GII.4/Teralba/NSW88IZ/2009/AUS
2D32	VPI	A0D43783	2032	B442	10852, 15262, 19672, 24082, 28492, 32902, 37312	norovirus Hu/GII.4/Turramurra/NSW8B2U/2003/AOS
2D33	VPI	A0V37805	2033	B443	10853, 152B3. 19B73, 24083, 28493, 32903, 37313	norovirus **Hu/GII.4/SeouI/D389/2009/K0R**
2D34	VPI	ADV37807	2034	B444	10854, 15264, 19674, 24084. 28494, 32904, 37314	norovirus **HU/GII .4/ SEOUI/ 0B54/ 200B/K0R**
2035	VPI	A0V37809	2035	B445	10855, 15265, 19675, 24085. 28495, 32905, 37315	**norovirus Hu/GII.4 / SEOul /092I /200a/K0R**
2036	VPI	ADV378I3	203B	B44B	10856, 15266, 19B7B, 2408B. 28496, 32906, 37316	norovirus Hu/GII.4/Seoul/0952/20IO/KOR
2037	VPI	A0V379I7	2037	B447	10857, I52B7, 19677, 24087, 28497, 32907, 37317	norovirus Hu/GII.4/Seoul/0902/200S/K0R
2038	VPI	AD V379I9	2038	B448	10858, 15268, 19B78, 24088, 28498, 32908, 37318	norovirus **HU/GII .4/ SBOUI/ 0945 / 2D09 / K0 R**
2030	VPI	AEI834B9	2039	B449	10859, 15269, 19679, 24089, 28499, 32909, 37319	**norovirus Hu/GII.I2 / ShBIby /2009/USA**
2040	VPI	AEP04093	204D	B450	10860, 15270, 19680, 24030, 28500, 32310, 37320	norovirus pig/GII/Ch6/China/2009
2041	VPI	AED77282	2041	B45I	10861, 15271, **16681.** 24031. 28501, 32911, 37321	norovirus Hu/GI.7/TCH-060/USA/2003
2042	VPI	AFA55I74	2042	B452	10862, 15272, I3B82, 24032, 28502, 32912, 37322	**norovirus Hu/GII.I/Ascension208/20IO/USA**
2043	VPI	AFC89B5B	2043	B453	I08B3, 15273, 13B83. 24033, 28503, 32313, 37323	norovirus Hu/GII.I3/VAI73/20IO/USA
2044	VPI	AFC89B59	2044	G454	I08B4, 15274, 19684, 24094, 28504. 32314, 37324	norovirus **Hu/Gf.7/Pravidencel9I/2DID/USA**
2045	VPI	AFC89BB2	2045	B455	10865, 15275, 19685, 24035, 28505, 32315. 37325	norovirus **Hu/GII.3/GlastonburyIIG4/2004/USA**

2D4B	VPI	AFC89BB5	204B	B45B	I08BB, I527B, I9B8B, 2409B. 2850B. 329IB, 3732B	nOpOVipus Hu/GII.2l/Salisburyl5D/20ll/USA
2047	VPI	AFC89BB7	2047	B457	I08B7, I5277, I9687, 24097, 28507. 329I7, 37327	narovirus Hu/GII.4/Minerva/CSI258/200G/OSA
2048	VPI	AFDB2272	2048	B458	ID8B8. 15278, 19B88, 24098, 28508, 32918, 37328	murine narovirus 3
2048	VPI	AFJ04707	2049	B459	I08B9, 15279, 19B89, 24099, 28509, 32919, 37329	narovirus Hu/GII.4/I997/USA
2050	VPI	AFJ04708	2050	B4B0	10870, 15280, I9B90, 24100, 28510, 32920, 37330	narovirus Hu/GII.4/Farmingtan Hills/2004/0SA
205I	VPI	AFJ0470e	205I	B4BI	10871, 15281, 19691, 24101, 28511, 32921, 37331	noravirus Hu/BII.4/Minerva/2006/USA
2052	VPI	AFP8B593	2052	B4B2	10872, 15282, I9B92, 24102, 28512, 32922, 37332	narovirus Hu/GII.4/0hio/7l/20l2/0SA
2053	VPI	AFU55B8B	2053	B4B3	10873, 15283, I9B93, 24103, 28513, 32923, 37333	narovirus Hu/GII.4/Alb_rtaEII3l/2D04/CA
2054	VPI	AF055B8B	2054	B4B4	10874, 15284, I9B94. 24104, 28514, 32924, 37334	norovirus Hu/GII.4/AlbBrtaEII42/200B/CA
2055	VPI	AF055BB2	2055	B4B5	10875, 15285, 19695, 24105, 28515, 32925, 37335	norovirus Hu/GIL4/AlbertaElf90/2D0B/CA
205B	VPI	AFU55B95	205G	B4BB	I087B, I528G, I9B9B, 24I0B, 285IB, 32926, 37336	noravirus Hu/BII.4/AlbertaEI438/2006/CA
2057	VPI	AFU55B98	2057	B4B7	10877, 15287, 19697, 24107, 28517, 32927. 37337	norovirus Hu/GII.4/AlbertaEI498/2006/CA
2058	VPI	AF05570I	2058	B4B8	10878. 15288, 19698, 24108, 28518, 32928. 37338	norovirus Hu/GII.4/AlbertaEI5l3/2006/CA
2D5B	VPI	AF055704	2059	B4B9	10879, 15289, I9B99. 24109. 28519, 32929, 37339	noravirus Hu/GII.4/Alb ertaEIB03/200B/CA
20B0	VPI	AF055707	20B0	B470	10880, 15290, 19700, 24110, 28520, 32930, 37340	norovirus Hu/GII.4/AlbertaEID09/Z008/CA
20BI	VPI	AFU557I0	20BI	B47I	10881, 15291, 19701. 24111, 28521, 32931, 37341	noravirus Hu/GII.4/AlbertaEII02/2008/CA
20B2	VPI	AFU557I3	20B2	B472	10882, 15292, 19702, 24112, 28522, 32932, 37342	noravirus Hu/GII.4/Alb ertaEI2IO/2008/CA

2063	VPI	AFU557IB	20B3	B473	10883, 15233, 13703, 24113, 28523, 32B33, 37343	norovirus Hu/GII.4/AfbBPtaEI425/2D0B/CA
20B4	VPI	AF0557I9	20B4	B474	10884, 15234, 13704, 24114, 28524, 32334, 37344	norovirus Hu/GII.4/AlbertaEII09/2009/CA
20B5	VPI	AF055722	20B5	B475	10885, 15235, 19705, 24115, 28525, 32935, 37345	norovirus Hu/GII.4/AlbertaEI045/2DI0/CA
20BB	VPI	AF055725	20BB	B47B	I088B, I5296, I970B, 24116, 28526, 32936, 3734B	norovirus Hu/GII.4/AlbertaEIII9/2DI0/CA
20B7	VPI	AF055728	20B7	B477	10887, 15297, 19707, 24117, 28527, 32937, 37347	norovirus Hu/GII.4/AlbertaEIZ04/20IO/CA
20B8	VPI	AF05573I	20B8	B478	10888, 15298, 19708, 24118, 28528, 32938, 37348	norovirus Hu/GII.4/AlbertaEI065/2DII/CA
20BB	VPI	AF055734	20B9	B473	10889, 15299, 13703, 24119, 28529, 32939, 37349	norovirus Hu/GII.4/AlbertaEI388/20II/CA
2070	VPI	AF055737	2070	B480	10890, 15300, 19710, 24120, 28530, 32940, 37350	norovirus Hu/GII.4/AlbertaEI003/20I2/CA
2071	VPI	AF0B2B53	2071	B48I	10891, 15301, 13711, 24121, 28531, 32341, 37351	norovirus Hu/GII.4/SG40I3-09/2004/SG
2072	VPI	AF092BB0	2072	B482	10892, 15302, 19712, 24122, 28532, 32942, 37352	norovirus Hu/GII.4/SG40IG-09/2004/SG
2073	VPI	AFU32BBI	2073	B483	10893, 15303, 19713, 24123, 28533, 32943, 37353	norovirus Hu/GII.4/SG4033-0I/2DD5/SG
2074	VPI	AFU32BB2	2074	B484	10894, 15304, 19714, 24124, 28534, 32944, 37354	norovirus Hu/GII,4/SG4033-02/2005/SG
2075	VPI	AFU32BB3	2075	B485	10895, 15305, 19715, 24125, 28535, 32945, 37355	norovirus Hu/GII.4/SG409I-06/200B/SG
207B	VPI	AF092BB4	207B	B48B	I089B, I53D6, 19716, 24126, 28536, 32946, 37356	norovirus Hu/GII.4/SG4D39-08/2006/SG
2077	VPI	AF0B2BBB	2077	B487	10897, 15307, 19717, 24127, 28537, 32947, 37357	norovirus Hu/GII.4/SG4009-03/2006/SG
2078	VPI	AF092BB7	2078	B488	10898, I53D8, 19718, 24128, 28538, 32948, 37358	norovirus Hu/GII.4/SG40I9-09/200G/SG
207B	VPI	AFU32BB8	2073	B483	I0899, 15309, 19719, 24129, 28539, 32949, 37359	norovirus Hu/GII.4/SG4024-IO/200G/SG

2D8D	VP1	AF092BB9	2080	B490	10900, 15310, 19720, 24130, 28540, 32950, 373B0	nnrovirus Hu/GII.4/SG4D35-ID/2DDG/SG
2081	VP1	AFU92B70	2081	B49I	10901, 15311, 19721, 24131, 28541, 32951, 373BI	norovirus Hu/GII.4/SG4060-IO/2006/SG
2D82	VPt	AFU92B7I	2082	B492	10902, 15312, 19722, 24132, 28542, 32952, 373B2	norovirus Hu/GII.4/SG406l-IO/2006/SG
2083	VPI	AFU92B72	2083	B493	10903. 15313, 19723, 24133, 28543, 32953, 37363	norovirus Hu/Gll.4/SG4097-I0/2D06/SG
2D84	VPI	AF092B73	2084	B494	10904, 15314, 19724, 24134, 28544, 32954, 37364	norovirus Hu/Gll.4/SG40I5-I0/200B/SG
2085	VPI	AFUB2B74	2085	B495	10905, 15315, 19725, 24135, 28545, 32955, 37365	norovirus Hu/GII.4/SG4D30-l2/2006/SG
208B	VPI	AFU92B7B	208B	B49B	I090B, 15316, 19726, 24I3B, 28546, 32956. 37366	norovirus Hu/Gll.4/SG4058-I2/200G/SG
2087	VPI	AFU92B77	2087	B497	10907, 15317, 19727, 24137, 28547, 32957, 373B7	norovirus Hu/Gll.4/SG4077-I2/200B/SG
2D88	VPI	AFU92B78	2088	B498	10908, 15318, 19728, 24138, 28548, 32958, 373B8	norovirus Hu/GII.4/SG4007-OI/2007/SG
2089	VPI	AF092B79	2089	B499	10909, 15319, 19729, 24139, 28549. 32959, 37369	norovirus Hu/GII.4/SG40IO-OI/2007/SG
2090	VPI	AF092B80	2090	B500	ID9I0, 15320, I973D, 24140, 28550, 32960, 37370	norovirus Hu/GII.4/SG404l-0l/2OO7/SG
2091	VPI	AF092B8I	2091	B50I	10911, 15321, 19731, 24141, 28551, 32961, 37371	norovirus Hu/GII.4/SG4047-OI/2007/SG
2092	VPI	AF092B82	2092	B502	10912, 15322, 19732, 24142, 28552. 32962. 37372	norovirus Hu/GII.4/SG405l-0l/2007/SG
2093	VPI	AFU92B84	2093	B503	10913. 15323, 19733, 24143, 28553, 329B3, 37373	norovirus Hu/GII.4/SG4042-07/2007/SG
2094	VPI	AFU92B85	2094	B504	10914, 15324, 19734, 24144, 28554, 32964, 37374	norovirus Hu/GII.4/SG4045-07/Z007/SG
2095	VPI	AFU92686	2095	G505	10915, 15325, 19735, 24145. 28555. 32965. 37375	norovirus Hu/GII.4/SG4052-08/2007/SG
2096	VPI	AF092B87	209B	B50B	10916, 15326, 19736. 24146, 28556, 32966, 37376	norovirus Hu/GII.4/SG4065-08/2007/SG

2D37	VPI	AF092G88	2037	G507	10917. 15327. 19737, 24147, 28557, 32967. 37377	**norovirus Hu/GH.4/SB4D75-DB/ZDD7/SG**
2098	VPI	AFU32G83	2098	G508	10918, 15328, 19738, 24148, 28558, 32968, 37378	**norovirus HU/GII .4/SG4086 -09/2007/SG**
2033	VPI	AF032690	2033	G509	10919, 15329, 19739, 24149, 28559, 329G9, 37379	**norovirus Hu/GII .4/SG4087-09/2007/SG**
2100	VPI	AF032B3I	2100	G5I0	10920, 15330, 19740, 24150, 28560, 32970, 37380	**norovirus Hu/GII.4/SG40II-09/2D07/SG**
2101	VPI	AFU32G32	2101	6511	10921, 15331, 19741, 24151. 28561, 32971 3738I	**norovirus Hu/GII .4/SG40G3-IO/2007/SG**
2102	VPI	AF092693	2102	G5I2	10922, 15332, 19742, 24152, 28562, 32972, 37382	**norovirus Hu/GII .4/SG4069-OI/2008/SG**
2103	VPI	AFU92G94	2103	G5I3	ID923, 15333, 13743, 24153, 28563, 32973, 37383	**norovirus Hu/GII .4/SG4079-07/2008/SG**
2104	VPI	AFUB2Be5	2104	G5I4	10924, 15334, 19744, 24154, 28564, 32974, 37384	**norovirus Hu/GII .4/SG4073-tI/2008/SG**
2105	VPI	AF032G3B	2105	G5I5	10325, 15335, 19745, 24155, 28565, 32975, 37385	**norovirus Hu/GII .4/SG4D92-II/2008/SG**
2I0G	VPI	AFU32G37	2IDG	G5IG	10926, 15336, 19746, 24156, 28566, 32976, 37386	**norovirus Hu/GII .4/SG40I5-I2/2D08/SG**
2107	VPI	AF032B38	2107	6517	10927, 15337, 19747, 24157. 28567. 32377, 37387	**norovirus Hu/GII.4/SG40I8-I2/2008 /SG**
2108	VPI	AF032G33	2108	6518	10928. 15338, 19748, 24158, 28568, 32978. 37388	**norovirus HU/GII .4/SG406I-OI/2009/SG**
2103	VPI	AF032700	2103	G5I9	10929, 15339, 19749, 24159, 28569, 32979, 37389	**norovirus Hu/GII .4/SG4067-DI/2009/SG**
2110	VPI	AF09270I	2110	6520	10930, 15340, 19750, 24160, 28570. 32980, 37330	**norovirus Hu/GII .4/SG4004 -D3 /2009/SG**
2111	VPI	AFU32702	2111	6521	10331. 15341, 13751, 24IGI, 28571, 32981, 37391	**norovirus Hu/GII .4/SG4023-05/2009/SG**
2112	VPI	AF092703	2112	6522	10932, 15342, 19752, 24162, 28572, 32982, 37392	**norovirus Hu/GII .4/SG4028-07/2009/SG**
2113	VPI	AF092704	2113	6523	10933, 15343, 19753, 24163. 28573, 32983, 37393	**norovirus Hu/GII .4/SG4070-Q7/2009/SG**

2114	VPI	AFU92705	2114	B524	10934, 15344, 19754, 24164, 28574, 32984, 37394	noravirus Hu/GII.4/SG4040-08/2009/SG
2115	VPI	AFU9270B	2115	B525	10935, 15345, 19755. 24165. 28575, 32985, 37395	noravirus Hu/GII.4/SG404l-09/2009/SG
2IIG	VPI	AFU92707	2116	B52B	10936, 15346, 19756, 24166, 28576. 32986, 37396	noravirus Hu/GII.4/SG4044-09/2009/SG
2117	VPI	AFU927D8	2117	B527	10937, 15347, 19757, 24167, 28577, 32987, 37397	noravirus Hu/GII.4/SG4D4B-D3/2DD9/SG
2118	VPI	AFU92709	2118	B528	10938, 15348. 19758, 24168, 28578, 32988, 37398	noravirus Hu/GII.4/SG4047-D9/2009/SG
2119	VPI	AFU927ID	2119	B529	I0B39, 15349, 19759, 24169, 28579. 32989, 37399	noravirus Hu/GII.4/SG405l-09/2D09/SG
2I2D	VPI	AFU927II	2I2B	B53D	10940, 15350, 19760, 24170, 28580. 32990, 37400	noravirus Hu/GII.4/SG4D57-Q9/2009/SG
2121	VPI	AF0927I2	2121	B53I	10941, 15351. 19761. 24171, 28581, 32991, 37401	noravirus Hu/GII,4/SG4058-ID/2009/SG
2122	VPI	AF0927I3	2122	B532	10942, 15352, 19762, 24172, 28582, 32992, 37402	noravirus Hu/GII.4/SG40BI-IO/2009/SG
2123	VPI	AFU927I4	2123	B533	10943, 15353, 19763, 24173, 28583, 32993, 37403	noravirus Hu/GII.4/SG40B2-IO/2009/SG
2124	VPI	AFU927I5	2124	6534	10944, 15354. 19764. 24174, 28584, 32994, 37404	noravirus Hu/GII.4/SG4075-l2/2009/SG
2125	VPI	AFU927I7	2125	B535	10945, 15355, I97B5, 24175, 28585, 32995, 37405	noravirus Hu/GII.4/SG40l4-04/2DI0/SG
2I2B	VPI	AFU927I8	2I2B	6536	I094B, 15356, 19766, 24176, 28586, 32996, 37406	noravirus Hu/GII.4/SG4D51-08/2OIQ/SG
2127	VPI	AFU927I9	2127	6537	10947, 15357, 19767, 24177, 28587, 32997, 37407	noravirus Hu/GII.4/SG4053-08/20IO/SG
2128	VPI	AFU9272D	2128	B538	10948, 15358, 19768, 24178, 28588, 32998, 37408	noravirus Hu/GII.4/SG4054-08/20ID/SG
2129	VPI	AFU9272I	2129	6539	10949, 15359, 19769, 24179, 28589, 32999, 37409	noravirus Hu/Gll.4/SG4002-I2/2DI0/SG
2I3D	VPI	AFU92722	2I3D	6540	10950, 15360, 19770, 24180, 28590, 33000, 37410	noravirus Hu/GII.4/SG4009-OI/20ll/SG

2131	VP1	AFU92723	2131	G541	10951. 15361, 19771, 24181, 28591, 33001, 37411	norovirus Hu/GII.4/SG40IO-OI/20ll/SG
2132	VP1	AG079474	2132	G542	10952, 15362, 19772, 24182. 28592, 33002, 37412	norovirus Hu/GII.3/0l-l3/477/200l/A0
2133	VPI	AGD79475	2133	G543	10953. I53G3, 19773, 24183, 28593, 33003, 37413	norovirus Hu/GII.3/02-l3/424cons/2002/AU
2134	VP1	AGD7947G	2134	G544	10954. 15364, 19774, 24184, 28594, 33004, 37414	norovirus Hu/GII.3/4l/89/2006/AU
2135	VPI	AGD79477	2135	G545	10955, 15365, IB775, 24185, 28595, 33005, 37415	norovirus Hu/GII.3/84/46/2007/AU
2136	VPI	AGD79478	2I3G	6546	10956, 15366, 19776, 24186, 2859B, 33006, 374IB	norovirus Hu/GII,3/693/425/20D8/A0
2137	VPI	AGD79479	2137	6547	ID957, 15367, 19777, 24187, 28597, 33007, 37417	norovirus Hu/GII.3/537/547/20IO/AU
2138	VPI	AGH2475D	2138	6548	10958, 15368, 19778, 24188, 28598, 33008, 37418	norovirus Hu/GII.4/IT00/ITA
2139	VPI	AGI37922	2139	6549	10959, 15369, 19779, 24189, 28599, 33009. 37419	norovirus HU/GII .4/SBOUI/I07I/20I0/K0R
2I4D	VPI	AGM4G344	2140	6550	10960, 15370, 19780. 24100, 28600, 33010, 37420	norovirus HU/GII/SEOUII 055/K0R/20I0
2141	VPI	AGM4B347	2141	6551	10961, 15371, 19781, 24191, 28B01. 33011, 37421	norovirus HU/GII/SBOUII 072/K0R/2010
2142	VPI	AGM4G349	2142	6552	10962, 15372, 19782, 24192, 28G02, 33012, 37422	noroviros Hu/GII/Seoull282/KOR/20IO
2143	VPI	AGM4G355	2143	6553	I09B3, 15373, 19783, 24193, 28603, 33013, 37423	norovirus HU/GII/SBOUII 488/K0R/20II
2144	VPI	AGM4G359	2144	6554	10964, 15374, 19784, 24194, 28604, 33014, 37424	norovirus Hu/GII/Seoull033/KOR/20IO
2145	VPI	AGM463G2	2145	6555	10965, 15375, 19785, 24195, 28605, 33015, 37425	norovirus HU/GII/SBOUII 08B/K0R/20I0
2I4G	VPI	AGM4G3GG	2I4G	6556	10966, 15376, 19786, 24196, 28B06, 33016, 37426	norovirus HU/GII/SBOUII 39I/K0R/2DI0
2147	VPI	AGM4G3G7	2147	6557	I09B7, 15377, 19787. 24197. 28607. 33017, 37427	norovirus HU/GII/SBOUII 4I2/K0R/2DI0

2148	VP1	AGM4637Q	2148	G558	ID9BB, 15378, 19788, 24198, 28B08, 33DI8, 37428	norovirus Hu/GII **/SBDulf37B**/ K0R/ 20iD
2149	VP1	AGM4B375	2149	G559	I0969. 15379, 19789, 24199, 28609, 3301 9, 37429	norovirus HU/GII/SBOUII 388/K0R/20I0
2150	VPI	AGM4B377	2150	B5BD	10970, 15380, 19790, 24200, 28610, 33020, 37430	norovirus HU/GI[/SBOUI !40Q/K0R/2DIQ
2151	VPI	AGM4G379	2151	B5BI	10971, 15381, 19791, 242DI, 28611, 33021, 37431	norovirus HU/GII/SEOUII 449/K0R/20II
2152	VPI	AGM4G384	2152	B5G2	10972, 15382, I97G2, 24202, 28612, 33022, 37432	norovirus Hu/GII/Seoull456/K0R/20ll
2153	VPI	AGM4G38B	2153	B5G3	10973, 15383, 19793, 24203, 28613, 33023, 37433	norovirus HU/GII/SBOUII 034/K0R/20I0
2154	VPI	AGM4G388	2154	B5B4	10974, 15384, 19794, 24204, 28614, 33024. 37434	norovirus HU/GII/SBQUII 049/KDR/ZDID
2155	VPI	AGM4B382	2155	B5B5	10975, 15385, 19795, 24205, 28BI5, 33025, 37435	norovirus HU/GII/SBOUIII 2I/K0R/2DI0
2I5B	VPI	AGM4G395	2I5B	B5BB	I097B, 15386, I979G, 24206, 28616, 33026, 37436	norovirus HU/GII/SBDUII 29B/K0R/20I0
2157	VPI	AGM4G398	2157	B5B7	10977, 15387, 19797, 24207, 28617, 33027, 37437	norovirus HU/GII/SBDUII 409/K0R/20I0
2158	VPI	AGM4B4DI	2158	B5B8	10978, 15388, 19798. 24208, 28BI8. 33028, 37438	norovirus HU/GII/SBOUII 444/K0R/20I0
2158	VPI	AGM4B4D3	2159	B5B9	10979, 15389. I97G9, 24209, 28619, 33029, 37439	norovirus HU/GII/SBOUII 445/K0R/20I0
2IBD	VPI	AGM4G407	2IBD	B57D	I0980, I5390, I98D0, 24210, 28620, 33030, 37440	norovirus HU/GII/SBOUII 835/K0R/20II
2IBI	VPI	AGM4B4DB	2IBI	G57I	10981, 15391, 19801, 24211, 28621, 33031, 37441	norovirus HU/GII/SBOUII 032/K0R/20I0
2IB2	VPI	AGM4B4I3	2IB2	B572	10982, 15392, 19802, 24212. 28B22. 33032, 37442	norovirus HU/GII/SBOUII 073/K0R/20I0
2IB3	VPI	AGM4G4I5	2IB3	B573	10983, 15393, 19803, 24213, 28623, 33033, 37443	norovirus HU/GII/SBDUII 2II/K0R/20I0
2IG4	VPI	AGM4B4I9	2IB4	G574	10984, 15394, I98D4. 24214. 28624. 33034, 37444	norovirus Hu/GII/Seoull259/KOR/20IO

2IG5	VPI	AGM4G42I	21G5	G575	10985. 15395, 1980S, 24215, 28625, 33035, 37445	norovirus Hu/GII/Seaull321/KDR/2DID
2IGG	VPI	AGM46425	2IGG	G57G	10986, 15396, 19806, 24216, 28G26, 33036, 37446	nornvirus Hu/GII/Seoull35I/KOR/20IO
2IG7	VPI	AGM4G427	2IG7	G577	10987, 15397, 19807, 24217, 28627, 33037, 37447	nornvirus HU/GII/SBDUII 43I/K0R/20I0
2IG8	VPI	AGM4G43I	2IG8	G578	10988, 15398, 19808, 24218, 28628, 33038, 37448	nornvirus HU/G[I/SEOUII 45D/K0R/2DI1
2IG9	VPI	AGNII43D	2IG9	6579	10989, 15399, 19809, 24219, 28629, 33039, 37449	narovirus Hu/GIV.I/CCDC GRIII3-59/CHN/20II
2I7G	VPI	AGGG4038	2I7D	6580	10990, 15400, 19810, 24220, 28G30, 33040, 37450	norovirus Hu/GII.3/TCH-l04/USA/2002
2171	VPI	AG0G4D40	2171	6581	10991, 15401, 19811, 24221, 28631, 33041, 37451	norovirus Hu/GII.7/TCH-I34/USA/20G3
2172	VPI	AGQG4D42	2172	6582	10992, 15402, 19812, 24222. 28B32, 33042, 37452	norovirus Hu/GII.I2/Texas/EI3842/USA/20GQ
2173	VPI	AGS4I450	2173	G583	10993, 15403, 19813, 24223, 28B33, 33043. 37453	norovirus Hu/GII.4 2006b/092895/2008/USA
2174	VPI	AGTG252I	2174	6584	10994, 15404, 19814, 24224, 28B34, 33044, 37454	norovirus Hu/GI.6/TCH-099/USA/2003
2175	VPI	AGTG2523	2175	6585	10995. 15405, 19815, 24225, 28635. 33045, 37455	norovirus Hu/GII.2/TCH-5B0/USA/2D02
2I7G	VPI	AGV4D22I	2I7G	658G	10996. 15406, 19816, 2422G, 28B3B, 3304B, 37456	narovirus Hu/GII.4/JPI0909/20I2/JPN
2177	VPI	AGV76553	2177	6587	10997, 15407. 19817. 24227, 28B37. 33047, 37457	norovirus Hu/GII.4/35444252/AUS/20I2
2178	VPI	AGV7G554	2178	6588	10998, 15408, 19818, 24228, 28B38, 33048, 37458	norovirus Hu/GII,4/30934022/AUS/20I2
2179	VPI	AGV7B555	2179	6589	10999, 15409, 19819. 24229, 28B39, 33049. 37459	norovirus Hu/GII.4/937B22BI/AUS/2DI2
2180	VPI	AGV7G55G	2180	6590	IIDOO, 15410. 19820, 24230, 28B40, 33050, 37460	norovirus Hu/GII.4/2I859972/AUS/ZOI3
2181	VPI	AGV7G557	2181	6591	IIOOI, 15411, 19821, 24231, 28641, 33051, 37461	narovirus Hu/GII.4/2I8599G4/AUS/20I2

2182	VP1	AGV7B558	2182	B592	11002. 15412. 19822. 24232, 28642, 33052, 374B2	norovirus Hu/GII.4/2l859969/AUS/20l3
2183	VP1	AGV7B559	2183	B593	11003, 15413, 19823, 24233, 28B43, 33053, 374B3	norovirus Hu/GII.4/2l859973/AUS/20l3
2184	VPI	AGV7B5BD	2184	B594	11004, 15414, 19824, 24234, 28B44, 33054, 374B4	norovirus Hu/GII.4/2l85 9977/AUS/20l3
2185	VPI	AGV765BI	2185	B595	11005, 15415, 19825, 24235. 28B45. 33055, 374B5	norovirus Hu/GII.4/2l859978/AUS/20l3
2I8B	VPI	AGV7B5G2	2I8B	B59B	IIOOB. 15416, I982B, 24236, 28B46, 3305B, 37466	norovirus Hu/GII.4/2l859980/AUS/20l3
2187	VPI	AGV7B5B3	2187	B597	11007, 15417, 19827, 24237, 28647, 33057, 37467	norovirus Hu/GII.4/3376503l/AUS/20l2
2188	VPI	AGV7B5B4	2188	B598	11008, 15418, 19828, 24238, 28648, 33058. 37468	norovirus Hu/GII.4/32973745/AUS/20l2
2189	VPI	AGV7B5B5	2189	6599	11009, 15419, IB829, 24239, 28649, 33059, 37469	norovirus Hu/GII.4/3476073l/AUS/20l2
2I9D	VPI	AGV7B5BB	2I9D	BBOD	IIOIO, 15420, 19830, 24240, 28650, 33060, 37470	norovirus Hu/GII.4/30949403/AUS/20l2
2191	VPI	AGV7B5B7	2191	BBDI	IIOII, 15421, 19831, 24241, 28651, 33061, 37471	norovirus Hu/GII.4/35857786/AUS/2DI2
2192	VPI	AGV7B5B8	2192	BBD2	10 12, 15422, 19832, 24242, 28B52, 33062, 37472	norovirus Hu/GII.4/36l26758/AUS/20l3
2193	VPI	AGV7G5B9	2193	BBD3	11013, 15423, 19833, 24243, 28B53, 33063, 37473	norovirus Hu/GII.4/36285l94/AUS/20l2
2194	VPI	AGV7B57Q	2194	BBD4	11014, 15424, 19834, 24244, 28B54, 33064, 37474	norovirus Hu/GII.4/90l8G7IO/AUS/20l2
2195	VPI	AGV7B57I	2195	BBD5	11015, 15425, 19835. 24245, 28655, 33065, 37475	norovirus Hu/GII.4/3099B947/AUS/20l2
2I9B	VPI	ABV7B572	2I9B	BBD6	11016, 15426, 1983B 2424B, 28656, 33066, 37476	norovirus Hu/GII,4/35408489/AUS/20l2
2197	VP!	AGV7G573	2197	BBD7	11017, 15427, 19837, 24247, 28657, 33067, 37477	norovirus Hu/GII.4/ll992339/AUS/20!2
2198	VPI	AGV7B574	2198	BBG8	11018, 15428, 19838, 24248. 28658, 330B8, 37478	norovirus Hu/GII.4/3450GI58/AUS/20l2

2I93	VPI	AGV7B575	2I93	BBB9	IIOIB, I5423, I3839, 24249, 28B59. 33BBB, 3747B	nDrovirus Hu/GII.4/34790954/AUS/20I3
22DD	VPI	AHA44844	22B0	BBIB	II020, I5430, I3840, 2425B, 28BB0, 33070, 37480	norovirus Hu/GII.4/AlbertaEI063/2OI2/CA
220I	VPI	AHA44847	220I	BBII	II02I, I543I, I384I, 2425I, 28BBI, 33071, 3748I	narovirus Hu/BfI.4/AlbertaEI3S7/20!1/CA
2202	VPI	AHBB2404	22D2	BBI2	II022, I5432, I9842, 24252, 28BG2, 33072, 37482	norovirus Hu/GII.4/Jiangsul/ZDII/CHN
2203	VPI	AHBB240B	2203	BBI3	II023, I5433, I9843, 24253, 28BB3, 33073, 37483	NoROviRUs Hu/Gf[.4/Jiangsu2/2D12/CHN
2204	VPI	AID5I5I5	2204	BBI4	II024, I5434, I3844, 24254. 28BB4, 33D74, 37484	noravirus I2-AS-I/2DI2/GII.4
2205	VPI	AID5I5I7	2205	BBI5	11025. 15435, 19845, 24255, 28BB5, 33075, 37485	norovirus I3-AV-I-6/20I2/GII.4
220B	VPI	AID5I5I9	220B	GBIG	II026, 15436, 19846, 24256, 28666, 33076, 37486	norovirus I3-AV-I-I0/20I2/GII.4
2207	VPI	AID5I522	2207	GBI7	11027, 15437, 19847, 24257, 286B7, 33077, 37487	norovirus I3-BE-4/20I2/GII.4
2208	VPI	AI05I53I	2208	G6I8	11028, 15438. 19848, 24258, 28668, 33078. 37488	norovirus I2-CG-2-4/20I2/GII.4
2209	VPI	AID5I534	220B	66I9	11029, 15439, 19849, 24259, 28660, 33079, 37489	norovirus I3-Z-2/2DI2/GII.4
22I0	VPI	AIL49840	22I0	BB20	11030, 15440. I985D, 242B0, 28670, 33080. 37490	norovirus JB03I230054/Luohu/0B/I2/20I2/SZ/CHN
22II	VPI	AIL49843	22II	B621	11031, 15441, 19851, 24261, 28671, 33081, 37491	norovirus JB03I230049/Nanshan/0B/I2/20I2/SZ/CHN
22I2	VPI	AIV999I4	22I2	BG22	11032, 15442, 19852, 24262, 28672, 33082. 37492	norovirus Hu/GII.4/gg-I2-08-04/20I2/KR
22I3	VPI	AJPI3BI9	22I3	G623	11033, 15443. 19853, 24263, 28G73, 33083, 37493	norovirus GI.2
22I4	VPI	AJPI3B20	22I4	6B24	11034, 15444, 19854, 242G4, 28G74, 33084. 37494	norovirus GI.3
22I5	VPI	AJPI3B2I	22I5	BG25	11035, 15445, 19855, 24265, 28B75, 33085, 37495	norovirus GII.3

22IG	VPI	AJPI3B22	22IB	BB2B	II03B, I544B, I985B, 242BB, 28676, 3308B, 3749B	norovirus GII.6
22I7	VPI	AJPI3B23	22I7	BB27	11037, 15447, 19857, 242B7, 28B77, 33087, 37497	norovirus GII.I2
22I8	VPI	AJWB7354	22I8	BB28	11038, 15448, 19858, 242B8, 28B78, 33088, 37498	norovirus Hu/GI.Pb/GI.G/Kaohsiung/14-A-7/2014/TW
22IB	VPI	AJWB7357	22IB	BB29	11039, 15449, 19850. 242B9, 28B79, 33080, 37499	norovirus Hu/GII.P7/GII.G/HualiEn/I4-AR-I/20I4/TW
2220	VPI	AJW67359	2220	BB30	11040, 15450, I98B0, 24270, 28B80, 33090, 37500	norovirus Hu/GII.P7/GII.6/New/Taipei/I4-AG-3/2014/TW
222I	VPI	AJWB73B2	222I	BB3I	11041, 15451, 19861. 24271, 28681, 33091, 37501	norovirus Hu/GII.P7/GII.6/Kaohsiung/I4-Z-2/2014/TW
2222	VPI	AJW67368	2222	BB32	11042, 15452, I98B2, 24272, 28682, 33092, 37502	norovirus Hu/GII.P22/GII.5/Kaohsiung/I2-AV-I/20I2/TW
2223	VPI	AJWB737I	2223	BB33	11043, 15453, I98B3, 24273, 28B83, 33093, 37503	norovirus Hu/GII.P22/GII.5/Taoyuan/I2-BB-4/2012/TW
2224	VPI	AJWB7374	2224	BB34	11044, 15454, I98B4, 24274, 28B84, 33094, 37504	norovirus Hu/GII.PI6/GII.I3/NBw/Taipei/I3-BA-I/2013/TW
2225	VPI	AJWB7377	2225	BB35	11045, 15455, I98B5, 24275, 28B85, 33095, 37505	norovirus I4-H-2/20I4/GI.P4/GI.4
222B	VPI	AJXI8IB0	222G	BB3B	II046, I545B, I98B6, 24276, 28686, 33096, 37506	norovirus 07-AF-I/2007/GII.P22/GII.5
2227	VPI	AJXI8I93	2227	BB37	11047, 15457, I98B7, 24277, 28687. 33097, 37507	norovirus II-FM-I/20II/GII.P22/GII.5
2228	VPI	AJZ77004	2228	BB38	11048, 15458, 19868, 24278, 28688, 33008, 37508	norovirus 06-AM-II/2006/GII.4/YersekB/20BGa
2229	VPI	AJZ770I0	2229	BB39	11049, 15459, 19869, 24279, 28B89, 33099. 37509	norovirus 08-F-2/2008/GII.4/D enHaag/2006b
2230	VPI	AJZ770I3	2230	BB40	11050, I54B0, 19870, 24280, 28B90, 33100, 37510	norovirus 08-W-I/2008/GII.4/A pBldoorn/2007
223I	VPI	AJZ770I5	223I	BB4I	11051, I5461, 19871, 24281, 28B91, 33101, 37511	norovirus 09-BI-2/20D9/GII.4/NBw0rlBans/200B
2232	VPI	AJZ770I9	2232	BB42	11052, 15462, 19872, 24282, 28692, 33102, 37512	norovirus 09-N-I/2009/GII.4/DenHaag/2006b

2233	VPI	AJZ77D22	2233	GG43	11053. I54B3, 19873, 24283, 28B03, 33103, 37513	norovirus I3-Z-2/2DI3/GII.Pe/GII.4/Sydn By
2234	VPI	AJZ77027	2234	GG44	11054, I54B4, 19874, 24284, 28694, 33104, 37514	norovirus I2-BA-I/20I2/GII.Pe/GII.4/Sydn By
2235	VPI	AJZ77030	2235	GG45	11055, I5465, 19875, 24285, 28695, 33105, 37515	norovirus I2-CG-2-4/20I2/GII.P B/GII.4/Sydney
223G	VPI	AJZ77033	223G	G64G	11056, 15466, 19876, 24286, 28696, 33I0G, 37516	norovirus I2-AY-I/20I2/GII.4/New0rleans/200g
2237	VPI	AJZ7703G	2237	GG47	11057, I54B7, 19877, 24287, 28697, 33107. 37517	norovirus I2-AY-2/2OI2/6II.4/NewOrlEans/2009
2238	VPI	AKE3I849	2238	GG48	11058, I54B8, 19878, 24288, 28698, 33108, 37518	norovirus Hu/GII.4/PRG87G/20IO/ITA
2233	VPI	AKE3I852	2239	GG49	11059, I5469, 19879, 24289. 28699, 33109. 37519	norovirus Hu/GII.4/PRII47I/20II/ITA
224D	VPI	AKE3I855	224D	GG5D	HOBO, 15470. 19880. 24290. 28700. 33110, 37520	norovirus Hu/GII.4/PR784I/20II/ITA
224!	VPI	AKE3I858	2241	G651	IIOBI, 15471, 19881, 24291, 28701, 33111, 37521	norovirus Hu/GII.4/PR9474/20II/ITA
2242	VPI	AKE3I86I	2242	GG52	11062. 15472. 19882. 24292, 28702, 33112. 37522	norovirus Hu/GII.4/PR328/20I3/ITA
2243	VPI	AKE3I8G4	2243	GG53	11063, 15473, 19883. 24293. 28703, 33113, 37523	norovirus Hu/GII.4/PA28B/2DII/ITA
2244	VPI	AKE3I867	2244	GG54	11064, 15474, 19884, 24294, 28704, 33114, 37524	norovirus Hu/GII.4/PA278/20II/ITA
2245	VPI	AKE3I870	2245	G655	11065, 15475, 19885. 24295, 28705, 33115, 37525	norovirus Hu/GII.4/PA330/20II/ITA
224G	VPI	AKE3I873	2246	GG5G	11066, 15476, 19886, 24296, 28706, 33116, 37526	norovirus Hu/GII.4/PA59/20I2/ITA
2247	VPI	AKE3I876	2247	6G57	11067, 15477, 19887, 24297, 28707, 33117. 37527	norovirus Hu/GII.4/PA99/20I2/ITA
2248	VPI	AKF02368	2248	BG58	11068. 15478, 19888, 24298. 28708, 33118, 37528	norovirus Gil
2249	VPI	AKF42429	2249	6G59	11069, 15479, 19889, 24299, 28709, 33119, 37529	narovirus Gil

Z25D	VPI	AKF42434	2250	B66D	II070, I5480, I3830, 24300. 287I0. 33I20, 37530	norovirus GiI
225I	VPI	AKF42437	225I	66GI	1I07I, I548I, I3B9I. 2430I, 287II, 33I21, 3753I	norovirus GII
2252	VPI	ALA27427	2252	66G2	II072, I5482, I3892, 24302. 287I2, 33I22. 37532	norovirus Hu/GII.P4_GII.4/Min prva/2006/USA
2253	VPI	ALD0B6I8	2253	6BB3	II073. I5483, I9893. 24303, 287I3. 33I23, 37533	norovirus Hu/GII.PI7_GII.I7/PR6G8/20I5/ITA
2254	VPI	ALM96644	2254	6664	II074. I5484, I9894. 24304, 287I4, 33I24, 37534	noravirus Hu/GII.4/SPHC2048/20I2/CHN
2255	VPI	ALM96B45	2255	6665	1I075, I5485, I3835, 24305, 287I5, 33I25, 37535	norovirus Hu/GII.4/SPHC27I5/2DI2/CHN
2256	VPI	ALM96646	225B	6666	II07B, I5486. I3896, 2430B, 287I6. 33I2B, 3753B	noravirus Hu/GII.4/SPHCII34/20I2/CHN
2257	VPI	ALM96647	2257	6667	II077, I5487, I98B7, 24307, 28717, 33127, 37537	norovirus Hu/GII.4/SPHCII83/20I2/CHN
2258	VPI	ALM9889I	2258	6668	11078, 15488, 19898, 24308, 28718, 33128, 37538	norovirus GiI
2259	VPI	ALMB88B2	2259	6663	11079, 15483, 13893, 24303, 28719, 33129, 37533	noravirus GiI
2260	VPI	ALM988B3	22BD	6670	11080, 15430, I39DD, 24310. 2872D, 33130, 37540	norovirus GiI
226I	VPI	ALM98894	226I	BB7I	11081, 15491, 13301. 24311, 28721, 33131, 37541	norovirus GiI
2262	VPI	ALM98895	2262	6672	11082, 15492, 13902, 24312, 28722, 33132, 37542	norovirus GiI
2263	VPI	ALM9889B	2263	6G73	11083, 15433, 13303, 24313, 28723, 33133, 37543	norovirus GiI
2264	VPI	ALM98897	2264	6674	11084, 15434, I9B04, 24314, 28724, 33134, 37544	norovirus GiI
2265	VPI	ALM98899	2265	6B75	11085, 15495, 13305, 24315, 28725. 33135, 37545	noravirus GiI
2266	VPI	ALM9890I	22BB	6B7B	11086, I543B, I390B, 243IB, 28726, 33I3B. 37546	norovirus GiI

22B7	VP1	ALM98e07	22B7	BB77	II087, I5497. I9907, 243I7, 28727, 33I37. 37547	noravirus Gil
22G8	VP1	ALM98910	22B8	BG78	II088, I5498, 19308. 24318, 28728. 33138, 37548	norovirus Gil
22B9	VP1	ALM989I3	22B9	BG79	11089, 15499, 19909, 24310, 28729, 33139, 37549	noravirus Gil
227D	VPI	ALM989IB	2270	BG80	11090, 15500, 19910, 24320, 28730, 33140, 37550	noravirus Gil
227I	VPI	ALT54478	227I	BB8I	11091, 15501, 19911, 24321, 28731, 33141, 37551	noravirus Hu/GII.4/AlbertaEI350/2014/CA
2272	VPI	ALT54488	2272	BB82	11092, I55D2, 19912, 24322, 28732, 33142, 37552	norovirus Hu/GI.7/AlbertaEI404/2012/CA
2273	VPI	ALT5449I	2273	GB83	11093, 15503, 19913, 24323, 28733, 33143, 37553	norovirus Hu/GII.4/AlbertaSPI/2DIZ/CA
2274	VPI	ALT54494	2274	BB84	11094, 15504, 19914, 24324, 28734, 33144, 37554	norovirus Hu/GII.4/AlbertaSPI/2013/CA
2275	VPI	BAMB5003	2275	BB85	11095, 15505, 19915, 24325, 28735, 33145, 37555	norovirus Hu/GI.7/2009/Miyagi/JP
227B	VPI	BAMB5005	227B	GB8B	11096, I550B, 19916, 24326, 28736, 33146, 37556	norovirus Hu/0ll.3/2009/Miyagi/JP
2277	VPI	BAMB5007	2277	GB87	11097, 15507, 19917. 24327. 28737, 33147, 37557	noravirus Hu/GII.B/2009/Miyagi/JP
2278	VP1	CCX28B04	2278	GG88	11098, I55D8, 19918, 24328, 28738, 33148, 37558	norovirus Hu/Gli.4/C000DG63I/20!I/UK
227B	VPI	CCX28B07	2279	GB89	11099, 15509, 19919, 24329, 28739, 33149, 37559	norovirus Hu/GII.4/C00007876/20ll/0K
2280	VPI	CCX28BI9	2280	BG90	111OO. 15510, 19920, 24330, 28740, 33150, 37560	norovirus Hu/GII.4/C00D07892/20ll/0K
228I	VPI	CCX28B22	228I	BB9I	11101,15511,19921,24331,28741, 33151, 375BI	norovirus Hu/GII.4/CD0007893/20ll/0K
2282	VPI	CCX28B25	2282	G692	IIID2, 15512, 19922, 24332, 28742, 33152, 375B2	norovirus Hu/GII.4/C00007B04/20ll/UK
2283	VPI	CCX28B28	2283	G693	11103, 15513, 19923, 24333, 28743, 33153, 375G3	norovirus Hu/GII.4/C00007905/20ll/UK

2284	VPI	CCX28B3I	2284	6B94	III04, I55I4. I9924. 24334, 28744, 33I54, 375B4	noravirus Hu/G11.4/C00DD73I5/2DI0/UK
2285	VPI	CCX28B34	2285	BB95	III05, I55I5, I9925, 24335, 28745, 33I55, 37565	norovirus. Hu/GII.4/C000079I6/20II/UK
228B	VPI	CCX28B37	228B	BB9B	IIIOB, I55IB, I9B2B, 2433B, 2874B, 33I5B, 375BB	narovirus Hu/GII.4/C000079I8/20II/UK
2287	VPI	CCX28B4D	2287	BG97	III07, I55I7. I9927, 24337, 28747, 33157, 375B7	norovirus Hu/GII.4/C00007927/20I0/UK
2288	VPI	CCX28B43	2288	BB98	11108, 15518, 19928, 24338, 28748, 33158, 375B8	noravirus Hu/BII.4/CDDDD7328/20II/UK
2289	VPI	CCX28B4B	2289	B699	IIIOB. 15519, 19929, 24339, 28749, 33159. 375B9	norovirus Hu/GII.4/C00007934/20I0/UK
2290	VPI	CCX28B49	229D	B700	IIIIO, 15520, 19930, 24340, 28750. 33IB0, 37570	norovirus Hu/GII.4/C0000794I/20II/UK
229!	VPI	CCX28B52	2291	B70I	11111,15521.19931,24341.28751, 33IBI, 37571	norovirus Hu/GII.4/C00007952/20II/UK
2292	VPI	AEEIDOOO	2292	B702	IIII2, 15522, IB932, 24342, 28752, 33IB2, 37572	murine norovirus GV/NIH-2409/2005/USA
2293	VPI	AEEID0I2	2293	B703	IIII3, 15523, 19933, 24343, 28753, 33IB3, 37573	murine norovirus GV/NIH-2750/2005/USA
2294	VPI	AGJ52I72	2294	B704	IIII4, 15524, I9934, 24344, 28754, 33IB4, 37574	norovirus Hu/GII.4/Huzhnul2I/20I2/CHN
2295	VPI	AGJ52I73	2295	B705	IIII5, 15525, 19935, 24345, 28755, 33IB5, 37575	norovirus Hu/GII.4/Huzhoul22/2DI2/CHN
2296	VPI	AGJ52I74	229B	B70B	IIIIB, I552B, 19936, 2434B, 28756, 33166, 37576	norovirus Hu/GII.4/Huzhoul28/20I2/CHN
2297	VPI	AGJ52I7B	2297	B707	IIII7, 15527, 19937, 24347, 28757, 33IB7, 37577	norovirus Hu/GI/HuzhouNI0/2008/CHN
2298	VPI	A0085555	2298	B708	IIII8, 15528, 19938, 24348, 28758, 33IB8, 37578	norovirus Hu/GIIg-GIII2/Velence/HUN44I7/20I0/HUN
2299	VPI	AFD84D35	2299	B709	HUB, 15529, 19939, 24349. 28759, 33169, 37579	murine norovirus
23DD	VPI	AFND99I8	2300	B7I0	11120, 15530, 19940, 24350. 287B0, 33170, 37580	norovirus Hu/GII-4/CGMH0I/200G/TW

230I	VPI	AFN0992I	230I	B7II	III2I, I553I, I994I, 2435I, 287BI, 33I71, 3758I	norovirus Hu/G!i-4/CGMHD2/2D0B/TW
2302	VPI	AFN09924	2302	B7I2	III22, I5532. I9942, 24352, 287B2, 33I72, 37582	nornvirus Hu/GII-4/CGMH03/20DB/TW
23D3	VPI	AFN09927	2303	B7I3	III23. I5533, I9B43, 24353, 287B3, 33I73, 37583	norovirus Hu/GII-4/CGMH04/20DB/TW
2304	VPI	AFN09930	2304	B7I4	III24, I5534, I9944, 24354, 287B4, 33I74, 37584	norovirus Hu/GII-4/CGMH05/200B/TW
2305	VPI	AFN09933	23D5	B7I5	III25, I5535, 19345. 24355, 287B5, 33I75, 37585	norovirus Hu/GII-4/CGMH0G/200B/TW
2306	VPI	AFN0993B	230B	B7IB	III2B, I553B, I994B, 2435B, 287BB, 33I7B, 3758B	norovirus Hu/GII-4/CGMH07/200B/TW
2307	VPI	AFN0993	2307	B7I7	11127, 15537, 19947, 24357, 287B7, 33I77, 37587	norovirus Hu/GII-4/CGMH08/200B/TW
2308	VPI	AFND9942	2308	B7I8	11128, 15538, 19948, 24358, 287B8, 33I78, 37588	norovirus Hu/GII-4/CGMH09/200G/TW
2309	VPI	AFND9945	2309	B7IB	11129. 15539, 19949, 24359, 287B9, 33179, 37589	norovirus Hu/GII-4/CGMHI0/20DB/TW
23I0	VPI	AFN09948	23I0	B720	11130. 15540, 19950, 243B0, 28770, 33180, 37590	norovirus Hu/GII-4/CGMHII/200B/TW
23II	VPI	AFN0995I	23II	B72I	III3I, 15541, 19951, 243B1, 28771, 33181, 37591	norovirus Hu/GII-4/CGMHI2/20D7/TW
23I2	VPI	AFN09954	23I2	G722	11132, 15542. 19952, 243B2, 28772, 33182, 37592	nornvirus Hu/GII-4/CGMHI3/2007/TW
23I3	VPI	AFN09957	23I3	B723	11133. 15543, 19953, 243B3, 28773, 33183, 37593	norovirus Hu/GII-4/CGMHI4/2007/TW
23I4	VPI	AFN099B0	23I4	G724	11134, 15544, 19954, 243B4, 28774. 33184, 37594	norovirus Hu/GII-4/CGMHI5/2007/TW
23I5	VPI	AFN099B3	23I5	B725	11135. 15545, 19955, 243B5, 28775, 33185, 37595	norovirus Hu/GII-4/CGMHIB/2007/TW
23I6	VPI	AFN099B6	23IB	G72B	III3B, I554B, I995B, 243BB, 2877B, 33I8B. 3759B	norovirus Hu/GII-4/CGMHI7/20D7/TW
23I7	VPI	AFN099B9	23I7	6727	11137. 15547, 19957, 243B7, 28777, 33187, 37597	norovirus Hu/GII-4/CGMHI8/2008/TW

2318	VPI	AFN09872	2318	B728	III38. I5548, I9958, 243B8. 28778, 3318B. 37538	norovirus Hu/GII-4/CGMHI9/2009/TW
2319	VPI	AFN03B75	231B	B729	IH3e, I554B. IB353, 24369. 28773. 3318B. 37539	norovirus Hu/GII-4/CGMH20/2009/TW
232D	VPI	AFN09978	2320	B73B	III40. I5550. I99B0. 24370, 28780, 3313O, 37B00	norovirus Hu/GII-4/CGMH2I/20IO/TW
232I	VPI	AFN0B88I	232I	B73I	III4I. I555I, I336I, 2437I, 28781, 33191, 37B0I	norovirus Hu/GII-4/CGMH22/20IO/TW
2322	VPI	AFND9B84	2322	B732	III42, I5552, I3362, 24372, 28782, 33132. 37602	norovirus Hu/GII-4/CGMH23/20ID/TW
2323	VPI	AFNQ9987	2323	B733	11143. 15553, I33B3, 24373, 28783, 33193, 37603	norovirus Hu/GII-4/GGMH24/20IO/TW
2324	VPI	AFN0933Q	2324	B734	11144, 15554, 19364, 24374, 28784, 33134, 37B04	norovirus Hu/GII-4/CGMH25/20IO/TW
2325	VPI	AFN0993	2325	B735	11145, 15555, 19965, 24375, 28785, 33195, 37B05	norovirus Hu/GII-4/CGMH2B/20IO/TW
232B	VPI	AFN0999B	232B	B73B	11146, 15556, 10966, 24376, 2878B, 33196, 37606	norovirus Ho/GII-4/CGMH27/20IO/TW
2327	VPI	AFN09999	2327	B737	11147, 15557, 19967, 24377, 28787, 33197, 37607	norovirus Hu/GII-4/CGMH28/20IO/TW
2328	VPI	AGC9B523	2328	B738	11148, 15558, 19968, 24378, 28788, 33198, 37608	norovirus Hu/GII.4/BZ20ID-L26/Guangzhnu/CHN/20I0
2328	VPI	AGC96532	2323	B739	11149, 15559, 19969, 24379, 28789, 33199, 37609	norovirus hVGII.4/GZ20!0-L87/Guangzhou/CHN/20II
2330	VPI	AGC3B535	2330	B740	III5D, 15560, 19970, 24380, 28790, 33200, 37610	norovirus Hu/GII.B/GZ2DID-L9G/Guangzhou/CHN/20II
233I	VPI	AGSIBB30	233I	B74I	III5I, 15561. 19971, 24381, 28791, 33201, 37611	norovirus Hu/GII.4/Guangzhou/GZ2DI0-L88/CHN/20II
2332	VPI	AGSIBB33	2332	B742	11152, 15562. 19972. 24382. 28792, 33202, 37612	norovirus Hu/GII.4/Guangzhou/GZ20IO-L9I/CHN/20II
2333	VPI	ALM389I9	2333	B743	11153, 15563, 19973, 24383, 28733, 33203, 37613	norovirus Gil
2334	VPI	ALM38B22	2334	G744	11154, 15564, 13374, 24384, 28734, 33204, 37614	norovirus Gil

2335	VPI	ALM98928	2335	B745	III55, I5565, I9975, 24385, 28795. 33205, 376I5	naravirus Gil
233B	VPI	ALM9803I	233B	B74B	III5B, I55BB, I997B, 24386, 28796, 332D6, 376IB	naravirus Gil
2337	VPI	ALM98934	2337	B747	III57, I5567, I9977, 24387, 28797, 332D7, 37BI7	norovirus Gil
2338	VPI	ALM9894D	2338	B748	III58, I55B8, 19378, 24388, 28788, 33208, 37B18	naravirus Gil
2339	VPI	ALM98943	2339	6749	11159. 15569, 19979, 24389, 28799, 33209, 37619	naravirus Gil
234D	VPI	ABD7393B	234D	B75D	11160, 15570, 19980. 24390. 28800, 33210, 37B20	naravirus Hu/GII/Carlow/20D2/Ire
234I	VPI	ABYB7257	234I	B75I	IIIBI, 15571, 19981. 24391, 28801, 33211, 37621	naravirus Bo/GIII.I/Aba-Z5/2002/H0N
2342	VPI	AHA9IB5B	2342	B752	IIIB2, 15572, 19982, 24392, 28802, 33212, 37622	naravirus GI.9
2343	VPI	BALBD747	2343	B753	11163, 15573, IB983, 24393, 28803, 33213, 37623	naravirus Hu/GII.2/DC0504I/2005/JP
2344	VPI	BALBD75I	2344	B754	11164, 15574, 19984, 24394, 28804, 33214, 37624	naravirus Hu/GII.2/0C05I43/2005/JP
2345	VPI	BALB07B3	2345	B755	11165, 15575, 19985, 24395, 28805. 33215, 37625	naravirus Hu/GII.2/0C07I07/2007/JP
234B	VPI	BALBD7B5	234B	B75B	11166, I557B, 19986, 24396, 2880B, 332IB, 3762B	naravirus Hu/GII,2/0C08079/20D8/JP
2347	VPI	BALBD787	2347	B757	IIIB7. 15577, 19987, 24397. 28807. 33217, 37B27	naravirus Hu/GII.2/0C09072/20D9/JP
2348	VPI	BALBD789	2348	B758	IIIB8, 15578, 19988, 24398, 28808, 33218, 37628	noravirus Hu/GII.Z/DCD9D94/2DD9/JP
2349	VPI	BALBD8D7	2349	6759	11169, 15579, 19989, 24399, 28809, 33218, 37629	norovirus Hu/GII.2/OCI0058/20IO/JP
235D	VPI	ACLI4997	235D	B76D	11170, 15580, 19990, 24400, 28810, 33220, 37B30	naravirus Hu/GII/2005/6675/ChBlyabinsk/RUS
235I	VPI	ACB5B49D	235I	676I	III7I, 15581, 19991, 24401, 28811, 33221, 37B3I	norovirus Hu/GII-4/Beijingl5l/2DD7/China

2352	VPI	ACF77ID6	2352	6762	III72, I5582, I9992, 24402, 288I2. 33222. 37632	norovirus Hu/GII.4/BJ222/2008/CHN
2353	VPI	ACF77I07	2353	6763	III73. 15583, I9993, 24403, 288I3, 33223, 37633	noravirus Hu/BII.4/BJZ25/2D0B/CHM
2354	VPI	ACU288D7	2354	6764	III74, I5584, I9994, 24404, 288I4, 33224, 37634	norovirus Hu/ GII.4/ HK/CU09N7/20D9/ CHN
2355	VPI	ACU288D8	2355	6765	III75, I5585, I9995, 24405, 288I5. 33225, 37635	norovirus Hu/GII.4/HK/CUDBNB/ZDD9/CHN
2356	VPI	ACV03476	2356	6766	III76, I5586, I9996, 24406. 288I6, 33226, 37636	nurovirus Hu/GII.4/Tianjin/75/2008/CHN
2357	VPI	ACV03479	2357	6767	III77, I5587, I9997, 24407, 288I7, 33227, 37637	noravirus Hu/GII/Tianjin/510/2003/CHN
2358	VPI	AFN70960.I	2358	6768	III78, 397I7, I5588, IB998, 24408, 28818, 33228, 37638	norovirus Hu/GII.4/03I6B3/USA/2003
235B	VPI	X8I879	2353	6769	11179, I558B, 19999, 24403, 28819, 33229, 37639	human calicivirus strain Melkshsm
2360	VPI	FJ875D27	2360	6770	11180, 15590, 20000, 24410, 28820, 33230, 37640	norovirus dog/GVI.I/Bari/BI/2007/ITA
2361	VPI	JFB39D46	236I	677I	III8I, 15591. 20001, 24411, 28821, 33231, 37641	norovirus dog/FD2IO/2007/lta
2362	VPI	JF939D689	2362	6772	11182, 15592, 20002, 24412, 28822, 33232, 37642	norovirus dog/FD53/2007/lta
2363	VPI	GQ4436II	2363	6773	11183, 15593, 20003, 24413, 28823, 33233, 37643	norovirus dog/C33/Viseu/2007/PRT
2364	VPI	EU224456	2364	6774	11184, 15594, 20004, 24414, 28824, 33234, 37644	norovirus dog/170/07/lta
2365	VPI	EF45Q827	2365	6775	11185, 15595, 20005, 24415, 28825, 33235, 37645	nurovirus lion/GIV.2/Pistoia/387/06/ITA
2366	VPI	JF78I268	2366	6776	11186, 15596, 20006, 24416. 28826, 33236, 37646	norovirus cat/GIV.2/CU08I2IDE/USA/20IO
2367	VPI	KT245I36	2367	6777	11187. 15597, 20007, 24417, 28827, 33237, 37647	norovirus cat/GVI,2/TE/77-I3/ITA
2368	VPI	AJ844470	2368	6778	11188. I55B8, 20008, 24418, 28828, 33238, 37648	Norwalk virus Hu/NV/Chiba/040502/2004/JP

2369	VPI	KJI9B29I	23G9	G779	1118 9, 15599, 20009, 244IB, 28829. 33239, 37649	norovirus GII/Hu/JP/2QII/GII/Yuzawa/Gira2HS
2370	VPI	KU87G455	237Q	G780	1190. I5G00, 20010. 24420. 28830. 33240, 37650	narnvirus GII.B
2371	VPI	AF4I44D8	2371	G78I	III9I, 15601, 20011, 24421, 28831, 33241, 37651	Horwalk-like virus HLV/Baltimore/274/1333/OS
2372	VPI	ABD8407I	2372	6782	11192. 15602, 20012, 24422, 28832. 33242, 37652	Horwalk-like virus
2373	VPI	AF4I44Q7	2373	G783	1193, 15603, 20013, 24423. 28833, 33243, 37653	Horwalk-like virus NLV/Florida/2B9/1993/0S
2374	VPI	AB039777	2374	6784	1194, I5B04, 20014, 24424, 28834. 33244, 37654	Norwalk-like virus
2375	VPI	AB078337	2375	6785	1195, 15605, 20015, 24425, 28835, 33245, 37G55	Norwalk-like virus
237G	VPI	AB D39 77G	237G	6786	1196, I5B06, 20016, 24426, 2883B, 3324B, 37B56	Horwalk-like virus
2377	VPI	KT030G74	2377	6787	11197. 15607, 20017. 24427. 28837, 33247, 37657	norovirus GIV.I
2378	VPI	DQG93QG7	2378	6788	11198, 15608, 20018, 24428, 28838, 33248, 37B58	Horwalk virus
2379	VPI	AFI95847	2379	6789	1199. I5B09. 2D0I9. 24423. 28833, 33243, 37659	human norovirus - Alphatron
2380	VPI	JQ97Q479	238D	6790	11200, 15610, 20020, 24430, 28840, 33250, 37B60	norovirus Hu/GIV.I/Ahrensh.Dp246/DE0/2QI2
2381	VPI	FM8G54I2	2381	6791	IIZDI. I5BII, 20021, 24431, 28841. 33251, 37661	norovirus Hu/GIV.I/ltaly/B80/2OO7/ITA
2382	VPI	AF4I442G	2382	G792	11202, 15612, 20022, 24432. 28842, 33252, 37BB2	Horwalk-like virus NLV/Fort Laudɐrdale/5B0/IS98/US
2383	VPI	AF4I4427	2383	G793	11203, 15613. 20023, 24433, 28843, 33253, 376B3	Horwalk-like virus HLV/Saint Cloud/B24/l338/US
2384	VPI	JQGI35G7	2384	B7B4	11204, 15614, 20024, 24434. 28844, 33254, 37664	norovirus Hu/GIV.I/LakeMacquarie/HSW2680/20IO/AO
2385	VPI	KC89473I	2385	G795	11205, 15615, 20025, 24435, 28845, 33255, 37665	norovirus Hu/GIV.I/CCDC GRIII3-59/CHN/20II

2386	VP1	AF427118	2386	B79B	1206, 1561B, 20026, 2443B, 28846, 33256, 37BBB	human calicivirus NLV/Erfurt/546/D0/DE
2387	VP1	AY2374I5	2387	6797	12D7, 1561 7, 20027, 24437, 28847, 33257, 37B67	human calicivirus strain Mc37
2388	VP1	AF50467I	2388	B798	1208, 1561 8, 20028, 24438. 28848, 33258, 37668	Norwalk virus
2389	VP1	KJ1345D4	2389	6799	H209. 1561 9, 20029, 24439, 28849, 33259, 37669	nurOvirus Hu/GII/Amsterdam/1994
2390	VP1	KJI94500	2390	6800	11210, 15620, 20030, 24440, 28850, 33260, 37670	norovirus Hu/GII/Amsterdam/I/1995
2301	VP1	D0093063	2391	6801	12II, 15621, 20031, 24441, 28851, 33261, 37B7I	Norwalk virus
2392	VP1	AY0303I3	2392	6802	11212, 15B22. 20032, 24442, 28852, 33262, 37672	human calicivirus Hu/NLV/GII/MDI34-I0/I987/0S
2393	VP1	002030	2393	B803	11213. 15623, 20033, 24443, 28853, 33263, 37673	MinireOvirus
2394	VP1	AB039782	2394	B804	11214, 15624, 20034, 24444, 28854. 33264, 37674	Norwalk-like virus
2395	VP1	046039	2395	B805	12 15, 15625, 20035, 24445, 28855, 33265, 37B75	small round structured virus
2396	VP1	00093066	2396	68D6	12IB, 15B2B, 2D03B, 24446, 28856, 33266, 37676	Norwalk virus
2397	VP1	D0093062	2397	6807	11217, 15627, 20037, 24447, 28857, 332B7, 37B77	Norwalk virus
2398	VP1	G0930737	2398	6808	12 18, 1562 8, 20038, 24448, 28858, 33268, 37678	Norwalk-like virus
2399	VP1	AF4I44I2	2399	B8D9	12 19, 1562 9, 20039, 24449, 28859, 33269, 37679	Narwalk-like virus NLV/NBW 0rleans/27e/I994/0S
2400	VP1	AB03978I	240D	68I0	11220, 15630, 20040, 24450, 28860. 33270. 37680	Norwalk-like virus
24DI	VP1	LC035073	240I	68II	11221, 1563 1. 2D04I. 24451. 28861, 3327 1, 37B8I	norovirus Hu/GII/I4-2523/Tokyo/20I4/JPN
2402	VP1	AF539440	2402	68I2	11222, 15632, 20042, 24452, 28862, 33272, 37682	human calicivirus NLV/Oberhausen 455/DI/DE

2403	VPI	AF4I44I4	2403	B8I3	11223, 15633, 20043, 24453, 28863, 33273, 37683	Norwalk-like virus NLV/TnwsDn/3I3/IB94/US
2404	VPI	ABI90457	2404	B8I4	11224, 15634, 20044. 24454, 28864, 33274, 37684	Norwalk virus
2405	VPI	AF4257B8	2405	B8I5	11225, 15635, 2D045, 24455, 288B5, 33275, 37B85	human calicivirus NLV/Oberhausen 455/01/DE
240G	VPI	AF4I44I5	240B	6816	11226, 15636, 20046, 24456, 28866, 33276, 37686	Norwalk-like virus NLV/Brattleboro/321/1995/IiS
2407	VPI	KT779557	2407	6817	11227, 15637, 2D047, 24457, 288B7, 33277, 37687	norovirus BII
2408	VPI	AY247432	2408	6818	11228, 15638, 20048, 24458, 28868, 33278, 37688	human calicivirus NLV/2004-D0/SWE
2409	VPI	AF4I44I!	2409	6819	11229, 15639, 20049, 24459, 28869, 33279, 37689	Norwalk-like virus NLV/Lionville/247/1993/OS
2410	VPI	AJ277BI7	2410	6820	11230, 15640, 20050, 24460, 28870, 33280, 37690	human calicivirus HU/ NLV/ Rbh/ 93/ OK
2411	VPI	LCB3B5BI	2411	6821	11231. 15641, 20051. 24461, 28871, 33281, 37691	norovirus Hu/BII/I4-3I7D/Wyo/20I4/JPN
2412	VPI	KT732274	2412	6822	11232, I5B42, 20052, 244B2, 28872, 33282, 37692	norovirus GII.3
2413	VPI	AY247430	2413	6823	11233, 15643, 20053, 244G3, 28873, 33283. 37693	human calicivirus NLV/II57-0I/SWE
2414	VPI	AF539439	2414	6824	11234, 15644. 20054, 244B4, 28874, 33284, 37694	human calicivirus NLV/Herzberg 385/OI/DE
2415	VPI	AF4I44I3	2415	6825	11235, 15645, 20055, 24465, 28875, 33285, 37695	Norwalk-like virus NLV/Montgomery/312/1994/US
24IB	VPI	AF427II2	24IB	6826	11236, I564B, 20056, 244BB, 28876, 33286, 37696	human calicivirus Hu/NLV/Bitburg/289/OI/DE
2417	VPI	AFI908I7	2417	6827	11237. 15647, 20057. 24467, 28877, 33287, 37697	human calicivirus strain Arg320
2418	VPI	LC035072	2418	6828	11238, 15648, 20058. 24468, 28878, 33288. 37698	norovirus Hu/GII/I4-2397/Myo/20I4/JPN
2419	VPI	DD0930B4	2419	6829	11239, 15649, 20059, 24469, 28879, 33289, 37699	Norwalk virus

2420	VP1	L2383D	2420	B830	11240, I5B50, 200B0, 24470, 28880, 33290. 37700	Norwalk virus
2421	VP1	KX907728	2421	B83I	11241, I5B5I, 200BI, 24471, 28881, 33291, 37701	norovirus Hu/0SA/20IB/GIV.3/WI7002
2422	VP1	ABD39779	2422	B832	11242, I5B52, 200B2, 24472, 28882, 33292, 37702	Norwalk-like virus
2423	VPI	AB039778	2423	B833	11243, I5B53, 2D0B3, 24473, 28883, 33293, 37703	Norwalk-like virus
2424	VP1	KY424345	2424	B834	11244, I5B54, 200B4, 24474, 28884, 33294, 37704	norovirus GII.B
2425	VP1	HQ[illegible]542	2425	B835	11245, I5B55, 20QB5, 24475, 28885, 33295, 37705	noravirus HU/ GII.B/ USB/2DD5/USA
2426	VPI	KX228762	242B	B83B	II24B, I5B5B, 200BB, 2447B, 2888B, 3329B. 3770B	norovirus sp.
2427	VPI	AF4I44ID	2427	B837	11247, I5B57, 200B7, 24477. 28887, 33297. 37707	Norwalk-like virus NLV/Miami/292/1994/US
2428	VPI	KU93573B	2428	B838	11248, I5B58, 200B8, 24478, 28888, 33298, 37708	norovirus Gil
2429	VPI	KX268709	2429	B839	11249, I5B59, 200B9, 24479, 28889, 33299, 37709	norovirus Hu/GM.P7_GII.B/Maryland/2D!4/USA
2430	VPI	KXI58282	2430	B840	11250, I5BB0, 2D070, 24480, 28890, 3330D, 37710	norovirus Gil
2431	VPI	ABI2B32D	2431	B84I	11251, I5BBI, 20071, 24481, 28891, 33301, 37711	Norwalk-like virus
2432	VPI	AYD77B44	2432	B842	11252. I5BB2, 20072, 24482, 28892, 33302, 37712	Norwalk-like virus Sw/NLV/VA34/I998/NL
2433	VPI	AY8233DB	2433	B843	11253, I5BB3, 20073, 24483, 28893, 33303, 37713	norovirus swine/GII/0H-QWI70/03/US
2434	VPI	KF58B5D8	2434	B844	11254, I5BB4, 20074, 24484, 28894, 33304, 37714	norovirus GI.9
2435	VPI	HQB372B7	2435	B845	11255, I5BB5, 20075, 24485, 28895, 33305, 37715	norovirus Hu/GI/Vancouver730/2004/CAN
243B	VPI	AYI34748	243B	B84B	II25B, I5BBB, 2007B, 2448B, 2889B, 333DB, 377IB	snow mountain virus

2437	VPI	AYD543DD	2437	B847	11257, I5BB7, 20077, 24487, 28897, 33307, 37717	human caiicivirus NLV/Chesterfield/434/1997/US
2438	VPI	KY485I25	2438	B848	11258, I5BB8, 2D078, 24488, 28898, 33308, 37718	norovirus IBF2l49_GII.2_Guangdong_CHN_201G
2430	VPI	KY485I23	2439	B849	11259, I5BB9, 20079, 24489, 28899, 33309, 37719	norovirus l6SF2ll34_BII.2_GuangdDng_CHN_2DI6
244D	VPI	KY485I2B	2440	B850	11260, 15G70, 20080, 24490, 2890D, 33310, 37720	norovirus l6F2l6l_GII.2_Guangdong_CHN_20l6
2441	VPI	U70059	2441	B85I	II2BI, 15671, 20081, 24491, 28901, 33311, 37721	snow mountain virus
2442	VPI	LCI458D8	2442	B852	11262, 15672, 20082, 24492, 28902, 33312, 37722	norovirus Hu/GII.2/Ehime5_20l4_JP
2443	VPI	LCI45795	2443	B853	11263. I5B73, 20083. 24493. 28903. 33313. 37723	norovirus Hu/GII.2/Hirashimacityl_20l2_JP
2444	VPI	ABB2994I	2444	B854	11264, I5B74, 20084, 24494, 28904, 33314, 37724	norovirus Hu/Tokyo/IO-14/2010/JPN
2445	VPI	LCI45792	2445	B855	11265. I5B75. 20D85, 24495, 28005, 33315, 37725	norovirus Hu/GII.2/Saitama5_20l2_JP
2446	VPI	LCI4578B	244B	B85B	11266, I5B7B, 2008B, 2449B, 28006, 33316, 37726	norovirus Hu/GII.2/AkitaB_2DI2_JP
2447	VPI	LCI45793	2447	B857	11267. I5B77, 20087, 24497, 28907, 33317, 37727	norovirus Hu/GII.2/Dsakacity5_20l2_JP
2448	VPI	LCI4579I	Z448	B858	11268. 15B78, 20088, 24498, 28908, 33318, 37728	norovirus Hu/GII.2/Saitama4_20l2_JP
2449	VPI	LCI45788	2449	B859	11269. 15679. 20089, 24499, 28909, 33319, 37729	norovirus Hu/GII.2/Niigata5_20l2_JP
2450	VPI	LCI45803	2450	B8B0	11270, I5B80, 20090, 24500, 28910, 33320, 37730	norovirus Hu/GII.2/0saka5_20l4_JP
2451	VPI	LCI458D4	2451	B8BI	11271, 15681, 20091, 24501, 28911, 33321, 37731	norovirus Hu/GII.2 /Hiroshim3B_20l4_JP
2452	VPI	LBI4580I	2452	B8B2	11272, 15682, 20092, 24502, 28912, 33322,37732	norovirus Hu/GII.2/Miyagi2_20l4_JP
2453	VPI	LBI45802	2453	B8B3	11273, 15683, 20093, 24503, 28913, 33323, 37733	norovirus Hu/GII.2/Dsaka4_2DI4_JP

2454	VPI	LCI458D5	2454	6864	11274. 15684, 20094, 24504, 28914, 33324, 37734	norovirus Hu/GII.2/Hiroshimacity5_20l4_JP
2455	VPI	LCI45797	2455	68B5	11275, 15685, 20095, 24505, 28915, 33325, 37735	norovirus Hu/BII.2/Ehime2_20l2_JP
245B	VPI	LCI45806	245B	686B	IIZ76, I5B8B, 2009B. 245D6. 28916, 33326, 37736	norovirus Hu/GII.2/Hiroshimacity6_20l4_JP
2457	VPI	KU30B738	2457	B867	11277, 15687, 20097, 24507, 28917, 33327, 37737	norovirus Gil
2458	VPI	KM036380	2458	6868	11278, 15688, 20098, 24508, 28918, 33328, 37738	norovirus Hu/GII.PIB/GII.I3/New/Taipei/I3-BA-I/20I3/TW
2458	VPI	AYII3ID6	2459	6869	11279, 15689, 20009, 2450B, 28919, 33329, 37739	Norwalk-like virus
24BD	VPI	ABD78334	246D	6870	11280, 15690, 20100, 24510, 28920, 33330, 37740	Norwalk-like virus
2461	VPI	KM28BI72	2461	6871	11281, 15691, 20101, 24511, 28921, 33331, 37741	norovirus Hu/PV_VoelkOOI8/20I3/DEU
2462	VPI	AYI3D762	2462	6872	11282, 15692, 20102, 24512, 28922, 33332, 37742	human calicivirus NLV/J23/I999/0S
2463	VPI	KJI96290	2463	B873	11283, 15693, 20103, 24513, 28923, 33333, 37743	norovirus GII/Hu/JP/2007/GII.PI5_GII.I5/Sapporo/HK299
2464	VPI	G0856474	2464	B874	11284, 15694, 20104, 24514, 28924, 33334, 37744	norovirus Hu/GII.4/Beijing/55I6I/2D0B/CHN
2465	VPI	LCI45787	2465	6875	11285. 15695, 20105. 24515, 28925. 33335, 37745	norovirus Hu/GII.2/Miyagil_20l2_JP
2466	VPI	AB629946	2466	6876	11286. I5696, 20106, 245IG, 28926, 33336, 37746	norovirus Hu/Tokyo/IO-4320/2011/JPN
2467	VPI	KT962983	2467	6877	11287, 15697, 20107, 24517. 28927, 33337, 37747	norovirus GII.2
2468	VPI	ABD8378D	2468	6878	11288, 15698, 20108, 24518, 28928, 33338, 37748	Norwalk-like virus
2469	VPI	KX98784D	2469	B879	11289, I5B99, 20109, 24519, 28929, 33339, 37749	murine norovirus
247D	VPI	KR349276	2470	6880	11290, I570D, 20110, 24520, 28930, 33340, 37750	murine norovirus

247I	VPI	KMID2449	2471	6881	II291, 15701. 20111, 24521, 28931, 33341, 37751	murine nurOvirus GV/WU20/2005/0SA
2472	VPI	KC792553	2472	6882	II2B2, 15702, 20112, 24522, 28932, 33342, 37752	murine nurovirus 3
2473	VPI	AB80999I	2473	6883	11293, 15703, 20113, 24523. 28933, 33343, 37753	nurovirus Hu/GII.I3/09N3698/2Q09/NP
2474	VPI	AB8D999D	2474	6884	II2B4, 15704, 20114, 24524, 28934, 33344, 37754	noruvirus Hu/GII.I3/09N3688/2003/NP
2475	VPI	AB8D9977	2475	6885	11295, 15705, 20115, 24525, 28935, 33345, 37755	norovirus Hu/GII.I3/09N3l80/2009/NP
2476	VPI	AB8D9987	2476	6886	II296, 15706, 20116, 24526, 28936, 33346, 37756	noruvirus Hu/GII.I3/09N3BI7/2009/NP
2477	VPI	AJ844469	2477	6887	11297, 15707, 20117, 24527, 28937, 33347, 37757	Norwalk virus Hu/NV/Chiba/030IOO/20D3/JP
2478	VPI	AY675555	2478	6888	11298, 15708, 20118, 24528, 28938, 33348, 37758	norovirus NLV/IF2D3B/2003/lraq
2479	VPI	EUD85479	2479	6889	11299, 15709, 20119, 24529, 28939, 33349, 37759	norovirus Hu/GII/PI.Cnnfectianary2004/ Gothenburg/Sweden
248D	VPI	AF54209D	248D	6890	II30D, 15710, 20120, 24530, 28940, 33350, 37760	human calicivirus NLV/Mex707B/l999
2481	VPI	KM386D68D	2481	6891	11301, 15711, 20121, 24531, 28941, 33351, 37761	norovirus 07-AF-I/2007/GII.P22/GII.5
2482	VPI	AF397I56	2482	6892	11302, 15712, 20122, 24532, 28942, 33352, 37762	human calicivirus NLV/ MOH/ 99
2483	VPI	AF4I4422	2483	6893	11303, 15713, 20123, 24533, 28343, 33353, 37763	Nnrwalk-like virus **NLV/NBW** 0rleans/30B/l994/0S
2484	VPI	AF4I4423	2484	6894	11304, 15714, 20124, 24534, 28944, 33354, 37764	Norwalk-like virus NLV/White IW290/I994/0S
2485	VPI	GQ85647G	2485	6895	11305, 15715, 20125, 24535, 28945, 33355, 37765	norovirus Hu/GII.4/Beijing/55l7l/2008/CHN
2486	VPI	AJ2776D7	2486	6896	11306, 15716, 20126, 24536, 28946, 33356, 37766	human calicivirus HU/NLV/Hillingdon/90/OK
2487	VPI	AY77273D	2487	6897	11307, 15717, 20127, 24537, 28947, 33357, 37767	norovirus Hu/NLV/BII/Neustrelitz2B0/200O/DE

2488	VPI	KT3I57I8	2488	B898	11308, 15718, 20128. 24538, 28948, 33358, 377B8	norovirus **Hu/BII.I7/CUHK-NS-B7D/HKG/ZDI5**
2489	VPI	KT3I5708	2489	B899	11309, 15719, 20129, 24539, 28949, 33359, 377B9	norovirus **Hu/BII.I7/CUHK-NS-B49/HKB/20I5**
249D	VPI	KT3I5B97	2490	BBOO	11310, 15720. 20130. 24540. 28950, 33360, 37770	norovirus **Hu/BII.I7/CUHK-NS-BIB/HKG/ZDI5**
2491	VPI	KT3I5689	2491	B90I	II3II, 15721, 20131, 24541, 28951, 333BI, 37771	norovirus **Hu/GII.I7/CUHK-NS-B00/HKG/20I5**
2492	VPI	KX2I6805	2492	6902	11312, 15722. 20132. 24542, 28952, 333B2, 37772	norovirus GiI
2493	VPI	KU557859	2493	B903	11313, 15723, 20133, 24543, 28953, 33363, 37773	norovirus Hu/GII.I7/34-057G/GD-DG/2OI5-03-27
2494	VPI	K0557828	2494	6904	11314, 15724, 20134. 24544, 28954, 33364, 37774	norovirus Hu/GII.I7/20-I695/GD-JM/20I4-I2-25
2495	VPI	KT3I5B92	2495	6905	11315, 15725, 2DI35, 24545, 28955, 33365, 37775	norovirus Hu/GII.I7/CUHK-NS-604/HKG/20I5
2496	VPI	KXIB8437	249B	6906	11316. 15726, 20136, 24546, 28956, 33366. 37776	norovirus GII.I7
2497	VPI	KXI68440	2497	6907	11317, 15727, 20137, 24547, 28957, 33367. 37777	norovirus GII.I7
2498	VPI	KX2IB793	2498	6908	11318, 15728, 20138. 24548. 28958, 33368, 37778	norovirus GiI
2499	VPI	KU55788I	2499	6909	11319, 15729, 20139, 24549, 28959, 333B9, 37779	norovirus Hu/GII.I7/5-0032/GD-ZH/20I5-0I-10
25D0	VPI	KY424350	2500	6910	11320, 15730, 20140, 24550, 289B0, 33370, 37780	norovirus GII.I7
25DI	VPI	KU557884	2501	B9II	11321, 15731, 2DI4I, 24551. 289BI, 33371, 37781	norovirus Hu/GII.I7/52-I8I9/GD-GZ/20I5-II-09
25D2	VPI	KU5BI253	2502	6912	11322, 15732, 20142, 24552, 289B2, 33372. 37782	norovirus GII.I7
25D3	VPI	KP902588	2503	6913	11323. 15733. 20143. 24553, 289B3, 33373. 37783	norovirus **Hu/BII.I7/HKG/2BI5/CUHK-NS-5B5**
2504	VPI	KXIB845B	25D4	6914	11324. 15734, 20144, 24554, 28964, 33374, 37784	norovirus GII.I7

25D5	VP1	KXIG8444	2505	G9I5	11325, 15735, 20145, 24555, 28965, 33375, 37785	norovirus Gil.17
25DB	VP1	KXZIG80G	250G	G9IG	11326, 15736, 20146, 2455B, 289BB, 33376, 37786	norovirus Gil
25D7	VP1	KX2IG794	2507	B9I7	11327, 15737, 20147, 24557, 289G7, 33377, 37787	norovirus Gil
2508	VPI	KX420895	2508	G918	11328, 15738. 20148, 24558, 28968, 33378, 37788	norovirus GII.I7
2509	VPI	KT59I50I	2509	B9I9	11329, 15739, 20149, 24559. 28969, 33379, 37789	narovirus GII/Hu/SI/20l5/GII.I7/Ljubljanal662
2510	VPI	KT3I57I4	2510	G92D	11330, 15740, 20150, 24560, 28970. 33380, 37790	norovirus Hu/GII.I7/C0HK-NS-658/HKG/20l5
2511	VPI	KT3I5G73	2511	G92I	11331. 15741. 20151, 24561, 28971, 33381, 37791	norovirus Hu/GII.I7/CUHK-NS-486/HKG/20l4
2512	VPI	KX2IG792	2512	G922	11332, 15742, 20152, 24562, 28972, 33382, 37792	norovirus Gil
2513	VPI	K0953398	2513	B923	11333, 15743, 20153, 24563, 28973, 33383, 37793	norovirus GII.I7
2514	VPI	KU557888	2514	B924	11334, 15744, 20154, 245B4, 28974, 33384. 37794	norovirus Hu/GII.I7/7-0057/GD-ZH/20l5-0l-05
2515	VPI	KU557808	2515	B925	11335, 15745, 20155, 245G5, 28975, 33385, 37795	norovirus Hu/Gll.l7/I5-I650/GD-DY/20I4-I2-18
25IG	VPI	KU557807	25IG	G926	11336, 15746, 20156, 24566, 28976, 33386, 37796	norovirus Hu/Gll.l7/I5-I649/G0-0Y/20I4-I2-19
2517	VPI	KX37IIII	2517	G927	11337, 15747, 20157, 245B7, 28977, 33387. 37797	norovirus GII.I7
2518	VPI	KX37III0	2518	G928	11338, 15748, 20158, 24568. 28978, 33388, 37798	norovirus GII.I7
2519	VPI	KXI34669	2519	B929	11339, 15749, 20159, 24569, 28979, 33389, 37799	norovirus GII.I7
2520	VPI	KU55787I	2520	G930	11340, 15750, 20IG0, 24570, 28980, 33390, 37800	norovirus Hu/GII.I7/4-OOI9/GD-HZ/20l5-OI-09
2521	VPI	KX37II08	2521	G931	11341, 15751, 20161, 24571, 28981, 33391, 37801	norovirus GII.17

2522	VPI	KU557829	2522	B932	11342, 15752, 20162, 24572, 28982, 33392, 37802	noravirus Hu/GII.I7/20-I7II/GD-JM/20I4-I2-26
2523	VPI	KXIG8452	2523	B933	11343, 15753, 20163, 24573, 28983. 33393, 37803	noravirus GII.I7
2524	VPI	KU953393	2524	G934	11344, 15754, 20164, 24574, 28984, 33394, 37804	noravirus 0II.I7
2525	VPI	KR05202D	2525	B935	11345, 15755, 20165, 24575, 28985, 33395, 37805	noravirus Hu/GII.I7/Changhua/I5-AH-I/20I5/TW
2526	VPI	KT3I56B7	252B	693B	11346, 15756, 20166, 2457B, 28986, 33396, 37806	noravirus Hu/GII.I7/CUHK-NS-593/HKG/20I5
2527	VPI	KX356908	2527	6937	11347, 15757, 20167, 24577, 28987, 33397, 378D7	noravirus GII.I7
2528	VPI	KX024652	2528	B938	11348, 15758, 20IB8, 24578, 28988, 33398, 37808	narovirus GII.I7
2529	VPI	KT3I57DB	2529	B939	1134 9, 15759, 2DIB9, 24579, 28989, 33399, 37809	noravirus Hu/GII.I7/CUHK-NS-G47/HKG/20I5
253D	VPI	KXI34B7G	2530	6940	11350, 15760, 20170, 24580, 28990, 33400, 37810	noravirus GII.I7
2531	VPI	KT78D399	2531	6941	11351, 15761, 2DI7I, 24581, 28991. 33401, 3781I	noravirus Hu/GII.I7/CUHK-NS-5D2/HKG/20I4
2532	VPI	KP9D2577	2532	B942	11352. 15762. 20172. 24582, 28992, 33402, 37812	noravirus Hu/GII.I7/HKG/20I4/CUHK-NS-502
2533	VPI	KU587B28	2533	B943	11353, 15763, 20173, 24583, 28903, 33403, 37813	narovirus GII.I7
2534	VPI	AF4I44DB	2534	6944	11354, 15764, 20174, 24584, 28994, 33404, 37814	Narwalk-like virus NLV/GwynBdd/273/1994/US
2535	VPI	KT9435B4	2535	6945	11355, 15765, 20175, 24585, 28995, 33405, 37815	noravirus TF3/0SA/2008
253B	VPI	KT9435B5	253B	6946	11356, I576B, 20I7B. 24586. 28996, 33406, 37816	narovirus TF4/USA/2D08
2537	VPI	KT9B2982	2537	6947	11357, 15767, 20177, 24587, 28997, 33407, 37817	narovirus GII.2I
2538	VPI	KXD79488	2538	6948	11358, 15768, 20178, 24588, 289B8, 33408, 37818	noravirus GII.2I

2539	VPI	KR92I938	2539	BB43	11359, I57BB, 20179. 24589, 28999, 33403, 37819	nornvirus Hu/GII.2l/CUHK-NS-5BI/HKG/2GI5
254D	VPt	KR92I940	2540	G950	11360, 15770, 20180, 24530, 23000, 33410, 37820	narovirus Hu/GII.2l/CUHK-NS-6D9/HKG/20l5
2541	VPI	DQ35S209	2541	B95I	II3GI, 15771, 20181, 24531. 23001, 33411, 37821	synthetic construct
2542	VPI	KP784G94	2542	B952	11362, 15772, 20182, 24532, 23002, 33412, 37822	narovirus GII/Hu/ZAF/2D12/GII.P4_GII.4/EmpangBni/8604
2543	VPI	KX3540G4	2543	B953	11363, 15773, 20183, 24533, 29003. 33413, 37823	nornvirus GII.4
2544	VPI	LCI77G58	2544	B954	11364, 15774, 20184. 24594. 23004, 33414, 37824	narovirus GII.4
2545	VPI	KX5I4232	2545	B955	11365, 15775, 20185, 24595, 23005, 33415, 37825	narovirus GII.4
254G	VPI	LCI45787	254G	G95G	11366, I577G, 20186, 24536, 23006, 33416, 37826	norovirus Hu/GII.2/Miyagil_2DI2_JP
2547	VPI	KT9G2983	2547	G957	11367, 15777. 20187, 24597, 23007, 33417, 37827	narovirus GII.2
2548	VPI	ABG2994G	2548	6958	11368, 15778, 20188. 24538, 29008, 33418, 37828	narovirus Hu/Tokyo/I0-4320/20II/JPN
2549	VPI	AB809993	2549	B959	11363, 15773, 20189, 24533, 23003, 33413, 37823	norovirus Hu/GII.I3/03N375l/2009/NP
2550	VPI	JQ743330	2550	B9B0	11370, 15780, 20130, 24600, 23010, 33420, 37830	norovirus Hu/GI.3/1999
2551	VPI	AF4392G7	2551	B9GI	11371. 15781. 20191, 24601, 29011, 33421, 37831	human calicivirus NLV/Potsdam 196/2000/DE
2552	VPI	EF547393	2552	B9G2	11372, 15782, 20192, 24602, 29012, 33422, 37832	narovirus Hu/0saka/0l03l4/200l/JP/3634
2553	VPI	AFI45709	2553	6963	11373, 15783, 20193, 24603, 29013. 33423, 37833	human calicivirus NLV/Stav/95/Nor
2554	VPI	FJ7IIIG3	2554	6964	11374, 15784. 20194, 24604, 29014, 33424, 37834	norovirus Hu/GI.3/JKPG_88l/SWE/2007
2555	VPI	FJ7IIIG4	2555	6965	11375, 15785, 20195, 24605, 29015, 33425. 37835	norovirus Hu/GI.3/JKPG_883/SWE/2007

2556	VPI	AF4I4405	2556	6966	II376, I5786, 20I96, 2460G. 290I6, 33426. 37836	Nnrwalk-like virus NLV/Little Rock/316/1994/US
2557	VPI	ABD22679	2557	6967	II377, I5787. 20I97, 24607. 290I7. 33427. 37837	chiba virus
2558	VPI	AF4I44D3	2558	6968	II378. I5788, 20I98, 24608. 290I8. 33428. 37838	Nnrwalk-like virus NLV/Hanolulu/219/1992/OS
2559	VPI	LCIDI82I	2559	6969	11379. 15789, 20199. 24609. 29019, 33429, 37839	narQvirus GI/Hu/Jp/20l3/GI.4/sl30149
256D	VPI	AY038598	256D	6970	11380. 15790, 202D0. 24610, 29020. 33430, 37840	human calicivirus NLV/VA98II5/I998
25GI	VPI	KJI96292	256I	697I	11381. 15791, 20201, 24611, 29021, 33431. 37841	noruvirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866
2562	VPI	JQ74333I	2562	6972	11382. 15792, 20202, 24612, 29022. 33432, 37842	naruvirus Hu/GI.4/2000
2563	VPI	EF547394	2563	6973	11383, 15793, 20203, 24613, 29023, 33433. 37843	norovirus Hu/Saga/0003l3/200D/JP/2876
2564	VPI	AF39496D	2564	6974	11384. 15794, 20204, 24614, 29024, 33434, 37844	human calicivirus H0/NLV/Koblenz/433/2000/DE
2565	VPI	AJ2776I6	2565	6975	11385, 15795, 20205, 24615, 29025, 33435, 37845	human calicivirus HO/NLV/ValEtta/95/Malta
2566	VPI	GQ4I397D	2566	6976	11386, 15796, 20206, 24616. 29026, 33436, 37846	naruvirus Hu/GI.4/IG43/2008/US
2567	VPI	KT73228I	2567	6977	11387, 15797, 20207, 24617, 29027, 33437, 37847	nuravirus GI.4
2568	VPI	AF4I44D4	2568	6978	11388, 15798, 20208, 24618, 29028, 33438, 37848	Nnrwalk-like virus NLV/Baltimore/277/1993/US
2569	VPI	AF4I44D2	2569	6979	11389, 15799. 20209. 24619, 29029, 33439, 37849	Nnrwalk-like virus NLV/NBW Orleans/266/1993/OS
2570	VPI	AJ3I3D3D	257D	6980	11390, 15800. 20210, 24620, 29030, 33440, 37850	human calicivirus Hu/NLV/Queen's Arms/Leeds/92/OK
257I	VPI	KM03G38I	257I	698I	11391, 15801, 20211. 24621, 29031, 33441, 37851	nnruvirus I4-H-2/20I4/GI.P4/GI,4
2572	VPI	LN854563	2572	6982	11392, 15802, 20212, 24622. 29032, 33442, 37852	nnrovirus GI/Hu/NL/20II/GI.4/Groningen

2573	VPI	ABD42808	2573	B983	11393. I58D3, 2D2I3, 24623, 29G33, 33443, 37853	chiba virus
2574	VPI	EUB04B79	2574	B984	11394, 15804. 2D2I4, 24B24, 29034, 33444, 37854	murine norovirus GV/CRII/2005/USA
2575	VPI	EUDD4B78	2575	B985	11395, I58D5. 20215, 24B25, 29035, 33445, 37855	murine norovirus GV/CRI0/2005/0SA
257B	VPI	AB28ID85	257B	B98B	11396, 15806, 20216, 24B2B, 29036, 3344B, 3785B	norovirus Hu/GII.2/Zwolle25E/200l/NL
2577	VPI	ABBB28B8	2577	B987	13397, 15807, 20217, 24B27, 29037. 33447, 37857	norovirus Hu/GII.2/0H0802D/2D08/JP
2578	VPI	ABBB28BI	2578	B988	11398, 15808, 20218, 24B28, 29038, 33448, 37858	norovirus Hu/GII.2/OCD8l54/2008/JP
2579	VPI	LCI4579I	2579	B989	11399, 15809, 20219, 24629, 29039, 33449. 37859	norovirus Hu/GII.2/Saitama4 _20l2_JP
258D	VPI	LCI4579D	258D	B99D	11400, 15810, 20220, 24630, 29040, 33450, 37860	norovirus Hu/GII.2/Fukui2_20l2JP
2581	VPI	LCI45793	2581	B99I	11401, 15811. 20221. 24631, 29041, 33451, 378BI	norovirus Hu/GII.Z/Dsakacity5_ZDI2_JP
2582	VPI	LCI45792	2582	6992	11402, 15812, 2D222, 24632, 29042, 33452, 378B2	norovirus Hu/GII.2/Saitama5_ZOI2_JP
2583	VPI	LCI45797	2583	B993	11403, 15813, 20223, 24633, 29043, 33453, 37863	norovirus Hu/GII.2/Ehime2_20l2_JP
2584	VPI	LCI45808	2584	B994	11404, 15814, 20224, 24634, 29044. 33454, 37864	norovirus Hu/GII.2/Ehime5_20l4_JP
2585	VPI	LCI458DI	2585	B995	11405, 15815, 20225, 24B35, 29045, 33455, 37865	norovirus Hu/GII.2/Miyagi2_20l4_JP
2586	VPI	ABBB2884	258B	B99B	11406, 15816, 20226, 24B3B, 29046, 3345B, 3786B	norovirus Hu/GII,2/OH09032/2009/JP
2587	VPI	LCI458D2	2587	B997	11407, 15817, 20227, 24B37, 29047, 33457, 378B7	norovirus Hu/GII,2/0saka4_20l4_JP
2588	VPI	ABBB2807	2588	B998	11408, 15818, 20228, 24638, 29048, 33458, 37868	norovirus Hu/GII.2/0HI0D2l/2DID/JP
2589	VPI	ABBB2899	2589	6999	11409, 15819, 20229, 24639, 29049, 33459, 378B9	norovirus Hu/GII,2/OHI0025/20IO/JP

2530	VPI	ABBB2894	2530	7DD0	II4I0, 15820, 20230, 24B40, 2905D, 334B0, 37870	norovirus Hu/GII.2/DHIDDI3/ZOIO/JP
2591	VPI	LCI458D3	2591	7001	II4II, 15821, 20231, 24B4I, 23051, 334BI, 37871	norovirus Hu/GII.Z/Dsaka5_ZDI4_JP
25B2	VPI	ABBB288B	2592	7002	11412, 15822, 2B232, 24B42, 23052, 33462, 37872	norovirus Hu/GII.2/OHI0006/20IO/JP
2593	VPI	ABBB287B	2533	7003	11413, 15823, 20233, 24B43, 29053, 334B3, 37873	norovirus Hu/GII.2/OCIOOI2-2/20IO/JP
2534	VPI	KU55584I	2534	7004	11414, 15824. 20234, 24644, 23054. 334B4. 37874	norovirus Hu/GII.I7/C0HK-NS-864/HKG/20l6
2595	VPI	GQ85B4B8	2535	7005	11415. 15825, 20235, 24B45, 29055, 334B5, 37875	norovirus Hu/GII.4/Beijing/55l85/2008/CHN
2596	VPI	ABB84B8I	2596	7006	11416, 15826. 20236. 24646. 2305B, 3346B, 37876	norovirus Hu/GII/27-3/Tokyo/l376/JPN
2537	VPI	AB8B9988	2537	7007	II417, 15827, 20237, 24647, 2S057. 33467. 37877	norovirus Hu/GII.I3/03N3B45/2D09/NP
2598	VPI	AB8ID0II	2538	7008	11418. 15828. 20238, 24B48, 28058, 33468, 37878	norovirus Hu/GII.I3/ION4489/20IO/NP
2593	VPI	AB8D3334	2533	7003	11413, 15823, 20239, 24B49, 29059, 33469, 37873	norovirus Hu/GII.I3/03N3758/2003/NP
2BDD	VPI	KX7B7083	26B0	7010	11420, 15830, 20240, 24B50, 29060. 33470, 37880	norovirus Hu/GII.4/Melbourne6623/20l6/A0S
2BBI	VPI	LN8545B5	2B0I	7011	11421, 15831. 20241, 24B5I, 29061, 33471, 37881	norovirus Gll/Hu/NL/20I2/Gll.4/Groningen
2B02	VPI	KX354D7I	2B02	7012	11422, 15832, 20242, 24652, 23062, 33472. 37882	norovirus GII.4
2B03	VPI	AB933688	2B03	7013	11423, 15833, 20243, 24653, 29063, 33473, 37883	norovirus Hu/GII.4/Shimane5/20IO/JP
2BD4	VPI	GQ845337	2B04	7014	11424, 15834, 20244, 24G54, 230B4, 33474, 37884	norovirus Hu/GII.4/NSW53BS/2B08/A0
2BD5	VPI	JXI55747	2BD5	7015	11425, 15835, 20245, 24B55, 29BB5, 33475, 37885	norovirus Hu/GII.4/Xi'an/CB/2BI0/CHN
2BBB	VPI	JXI55737	26D6	7016	11426, I583B, 2024B, 24B56, 29066, 33476, 37886	norovirus Hu/GII.4/Xi'an/PI3/2DI0/CHN

2BD7	VP1	KX354055	2607	7017	11427, 15837, 20247, 24657, 29067, 33477, 37887	norovirus GII.4
2GD8	VP1	KX353957	2608	7018	11428, 15838, 20248, 24658, 29068, 33478, 37888	norovirus GII.4
2609	VP1	KF509947	2609	7019	11429, 15839, 20249, 24659, 29069, 33479, 37889	norovirus Hu/GII.4/Alb ertaEI337/20ll/CA
2610	VP1	AB50432G	2610	7020	11430, 15840. 20250, 24660, 29070, 33480, 37890	norovirus Hu/Gll.4/Hiroshima/I29/2007/JPN
2611	VP!	KX354056	2611	7021	**11431.** 15841, 20251, 24661, 29071, 33481, 37891	norovirus GII.4
2612	VP1	AB54I255	2612	7022	11432, 15842, 20252, 24662, 29072, 33482, 37892	norovirus Hu/GIM/Hiroshima3/2007/JP
2613	VP1	KP784696	2613	7023	11433, 15843, 20253, 24663, 29073, 33483, 37893	norovirus GII/Hu/ZAF/20l2/GII.P4_GII.4/CapeTown/9772
2614	VP1	KX354042	2EI4	7024	11434, 15844, 20254, 24664, 29074, 33484. 37894	norovirus GII.4
2615	VP1	KX354007	2615	7025	11435, 15845, 20255, 24665, 29075. 33485, 37895	norovirus GII.4
2616	VP1	KT78Q333	2616	7026	11436, 15846, 20256, 24666, 29076, 33486, 37896	norovirus Hu/GII.4/CUHK-NS-663/HKG/20l5
2617	VP1	KX354043	2617	7027	11437, 15847, 20257, 24667, 29077, 33487, 37897	norovirus GII.4
2618	VP1	KX354008	2618	7028	11438, 15848, 20258, 24668, 29078, 33488, 37898	norovirus GII.4
2619	VP1	KR904217	2619	7029	11439, 15849, 20259, 24669, 29079, 33489, 37899	norovirus Gil
2620	VP1	KJ6854I2	2620	7030	11440, 15850, 20260, 24670, 29080, 33490, 37900	norovirus Hu/Gll/BGIC0405/20I2/BGD
2621	VP1	KF0DB240	2621	7031	11441, 15851, 20261, 24671, 29081, 33491, 37901	norovirus Hu/Gll.4/ variant Sydney 2012/FRA
2622	VP1	KX354125	2622	7032	11442, 15852, 20262, 24672, 29082, 33492, 37902	norovirus GII.4
2623	VP1	KX354094	2623	7033	11443, 15853, 20263, 24673, 29083, 33493, 37903	norovirus GII.4

2624	VP1	KX354058	2624	7034	11444, 15854, 20264, 24B74, 29084. 33494, 37904	norovirus GII.4
2625	VPI	KX354057	2B25	7035	11445, 15855, 20265, 24675, 29085, 33495, 37905	norovirus GII.4
2626	VP!	KX354034	2B26	7036	11446, 15856, 20266, 24676. 29086, 33496, 37906	norovirus GII.4
2627	VPI	KX354027	2627	7037	11447, 15857, 20267, 24677, 29087, 33497, 37907	norovirus GII.4
2628	VPI	KX354D25	2628	7038	11448, 15858, 20268, 24B78, 2BD88, 33498, 37908	narovirus GII.4
2629	VPI	KJ685406	2629	7039	11449, 15859, 20269, 24679, 29089, 33499. 37909	norovirus Hu/Gll/BGICD39I/20I2/BG0
2630	VPI	KF00824I	2630	7040	11450, 15860, 20270, 24680. 29090. 33500, 37910	norovirus Hu/GII.4/variant Sydney 2012/FRA
2B3I	VPI	A6504327	2631	7041	11451, 15861, 20271, 24681. 29091. 33501, 37911	norovirus Hu/Gll.4/Hiroshim_/I34/2B07/JPN
2632	VPI	KY424329	2B32	7042	11452, I58B2, 20272, 24682, 29092, 33502, 37912	norovirus GII.4
2633	VPI	KT78038B	2B33	7043	11453, 15863, 20273, 24683, 29093, 33503, 37913	norovirus Hu/GII.4/CUHK-NS-65l/HKG/20l5
2B34	VP!	KX354I34	2634	7044	11454, 15864, 20274, 24B84, 29094, 33504. 37914	norovirus GII.4
2B35	VPI	KX354I26	2635	7045	11455, 15865, 20275, 24685, 29095, 33505. 37915	norovirus GII.4
2B3B	VPI	KRB04237	263B	7046	11456, I586B, 2027B, 24686, 29096, 33506, 37916	norovirus Gil
2B37	VPI	KP24I9II	2B37	7047	11457, I58B7, 20277, 24687, 29097, 33507, 37917	norovirus GII.4
2638	VPI	KJ6S541l	2638	7048	11458, 15868. 20278, 24688, 29098, 33508, 37918	nomvirus Hu/Gll/BGIC0398/20I2/BGD
2B38	VPI	KF008242	2639	7049	11459, I58B9, 20279. 24689, 29099, 33509, 37919	norovirus Hu/GII.4/ Variant Sydney 2012/FRA
2640	VPI	KF060II2	2640	7050	11460, 15870, 20280, 24690, 29100, 33510, 37920	norovirus Hu/GII.4/NSW8632/20l2/A0

2644	VPI	JXI269I2	2641	7D5I	11461, 15871, 20281, 24691, 29101, 33511, 37921	norovirus Hu/Bli.4/0hia/7l/20l2/USA
2642	VPI	KX354I43	2642	7D52	11462, 15872, 20282, 24692, 29102, 33512, 37922	norovirus GII.4
2643	VPI	K0985IG4	2643	7D53	11463, 15873, 20283, 24693, 29103, 33513, 37923	norovirus GII.4
2644	VPI	KX950760	2644	7054	11464, 15874, 20284, 24694, 29104, 33514, 37024	norovirus Hu/GII.4/CUHK-NS-IOB4/HKG/2DIB
2645	VPI	KJ685402	2645	7055	11465, 15875, 20285, 24695, 29105, 33515, 37925	norovirus Hu/Gll/BGIC0434/20I2/BGD
2646	VPI	KF060I4D	2646	7056	11466, 15876, 20286, 24696, 29ID6, 33516, 37926	norovirus Hu/GII.4/NLV-IZ-B72/2DI2/NZ
2647	VPI	KX354I32	2647	7057	11467, 15877, 20287, 24697, 29107, 33517, 37927	norovirus GII.4
2648	VPI	KX354006	2648	7058	11468, 15878, 20288, 24698, 29108, 33518, 37928	norovirus GII.4
2649	VPI	KX354I45	2649	7059	11469, 15879, 20289, 24699, 29109, 33519. 37929	norovirus GII.4
265D	VPI	KX354I40	2650	7060	11470, I588D, 20290, 24700, 29110, 33520, 37930	norovirus GII.4
2651	VPI	KX354II9	2651	7061	11471, 15881, 20291, 24701, 29111, 33521, 37931	norovirus GII.4
2652	VPI	KX3540I8	2652	7062	11472, 15882, 20292, 247D2, 29112, 33522, 37932	norovirus GII.4
2653	VPI	A6972499	2653	7063	11473, 15883, 20293, 24703, 29113, 33523, 37933	norovirus Hu/GII.4/GII4-HK0l/20ll/JP
2654	VPI	KF060I42	2654	7064	11474, 15884, 2D294, 24704, 29114. 33524, 37934	noravirus Hu/GII.4/NLV-l2-723/20l2/NZ
2655	VPI	KFD6DI38	2655	7065	11475, 15885. 20295. 24705, 29115, 33525, 37935	norovirus Hu/GII.4/NLV-l2-65/20l2/NZ
2656	VPI	KP784697	2656	7066	11476, 15886, 20296, 24706, 29116, 33526, 37936	norovirus GII/Hu/ZAF/20l2/GII.P4_GII.4/CapeTown/IOIO5
2657	VPI	KFD6 DIII	2657	7067	11477, 15887, 20297. 24707, 29117, 33527, 37937	norovirus Hu/GII.4/NSW8G2G/20l2/AU

2G58	VPI	KF0B0089	2B58	7068	11478. 15888. 20298, 24708. 29118, 33528. 37938	norovirus Hu/GII.4/NSWB84S/2DI2/AU
2659	VPI	KP096333	2659	70B9	11479, 15889, 20299. 24709. 29119, 33529, 37939	norovirus Hu/GII/HKG/2DI4/BII.4/CUHK-NS-383
2GGD	VPI	KF060I53	266D	7070	11480, 15890, 20300, 24710, 29120, 33530, 37940	norovirus Hu/GII.4/NLV-I2-934/ZDI2/NZ
2GGI	VPI	KF0G0I25	2BBI	7071	11481, 15891, 20301, 24711, 29121, 33531, 37941	norovirus Hu/GII.4/NLV-I2-ID34/20I2/NZ
2GG2	VPI	KX354135	2B62	7072	11482, 15892, 203D2, 24712, 29122, 33532, 37942	norovirus GII.4
2663	VPI	KX354045	2663	7073	11483, 15893, 20303, 24713, 29123, 33533, 37943	norovirus GII.4
2G64	VPI	LCI53I2I	2664	7074	11484, 15894, 20304, 24714, 29124, 33534, 37944	norovirus GII/Hu/JP/20IG/GII.PI6_GII.4_SydnBy20I2 /0HI6002
2665	VPI	KFG68568	2665	7075	11485, 15895, 20305, 24715, 29125, 33535. 37945	norovirus Hu/GII.4/PA48/20I2/ITA
2666	VPI	KFB68567	266B	7076	11486, I589B, 20306, 24716, 29126, 33536, 37946	norovirus Hu/GII.4/PA3B3/20II/ITA
2667	VPI	KR9042I0	2B67	7077	11487, 15897, 20307, 24717, 29127, 33537, 37947	norovirus GiI
2668	VPI	JX4599D7	2668	7078	11488, 15898, 20308, 24718. 29128. 33538, 37948	norovirus Hu/GII.4/Woonona/NSW33D9/2012/A0
2669	VPI	KFDBDDB2	2669	7079	11489, 15899, 20309, 24719, 29129, 33539, 37949	norovirus Hu/GII,4/NSW558V/20I2/AU
2670	VPI	KF060080	2670	7080	11490, 15900, 20310, 24720, 29130, 33540, 37950	norovirus Hu/GII,4/NSWB28G/20I2/A0
2671	VPI	KF37873I	2671	7081	11491, 15901, 20311, 24721, 29131, 33541, 37951	narovirus PAI3/20I3/ITA
2G72	VPI	AB33373I	2672	7082	11492, 15902, 20312, 24722, 29132, 33542, 37952	norovirus Hu/GII.4/Hokkaidol/2009/JP
2673	VPI	AB933749	2G73	7083	11493, 15903, 20313, 24723, 29133, 33543, 37953	norovirus Hu/GII.4/Sakai5/2009/JP
2674	VPI	KC517370	2674	7084	11494, 15904, 20314, 24724, 29134, 33544, 37954	norovirus Hu/GII-4/Taoyuan/CGMH60/20I2/TW

2675	VP1	EF547396	2675	7085	11495, 15905. 20315, 24725, 29135, 33545, 37955	norovirus Hu/Akabanfi/99ll3D/l99g/JP/2258
2676	VP1	JN609D47	2676	7086	11496, 15906, 20316, 24726, 29136, 33546, 37956	noravirus Hu/Gl/E8/0G/I97G
2677	VP1	KT78I4II	2677	7087	11497, 15907, 20317, 24727, 29137, 33547, 37957	noravirus GI.3
2678	VP1	UD4469	2678	7088	11498, 15908, 20318, 24728, 29138, 33548, 37958	desert shield virus
2678	VPI	JN699049	2679	7089	11499, 15909, 20319, 24729, 29139, 33549, 37959	noravirus Hu/Gl.3/C9/GF/I978
2680	VPI	G0856473	268D	7000	11500, 15910, 20320, 24730, 29140, 33550, 37960	narovirus Hu/GII.4/8eijing/55042/2007/CHN
2681	VPI	JN699D5D	2681	7091	11501, 15911, 20321, 24731, 29141, 33551, 37961	noravirus Hu/Gl.3/B8/CF/I977
2682	VPI	GQ856472	2682	7092	11502, 15912, 20322, 24732, 29142, 33552, 37962	narovirus Hu/GlI.4/Beijing/54BBD/2007/CHN
2683	VPI	GQ85647I	2683	7093	11503, 15913, 20323, 24733, 29143, 33553, 37963	narovirus Hu/GII.4/Beijing/54ll4/2007/CHN
2684	VPI	**JQeil594**	2684	7094	11504, 15914, 20324, 24734, 29144, 33554, 37964	narovirus Hu/Gl/I0360/20I0/VNM
2685	VPI	GU296356	2685	7095	11505. 15915, 20325, 24735, 29145, 33555, 37965	noravirus Hu/GI/Lilla Edet/p2/SWE/2008
2686	VPI	KM46I693	2686	7096	11506, 15916, 20326, 24736, 20146, 33556, 37966	noravirus II-FJ-3/20I1/GII.P7/GII.6
2687	VPI	LCI45789	2687	7097	11507, 15917, 20327, 24737, 29147, 33557, 37967	noravirus Hu/GII.2/Fukuil_20l2_JP
2688	VPI	KXI7I4I7	2688	7098	11508, 15918, 20328, 24738, 29148, 33558, 37968	narovirus GII.I'7
2688	VPI	KXI7I4I2	2689	7099	11509, 15919, 20329, 24739, 29149, 33559, 37969	narovirus 0II.I7
268D	VPI	KU557839	2690	7100	11510, 15920, 20330. 24740. 29150, 33560, 37970	noravirus Hu/GII.I7/2238/GD-JM/20l3-D8-30
2691	VPI	KP9D2564	2691	7101	II5II, 15921, 20331, 24741, 29151, 33561, 37971	noravirus Hu/GII.I7/HKG/2DI4/CUHK-NS-27G

2GBZ	VPI	KU587625	2632	7102	11512, 15322, 20332, 24742, 23152, 335G2, 37372	norovirus GII.I7
2693	VPI	KXI7I4I3	2633	7103	11513, 15323, 20333, 24743, 23153, 335B3, 37373	norovirus 0 1.I7
2B34	VPI	KP902565	2694	7104	11514, 15324. 20334, 24744, 23154, 335B4, 37974	norovirus Hu/GII.I7/HKG/20I4/CUHK-NS-3G0
2G95	VPI	KXI7I4I6	2635	7105	11515, I5925, 20335, 24745. 29155, 33565, 37975	norovirus GII.I7
2696	VPI	K056I250	2696	7I0B	11516, I592B. 20336, 2474B, 23156, 33566, 37976	norovirus 0 I1I7
2697	VPI	K056I25I	2637	7107	11517, 15827, 20337, 24747, 29157. 33567, 37977	norovirus GII.I7
2698	VPI	AB8ID0I4	2638	7108	11518, 15928, 20338, 24748. 23158. 33568, 37378	norovirus Hu/GII.I3/ION4598/20IO/NP
2699	VPI	AB8096385	2699	7103	1I513. 15323, 20333, 24749, 23159, 335G9, 37979	norovirus Hu/GII.I3/09N3564/2009/NP
2700	VPI	AB8I0003	2700	7110	11520, 15330, 20340, 24750, 29160, 33570, 37980	norovirus Hu/GII.I3/ION4254/20IO/NP
2701	VPI	AB8099675	2701	7111	11521, 15931, 20341, 24751, 29161 33571, 37981	norovirus Hu/GII.I3/09N3I20/2009/NP
2702	VPI	JX40I280	2702	7112	11522, 15932. 2D342, 24752, 29162, 33572, 37982	norovirus Hu/GII/KL45/MY/I978
2703	VPI	KC962462	2703	7113	11523, 15933, 20343, 24753, 29163, 33573, 37983	norovirus GiI
2704	VPI	KX353374	2704	7114	11524. 15934, 20344, 24754. 29164, 33574, 37984	norovirus GII.4
2705	VPI	KF060I22	2705	7115	11525, 15935, 20345, 24755, 29165. 33575. 37985	norovirus Hu/GII.4/NLV-IO-603/20IO/NZ
2706	VPI	KR904234	2706	7116	11526. 15936, 20346, 24756, 29I6B, 33576, 37986	norovirus GiI
2707	VPI	KR13I769	2707	7117	11527, 15937, 20347, 24757. 23167, 33577, 37387	norovirus GII/HU/IN /2009/GII.PE_GII.4_ 0saka2007/Pune-092434
2708	VPI	KRI3I764	2708	7118	11528, 15938, 20348, 24758, 29IB8, 33578, 37988	norovirus GII/Hu/IN/2007/GII.Pe_GII.4_ 0saka2007/PunB-07I3603

270B	VPI	GU3BD3DI	27BB	7113	11523, 15939, 20343. 24753, 29IB9, 3357B, 37983	norovirus Hu/GII.4/Chungnam(l2-I07)/ 2008/ KOr
2710	VPI	EUD78408	2710	7120	11530, 15940, 20350, 247B0, 29170, 33580, 37BB0	noravirus Hu/Lonacnning/200I/USA
2711	VPI	AB333B7G	2711	7121	1(531. 15941, 20351, 247BI. 23171, 33581, 37991	norovirus Hu/GII.4/Niigata2/20IO/JP
2712	VPI	KX354Q82	2712	7122	11532, 15942, 20352, 247B2, 29172, 33582, 37992	norovirus GII.4
2713	VPI	KJ4D707G	2713	7123	11533, 15943, 20353, 247B3, 23173, 33583, 37993	norovirus Hu/GII.4/HSBB/2DDI/USA
2714	VPI	JX453G3B	2714	7124	11534, 15944, 20354, 247B4, 29174, 33584, 37994	norovirus Hu/GII.4/SG40B7-OI/2009/SG
2715	VPI	JX445IBI	2715	7125	11535, 15945, 20355, 247B5, 29175, 33585, 37995	norovirus Hu/GII.4/AlbertaEI2IO/Z008/CA
27IB	VPI	EU87G888	27IB	7I2G	11536. I594B, 2B35B, 247BB, 23I7B, 3358B, 3793B	norovirus Hu/GGII.4/Cairo8/20Q7/EGY
2717	VPI	EU833584	2717	7127	11537, 15347, 20357, 247B7, 23177, 33587, 37397	norovirus Hu/GII/Beijing/221/2005/CHN
2718	VPI	KX3540B0	2718	7128	11538. 15348. 20358, 247B8. 23178, 33588, 37998	norovirus GII.4
27IB	VPI	KF0E0I24	2713	7123	11539, 15949. 20359, 247B9. 29179, 33589, 37999	norovirus Hu/GII.4/NLV-IO-B40/ZDIO/NZ
272D	VPI	JX433B2B	2720	7130	11540, 15950, 203B0, 2477B, 29180, 33590, 38000	norovirus Hu/GII/Seoull400/K0R/2QI0
2721	VPI	JX4338I5	2721	7131	11541, 15951, 203BI, 24771, 29181, 33591, 38001	norovirus HU/GII/SEOUII055/ K0R/20 I0
2722	VPI	KC57G9I2	2722	7132	11542, 15952, 203B2, 24772, 29182, 33592, 38002	norovirus Hu/GII.4/NIHIC4.l/20ll/0SA
2723	VPI	G0845368	2723	7133	11543, 15953, 203B3, 24773, 2BI83. 33593. 38003	norovirus Hu/GII.4/Sutherland/NSW505G/2D07/AUS
2724	VPI	AB54I243	2724	7134	11544, 15954, 203B4, 24774, 2BI84. 33594, 38004	norovirus Hu/GII-4/Fukui5/20D7/JP
2725	VPI	EUB784I2	2725	7135	11545, 15955, 203B5, 24775, 29185, 33595, 38005	norovirus Hu/FL04/2004/0SA

272G	VPI	AB445395	272B	7I3B	II54B. I595B, 203BB, 2477B, 29I8B, 33596, 38006	norovirus Hu/GII.4/Apeldoorn3I7/2007/NL
2727	VPI	AB933G55	2727	7I37	II547, I5957, 20367, 24777, 29I87, 33597, 38007	norovirus Hu/GII.4/ShimaneZ/2DD9/JP
2728	VPI	KM245072	2728	7I38	II548, I5958, 203B8, 24778, 29I88, 33598, 38008	nomvirus 08-W-I/2008/GII.4/Apeldoorn/2007
2729	VPI	AB54I282	2729	7I39	II549. I5959, 20369. 24779, 29I89, 33599, 38009	norovirus Hu/GtI-4/Miyagi2/ZD07/JP
2730	VPI	AB54I202	2730	7I40	II550, I5960, 2037D, 24780, 29I90, 33600, 38010	nomvirus Hu/GII-4/Aichil/2008/JP
273I	VPI	FJ5I4242	273I	7I4I	11551. 15961, 20371, 24781, 29191, 33601, 38011	norovirus Hu/GII-4/C0K-3/2008/KR
2732	VPI	KX353397B	2732	7I42	11552, 15962, 20372, 24782, 29192, 33602, 38012	nomvirus GII.4
2733	VPI	KX353952	2733	7I43	11553, 15963, 20373, 24783, 29193, 33603, 38013	nomvirus GII.4
2734	VPI	KR13I771	2734	7I44	11554, 15964, 20374, 24784, 29194, 33604, 38014	norovirus GII/HU/IN /2008/GII.PE_GII.4_0saka2007/Pune-084Q93
2735	VPI	AB933729	2735	7I45	11555, 15965, 20375, 24785, 29195, 33605, 38015	norovirus Hu/GII.4/Fukui5/2009/JP
273G	VPI	AB933B4B	273G	7I4B	11556, 159BB, 20376, 2478B, 29196. 33606, 38016	norovirus Hu/GII.4/Shimanel/Z0Q9/JP
2737	VPI	JXI55742	2737	7I47	11557, 15967, 20377, 24787, 29197, 33607, 38017	norovirus Hu/GII.4/Xi'an/PI43/2DI0/CHN
2738	VPI	J40QBI4	2738	7I48	11558, 15968, 20378, 24788, 29198, 33608, 38018	nomvirus Hu/GII-4/CGMHIG/2007/TW
2733	VPI	J400B0I	2739	7I49	11559, 15969, 20379. 24789. 29199, 33B09, 38019	norovirus Hu/GII-4/CGMH03/2006/TW
2740	VPI	J06I3538	2740	7I50	11560, 15970, 20380, 24790, 29200, 33610, 38020	norovirus Hu/GII.4/NSW452P/20D9/A0
274I	VPI	HM802543	274I	7I5I	11561, 15971, 20381, 24791, 29201, 33611, 38021	norovirus Hu/GII.4/Hong Kong/CU050IOB/2005/CHN
2742	VPI	AB54I337	2742	7I52	11562, 15972, 20382. 24792, 29202, 33612, 38022	norovirus Hu/GII-4/Saga5/Z007/JP

2743	VPI	AB54I252	2743	7153	11563, 15973, 2D383, 24793, 29203. 33613, 38023	norovirus Hu/GII-4/Hiroshimal/200B/JP
2744	VPI	GU27D580	2744	7154	11564, 15974, 20384, 24794, 29204, 33614, 38024	narovirus Hu/GII.4/New 0rl Bansl500/2008/USA
2745	VPI	EU87B882	2745	7155	11565, 15975, 20385, 24705, 29205, 33615, 38025	narovirus Hu/GGII.4/Caira2/200G/EGY
2746	VPI	AB933B49	274B	7I5B	11566, 15976, 20386, 24796, 29206. 33BIB, 3802B	narovirus Hu/GII.4/Hiroshimacity3/2009/JP
2747	VPI	JX4398IB	2747	7157	11567, 15977, 20387, 24797, 29207, 33617. 38027	narovirus HU/GII/SEOUII072/K0R/20I0
2748	VPI	JXI55739	2748	7158	11568, 15978, 2D388, 24798, 29208, 33618. 38028	noravirus Hu/GII.4/Xi'an/P4B/20IO/CHN
2743	VPI	HQ45G338	2749	7159	11569, 15979, 20389, 24799, 29209, 33619, 38029	narovirus Hu/GII.4/08-N-I(2008a)/2008/TW
275D	VPI	AB54I359	2750	7IBD	11570, 15980, 20390, 24800, 29210, 33620, 38030	narovirus Hu/GII-4/Tayama4/2007/JP
2751	VPI	AB54I28Q	2751	7IBI	11571. 15981, 20391, 24801, 29211, 33B21, 38031	narovirus Hu/GII-4/Kumamoto4/2007/JP
2752	VPI	AB54I244	2752	7IB2	11572, 15982, 20392, 24802, 29212, 33622, 38032	narovirus Hu/GII-4/Fukuil/2D08/JP
2753	VPI	AB54I203	2753	7IB3	11573, 15983, 20393, 24803, 29213. 33623, 38033	narovirus Hu/GII-4/Aichi2/2007/JP
2754	VPI	GQ850882	2754	7IB4	11574, 15984. 20394, 24804, 29214, 33624, 38034	narovirus Hu/GII,4/Rivieral590/2008/US
2755	VPI	KRI3I772	2755	7IB5	11575. 15985, 20395, 24805, 29215, 33625, 38035	norovirus GII/Hu/IN/2008/GII.P4_GII.4_ Apeldoorn2007/Pune-0866I9
275B	VPI	KR90421I5	275B	7I6B	11576, 15986, 20396, 24806, 29216, 33626, 38036	norovirus Gil
2757	VPI	AB9337I5	2757	7IB7	11577. 15987, 20397, 24807, 29217, 33G27. 38037	narovirus Hu/GII.4/Iwate4/2DII/JP
2758	VPI	AB933B95	2758	7IB8	11578, 15988. 20398. 24808, 29218, 33628, 38038	narovirus Hu/GH.4/SakailO/20ll/JP
2753	VPI	AB933B8I	2759	7IB9	11579. 15989, 20399, 24809, 29219, 33629, 38039	narovirus Hu/GII.4/Fukui4/20IO/JP

27BD	VPI	AB933675	27B0	7170	11580, 15990. 20400, 24810, 29220, 33B30, 38040	norovirus Hu/GII.4/HokkaidD4/2DI0/JP
27BI	VPI	ABB33B52	27BI	7171	11581, 15991, 20401, 24811. 29221, 33B31, 38041	norovirus Hu/GII.4/Iwate2/2D09/JP
27B2	VPI	KF4297B2	27B2	7172	11582, 15992, 20402, 24812, 29222, 33B32, 38042	norovirus Hu/GII.4/NIHICI7.7/20I2/0SA
27B3	VPI	JXB44D27	27B3	7173	11583, 15993, 20403, 24813, 29223, 33633, 38043	norovirus Hu/GII.4/N3/Z0D8/HuZhou
27B4	VPI	JN4DQBI7	27B4	7174	11584, 15994, 20404, 24814, 29224, 33B34, 38044	norovirus Hu/GiI-4/CGMHI9/2DDB/TW
27B5	VPI	JQ6I35I9	27B5	7175	11585, 15995, 20405, 24815, 29225, 33635, 38045	norovirus Hu/GII.4/NSW39I2/2008/AU
27BB	VPI	HQ45634I	27BB	7176	11586, 15986, 20406, 24816, 29226, 33636, 38046	norovirus Hu/GII.4/08-W-I(2008b)/20D8/TW
27B7	VPI	HM802540	27B7	7177	11587, 15997, 20407, 24817. 29227, 33637, 38047	norovirus Hu/GII.4/Hong Kong/CU050I4I/2005/CHN
27B8	VPI	AB54I257	27B8	7178	11588, 15998, 20408, 24818. 29228, 33B38, 38048	norovirus Hu/GII-4/Hiroshima4/2007/JP
27BB	VPI	AB54I242	2769	7179	11589, 15999, 20409. 24819, 29229. 33639, 38049	norovirus Hu/GII-4/Ehime4/2008/JP
277D	VPI	AB54I225	2770	7180	11590, I6Q00. 20410, 24820, 29230, 33640, 38050	norovirus Hu/GII-4/Aomori4/2008/JP
2771	VPI	AB54II90	2771	7181	11591, 16001, 20411, 24821, 29231, 33641, 38051	norovirus Hu/GII-4/2007a_0RF2-3/JP
2772	VPI	AB492092	2772	7182	11502, 16002, 20412. 24822, 29232, 33B42, 38052	norovirus Hu/GII.4/Stockholm/I9865/2008/SE
2773	VPI	EU9IB95B	2773	7183	11593, 16003. 2D4I3, 24823, 29233, 33643, 38053	norovirus Hu/Monastir 8655/2007/TUN
2774	VPI	EFI2B9B2	2774	7184	11594, 16004, 20414, 24824, 29234, 33644, 38054	norovirus Hu/GII.4/0enHaag54/20DB/NL
2775	VPI	ABBB3B87	2775	7185	11595, 16005, 20415, 24825. 29235, 33645, 38055	norovirus Hu/GII.4/Wakayama/TIG9/20IO/JP
277B	VPI	AB933759	277B	7186	11596. 16006, 204IB, 24826, 29236, 33646, 38056	norovirus Hu/GII.4/Nagano2B/20II/JP

2777	VPI	AB333755	2777	7187	11597, IB007, 20417. 24827, 29237, 33B47, 38057	norovirus Hu/GII.4/Saga2/2009/JP
2778	VPI	AB333B77	2778	7188	11598, IB008, 20418, 24828, 29238, 33B48, 38058	norovirus Hu/GII.4/Niigata3/20IO/JP
2773	VPI	AB933650	2779	7183	11599, IB0D9, 20413, 24823, 23239, 33B49, 38059	norovirus Hu/GII.4/Hiroshimacity4/20Q3/JP
278D	VPI	KM245071	2780	7130	11600. 16010, 20420, 24830, 29240, 33B50, 38060	norovirus 08-F-2/2008/GII.4/DenHaag/2006b
2781	VPI	KF7I2437	2781	7131	11601, 16011, 20421, 24831, 29241, 33B51, 38061	norovirus Hu/Gll.4/NIHIC27.2/20I2/USA
2782	VPI	KC990823	2782	7132	11602, 16012, 20422, 24832, 29242, 33B52, 38062	norovirus Hu/GII.4 2006b/092835/2008/0SA
2783	VPI	JX433843	2783	7133	11603. 16013, 20423, 24833, 29243, 33B53, 38063	norovirus Hu/GII/Seoull43l/KOR/20IO
2784	VPI	JX43384I	2784	7134	11604, 16014, 20424, 24834, 29244, 33654, 38064	norovirus Hu/GII/Seoull32l/K0R/20l0
2785	VPI	JX433830	2785	7135	11605, 16015, 20425, 24835, 29245. 33655, 380B5	norovirus Hu/GII/Seoull049/K0R/20l0
2786	VPI	JX43S828	278B	7196	II60B, 16016, 20426, 24836, 29246, 33656, 38066	norovirus Hu/GII/Seoul!456/K0R/20ll
2787	VPI	JX445I53	2787	7137	11607, 16017, 20427, 24837, 29247, 33657, 38067	norovirus Hu/GII.4/AlbertaEII42/2006/CA
2788	VPI	JXI55754	2788	7138	11608, IB0I8. 20428, 24838, 29248, 33658, 38068	norovirus Hu/GII.4/Xi'an/C45/20IO/CHN
2783	VPI	JN4DDB08	2789	7133	11609, 16019, 20429, 24839, 29249, 33659, 38069	norovirus Hu/GII-4/CGMHI0/2006/TW
2730	VPI	EFI87437	2790	7200	11610, 16020, 20430, 24840, 29250. 33660, 38D70	norovirus Hu/GII.4/Kenepuru/NZ327/20D6/NZL
2731	VPI	ABBB8028	2731	7201	II6II, 16021. 20431, 24841, 29251. 33B61. 38071	norovirus sBwage /GII/Influent/Nov200G/JPN
2732	VPI	HM802542	2792	7202	11612. 16022. 20432. 24842, 29252. 33B62, 38072	norovirus Hu/GII.4/Hong Kong/C0050l40/2005/CHN
2793	VPI	HQB035I3	2793	7203	11613, 16023. 20433, 24843, 23253, 33663, 38073	norovirus Hu/GII.4/JB-I5/K0R/2O08

2734	VPI	AB54I322	2794	7204	IIBI4, IB024, 20434, 24844, 29254, 33BB4, 38074	norovirus Hu/GII-4/Osaka2/2008/JP
2795	VPI	AB54I32I	2795	7205	IIBI5, IB025, 20435, 24845, 29255, 33BB5, 38075	norovirus Hu/GII-4/0saka2/2007/JP
279B	VPI	AB54I253	279B	720B	IIBIB, IB02B, 2043B, 2484B, 2925B, 33BBB, 3807B	norovirus Hu/GII-4/Hiroshima2/2007/JP
2797	VPt	AB54I250	2797	7207	IIBI7, IB027, 2B437, 24847, 29257, 33BB7, 38077	norovirus Hu/GII-4/Fukui5/2008/JP
2798	VPI	AB54I2II	2798	7208	IIBI8, IB028, 20438, 24848, 29258, 33BB8, 38078	norovirus Hu/GII-4/Akital/2007/JP
2790	VPI	GQ248797	2799	7209	IIBI9, 16029, 20439, 24849, 29259, 33BB9, 38079	norovirus Hu/GGII.4/Dijon/E3642/2008/FRA
280D	VPI	GQ24B794	2800	7210	IIB20, IG030, 20440, 24850, 2926D, 33B70, 38080	norovirus Hu/GGII.4/Dijon/E3436/2008/FRA
2801	VPI	E087B884	2801	7211	11621, 16031, 20441, 24851, 29261, 33671, 38081	norovirus Hu/GGII.4/Cairo4/200B/EGY
2802	VPI	FJ4III70	2802	7212	11622, 16032, 20442, 24852, 29262,33672, 38082	norovirus Hu/GII.4/Henry/2000/0SA
2803	VPI	E0839589	2803	7213	11623, 16033, 2D443, 24853, 29263. 33B73, 38083	norovirus Hu/GII/BBijing/34/20D6/CHN
2804	VPI	KX3539BI	2804	7214	11624, IB034, 20444, 24854, 292B4, 33B74, 38084	norovirus GII.4
2805	VPI	AB933757	2805	7215	11625, IB035, 20445, 24855, 29265, 33B75, 38085	norovirus Hu/GII.4/Saga4/2009/JP
2806	VPI	KM245074	280B	72IG	11626, 16036, 20446, 24856, 2926B, 3367B, 38086	norovirus 09-N-l/2Q09/GII.4/DenHaag/2006b
2807	VPI	E092I3B8	2807	7217	11627, 16037, 20447, 24857, 29267, 33B77, 38087	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ Hunter2004/Pune-PC3l
2808	VPI	EUB2I338	2808	7218	IIB28, IB038. 20448. 24858, 29268, 33678, 38088	norovirus GII/Hu/IN/2005/GII.P4_GII,4_ Hunter2004/Pune-PC09
2809	VPI	LC005708	2809	7219	11629, 16039, 20449, 24859, 29269, 33679, 38089	norovirus GII/Hu/JP/2008/GII.4/y08-207-2
2810	VPI	LCD05704	2810	7220	11630, IB040, 20450, 24860, 29270, 33B80, 38090	norovirus GII/Hu/JP/2007/GII.4/y0G-V82-2

2811	VPI	KF429777	2811	7221	IIG3I, IBD4I, 2B45I, 248BI, 29271, 33B81, 38D9I	norovirus Hu/Gll.4/NIHIC27.I/20I2/0SA
2812	VPI	JX43884D	2812	7222	IIB32, IBB42, 2D452, 248B2, 29272, 33682. 38092	noravirus Hu/Gil/Seoutl253/KDR/20ID
2813	VPI	JXG44D2G	2813	7223	11633, IBD43, 20453, 248B3, 29273, 33B83, 38093	norovirus Hu/GII.4/N2/200B/HuZhou
2814	VPI	JX4599DG	2814	7224	11634, IB044, 20454, 24864, 29274, 33684, 38094	noravirus Hu/GII.4/Miranda/NSWB5DK/201l/AU
2815	VPI	JX45B597	2815	7225	IIG35. 16045, 20455, 248B5, 29275, 33685, 38095	norovirus Hu/GII.4/SG4033-DI/2D05/SG
2816	VPI	HQ45G334	28IB	722G	11636, 16046, 20456, 24866, 2927B, 33B86, 38096	norovirus Hu/GII.4/08-D-l(2008a)/2008/TW
2817	VPI	HM8D2553	2817	7227	11637, 16047, 20457, 248B7, 29277, 33B87, 38097	norovirus Hu/GII.4/Hong Kong/C005IOI3/2005/CHN
2818	VPI	HQQG8055	2818	7228	11638, 16048, 20458, 24868, 29278, 33688, 38098	norovirus Hu/GII.4/8483/2008/ZAP
2819	VPI	AB54I3G0	2819	7229	11639, 16049, 20459, 24869, 29279, 33689, 38099	norovirus Hu/GII-4/Toyama4/2008/JP
282D	VPI	AB54I2G2	282B	723D	11640, 16050, 20460, 24870, 29280, 33690, 38100	norovirus Hu/GII-4/Hokkaido2/2007/JP
2821	VPI	AB54I23I	2821	7231	11641, 16051, 20461, 24871, 29281, 33691, 38101	norovirus Hu/GII-4/Chiba2/2008/JP
2822	VPI	BD24B792	2822	7232	11642. 16052, 204B2, 24872, 29282, 33692, 38102	norovirus Hu/GGII.4/Qijon/E3l65/2008/FRA
2823	VPI	AB5D4329	2823	7233	11643. 16053, 20463, 24873, 29283, 33693, 38103	norovirus Hu/Gll.4/Hiroshima/I5l/2008/JPN
2824	VPI	AB5Q43DB	2824	7234	11644, 16054, 20464, 24874, 29284, 33B94, 38104	norovirus Hu/Gll.4/Hiroshima/I9/200I/JPN
2825	VPI	GQ3Q3445	2825	7235	11645, 16055, 20465, 24875, 29285, 33695, 38105	norovirus Hu/MannliEiml3l/2DD9/DE
282B	VPI	EU839588	2828	723G	11646, I605B, 20466, 24876, 29286. 33696, 38106	norovirus Hu/GII/Beijing/07/2006/CHN
2827	VPI	DQ3G4459	2827	7237	11647, 16057. 20467, 24877, 29287, 33697, 38107	norovirus Gil

2828	VPI	KYG28449	2828	7238	IIB48, IB058, 204B8, 24878, 29288, 33698, 38108	noravirus GII.4
2829	VPI	KX371B08	2829	7239	11649, IB059, 20469, 24879, 29289, 33699, 38109	norovirus GII.4
2830	VPI	KX354D89	2830	7240	11650, IBOBO, 20470, 24880, 29290, 33700, 38110	norovirus GII.4
2831	VPI	KX35400I	2831	7241	IIB5I, 16061, 20471, 24881, 29291, 33701, 38111	norovirus GII.4
2832	VPI	KX35397I	2832	7242	11652, 16062, 20472. 24882, 29292, 33702, 38112	noravirus GII.4
2833	VPI	KRI3I766	2833	7243	**11653.** IB0B3, 20473. 24883, 29293, 33703, 38113	norovirus GII/Hu/IN/2008/GII.Pe_GII.4_ 0saka2007/PunE-084D97
2834	VPI	ABBG3B85	2834	7244	11654. 16064, 20474, 24884, 29294. 33704, 38114	norovirus Hu/GII.4/Wakayama/TI62/20IO/JP
2835	VPI	AB93374B	2835	7245	**11655.** IB065, 20475. 24885, 29295, 33705, 38115	norovirus Hu/GII.4/0sakal/2009/JP
283B	VPI	AB93370I	283B	724B	**11656.** 16066, 20476, 24886, 29296, 33706, 38116	norovirus Hu/GII.4/Akita3/20ll/JP
2837	VPI	AB933B8B	2837	7247	**11657.** 16067, 20477. 24887, 29297, 33707, 38117	norovirus Hu/GII.4/Ehime5/2BI0/JP
2838	VPI	AB933B80	2838	7248	11658, 16068. 20478, 24888, 29298, 33708, 38118	norovirus Hu/GII.4/Fukui3/20IO/JP
2839	VPI	AB933B72	2839	7249	11659, 16069, 20479. 24889, 29299, 33709, 38119	norovirus Hu/GII.4/Hirushima4/20IO/JP
2840	VPI	AB933BB4	2840	7250	**11660.** 16070, 20480, 24890, 29300, 33710, 38120	noravirus Hu/GII.4/Naganal/20IO/JP
2841	VPI	AB933BB2	2841	7251	IIBBI, 16071, 20481, 24891, 29301, 33711, 38121	norovirus Hu/GII.4/Chiba3/20IO/JP
2842	VPI	AB933B5B	2842	7252	11662, 16072, 20482, 24892, 29302, 33712. 38122	noravirus Hu/GII.4/Miyazakil/2009/JP
2843	VPI	EU92I34B	2843	7253	11663, 16073. 20483, 24893, 20303, 33713, 38123	noravirus GII/Hu/IN/200B/GII.P4_GII.4_ YersekB200Ga/Pun$_{E}$-PCII
2844	VPI	KC962453	2844	7254	11664. 16074, 20484, 24894, 29304. 33714, 38124	norovirus Gil

2845	VPI	KF7I2501	2845	7255	1166 5. IB075, 2D485, 24895. 293B5, 33715, 38125	norovirus Hu/GII.4/NIHICI7.G/20I2/USA
284B	VPI	JX459903	284B	725B	1166, IBD7B, 2D48B, 2489B, 293DB, 337IB, 38I2B	norovirus **Hu/GII.4/Jannali/NSW774M/20II/AU**
2847	VPI	JX459B29	2847	7257	**IIGB7.** IB077, 20487, 24897, 29307, 33717, 38127	norovirus Hu/GII.4/SG4069-OI/2008/SG
2848	VPI	JX445IB5	2848	7258	11668, IB078, 20488, 24898, 29308, 33718, 38128	norovirus **Hu/GII.4/AlbertaEIII9/ZOIO/CA**
2849	VPI	HMB35I5G	2849	725B	1169, 16079, 20489, 24899, 29309, 33719, 38129	norovirus **Hu/GII.4/Seoul/0945/2009/K0R**
2850	VPI	JQB22I97	285B	72BD	**11670.** IBD80, 20490. 249D0. 29310, 33720, 38130	norovirus Hu/GII-4/CBN02/2007/KR
2851	VPI	JQ6I3520	2851	72BI	**IIG7I.** 16081, 20491, 24901. 29311, 33721. 38131	norovirus Hu/GII.4/NSW04IG/2008/AU
2852	VPI	HQ45B32B	2852	72B2	1167 2. 16082, 20492, 24902, 29312, 33722, 38132	norovirus Hu/GII.4/04R-2/2004/TW
2853	VPI	A854I353	2853	72B3	11673, IB083, 20493, 24903, 29313. 33723, 38133	norovirus Hu/GII-4/Shimane5/2008/JP
2854	VPI	A854I348	2854	72B4	11674, 16084. 20494, 24904, 29314, 33724. 38134	norovirus Hu/GII-4/Shimane2/2008/JP
2855	VPI	AB54I339	2855	72B5	11675, I6D85, 20495. 24905, 29315, 33725. 38135	norovirus Hu/GII-4/Sakail/2007/JP
285B	VPI	AB54I3D3	285B	72BB	11676, 16086, 2049B, 2490B, 293IB, 33726, 38136	norovirus Hu/GII-4/Nagano2/2007/JP
2857	VPI	GD24B799	2857	72B7	**11677.** IB087, 20497, 24907, 29317, 33727, 38137	norovirus Hu/GGII.4/0ijon/E3808/2009/FRA
2858	VPI	EU87B88B	2858	72B8	11678, IB088. 20498. 24908, 29318, 33728. 38138	norovirus Hu/GGII.4/Cairo6/2006/EGY
2859	VPI	AB385B30	2859	7269	11679, 16089, 20499, 24909, 29319, 33729, 38139	norovirus **Hu/GII.4/RotterdamP3D0/2D06/NL**
28BD	VPI	KUI82483	28BB	7270	11680, 16090, 20500, 24910. 29320, 33730, 38140	norovirus GII.4
28BI	VPI	ABBB53B4	28BI	7271	11681, 16091, 20501, 24911, 29321, 33731, 38141	norovirus Hu/GII,4/0saka/NV22ID/2007/JP

2862	VP)	A8663G86	28G2	7272	11682. IB092. 20502, 24912, 29322, 33732, 38142	narovirus Hu/GII.4/Wakayama/TI64/20IO/JP
28B3	VPI	A8933702	28B3	7273	11683. 16033, 20503, 24913, 29323, 33733. 38143	narovirus Hu/GII.4/0saka3/20II/JP
28G4	VP!	AB933G85	28B4	7274	11684, 16094, 20504, 24914, 29324, 33734, 38144	noravirus Hu/GII.4/Ehime3/20IO/JP
28G5	VPI	ABB33G45	28B5	7275	11685, 16095, 20505, 24915, 29325. 33735, 38145	narovirus Hu/GII.4/Toyama4/2009/JP
28G6	VPI	LC00570G	28BB	727B	IIG86. I609G, 20506, 24916, 29326, 33736, 38I4B	norovirus GII/Hu/JP/2008/GII.4/y07-VI79-I
28G7	VPI	KMI985B2	28B7	7277	11687, 16097, 20507, 24917, 29327, 33737. 38147	narovirus Hu/GII/C2H-55/20II/VNM
28G8	VPI	KC4D93II	28B8	7278	11688. 16098, 20508, 24918, 29328, 33738, 38148	narovirus Hu/GII/30199/2009/VNM
28G9	VPI	KC4Q92B3	28B9	7279	11689, 16099, 20509, 24919, 29329, 33739, 38149	narovirus Hu/GII/20I73/200B/VNM
2870	VPI	JX4599Q0	2870	7280	11690, 16100, 20510, 24920, 29330, 33740, 38150	norovirus Hu/GII.4/Randwick/NSW882J/20II/A0
2871	VPI	JX459BI7	2871	7281	IIB9I, 16101. 20511. 24921, 29331, 33741, 38151	norovirus Hu/GII.4/SG4047-0I/2007/SG
2872	VPI	GQ84536G	2872	7282	11692, I6ID2, 20512, 24922, 29332, 33742. 38152	norovirus Hu/GII.4/WBstmead/NSW3639/2008/AUS
2873	VPI	GQ845345	2873	7283	11693, 16103, 20513. 24923, 29333, 33743, 38153	norovirus Hu/GII.4/NSW80BJ/2008/A0
2874	VPI	GQ84534I	2874	7284	11694, 16104, 20514, 24924, 29334, 33744, 38154	norovirus Hu/GII.4/NSW587V/2007/A0
2875	VPI	HQ005292	2875	7285	11695. 16105. 20515, 24925, 29335, 33745, 38155	norovirus Hu/II.4/222I223/HK/2009
287G	VPI	HQ45G32I	287B	728G	11696. 16106. 20516, 24926, 29336, 3374B, 38156	norovirus Hu/GII.4/05R-2/2005/TW
2877	VPI	AB54I32G	2877	7287	11697, 16107, 20517, 24927, 29337, 33747, 38157	norovirus Hu/GII-4/0saka4/2008/JP
2878	VPI	AB54I25I	2878	7288	11698. 16108. 20518, 24928, 29338, 33748, 38158	narovirus Hu/GII-4/Hiroshimal/2007/JP

2879	VPI	AB54I24I	2879	7280	IIBOO, **16109.** 20519, 24929, 29339, 33749, 38159	narovirus Hu/GII-4/Ehim $_{E}$4/2007/JP
2880	VPI	AB54I2IB	2880	720D	11700, IBIIO, 20520, 24930, 29340, 33750, 38IB0	norovirus Hu/GII-4/Akita4/2D08/JP
2881	VPI	EU87B885	2881	7291	11701, IBIII, 20521, 24931, 29341, 33751, 38IBI	noravirus Hu/GGII.4/Cairo5/20D6/EGY
2882	VPI	AB447435	2882	7202	11702, IBII2, 20522, 24932, 29342, 33752, 38IB2	noravirus Hu/GII-4/Aomori5/200B/JP
2883	VPI	KX354073	2883	7203	11703, IBII3, 20523, 24933, 29343, 33753, 38163	narovirus GII.4
2884	VPI	KX35398I	2884	7294	11704, 16114, 20524, 24934, 29344, 33754, 38164	narovirus GII.4
2885	VPI	KUI82479	2885	7205	11705, 16115, 20525, 24935, 29345, 33755, 38165	noravirus GII.4
2886	VPI	KUI82478	288B	720B	11706, 16116, 20526, 24936, 29346, 33756, 38166	noravirus GII.4
2887	VPI	AB97250I	2887	7207	11707, 16117, 20527, 24937, 29347, 33757, 38167	narovirus **Hu/GII.4/6II4-HKD3/2DII/JP**
2888	VPI	KR9D42I4	2888	7208	11708, 16118, 20528, 24938, 29348, 33758, 38168	narovirus GiI
2889	VPI	AB933758	2880	7290	11709, 16119, 20529, 24939, 29349, 33759, 38169	narovirus Hu/GII.4/Chiba6/20II/JP
289D	VPI	AB933B98	2890	7300	11710. 16120, 20530. 24940, 29350, 33760, 38170	noravirus Hu/GII.4/Hirashimacity2/20II/ JP
2891	VPI	KJ678I4I	2801	7301	II7II, 16121, 20531, 24941, 29351, 33761, 38171	narovirus Hu/GII.4/Beijing/PKUPH-02-08/inpatient/20I3/CHN
2892	VPI	EU92I347	2802	7302	**11712. 16122.** 20532, 24942. 29352, 33762, 38172	noravirus GII/Hu/IN/2006/GII.P4_GII.4_YErsBkB2006a/Pune-PCI8
2893	VPI	JX459B28	2803	7303	**11713. 16123.** 20533, 24943, 29353, 33763, 38173	noravirus **Hu/GII.4/SG4D63-ID/20D7/SG**
2894	VPI	JQBI35B4	2804	7304	11714, 16124, 20534, 24944, 29354, 33764, 38174	noravirus **Hu/GII.4/NSW944J/2DID/AU**
2895	VPI	GQ845332	2805	73D5	**11715.** 16125, 20535, 24945, 29355, 33765, 38175	narovirus Hu/GII.4/NSW6I8P/20O8/A0

2896	VPI	GQ85646I	2896	7306	II7IB, I6I26, 20536. 24946. 29356, 33766, 38I76	norovirus Hu/GII.4/B Beijing/546G7/2007/CHN
2897	VPI	AB54I245	2897	7307	H7I7. I6I27, 20537, 24947, 29357, 33767, 38I77	norovirus Hu/GII-4/Fukui2/2007/JP
2898	VPI	AB54I229	2898	7308	II7I8. I6I28, 20538, 24948, 29358, 33768. 38I78	norovirus Hu/GII-4/Chibai/2DD8/JP
2899	VPI	AB54I226	2899	7309	II7I9, I6I29, 20539, 24949, 29359, 33769, 38I79	norovirus Hu/GII-4/Aomori5/2DD7/JP
29DD	VPI	DQ0788I4	2900	73I0	II720, I6I30, 20540, 24950, 29360, 33770, 38I80	noravirus Hu/GII.4/Hunter504Q/04Q/AU
29DI	VPI	EU0784IG	290I	73II	II72I, I6I3I, 2054I. 2495I, 29361, 33771, 38181	noravirus Hu/Billings/2006/USA
2902	VPI	E0839590	2902	73I2	II722, I6I32, 20542, 24952, 29362, 33772, 38182	norovirus Hu/GII/Beijing/116/2007/CHN
2903	VPI	AB294783	2903	73I3	11723, 16133, 20543, 24953. 29363. 33773, 38183	noravirus Hu/GII-4/Katari/04I008/2004/JP
2904	VPI	AB30334I	2904	73I4	11724, 16134, 20544, 24954, 29364, 33774, 38184	noravirus Hu/GGII.4/Nijmegen083/2004/NL
2905	VPI	EFI2696I	2905	73I5	11725. 16135, 20545, 24955. 29365, 33775, 38185	norovirus Hu/GII.4/Dangen46/200G/NL
2906	VPI	LCI53749	2906	73I6	11726, 16136. 20546, 24956, 29366, 33776, 38186	naravirus Hu/GII.4/Myo-TCN/20IO/JP
2907	VPI	KX371610	2907	73I7	11727, 16137, 20547, 24957, 29367, 33777, 38187	noravirus GII.4
2908	VPI	KX354031	2908	73I8	11728, 16138, 20548, 24958, 29368, 33778, 38188	noravirus GII.4
2909	VPI	KX353990	2909	73I9	11729, 16139, 20549, 24959, 29369, 33779, 38189	noravirus GII.4
29I0	VPI	KX353972	29I0	7320	11730, 16140. 20550. 24960. 29370, 33780. 38190	norovirus GII.4
29I1	VPI	KX353968	29II	732I	11731. 16141, 20551, 24961, 29371, 33781, 38191	noravirus GII.4
29I2	VPI	KX353967	29I2	7322	11732, 16142, 20552, 24962, 29372, 33782, 38192	norovirus GII.4

2313	VPI	KX353966	2913	7323	11733, 16143. 2D553, 24963, 29373, 33783, 38193	norovirus GII.4
2914	VPI	ABBB3B84	2914	7324	11734, 16144, 2D554, 24964, 29374. 33784, 38194	norovirus Hu/GII.4/Wakayama/TI58/20IO/JP
2915	VPI	KR9042D9	2915	7325	11735, 16145, 2D555, 24965, 29375, 33785, 38195	norovirus GiI
291G	VPI	AB9337IB	291B	732B	11736, I6I4G, 2D55B. 24966, 29376, 33786, 38196	norovirus Hu/GII.4/Iwate5/20II/JP
2917	VPI	AB933BBB	2917	7327	11737, IBI47, 20557, 24967, 29377. 33787. 38197	norovirus Hu/GII.4/0saka2/2DI0/JP
2918	VPI	EU92I349	2918	7328	11738, 16148, 20558, 24968, 29378, 33788, 38198	norovirus GII/Hu/IN/200G/GII,P4_GII.4_ YersekB200Ga/PunE-PC20
2919	VPI	EU92I348	291B	7329	11739, 16149, 20559. 24969, 29379, 33789. 3819	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ YErsBkB2006a/Pune-PCI9
292D	VPI	EU92I345	292G	733D	11740, 16150, 20560. 24970, 29380, 33790, 38200	norovirus GII/Hu/IN/200B/GII.P4_GII.4_ YErsBke2006a/Pune-PCI6
2921	VPI	KPG989 24	2921	7331	11741. IBI5I, 20561, 24971, 29381, 33791 38201	norovirus GII.4
2922	VPI	LC0057D7	2922	7332	11742, 16152. 20562. 24972, 29382, 33792, 38202	norovirus GII/Hu/JP/2008/GII,4/y07-V203-I
2923	VPI	KJ54I743	2923	7333	11743, 16153, 205B3, 24973, 29383. 33793, 38203	norovirus Hu/GII.4/SG0-H042I/KDR/20II
2924	VPI	KFI77443	2924	7334	11744, 16154, 205G4. 24974, 29384, 33794, 38204	norovirus Hu/GII,4/3585778B/AUS/2012
2925	VPI	JX439842	2925	7335	11745, 16155, 205B5, 24975, 29385, 33795, 38205	norovirus HU/GII/SEOUII 35I/K0R/20I0
2926	VPI	HF052I35	292B	733B	11746, 16156, 2056B, 2497G, 29386, 3379B, 38206	norovirus Hu/GII.4/C00007952/20II/UK
2927	VPI	JX459598	2927	7337	11747, 16157, 205B7, 24977, 29387, 33797, 38207	norovirus Hu/GII.4/SG4039-02/2005/SG
2928	VPI	JX445IB2	2928	7338	11748, 16158. 20568, 24978, 29388, 33798, 38208	norovirus Hu/GII.4/AlbertaEI425/2008/CA
2929	VPI	JX445I54	2929	7339	11749. 16159, 20569, 24979, 29389, 33799, 38209	norovirus Hu/GII.4/Alb ertaEII90/200G/CA

2930	VPI	JXI55752	2330	7340	11750, **16160.** 20570, 24980, 29390, 33800, 38210	norovirus Hu/GII.4/Xi'an/C3I/2DI0/CHN
2931	VPI	HM74897I	2931	7341	**11751.** 16161, 20571, 24981, 23391, 33801, 3821	norovirus Hu/GII.4/8eecroft/NSW305P/2009/AUS
2932	VPI	GD8453B7	2332	7342	11752, **16162.** 20572, 24382, 23332, 33802, 3821 2	norovirus Hu/GII.4/0range/NSW00IP/2008/AU
2933	VPI	G085B455	2333	7343	11753. 16163. 20573, 24383, 29333, 33803, 38213	norovirus Hu/GII.4/Beijing/55058/2007/CHN
2934	VPI	G0856447	2334	7344	11754, **16164.** 20574, 24984, 29334, 33804, 38214	norovirus **Hu/GII.4/8eijing/540SI/2007/CHN**
2935	VPI	AB54I3I8	2335	7345	11755. **16165.** 20575, 24985, 29395. 338D5, 38215	norovirus Hu/GII-4/Niigata5/2008/JP
293G	VPI	AB54I3B7	233B	734B	**11756. 16166.** 20576, 24986, 29396, 3380B, 38216	norovirus Hu/GII-4/Nagano4/2008/JP
2937	VPI	AB54I254	2337	7347	11757, **16167.** 20577, 24987, 23337. 33807, 38217	norovirus Hu/GII-4/Hiroshima2/2008/JP
2938	VPI	AB54I243	2338	7348	11758, **16168.** 20578, 24388, 23338, 33808. 38218	norovirus Hu/GII-4/Ehime5/2008/JP
2939	VPI	AB54I232	2339	7343	11753, 16169. 20579. 24989, 29399, 33809, 3821 8	norovirus Hu/GII-4/Chiba4/2007/JP
294D	VPI	GQ246800	2940	735B	11760, **16170.** 20580, 24990, 29400, 33810, 38220	norovirus Hu/GGII.4/0ijon/E388D/2003/FRA
2941	VPI	GU39D90D	2941	7351	11761, IBI7I, 2D58I, 24331. 23401, 33811, 38221	norovirus Hu/GII.4/Chungnam(II-34)/20B8/Kor
2942	VPI	AB504328	2942	7352	11762, 16172, 20582, 24992. 29402, 33812, 38222	norovirus Hu/GII.4/Hiroshima/I39/2007/JPN
2943	VPI	AB447434	2943	7353	11763, 16173, 2B583, 24993, 29403, 33813, 38223	norovirus Hu/GII-4/Aomori4/2006/JP
2944	VPI	EU83353I	2944	7354	11764. **16174.** 20584, 24994. 29404. 33814. 38224	norovirus Hu/GII/BBijing/125/2007/CHN
2945	VPI	AB2BI542	2945	7355	11765, 16175, 20585, 24995, 29405, 33815, 38225	norovirus Hu/Gff.4/KobeD34/2DDB/JP
294B	VPI	KX354I23	294B	735B	11766, 16176, 20586, 2499B, 29406, 33816. 38226	norovirus GII.4

2947	VPI	KX354B5D	2947	7357	**11767. 16177.** 2B587, 24997, 294B7, 33817, 38227	narovirus GII.4
2948	VPI	AB9337I7	2948	7358	**11768. 16178.** 2B588. 24998. 294B8, 33818, 38228	noravirus Hu/BII.4/Toyama5/20ll/JP
2949	VPI	AB933707	2949	7359	11769, 16179, 2B589, 24999, 29409, 33819, 38229	narovirus Hu/GII.4/Saga2/20ll/JP
295D	VPI	AB9337B5	295B	73BD	11770, 16180, 20590, 25000, 29410, 33820, 38230	noravirus Hu/GII.4/Ehime2/20ll/JP
2951	VPI	AB933704	2951	73BI	11771, 16181, 20591, 25001, 29411, 33821, 38231	narovirus Hu/GII.4/Ehimel/20ll/JP
2952	VPI	AB933B99	2952	73B2	11772, 16182, 20592, 25002, 29412, 33822, 38232	narovirus Hu/GII.4/Akita2/20ll/JP
2953	VPI	AB933B79	2953	73B3	11773, 16183, 20593, 25003, 29413, 33823, 38233	noravirus Hu/GII,4/Fukui2/20IO/JP
2954	VPI	AB933BBI	2954	73B4	11774, 16184, Z0594, 25004, 29414, 33824, 38234	noravirus Hu/GII.4/Chibal/20IO/JP
2955	VPI	KTI52I48	2955	73B5	11775, 16185, 20595, 25005, 29415, 33825, 38235	narovirus **Hu/GII.P4_6ll.4/MinBrva/2006/USA**
295B	VPI	EU92I393	295B	73BB	11776, **16186.** 2059B, 25006, 29416, 33826, 38236	narovirus **GII/Hu/IN/2DD7/GII.P4_GII.4_** DenHaag2006b/Pune-PC56
2957	VPI	KM39BBBI	2957	73B7	11777, **16187.** 20597, 25007, 29417, 33827, 38237	norovirus **GII/ Hu/HKG/ZDI4/GII.4 / CUHK-NS-**339
2958	VPI	KM198485	2958	73B8	11778, 16188, 20598, 25008, 29418, 33828, 38238	norovirus Hu/GII/IOI48/2009/VNM
2959	VPI	KF3DB2I4	2959	73B9	11779, 16189, 20599, 25009, 29419, 33829, 38239	noravirus **Hu/GII.4/Jingzhou/20I34Q3/CHN**
29BD	VPI	JX43983I	296B	737D	11780, 16190, 20B00, 25010, 29420, 33830, 38240	norovirus HU/GII/SEOUIII2I/K0R/20I0
29BI	VPI	KC4D928I	29BI	7371	11781. 16191, 20601, 25011, 29421, 33831, 38241	narovirus Hu/GII/20229/2009/VNM
29B2	VPI	JX459B39	29B2	7372	11782, 16192. 20602. 25012. 29422, 33832, 38242	narovirus Hu/GII.4/SG4028-07/2009/SG
29B3	VPI	JX459BD9	29B3	7373	11783, **16183.** 20603, 25013, 29423, 33833, 38243	narovirus Hu/GII.4/SG40I5-I0/2006/SG

29B4	VPI	JN400599	29B4	7374	11784. 16194, 20B04, 25DI4, 29424. 33834, 38244	noravirus Hu/BII-4/CBMH0I/2DDB/TW
2BB5	VPI	J0BI3539	29B5	7375	11785, 16195. 20B05, 25015, 29425. 33835, 38245	nomvirus Hu/GII.4/NSW447T/2009/A0
29GB	VPI	HQ45G329	29BB	737B	II78B, IGI96. 20BDB, 25016, 2942B, 3383B, 3824G	noravirus Hu/GII.4/07-B-I/2006/TW
29B7	VPI	HM80253B	23B7	7377	11787, 16197, 20B07, 25017, 29427, 33837, 38247	norovirus Hu/GII.4/Hong Kong/C0060039/2006/CHN
29B8	VPI	HM802532	2968	7378	11788, 16198, 20608, 25018, 29428, 33838, 38248	noravirus Hu/GII.4/Hang Kong/CUD60030/2006/CHN
29B9	VPI	AB54I34I	29B9	7379	11789, 16199, 2D6B9, 25019, 29429, 33839, 38249	narovirus Hu/GII-4/Sakai2/2007/JP
2970	VPI	AB54I2G4	2970	7380	11790, IB200, 2DBI0, 25020, 29430, 33840, 38250	narovirus Hu/GII-4/Hokkaido3/2008/JP
2971	VPI	AB54I236	2971	7381	11791. 16201, 20611, 25021, 29431, 33841, 38251	norovirus Hu/GII-4/Ehimel/2007/JP
2972	VPI	AB54I208	2972	7382	11792, IB202, 20612. 25022. 29432. 33842. 38252	narovirus Hu/GII-4/Aichi4/2008/JP
2973	VPI	EU87B890	2973	7383	11793. I62D3, 20613, 25023, 29433, 33843, 38253	norovirus Hu/GGII.4/Dijon-EID57/ZD02/FRA
2974	VPI	AB385638	2974	7384	11794, 16204, 20614, 25024, 29434, 33844, 38254	norovirus Hu/GII.4/RottBrdamP6D33/2006/NL
2975	VPI	AB385B35	2975	7385	11795, 16205, 20615, 25025, 29435, 33845, 38255	narovirus Hu/GII.4/RotterdamP5D36/2005/NL
297B	VPI	EU3BBII3	2976	738B	11796, I62D6, 206IB, 25026, 29436, 33846, 38256	norovirus Hu/Duan/Beijing/2006/China
2977	VPI	KX3540B7	2977	7387	11797. 16207, 20617, 25027, 29437, 33847, 38257	noravirus GII.4
2978	VPI	AB933727	2978	7388	11798, 16208, 20618. 25028, 29438, 33848, 38258	norovirus Hu/GII.4/ChibalO/20II/JP
2979	VPI	AB93372B	2979	7389	11799, 16209, 20619, 25029, 29439, 33849, 38259	norovirus Hu/GII.4/Ehime4/20II/JP
2980	VPI	AB933720	2980	7390	11800, 16210, 20620, 25030, 29440, 33850, 38260	norovirus Hu/GII.4/Hiroshima2/2DII/JP

2981	VPI	AB933G9I	2381	7331	11801, IB2II, 20B2I, 25031. 29441. 33851, 38261	norovirus Hu/GII.4/Miyazaki5/2DID/JP
2982	VPI	AB933B82	2982	7392	11802. 16212, 20622, 25032, 29442, 33852, 38262	norovirus Hu/GII.4/Nagano3/2010/JP
2983	VPI	KM2450BB	2983	7333	II8D3. 16213, 20B23, 25033. 29443, 33853, 382B3	nnrovirus 06-AM-II/2006/GII.4/Yerseke/2006a
2984	VPI	LCBD57I7	2984	7394	11804, 16214, 2BB24, 25034, 23444, 33854, 382B4	norDvirus GII/Hu/JP/20I2/GII.4/yII-V683-2
2985	VPI	LCGB57B5	2985	7395	11805, 16215, 20B25, 25D35, 29445, 33855, 38265	norovirus GII/Hu/JP/2007/GII.4/y0G-VII0-5
2986	VPI	KC894943	298B	739B	11806, 16216, 20626, 25036, 2344B, 33856, 38266	nnrovirus Hu/GII.4/Guangzhou/GZ20IO-L3I/CHN/20II
2987	VPI	KF0BBG23	2987	7397	11807, 16217. 20B27. 25037, 23447, 33857, 38267	norovirus Hu/GII.4/NSW25BG/2DI2/AU
2988	VPI	KC4093IB	2988	7398	11808, 16218, 20628. 25038, 29448, 33858, 38268	norovirus Hu/GII/30I2S/2009/VNM
2989	VPI	JX989B73	2989	7399	11809, 16213, 20623, 25039, 23449, 33859, 38269	norovirus Hu/GII.4/GZ20IO-L2B/Buangzhnu/CHN/20I0
299D	VPI	JX4599D2	2330	7400	11810, 16220, 20B30, 25040, 2345B, 338B0, 38270	norovirus Hu/GII.4/B Browra/NSW767L/20I2/AU
2991	VPI	JX459B44	2391	74BI	II8II, 16221. 20631. 25041, 29451, 33861, 38271	nnrovirus Hu/GII.4/SG404G-09/2009/SG
2992	VPI	JX453BID	2992	74B2	11812, IB222, 20B32. 25B42, 29452, 33862, 38272	norovirus Hu/GII.4/SG4030-I2/2006/SG
2993	VPI	JX459BBB	2933	7403	11813, 16223, 2D633, 25Q43, 23453, 33863, 38273	norovirus Hu/GII.4/SG406D-ID/2DDG/SG
2994	VPI	JX445I53	2334	7404	11814, IB224, 20634, 25044, 23454, 338B4, 38274	norovirus Hu/GII.4/AlbertaEI009/2008/CA
2995	VPI	JN400606	2335	7405	11815, 16225, 20635, 25D45. 23455, 33865, 38275	norovirus Hu/GII-4/CGMH08/2006/TW
299B	VPI	JBBI35B2	2996	740B	11816, 16226. 20B3B, 25046, 29456, 338B6, 38276	norovirus Hu/GII.4/NSWB270/2DID/AU
2997	VPI	HQ45B343	2997	7407	11817. IB227, 20B37, 25047, 23457, 33867, 38277	norovirus Hu/GII,4/09-L-4(2009a)/2009/TW

2BB8	VPI	HQ45B342	2998	7408	11818. IB228, 2DB38, 25048. 23458, 338B8. 38278	norovirus Hu/GII.4/08-AA(2008b)/2008/TW
2999	VPI	HQ45B34D	2999	7409	11819, IB229, 2BB39, 25049, 29459, 338B9, 38273	norovirus Hu/GII.4/08-U-2(2008a)/2008/TW
3BB0	VPI	HQ45B32B	3B0B	7410	11820, IB23B, 20B40, 25050, 2B4B0, 33870, 38280	noravirus Hu/GII.4/DB-CJ-I/2DDB/TW
3001	VPI	HM802527	3001	7411	11821, 1623I, 20B4I, 25051, 234BI, 33871, 38281	norovirus Hu/GII.4/Hong Kong/C00G00l2/2006/CHN
3002	VPI	GQ856448	3002	7412	11822, IB232, 20B42, 25052, 234B2, 33872, 38282	noravirus Hu/GII.4/Beijing/54ll6/2007/CHN
3003	VPI	AB54I347	30B3	7413	11823, IB233, 20B43, 25053, 2S4B3, 33873, 38283	noravirus Hu/GII-4/Shimane2/2Q07/JP
3004	VPI	AB54I298	3004	7414	11824, IB234, 20B44, 25D54, 29464, 33874. 38284	norovirus Hu/GII-4/Miyazaki7/2008/JP
3005	VPI	AB54I27B	3005	7415	11825, IB235. 2D645. 25055, 29465, 33875, 38285	noravirus Hu/GII-4/Iwate2/2007/JP
300B	VPI	AB54I2B3	300B	74IB	11826. IB23B, 2BB4B, 25056. 29466. 3387B. 38286	norovirus Hu/GII-4/Hokkaido2/2008/JP
3007	VPI	AB54I25B	3007	7417	11827, IB237, 20B47, 25057, 29467, 33877, 38287	noravirus Hu/GII-4/Hirashima3/2008/JP
3008	VPI	AB54I240	3008	7418	11828, IB238. 2DB48, 25058, 29468, 33878, 38288	noravirus Hu/GII-4/Ehime3/2008/JP
3003	VPI	AB54I233	3009	7419	11823, IB239, 20649. 25059. 234B3, 33873, 38289	noravirus Hu/GII-4/Chiba4/2008/JP
3DI0	VPI	AB54I2I5	3010	7420	II83B. IB24B. 20B50, 2506B, 29470, 3388B, 3829D	norovirus Hu/GII-4/Akita3/2008/JP
3GII	VPI	AB54I20I	3011	7421	11831, 16241, 2D65I. 250BI, 29471. 3388I. 38291	norovirus Hu/GII-4/Aichil/20Q7/JP
3012	VPI	FJ4III72	3012	7422	11832. 16242, 20652, 250B2, 29472, 33882, 38292	noravirus Hu/GII.4/RIS/2D0B/USA
3BI3	VPI	AB447449	3DI3	7423	11833, 16243. 2D653. 25063, 29473, 33883, 38293	narovirus Hu/GII-4/Sakai3/200B/JP
3014	VPI	AB44743I	3014	7424	11834, 16244. 20654, 250B4, 29474, 33884, 38294	narovirus Hu/GII-4/Hokkaido5/20B6/JP

3015	VP1	EU078415	3015	7425	11835, IB245. 20B55, 250B5. 29475, 33885. 38295	norovirus Hu/Ryndam/2005/0SA
3016	VP1	AB385643	30IB	742B	11836. IB24B, 20B56. 250B6, 29476. 3388B, 3829B	narovirus Hu/GII.4/RottBrdamP8D65/2006/NL
3017	VPI	AB385B3B	3017	7427	11837, 16247. 20B57, 25067, 29477. 33887, 38297	norovirus Hu/GII.4/RotterdamP5D5l/2005/NL
3018	VPI	AB385B29	3018	7428	11838, IB248, 20658. 250B8, 29478, 33888, 38298	norovirus Hu/GII.4/RDtterdamP2DI82/2005/NL
3019	VPI	E083958B	3019	7429	11839, 16249, 20659. 25069, 29479, 33889. 38299	norovirus Hu/GII/Beijing/484/2005/CHN
3020	VPI	E03I0927	302D	7430	11840, IB250, 20660, 25070, 29480, 33890, 38300	narovirus Hu/Houston/TCHI86/2002/US
3021	VPI	AB294787	3021	7431	11841, 16251, 20661, 25071, 29481, 33891, 38301	norovirus Hu/GII-4/Ichikawa/05070l/2005/JP
3022	VPI	AY587987	3022	7432	11842, 16252, 20BB2, 25072, 29482, 33892, 38302	norovirus Hu/NLV/0xford/B4S7/2002/UK
3023	VPI	AY5020I9	3023	7433	11843, 16253, 20663. 25D73, 29483, 33893, 38303	norovirus Gil
3024	VPI	LCI77B53	3024	7434	11844, IB254, 2DBB4, 25074, 29484, 33894, 38304	norovirus GII.4
3025	VPI	AB97248B	3025	7435	11845, 16255, 20665, 25075, 29485, 33895, 38305	norovirus Hu/GII.4/0sakaCity4/20l2/JP
3026	VPI	KR904235	302B	743B	11846. 16256, 20666, 25076, 29486, 33896, 38306	norovirus Gil
3027	VPI	AB933753	3027	7437	11847. 16257, 20667, 25077, 29487, 33897, 38307	norovirus Hu/GII.4/Ehime4/2009/JP
3028	VPI	AB93372I	3028	7438	11848. IB258, 206B8, 25078, 29488, 33898, 38308	norovirus Hu/GII.4/Hiroshima4/20ll/JP
3029	VPI	AB93370B	3029	7439	11849. 16259. 206B9. 25079, 29489, 33899, 38309	norovirus Hu/GII.4/Sagal/20ll/JP
3030	VPI	AB933BB9	3030	7440	11850, 16260, 20G70, 25080. 29490, 33900. 38310	norovirus Hu/GII.4/Sakail/20IO/JP
3031	VPI	EU92I350	3031	7441	11851, 16261, 20671, 25081, 29491, 33901, 38311	norovirus GII/Hu/IN/2006/GII.P4_GII.4_YersEke200Ga/PunB-PC2l

3032	VPI	LC0057I2	3032	7442	11852, IB2B2, 20B72, 25082, 29492, 33902, 38312	norovirus GII/Hu/JP/20IO/GII.4/y09-205-l
3033	VPI	LC0I8707	3033	7443	11853, IB2B3, 20B73, 25083, 29493, 33903, 38313	norovirus Hu/GII.4/AichiNishio7-l4/20l4
3034	VPI	KM982955	3034	7444	11854, IB2B4, 2DB74, 25084, 29494, 33904, 38314	norovirus GII/Hu/HKG/20l4/GII.4/C0HK-NS-369
3035	VPI	KM38294e	3035	7445	11855, IB2B5, 20B75, 25085, 29495, 33905, 38315	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-3BI
3036	VPI	KM40B485	303B	744B	II85B, IB2BB, 2DB7B, 2508B, 29496, 33906, 38316	norovirus Hu/Gtl.4/ variant Sydney 2012/FRA
3037	VPI	KMI98574	3037	7447	11857, I62B7, 20B77, 25087, 29497, 33907, 38317	norovirus Hu/GII/IOI83/2009/VNM
3038	VPI	KMI985I7	3038	7448	11858, 162B8, 20678, 25088, 29498, 33908, 38318	norovirus Hu/GII/30399/2010/VNM
3039	VPI	JX439839	3039	7449	11859, 162B9, 20679, 25089, 29499, 33909, 38319	norovirus Hu/GII/Seoull2ll/KOR/20IO
3040	VPI	JX439837	3040	7450	11860, 16270, 20B80, 25090, 29500, 33910, 38320	norovirus HU/GII/SEOUII032/K0R/20I0
3041	VPI	KC63I8I5	3041	7451	11861, 16271, 20681, 25091, 29501, 33911, 38321	norovirus Hu/GII.4/MI002/20ll/OSA
3042	VPI	KC4093I5	3042	7452	11862. 16272. 20682, 25092, 29502, 33912, 38322	norovirus Hu/GII/302ll/2009/VNM
3043	VPI	KC409289	3043	7453	11863, 16273, 20B83, 25D93, 29503, 33913, 38323	norovirus Hu/GII/20302/2009/VNM
3044	VPI	KC4D9278	3044	7454	11864, IB274, 20684, 25094, 29504, 33914, 38324	norovirus Hu/GII/20208/2009/VNM
3045	VPI	KCI754Q2	3045	7455	11865, IB275, 20B85, 25095, 29505, 33915, 38325	norovirus Hu/Norwalk/20094/2009/VHM
304B	VPI	JX459BIB	304B	745G	11866, 1627B, 20B8B, 25096, 29506, 33916, 38326	norovirus Hu/GII.4/SG404l-OI/2007/SG
3047	VPI	JX459599	3047	7457	11867, IB277, 20687, 25097, 29507, 33917, 38327	norovirus Hu/GII.4/SG409!-06/Z006/SG
3048	VPI	JN400B03	3048	7458	11868, 16278, 20688, 25D98, 29508, 33918, 38328	norovirus Hu/6ll-4/CGMH05/2006/TW

3049	VPI	JQGI3572	3049	7459	**11869.** 16279. 20B89. 250SB, 29509, 33919, 38329	narovirus **Hu/GII.4 / StVincEnts /NSW2I7I/2DID/AU**
3050	VPI	JQGI3525	3050	74BD	11870, IB280, 20G90, 25100, 29510, 33920, 38330	noravirus Hu/GII.4/NSW8I90/2009/AU
3051	VPI	JQBI35I0	3051	74BI	11871. 16281, 20G9I, 25101, 29511, 33921, 38331	narovirus **Hu/GII.4/NSWB33M/2D07/AU**
3052	VPI	G0856450	3052	74B2	11872, 16282, 20692, 25102, 29512, 33922, 38332	norovirus Hu/GII.4/BEijing/54I35/2007/CHN
3053	VPI	AB54I29G	3053	74B3	11873, 16283, 2DG93, 25103, 29513, 33923, 38333	noravirus Hu/BII-4/Miyazaki5/2DD7/JP
3054	VPI	AB54I2I2	3054	74B4	11874, 16284, 20694, 25104, 29514, 33924, 38334	norovirus Hu/GII-4/Akital/2008/JP
3055	VPI	AB50432I	3055	74B5	11875, IB285, 20B95, 25105, 29515, 33925, 38335	noravirus **Hu/GII.4 / HiPDshima /92/20D6/JPN**
305B	VPI	AB294785	305B	74BB	**11876.** 16286, 2069B, 25106. 295IB. 33926. 38336	noravirus Hu/GII-4/Inba/050590/2005/JP
3057	VPI	AB234780	3057	74B7	11877, IB287, 20B97, 25107. 29517, 33927, 38337	noravirus Hu/GII-4/Chiba/040095/2003/JP
3058	VPI	AB3D3933	3058	74B8	11878, 16288, 2D698, 25108, 29518, 33928, 38338	narovirus Hu/GGII.4/Haarlem457/2003/NL
3059	VPI	AY587988	3059	74B9	11879, 16289, 20699, 25109, 29519, 33929, 38339	noravirus Hu/NLV/0xford/B4SI/2D02/0K
30GD	VPI	KX354103	30B0	7470	11880, IG290, 2070D, 25110, 29520, 33930, 38340	narovirus GII.4
30BI	VPI	KX354048	30BI	7471	**11881.** 16291. 20701, 25111, 29521, 33931, 38341	narovirus GII.4
30B2	VPI	KX354047	30B2	7472	11882, 16292, 20702, 25112, 29522, 33932, 38342	noravirus GII.4
30B3	VPI	KU985IGI	3DB3	7473	11883, 16293, 20703. 25113, 29523, 33933, 38343	noravirus GII.4
30G4	VPI	AB9725I7	30B4	7474	11884, 16294, 20704, 25114, 29524, 33934, 38344	narovirus Hu/GII.4/Aichi3/2DI2/JP
30G5	VPI	AB972494	30B5	7475	11885, IG295, 20705, 25115, 29525, 33935, 38345	narovirus Hu/GII.4/Hirashima4/20I2/JP

3066	VPI	KU3IIIB3	30BB	747B	II88B. IB29B, 2070B, 25IIG, 2952B, 33936. 3834B	norovirus Hu/GII.4/AlbertaSPI/20l3/CA
3067	VPI	KR904023B	30B7	7477	11887, IB297, 20707. 25117, 29527, 33937. 38347	narovirus Gil
3DB8	VPI	KR904225	30B8	7478	11888. IB298, 20708, 25118, 29528, 33938, 38348	narovirus Gil
30B9	VPI	LC0057I0	30B9	7479	11889, 16299, 20709, 25119, 29529, 33939, 38349	norovirus GII/Hu/JP/2009/GII.4/y08-238-2
3D7D	VPI	LCDI8709	3070	7480	11890, 16300, 20710, 25120, 29530, 33940, 38350	norovirus Hu/Gll.4/Aichi352-I4/20I4
307I	VPI	KMI98587	307I	748I	11891, 16301, 20711. 25121, 29531, 33941, 38351	narovirus Hu/GII/20153/2009 / VNM
3072	VPI	KMI985BD	3072	7482	11892, IB302. 20712. 25122. 29532, 33942, 38352	norovirus Hu/GII/C2H-50/20ll/VNM
3D73	VPI	KMI9852I	3073	7483	11893, IB303, 20713, 25123, 29533, 33943, 38353	narovirus Hu/GII/10176/2009 / VNM
3D74	VPI	KMI98490	3074	7484	11894. IB304, 20714, 25124, 29534, 33944, 38354	norovirus Hu/GII/10002/2009 /VNM
3D75	VPI	KC40924I	3075	7485	11895, 16305, 20715, 25125, 29535, 33945, 38355	norovirus Hu/GII/10405/2010 /VNM
307B	VPI	JX459B25	307B	748B	11896, 16306, 20716, 25126, 29536, 33946, 38356	narovirus Hu/GII.4/SG4086-09/2007/SG
3B77	VPI	JX459BI3	3077	7487	11897. 16307, 20717, 25127, 29537, 33947, 38357	narovirus Hu/Gll.4/SG4077-I2/200G/SG
3D78	VPI	JX459B00	3078	7488	11898, IB308, 20718, 25128, 29538, 33948, 38358	norovirus Hu/GII.4/SG4099-08/20D6/SG
3D7B	VPI	JX459596	3079	7489	11899, IB309, 20719, 25129, 29539, 33949, 38359	norovirus Hu/GII.4/SG40I6-09/2004/SG
3D8D	VPI	JXI55749	3080	7490	11900. 16310. 20720. 25130. 29540, 33950, 38360	narovirus Hu/GII.4/Xi'an/CI5/20IO/CHN
3D8I	VPI	JQ6I35II	308I	7491	11901. IB3II. 20721, 25131, 29541, 33951, 38BI	norovirus Hu/GII.4/WA223N/2007/AU
3082	VPI	HM8Q2547	3082	7492	11902, 16312, 20722, 25132, 29542, 33952, 38362	norovirus Hu/GII.4/Hong Kong/C004I225/2004/CHN

3083	VPt	HM802544	3083	7403	11903, 16313. 20723, 25133, 29543. 33953, 38363	norovirus Hu/GII.4/Hong Kong/C005II4B/2005/CHN
3D84	VPI	GD856456	3084	7494	11904, 16314, 20724, 25134, 29544, 33954, 38364	norovirus **Hu/GII.4/Beijing/55DB5/20Q7/CHN**
3D85	VPI	AB54I332	3085	7495	11905, 16315, 20725, 25135, 29545, 33955, 38365	norovirus Hu/GII-4/Saga2/2Q07/JP
3086	VPI	AB54I3I6	3086	7496	11906, 16316, 20726, 25I3B, 29546, 33956, 38366	norovirus Hu/GII-4/Niigata4/2008/JP
3087	VPI	AB54I238	3087	7497	11907, 16317, 20727, 25137, 29547, 33957, 38367	norovirus Hu/GiI-4/Ehime2/2DD7/JP
3088	VPI	AB535750	3088	7498	11908, 16318, 20728, 25138, 29548, 33958, 38368	norovirus Hu/GII.4/0C090053/2D09/JPN
3089	VPI	FJ538900	3089	7499	11909, 16319, 20729, 25139, 29549, 33959, 38369	norovirus Hu/GII.4/Dijon/E872/2 D02/FRA
3090	VPI	EU87B889	3090	7500	**11910.** 16320, 20730, 25140, 29550, 33960, 38370	norovirus Hu/GGII.4/Cairo9/2007/EGY
3091	VPI	EU87B887	3091	7501	HEM. 16321, 20731, 25141, 29551. 33961, 38371	norovirus Hu/GGII.4/Cairo7/2007/EGY
3092	VPI	**FJ4III7I**	3092	7502	11912, 16322, 20732, 25142, 29552, 339B2, 38372	norovirus Hu/GII.4/SSCS/2005/USA
3093	VPI	AB4474B0	3093	7503	11913. 16323. 20733, 25143. 29553, 33963, 38373	norovirus Hu/GII-4/Kumamoto2/200B/JP
3094	VPI	AB447454	3094	7504	11914, IB324, 20734, 25144, 29554, 339B4, 38374	norovirus Hu/GII-4/Ehime2/2006/JP
3095	VPI	AB447443	3095	7505	11915, IB325, 20735, 25145, 29555, 33965, 38375	norovirus Hu/GII-4/Toyamal/200B/JP
3096	VPI	AB44743D	3096	7506	11916. IB32B, 2D736, 25146, 29556, 33966, 3837B	norovirus Hu/GII-4/Hokkaido4/20D6/JP
3097	VPI	E0078420	3097	7507	**11917.** IB327, 20737, 25147. 29557, 33967, 38377	norovirus Hu/MT0l/2006/USA
3098	VPI	AB385B37	3098	7508	11918. 16328, 20738, 25148, 29558, 33968, 38378	norovirus Hu/GII.4/RatterdamP6D0/200B/NL
3099	VPI	EF202568	3099	7509	11919. IB329, 20739, 25149, 29559, 33969, 38379	norovirus Hu/GII/Toronto/SK/2005/GAN

3100	VP!	AB29478I	3100	7510	11920, IB330, 20740, 25150, 29560, 33970, 3838D	norovirus Hu/GII-4/Awa/040354/2004/JP
3101	VPI	AB303940	3101	7511	11921, 16331. 20741, 25151, 295BI, 33971, 38381	norovirus Hu/GGII.4/Tilburg059/ZDD4/NL
3ID2	VPI	DQ4I5279	3102	7512	11922, 16332, 20742, 25152, 29562, 33972, 38382	norovirus Hu/GII/Carluw/2002/Ire
3ID3	VPI	DQ078794	3103	7513	11923, 16333, 20743, 25153, 29563, 33973, 38383	norovirus Hu/GII.4/Hunter 284E/040/AU
3104	VPI	KP78469I	3104	7514	11924, 16334, 20744. 25154, 295B4, 33974, 38384	norovirus GII/Hu/ZAF/2009/GII.P4_GII,4/ JohannEsburg /4175
3105	VPI	KX9D7727	3105	7515	11925, 16335, 20745. 25155. 29565, 33975, 38385	norovirus Hu/USA/20I5/GII.PI6_GII.4_Sydney/CA3477
3I0G	VPI	KX354049	3I0B	75IB	11926, 16336. 20746. 25156. 29566, 33976, 38386	norovirus GII.4
3107	VPI	KX354024	3107	7517	11927. 16337, 2D747, 25157, 29567, 33977, 38387	norovirus GII.4
3108	VPI	KX353955	3108	7518	11928, 16338, 20748, 25158, 295B8, 33978, 38388	norovirus GII.4
3109	VPI	AB9725I8	3109	7519	11929, 16339, 20749, 25159, 29569, 33979, 38389	norovirus Hu/GII.4/Aichi4/20I2/JP
3110	VPI	AB933744	3110	7520	11930, 16340, 2075D, 25160, 29570, 33980, 38390	norovirus Hu/GII.4/Nagano5/2009/JP
3111	VPI	AB933B73	3111	7521	11931, 16341, 20751, 25161, 29571, 33981, 38391	norovirus Ho/GII.4/Miyazaki2/20IO/JP
3112	VPI	KM24507Q	3112	7522	11932, 16342, 20752, 25IB2, 29572, 33982, 38392	norovirus 07-B-I/2007/GII.4/0enHaag/2Q06b
3113	VPI	EU02I382	3113	7523	11933, 16343, 20753, 25163, 29573, 33983, 38393	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/Pune-PC45
3114	VPI	KP293589	3114	7524	11934. 16344, 20754, 25164, 29574, 33984, 38394	norovirus GII/Hu/HKG/20I4/GII.4/C0HK-NS-461
3115	VPI	KP24I908	3115	7525	11935, 16345, 20755, 25165, 29575. 33985, 38395	norovirus GII.4
3116	VPI	KJ45I059	3IIB	752B	11836, 16346, 20756, 25166, 2957B, 33986, 38396	norovirus I3-BE-4/20I2/GII.4

3117	VP1	KMI98570	3117	7527	11937, 16347, 2D757, 25IG7, 29577, 33987, 38397	norovirus Hu/GII/20146/2009/VNM
3118	VP1	KMI98558	3118	7528	11938, 16348, 20758. 25168, 29578, 33988, 38398	norovirus Hu/GII/30257/2009/VNM
3119	VP1	AB44745G	3119	7529	11939, 16349, 20759, 25169, 29579, 33989, 38399	norovirus Hu/GII-4/Sagal/2006/JP
3I2D	VP1	KFI77444	3I2D	753G	11040, 16350, 20760, 25170, 29580. 33990, 38400	norovirus Hu/GII.4/36I26758/AUS/20I3
3121	VP1	KF42977G	3121	7531	11941, 16351. 20761. 25171. 29581, 33991, 38401	norovirus Hu/GII.4/NIHICI7.I/20I2/0SA
3122	VP1	KC243078	3122	7532	11942, 16352, 20762, 25172, 29582, 33992, 38402	norovirus Hu/GII.4/Taichung/I2-BA-I/20I2/TW
3123	VP1	KC409280	3123	7533	11943, 16353, 20763, 25173, 29583, 33993, 38403	norovirus Hu/GII/20217/2009/VNM
3124	VP1	KC175357	3124	7534	11944, 16354, 20764, 25174, 29584, 33994, 38404	norovirus Hu/ Norwalk/ 1o148/ 2009/ vNM
3125	VP1	JX459G2I	3125	7535	11945, 16355. 20765, 25175. 29585, 33995, 38405	norovirus Hu/GII.4/SG4045-07/2007/SG
3I2G	VP1	JQG1354I	3126	753G	11946. 16356, 20766, 25176, 29586, 33996, 38406	norovirus Hu/GII.4/NSWI3IL/2009/A0
3127	VP1	JQGI3527	3127	7537	11947, 16357, 2D767, 25177, 29587. 33997, 38407	norovirus Hu/GII.4/NSW8Zi J/20D9/AU
3128	VP1	JF82729G	3128	7538	11948, 16358, 20768, 25178, 29588, 33998, 38408	norovirus Hu/GII.4/Houston/TCH492/2005/US
3129	VP1	JF7I3050	3129	7539	11949, 16359, 20769, 25179, 29589, 33999, 38409	norovirus Hu/GII.4/Hong Kong/CUB00I/20I0/CHN
3I3D	VP1	HM802548	3130	7540	11950, 16360, 20770, 25180, 29590, 34000, 38410	norovirus Hu/GII.4/Hong Kong/C0050I28/2005/CHN
3131	VP1	GQ856459	3131	7541	11951. 16361. 20771. 25181, 29591. 34001. 38411	norovirus Hu/GII.4/Beijing/55I76/2008/CHN
3132	VP1	AB54I308	3132	7542	11952. 16362, 20772, 25182, 29592, 34002, 38412	norovirus Hu/GII-4/Nagano5/2007/JP
3133	VP1	AB54I276	3133	7543	11953, 16363, 2D773, 25183, 29593, 34003, 38413	norovirus Hu/GII-4/Iwate5/2008/JP

3134	VPI	AB54I224	3134	7544	11954, IB3B4, 2D774. 25184, 29594, 34004, 38414	narovirus Hu/GII-4/AamDri4/2007/JP
3135	VPI	AB5D4330	3135	7545	11955, IB3B5, 20775, 25185, 29595, 34005, 38415	norovirus Hu/Gli.4/Hiroshima/I54/2Q08/JPN
3I3B	VPI	AB447445	3I3B	754B	11956. IB3BB, 2077B, 25I8B, 29596, 3400B, 384IB	narovirus Hu/GII-4/Tnyama5/2D06/JP
3137	VPI	AB2947B3	3137	7547	11957, IB3B7, 20777, 25187. 29597, 34007, 38417	narovirus Hu/GII-4/Kashiwa/06l256/2006/JP
3138	VPI	AB3D3934	3138	7548	11958, IB368, 20778, 25188, 29598, 34008, 38418	noravirus Hu/GGII.4/DenHelder003/2004/NL
3139	VPI	KUB782D5	3139	7549	11959, 16369, 20779, 25189, 29599, 34009. 3841B	narovirus l6-J-l/20IB/GII,Pe/GII.4 Sydney_20l2
3I4D	VPI	LCI77B57	3I4B	755B	11960, 16370, 20780, 25190, 29600, 34010, 38420	noravirus GII.4
3141	VPI	LCI77B5B	3141	7551	11961, 16371, 20781, 25191, 29601, 34011. 38421	noravirus GII.4
3142	VPI	KX354I36	3142	7552	11962, 16372, 20782, 25192, 29602, 34012, 38422	norovirus GII.4
3143	VPI	KX354I2I	3143	7553	11963, 16373, 20783, 25193, 29603, 34013, 38423	narovirus GII.4
3144	VPI	KX354II0	3144	7554	11964. IB374, 20784, 25194, 29604, 34014, 38424	norovirus GII.4
3145	VPI	KX354IB7	3145	7555	11965. 16375, 20785, 25195, 29605, 34015, 38425	narovirus GII.4
3I4G	VPI	KX35399I	3I4B	755B	II96B, 16376, 20786, 25196, 29606, 34016, 3842B	norovirus GII.4
3147	VPI	KU985IB2	3147	7557	11967. 16377, 20787. 25197. 29G07. 34017. 38427	narovirus GII.4
3148	VPI	AB97247B	3148	7558	11968, IB378, 20788, 25198, 29608, 34018, 38428	noravirus Hu/GII.4/Toyama2/20l2/JP
3149	VPI	KU3III62	3149	7559	11969, IB379, 20789, 25198. 29609, 34019, 38429	norovirus Hu/GII.4/AlbertaSPI/20l2/CA
3I5D	VPI	KR9042I2	3I5D	75BB	II97D, 16380, 20790, 25200, 29610, 34020, 38430	norovirus Gil

3151	VPI	AB933B78	3151	75BI	11971. 16381. 20791, 252DI, 29611, 34021, 38431	narovirus Hu/6II.4/Niigata4/20ID/JP
3152	VPI	ABB33B48	3152	75B2	11972, 16382, 20792, 25202, 29612, 34022, 38432	narovirus Hu/GII.4/Aornori2/2009/JP
3153	VPI	LN85457I	3153	75B3	11973, 16383, 20793, 25203, 29BI3, 34023, 38433	nnrovirus GII/Hu/NL/20I2/GIi.4/NijmegBnOI
3154	VPI	EU92I384	3154	75B4	11074, IB384. 20794. 25204, 29614, 34024, 38434	norovirus GII/Hu/IN/2DD7/GII.P4_GII.4_DenHaag2006b/Pune-PC47
3155	VPI	LC0D57IB	3155	75B5	11975, IB385, 20795, 25205, 29BI5, 34025, 38435	norovirus GII/Hu/JP/20I2/GII,4/yII-V664-I
3156	VPI	KP241BI4	3I5B	75BB	11976, 16386, 20796, 25206, 296IB, 34026, 38436	norovirus GII.4
3157	VPI	KJ4330B8	3157	75G7	11977, 16387, 20797. 25207, 29617, 34027, 38437	norovirus I2-AS-I/2DI2/GII.4
3158	VPI	KPI7B4B9	3158	75B8	11978, IB388, 20798, 25208, 29618, 34028, 38438	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-430
3159	VPI	KM5I4DB4	3159	75B9	11979, 16389, 20799, 25209, 29619, 34029, 38439	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-319
3IBD	VPI	KJB497D3	3IBB	7570	11980, 16390, 20800, 25210, 29B20. 34030, 38440	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-246
3IBI	VPI	KFI77447	3IBI	7571	113S1. 16391. 20801, 25211, 29621. 34031. 38441	norovirus Hu/GII.4/3D996947/AUS/2DI2
3IB2	VPI	JX43982B	3IB2	7572	11982, 16392, 20802, 25212, 29B22, 34032, 38442	norovirus HU/GII/SEOUII033/KDR/2DI0
3IB3	VPI	HF952I2D	3IB3	7573	11983, IB393, 20803, 25213, 29623, 34033, 38443	norovirus Hu/GII.4/CD0007876/20II/0K
3IB4	VPI	KC5I7369	3IB4	7574	11984, 16394, 20804, 25214, 29624, 34034, 38444	norovirus Hu/GII-4/Taoyuan/CGMH59/20I2/TW
3IB5	VPI	KC409293	3IB5	7575	11985, IB395, 20805, 25215, 29625, 34035, 38445	norovirus Hu/GII/20365/2DIO/VNM
3IBB	VPI	JX98495I	3IBB	757B	11986, 16396, 2080B, 2521B, 29626, 34036, 3844B	norovirus Hu/GII.4/GZ20IO-L88/Guangzhou/CHN/20II
3IB7	VPI	JX459BI2	3IB7	7577	11987, IB397, 20807, 25217, 29627, 34037, 38447	norovirus Hu/GII.4/SG4058-I2/200G/SG

3168	VPI	JX459BD4	3IB8	7578	11988, IB398, 20808, 25218, 29B28, 34038, 38448	norovirus Hu/GII.4/SG4024-I0/2006/SG
3IB8	VPI	JXI55745	3IB9	7579	11989, 16399, 20809, 25219, 29B29, 34039, 38449	noPDvirus Hu/GII.4/Xi 'an/PI58/2OI0/CHN
3I7D	VPI	HMB35I55	3170	7580	11990, 16400, 20810, 25220. 29630, 34040. 38450	norovirus Hu/GII.4/Seoul/090Z/Z009/K0R
3171	VPI	JN400G2D	3171	7581	11991, 16401. 20811, 25221, 29B31. 34041, 38451	norovirus Hu/Gli-4/CGMH22/20IO/TW
3172	VPI	JQ6I3573	3172	7582	11992, IB402, 20812, 25222, 29632, 34042, 38452	narovirus Hu/GII.4/Helensburgh/NSW2B5E/20I0/A0
3173	VPI	JQ4784D8	3173	7583	11993, 16403, 20813, 25223, 29633. 34043. 38453	nOROviRUs Hu/GII.4/Farmington Hills/2004/0SA
3174	VPI	EFG849I5	3174	7584	11994, IG404, 20814, 25224, 29B34, 34044, 38454	narovirus Hu/GII.4/ShBllharbour/NSW69GT/20D6/AUS
3175	VPI	HQ45B33I	3175	7585	11995, 16405, 20815, 25225, 29635, 34045, 38455	narovirus Hu/GII.4/07-H-3/20D6/TW
3I7B	VPI	HQ45B322	3I7B	758B	11996, 16406, 20816, 25226, 29636, 3404B, 38456	naravirus Hu/GII.4/06-AM-2/2006/TW
3177	VPI	HM80255I	3177	7587	11997, 16407, 20817, 25227, 29637, 34047, 38457	narovirus Hu/GII.4/Hong Kong/CU04I222/2004/CHN
3178	VPI	HM802546	3178	7588	11998, IB408, 20818, 25228, 29B38, 34048, 38458	norovirus Hu/GII.4/Hong Kang/CU04I20G/2004/CHN
3179	VPI	GQ85B453	3179	7589	11999, 16409, 20819, 25229, 29639, 34049, 38459	norovirus Hu/GII.4/Beijing/55D47/ZDD7/CHN
3180	VPI	GQ856445	3180	7590	12000, 16410. 2D820, 25230, 29640, 34050, 38460	norovirus Hu/GII.4/Beijing/53952/2007/CHN
3181	VPI	AB54I358	3181	7591	12001, 16411, 20821, 25231, 29641, 34051, 38461	norovirus Hu/GII-4/Toyama3/2008/JP
3182	VPI	AB54I349	3182	7592	12002, 16412, 20822, 25232, 29642, 34052, 38462	norovirus Hu/GII-4 **/ShimanE3**/2Q07/JP
3183	VPI	AB54I342	3183	7593	12003, 16413, 20823, 25233, 29643, 34053. 38463	narovirus Hu/GII-4/Sakai3/2007/JP
3184	VPI	AB54I248	3184	7594	12004, 16414, 20824, 25234, 29644, 34054, 38464	narovirus Hu/GII-4/Fukui4/2008/JP

3185	VPI	GQ24G798	3185	7595	12005, IB4I5. 20825, 25235, 29645, 34055, 384B5	nDrovirus Hu/GGII.4/Dijon/E3743/ZDD9/FRA
3I8B	VPI	GQ24G79I	3I8B	759B	I200B, 16416, 2082B, 2523G, 29646, 34056, 38466	nopovirus Hu/GGII.4/Dijon/E302D/ZD0B/FRA
3187	VPI	GU350225	3187	7597	12007, 16417, 20827, 25237, 29647, 34057, 38467	norovirus Hu/GII-4/Beijing/hl/2005/CHN
3188	VPI	AB5D43I9	3188	7598	12008. 16418, 20828, 25238, 29648, 34058, 38468	norovirus Hu/GII.4/Hiroshima/74/2D0G/JPN
3189	VPI	AB447458	3189	7599	12009, 16419, 20829, 25239, 29649, 34059, 38469	norovirus Hu/GII-4/Saga5/2006/JP
3190	VPI	AB385B4Q	3I9D	7B00	12010, 16420, 20830, 25240. 29650, 340B0, 38470	norovirus Hu/GII.4/RotterdamP7Dlia/2D07/NL
3191	VPI	AB385B33	3191	7B0I	12011, 16421, 20831, 25241, 29651, 34061, 38471	norovirus Hu/GII.4/RottErdamP4D33/2D0B/NL
3192	VPI	DQ6584I3	3192	7B02	12012, 16422, 20832, 25242, 29652, 34062, 38472	norovirus Hu/GII.4/MD-2004/2004/US
3193	VPI	AB22D923	3193	7B03	12013, 16423, 20833, 25243, 29653, 34063, 38473	norovirus Hu/Ehime/05-30/2005/JP
3194	VPI	AY5880IB	3194	7B04	12014, 16424, 20834, 25244, 29654, 34064, 38474	norovirus Hu/NLV/0xford/85S9/2002/0K
3195	VPI	AY5D2D22	3195	7B05	12015, 16425, 20835, 25245, 29B55, 34065, 38475	norovirus Gil
3196	VPI	KXI58280	3I9B	7B0B	12016, 16426, 2D836, 25246, 29656, 34066, 3847B	norovirus Gil
3197	VPI	KX37IB0E	3197	7B07	12017, 16427, 20837, 25247, 29657, 34067, 38477	norovirus GII.4
3198	VPI	KX37IBD5	3198	7B08	12018. 16428. 20838, 25248. 29658, 34068. 38478	norovirus GII.4
3199	VPI	KX354I28	3199	7B09	12019, 16429, 20839, 25249, 29G59, 34069, 38479	norovirus GII.4
32DD	VPI	KX35409B	3200	7BI0	12020, 16430, 20840, 25250, 29660, 34070, 38480	norovirus GII.4
32DI	VPI	KX354087	3201	7BII	12021, 16431, 20841, 25251, 29661. 34071. 38481	norovirus GII.4

3202	VPl	KX354009	3202	7BI2	12022. IG432, 20842, 25252, 29BB2, 34072, 38482	namvirus GII.4
3203	VPl	KRI3I784	3203	7613	12023, IB433, 20843, 25253, 29BG3, 34073, 38483	norovirus GII/Hu/IN/2DI3/GII.PE_GII.4_Sydn By20l2/PunB-I36935
3204	VPI	AB972527	3204	7BI4	12024, IG434, 20844, 25254, 29GB4, 34074, 38484	noravirus Hu/GII.4/0sakaCity3/20l2/JP
3205	VPt	ABB72525	3205	7BI5	12025, IB435, 20845, 25255, 29BB5, 34075, 38485	noravirus Hu/BII.4/Toyama4/2DIZ/JP
320G	VPI	KT780388	320B	7BIB	I202B, IB43B. 2084B, 2525B, 29BBB, 3407B, 3848B	namvirus Hu/GII.4/CUHK-NS-GI8/HKG/ZDI5
3207	VPI	KT780373	3207	7BI7	12027, IB437, 20847, 25257, 23BB7, 34077, 38487	noravirus HU/GII.4/C0HK-NS-5I6/HKG/20I5
3208	VPI	AB933723	3208	7BI8	12028, IB438, 20848, 25258, 20BB8, 34078, 38488	namvirus Hu/GII.4/Saga3/20ll/JP
3209	VPI	AB833708	3209	7BIB	12029, IB439, 20849, 25259, 2BBB9, 34079, 38489	noravirus Hu/GII.4/Hiroshimacity3/20ll/ JP
3210	VPI	LC0BBB4B	3210	7G20	12030, IB44D, 20850. 252B0, 29B70, 34080, 38490	noravirus Hu/GII/JP/20l5/GII.Pe_GII.4/0saka/0SF78
3211	VPI	KJB78I40	3211	7B2I	12031, 16441. 20851, 252BI, 29671, 34081, 38491	namvirus Hu/GII.4/Beijing/PK0PH-02-07/inpati Bnt/20l3/CHN
3212	VPI	KJ678I39	3212	7B22	12032. 16442, 20852, 25262, 29672, 34082, 38492	namvirus Hu/GII.4/Beijing/PKUPH-02-06/inpatiEnt/20l3/CHN
3213	VPI	E0B2I383	3213	7B23	12033, 16443, 20853, 252B3, 29B73, 34083, 38493	noravirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/PunE-PC46
3214	VPI	KPI76405	3214	7B24	12034, IB444, 20854, 25264, 29674, 34084, 38494	namvirus Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-418
3215	VPI	KPI7B403	3215	7B25	12035, 16445, 20855, 25265. 29675, 34085, 38495	namvirus Hu/GII/HKG/ZDI4/GII.4/CUHK-NS-416
3216	VPI	KP086343	32IG	7B2B	12036, IB446, 20856, 252BB, 29B76, 34086, 38496	namvirus Hu/GII/HKG/ZGI4/GII.4/CUHK-NS-397
3217	VPI	KM268I0I	3217	7B27	12037, 16447, 20857, 25267, 29677, 34087, 38497	namvirus GII.4

3218	VP1	KMI985G8	3218	7628	12038, 16448, 20858, 25268, 29678, 34088, 38498	norovirus Hu/GII/C2H-G2/2011/VNM
3219	VPt	KMI98532	3219	7G29	12039, 16449, 20859, 252GB. 29679, 34089, 38499	nomvirus Hu/GII/IOID8/2009/VNM
322D	VPI	KMI98527	322G	7630	I2D40, 16450, 20860, 25270, 29680, 34090, 38500	narovirus Hu/GII/10074/2009/VNM
3221	VPI	KFI77448	3221	7631	12041. 16451, 20861. 25271, 29681, 34091, 38501	norovirus Hu/GII.4/35408489/AUS/2012
3222	VPI	KFD08244	3222	7632	12042, 16452, 20862, 25272, 29682, 34092, 38502	narovirus Hu/GII.4/ variant Sydney 2012/FRA
3223	VPI	KF0G0I03	3223	7633	12043, 16453, 20863, 25273, 29683. 34003. 38503	norovirus Hu/GII.4/NSW8IIG/2011/A0
3224	VPI	KC9606I5	3224	7634	12044, 16454, 20864, 25274, 29684, 34094, 38504	norovirus Hu/GII.4/2019 99/2009/VNM
3225	VPI	KC5I7373	3225	7635	12045, 16455, 2D865, 25275, 29685, 34095, 38505	norovirus Hu/GII-4/Taayuan/CGMH63/2012/TW
3226	VPI	JX4596I5	322B	7636	12046, 16456, 20866, 25276. 29686, 34096, 38506	norovirus Hu/GII.4/SG40IO-OI/2007/SG
3227	VPI	JX459GD3	3227	7637	12047, 16457. 20867, 25277. 29687, 34097, 38507	norovirus Hu/GII.4/SG4OI9-09/2DO6/SG
3228	VPI	JXI5574G	3228	7638	12048. 16458, 20868, 25278, 29688. 34098. 38508	norovirus Hu/GII.4/Xi'an/PI85/20IO/CHN
3229	VPI	AB54I333	3229	7639	12049, 16459, 20869, 25279, 29689, 34099. 38509	norovirus Hu/GII-4/Saga2/2008/JP
323D	VPI	AB54I22Q	323D	7640	12050. 16460. 20870, 25280, 29690, 34100, 38510	norovirus Hu/GII-4/Aomori2/2007/JP
3231	VPI	AB5D43I2	3231	7641	12051, 16461, 20871, 25281, 29691, 34101. 38511	norovirus Hu/GII.4/Hiroshima/57/2005/JPN
3232	VPI	GQ849I2G	3232	7642	12052, 16462. 20872. 25282, 29692, 34102, 38512	norovirus Hu/GII.4/NSW023C/2008/A0S
3233	VPI	AB447459	3233	7643	I2D53, 16463, 20873, 25283, 29693, 34103, 38513	norovirus Hu/GII-4/Kumamotol/200G/JP

3234	VPI	EUD784I3	3234	7B44	12054. IB4B4, 20874, 25284, 29B94, 34104, 38514	norovirus Hu/GA04/2004/USA
3235	VPI	EU0784II	3235	7B45	12055, IB4B5, 20875. 25285. 29B95, 34105, 38515	nnrovirus Hu/OM2-CS/2004/0SA
323B	VPI	AB385B32	323B	7B4B	I205B. IB4BB, 2087B, 2528B, 29696, 34I0B, 385IB	norovirus Hu/GII.4/RotterdamP4D0/20Q6/Nl
3237	VPI	EU839595	3237	7B47	12057, 16467, 20877, 25287, 29697, 34107, 38517	norovirus Hu/GII/Beijing/362/2007/CHN
3238	VPI	AB294788	3238	7B48	12058, 164B8, 20878. 25288, 29698, 34108, 38518	norovirus Hu/GII-4/Sanbu/050878/200B/JP
323B	VPI	AB3D393B	3239	7B49	12059, 16469, 20879, 25289, 29699, 34109, 38519	nnrovirus Hu/GGII.4/ElslnoOI2/2004/NL
3240	VPI	AB3D3935	324D	7B5B	12060, IB470, 20880, 25290, 29700, 34110, 38520	norovirus Hu/GGII,4/MiddBlburgD07/2004/NL
3241	VPI	AY588DI8	3241	7B5I	**12061. 16471.** 20881. 25291, 29701, 34111, 38521	norovirus Hu/NLV/0xford/B5SI3/2002/0K
3242	VPI	KU678203	3242	7B52	12062, 16472, 20882, 25292, 29702, 34112, 38522	norovirus I5-J0-2/20I6/GIIJVGII.4 Sydney_20l2
3243	VPI	KPI7B4I0	3243	7B53	I20B3, IB473, 20883, 25293, 29703, 34113, 38523	norovirus **Hu/6II/HKG/ZDI4/GII.4/CUHK-NS-**431
3244	VPI	KX371B0B	3244	7B54	12064, IB474, 2B884, 25294, 29704, 34114, 38524	nnrovirus GII.4
3245	VPI	KX354I30	3245	7B55	I20B5, IB475. 20885. 25295. 29705, 34115, 38525	norovirus GII.4
324B	VPI	KX354I20	324B	7B5B	I20B6, 1647B, 2088B. 25296, 2970B, 34116. 38526	norovirus GII.4
3247	VPI	KX354II3	3247	7B57	I20B7. IB477, 20887, 25297, 29707, 34117, 38527	norovirus GII.4
3248	VPI	KX354I05	3248	7B58	12068, 16478, 20888, 25298. 29708. 34118. 38528	norovirus GII.4
3240	VPI	KX354077	3249	7B59	12069, 16479, 20889, 25299, 29709, 34119, 38529	norovirus GII.4

3250	VPI	KRI3I785	3250	7BB0	I207D, IG480, 20890, 25300, 29710, 34120, 38530	**norovirus GII/Hu/IN/ZDI3/GII.Pe_GII.4_** SydnEy20I2/Pune-I3243I8
3251	VPI	AB97253D	3251	7BBI	**12071.** 16481, 208BI, 25301, 29711, 34121, 38531	norovirus Hu/GII,4/Hiroshima3/20I2/JP
3252	VPI	AB97252B	3252	7BB2	12072, IB482, 20892, 25302, 29712, 34122, 38532	**norovirus Hu/GII.4/Fukui5/20IZ/JP**
3253	VPI	AB972522	3253	7BB3	12073, IB483, 20893, 25303, 29713, 34123, 38533	norovirus **Hu/GII.4/Niigata2/Z01Z/JP**
3254	VPI	ABB725I4	3254	7BB4	12074, IB484. 20894, 25304, 29714, 34124, 38534	norovirus Hu/GII.4/Iwatel/20I2/JP
3255	VPI	AB9725D5	3255	7BB5	12075, IB485, 20895, 253D5, 29715. 34125, 38535	norovirus Hu/GII.4/GII4-NGI3B5/20II/JP
325B	VPI	AB972473	325B	7BBB	I207B, IB48B. 2089B, 2530B, 297IB, 34I2B, 3853B	norovirus Hu/GH.4/Iwate5/20I2/JP
3257	VPI	KT78D38I	3257	7BB7	12077, IB487, 20897, 25307, 29717, 34127, 38537	norovirus Hu/GII.4/C0HK-NS-554/HKG/2DI5
3258	VPI	KT780372	3258	7BB8	12078, IB488, 20898, 25308, 29718. 34128, 38538	**norovirus Hu/GII.4/CUHK-NS-5I5/HKG/2DI5**
3259	VPI	KT202797	3259	7BB9	12079. IB489, 20899, 25309, 29719, 34129. 38539	norovirus Gil
32B0	VPI	KR9D4226	32B0	7B70	12080. 16490, 20900, 25310. 29720. 34130, 38540	norovirus Gil
32BI	VPI	KR904208	32BI	7B7I	12081. 16491, 20901, 25311, 29721, 34131, 38541	norovirus Gil
32B2	VPI	AB9337D9	32B2	7B72	12082, 16492, 20902, 25312, 29722, 34132. 38542	norovirus **Hu/GII.4/Hokkaidol/2DII/JP**
32B3	VPI	EU92I352	32B3	7B73	12083, IB493, 20903, 25313, 29723. 34133. 38543	norovirus GII/Hu/IN/200G/GII.P4_GII,4_ Yerseke20Q6a/Pune-PC23
32B4	VPI	LCQD5735	32B4	7B74	12084, IB494, 20904, 25314, 29724, 34134, 38544	norovirus GII/Hu/JP/20I4/GII.4/yI3-VI010-I
32B5	VPI	KP24I909	32B5	7B75	12085, 16495, 20905. 25315. 29725, 34135, 38545	norovirus GII.4

3266	VPI	KJ533I32	3266	7676	12086, 16496, 20906, 25316, 29726, 34136, 38546	noravirus I2-BA-I/20I2/GII.4
3267	VPI	KPI76407	3267	7677	12087, 16497, 20907, 25317, 29727, 34137, 38547	norovirus Hu/GII/HKG/20l4/GII.4/C0HK-NS-421
3268	VPI	KPI76406	3268	7678	12088, 16498, 20908, 25318, 29728, 34138, 38548	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-420
3269	VPI	KPI23606	3269	7679	12089, 16499, 20909, 25319, 29729. 34139, 38549	norovirus Hu/GII/HKG/20l4/GII.4/C0HK-NS-426
3270	VPI	KP096335	3270	7680	12090, 16500, 20910, 25320, 29730, 34140, 38550	norovirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-385
3271	VPI	KM268095	3271	7681	12091, 16501, 20911, 25321, 29731, 34141, 38551	norovirus GII.4
3272	VPI	KM268094	3272	7682	12092, 16502, 20912, 25322, 29732, 34142, 38552	norovirus GII.4
3273	VPI	KM268093	3273	7683	12093, 16503, 20913, 25323, 29733, 34143, 38553	norovirus GII.4
3274	VPI	KMI9859I	3274	7684	12094, 16504, 20914, 25324, 29734, 34144, 38554	norovirus Hu/GII/20122/2009/VNM
3275	VPI	KMI98589	3275	7685	12095, 16505, 20915, 25325, 29735, 34145, 38555	norovirus Hu/GII/20144/2009/VNM
3276	VPI	KM1B857B	3276	7686	12096, 16506, 20916, 25326, 29736, 34146, 38556	norovirus Hu/GII/C2H-43/20ll/VNM
3277	VPI	KMI98564	3277	7687	12097, 16507, 20917, 25327, 29737, 34147, 38557	nurovirus Hu/GII/C2H-44/20ll/VNM
3278	VPI	KJ7I6355	3278	7688	12098, 16508, 20918, 25328, 29738, 34148, 38558	norovirus Hu/GII.4/Beijing
3279	VPI	KJ685408	3279	7689	12099, 16509, 20919, 25329, 29739, 34149, 38559	norovirus Hu/GII/BGIC0066/20ll/BGD
3280	VPI	KJI44999	3280	7690	12100, 16510, 20920, 25330, 29740, 34150, 38560	norovirus GII.4
3281	VPI	KF0600I6	3281	7691	12101, 16511, 20921, 25331, 29741, 34151, 38561	norovirus Hu/GII.4/NSWI749/20ll/AU
3282	VPI	KC5I7367	3282	7692	12102, 16512, 20922, 25332, 29742, 34152, 38562	norovirus Hu/GII-4/Taoyuan/CGMH57/20l2/TW

3283	VPI	KC5I736 6	3283	7B93	12103, 16513, 20323, 25333, 23743, 34153, 38563	norovirus HU/GII-4/NEW Taipei/CGMH56/20IZ/TW
3284	VP!	KC5I7353	3284	7694	12104, 16514, 20924, 25334, 29744, 34154, 38564	norovirus Hu/GII-4/New Taipei/CGMH49/20ll/TW
3285	VPI	KC409303	3285	7695	12105, 16515, 20325, 25335, 23745, 34155, 385B5	norovirus Hu/GII/20478/2010/VNM
328B	VPI	JX453BD8	328B	7B9B	12106, 16516. 2D926, 2533B, 2974B, 34156, 38566	norovirus Hu/GII.4/SG4097-ID/200B/SG
3287	VPI	J0320073	3287	7B37	12107, 16517. 20327, 25337, 23747, 34157, 385B7	norovirus Hu/GII.4/NF2003/USA/2003
3288	VPI	HM8D2552	3288	7B98	12108, 16518, 2D328, 25338, 23748, 34158, 38568	norovirus Hu/GII.4/Hong Kong/CUQ50S52/2D05/CHN
3289	VPI	AB54I32B	3289	7699	12103, 16519. 20929, 25333, 23743, 34159, 38569	norovirus Hu/GII-4/0sakal/2008/JP
32BD	VPI	AB54I227	3230	7700	12110, 16520, 20B30, 25340, 23750, 34IB0, 38570	norovirus Hu/GII-4/Aomori5/2008/JP
3291	VPI	AB5G43I8	3231	7701	I2III. 16521, 20B3I, 25341, 29751, 34161, 38571	norovirus Hu/GII.4/Hiroshima/69/2006/JPN
3232	VPI	AB5D43II	3232	7702	12112, 16522, 20332, 25342, 29752, 34IB2, 38572	norovirus Hu/6ll.4/Hiroshima/56/2005/JPN
3293	VPI	FJ537I35	3233	77D3	12113, IB523, 20933, 25343, 29753, 34163. 38573	norovirus Hu/Gll.4/CHDC2094/I974/0S
3234	VPI	G04I3963	3294	7704	12114, IB524. 20934, 25344. 23754, 34IB4. 38574	norovirus Hu/GII.4/Rivieral635/2008/US
3235	VPI	EU833532	3235	7705	12115, IB525, 20335. 25345, 23755, 34165, 38575	norovirus Hu/Bll/BEijing/l27/20D7/CHN
323B	VPI	EU833587	3296	770B	12116. IB52B, 20336, 25346, 23756, 34I6B, 38576	norovirus Hu/GII/BEijing/493/2005/CHN
3237	VPI	EU833583	3297	7707	12117. 16527, 20337, 25347, 29757, 34167, 38577	norovirus Hu/GII/Beijing/79/2004/CHN
3298	VPI	AB3B393I	3298	7708	12118, 16528, 20938, 25348, 29758. 34IB8, 38578	norovirus Hu/GGII.4/ApeldoornDZ3/Z003/NL
3299	VPI	KY34I923	3299	7709	12119, IB529. 20939, 25349, 29759, 34169, 38579	norovirus GII.4

3300	VPI	KX5I43I7	3300	7710	12120. IG530. 20940. 25350, 29760, 34170, 38580	norovirus GII.4
3301	VPI	K0G78204	3301	7711	12121, 16531, 20941, 25351. 297GI, 34171, 38581	norovirus I6-C-2/20IG/GII.Pe/GII.4 Sydney_2DI2
330Z	VPI	KXI58283	3302	7712	12122, IG532, 20942, 25352, 29762. 34172, 38582	norovirus Gil
3303	VPI	KX354088	3303	7713	12123, 16533, 20943, 25353, 29763. 34173. 38583	norovirus GII.4
3304	VPI	KX354032	3304	7714	12124. 16534. 20944, 25354, 297G4, 34174, 38584	norovirus GII.4
3305	VPI	KX3540I5	3305	7715	12125, IG535, 20945. 25355, 29765, 34175, 38585	norovirus GII.4
330G	VP!	KX35393B	330G	77IG	12126, 16536, 20946, 25356, 29766. 34176, 38586	norovirus GI!.4
3307	VPI	KX353987	3307	7717	12127, 16537, 20947, 25357, 29767, 34177, 38587	norovirus GII.4
3308	VPI	KX353970	3308	7718	12128, 16538. 20948. 25358, 29768, 34178, 38588	norovirus GII.4
3309	VPI	KU985I5G	3309	7719	12129, 16539, 20949, 25359, 29769, 34179, 38589	norovirus GII.4
33ID	VPI	KU885I55	3310	7720	12130, 16540, 20950. 25360, 29770, 34180, 38590	norovirus GII.4
3311	VPI	KM5I4075	3311	7721	12131, 16541, 2D95I, 25361, 29771, 34181, 38591	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-332
3312	VPI	AB972484	3312	7722	12132, 16542, 20952, 25362, 29772, 34182, 38592	norovirus Hu/GII.4/QsakaCityl/20I2/JP
3313	VPI	KT780391	3313	7723	12133, 16543. 20953, 25363, 29773, 34183, 38593	norovirus Hu/GII.4/CUHK-NS-660/HKG/20I5
3314	VPI	KT780390	3314	7724	12134, 16544, 20954, 25364, 29774, 34184, 38594	norovirus Hu/GII.4/C0HK-NS-652/HKG/20I5
3315	VPI	KT78037G	3315	7725	12135, 16545, 20955, 25365, 29775, 34185. 38595	norovirus Hu/GII.4/C0HK-NS-526/HKG/20I5
3316	VPI	KT780375	3316	772G	12136, 16546, 20956. 25366, 28776. 34186, 38596	norovirus Hu/GII.4/C0HK-NS-525/HKG/20I5

3317	VPI	LC0IBB07	3317	7727	12137. IB547, 20957, 253B7, 29777, 34187, 38597	norovirus Hu/JP/2004/GII.4/Sakai/OI-inpatient8-54d-2
3318	VP1	KP24I9I5	3318	7728	12138, IB548, 20958. 253B8, 29778, 34188. 38598	norovirus GII.4
3319	VPI	KM5I40B5	3319	7729	12139, IB549, 20959, 25369, 29779, 34189, 38599	norovirus **GII/Hu/HKG/20I4/GII.4/CUHK-NS-**320
3320	VPI	KM268097	3320	7730	12140, 16550, 209BD, 25370, 29780, 34190, 38B00	norovirus GII.4
3321	VPI	KM268084	3321	7731	12141, 16551, 20961, 25371, 29781, 34191, 38601	norovirus GII.4
3322	VPI	KJB49704	3322	7732	12142, IB552, 20962. 25372, 29782, 34192, 38602	norovirus **GII/Hu/HKG/20I4/GII.4/CUHK-NS-**250
3323	VPI	KC577I74	3323	7733	12143, 16553, 20963, 25373, 29783, 34193, 38603	norovirus Hu/GII.4/Jiangsul/20II/CHN
3324	VPI	KFI7745I	3324	7734	12144, 16554, 209B4, 25374, 29784, 34194, 38B04	norovirus Hu/GII.4/34790954/AUS/20I3
3325	VPI	KFI77429	3325	7735	12145, IB555. 20965, 25375, 29785. 34195, 38B05	norovirus Hu/GII.4/35444252/AUS/20I2
3326	VPI	KF0B0005	332B	773B	**12146.** IB556, 20966. 2537B, 2978B, 34I9B, 3860B	norovirus **Hu/GII.4/NSW0979/20I2/AU**
3327	VPI	JX43982I	3327	7737	12147, IB557, 20967. 25377, 29787, 34197, 38B07	norovirus HU/GII/SEOUII0S6/KDR/2010
3328	VPI	KC5I73BI	3328	7738	12148, 16558, 20968. 25378, 29788, 34198, 38608	norovirus Hu/GII-4/Taoyuan/CGMH5I/20I2/TW
3329	VPI	KCI75378	3329	7739	12149, IB559, 20969, 25379, 29789, 34199, 38B09	norovirus Hu/Norwalk/I0247/2009/VNM
3330	VPI	JX459648	3330	7740	12150, 16560, 20970, 25380, 29790. 34200, 38610	norovirus Hu/GII.4/SG4058-I0/2009/SG
3331	VPI	JX459635	3331	7741	12151, 16561, 20971, 25381. 29791, 34201. 38611	norovirus Hu/GII.4/SG406I-OI/2009/SG
3332	VPI	JX459B24	3332	7742	12152, 16562, 20972. 25382, 29792. 34202, 38BI2	norovirus Hu/GII.4/SG4075-08/2007/SG
3333	VPI	JX4596I4	3333	7743	12153, IB563, 20973, 25383, 29793, 34203, 38BI3	norovirus Hu/GII.4/SG4007-OI/2007/SG

3334	VPI	HMB35I03	3334	7744	12154, IB5B4, 20974, 25384, 29794, 34204, 38BI4	narovirus **Hu/ GII.4/ Seoul/ 0952/ 2010/ KOR**
3335	VPI	JQGI3522	3335	7745	12155, IB5B5, 20975, 25385, 29795, 342D5, 38BI5	narovirus Hu/GII.4/NSW7B4D/2008/AO
333B	VPI	ABB29942	333B	774B	**12156.** IB5BB, 2097B, 2538B, 2979B, 3420G, 38BIB	noravirus Hu/Tokyo/lD-2D/2DtD/JPN
3337	VPI	GQ85B457	3337	7747	12157, IB5B7. 20977, 25387, 29797, 34207, 38BI7	narovirus Hu/GII.4/BBijing/55l50/2008/CHN
3338	VPI	EU87B883	3338	7748	12158, IB5B8, 20978, 25388, 29798, 34208, 38BI8	noravirus Hu/GGII,4/Cairo3/200B/EGY
333B	VPI	AB447455	3339	7749	12159, 16569, 20979, 25389, 29799, 34209, 38619	narovirus Hu/GII-4/Enime5/2006/JP
3340	VPI	EUD78409	334D	7750	12160, 16570, 20980, 25390, 29800, 34210, 38620	noravirus Hu/WarrBn/2002/USA
3341	VPI	AB303928	3341	7751	12161, 16571, 20981, 25391, 29801, 34211, 38621	**noravirus Hu/BBII.4/WeertE022/2002/NL**
3342	VPI	AY502023	3342	7752	12162, IB572, 20982, 25392, 29802, 34212, 38622	noravirus Gil
3343	VPI	KU678202	3343	7753	12163, 16573, 20983, 25393, 29803, 34213, 38623	noravirus I5-IZ-I/20I5/GII.PB/GII.4 Sydney_2DI2
3344	VPI	KX37IB07	3344	7754	12164, IB574, 20984, 25394, 29804, 34214, 38B24	norovirus GII.4
3345	VPI	KX354II2	3345	7755	I2IB5, IB575, 20985, 25395, 29805, 34215, 38B25	narovirus GII.4
334B	VPI	KX353993	334B	775B	I2IB6, 16576, 20986, 25396, 29806, 34216, 38B2B	narovirus GII.4
3347	VPI	KRI3I7B2	3347	7757	12167, 16577, 20987, 25397, 29807, 34217, 38627	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DBnHaag2006b/Pune-07I6584
3348	VPI	ABB725I9	3348	7758	12168, 16578, 20988, 25398, 29808, 34218, 38628	**noravirus Hu/GII.4/Aichi5/2DI2/JP**
3349	VPI	AB972438	3349	7759	12169, 16579, 20989, 25399, 29809, 34219, 38B29	noravirus **Hu/GII.4/Ehime3/2DI2/JP**
3350	VPI	AB972488	3350	77BD	12170, IB580, 20990, 2540D, 29810, 34220, 38B30	noravirus **Hu/GII.4/Sakai2/2DI2/JP**

3351	VPI	AB972483	3351	7761	12171, **16581.** 20991. 25401, 29811. 34221, 38631	norovirus Hu/GII.4/Ehime5/20l2/JP
3352	VPI	KP8B4I0B	3352	7762	12172, IB582, 20992. 25402, 29812, 34222, 38632	norovirus GII.4
3353	VPI	KRB042I6	3353	77B3	12173, 16583, 20993, 25403, 29813, 34223, 38633	norovirus Gil
3354	VPI	AB93377I	3354	77B4	12174, 16584, 2D994, 25404, 29814, 34224, 38634	norovirus Hu/GII.4/Hiroshimacityl/20ll/ JP
3355	VPI	LC005732	3355	7765	12175, 16585, 20995, 25405, 29815, 34225, 38B35	norovirus GII/Hu/JP/20l3/GII.4/yl3-V938-3
335G	VPI	KP29359I	335B	7766	**12176.** 16586, 20996, 25406, 29816, 34226, 38636	norovirus **BII/Hu/HKG/ZDI4/GII.4/CUHK-NS-**464
3357	VPI	KPI7B3B6	3357	7767	12177, IB587, 20997, 25407, 29817, 34227, 38B37	norovirus **Hu/GII/HKG/20l4/GII.4/CUHK-NS-**35B
3358	VPI	KPI76394	3358	7768	12178, IB588, 20998, 25408, 29818, 34228, 38638	norovirus **Hu/GII/HKG/ZOI4/GII.4/CUHK-NS-**346
3358	VPI	KP096348	3359	7769	12179, IB589, 20999, 25409, 298IB, 3422B, 38639	norovirus **Hu/GII/HKG/20l4/GII.4/CUHK-NS-**40B
3360	VPI	KP096344	33B0	7770	12180, IB590, 21000, 25410, 2982D, 34230, 38640	norovirus **Hu/GII/HKG/20l4/GII.4/CUHK-NS-**398
336!	VPI	KM98294B	33BI	7771	12181, 16591, 21001, 25411, 29821, 34231, 38641	norovirus GII/Hu/HKG/20l4/GII.4/CUHK-NS-357
3362	VPI	KM5I4070	33B2	7772	12182, 16592, 21002, 25412. 29822, 34232, 38642	norovirus GII/Hu/HKG/20l4/GII.4/C0HK-NS-327
3363	VPI	KM51406I	33B3	7773	12183, 16593, 21003, 25413, 29823, 34233, 38643	norovirus **GII/Hu/HKG/20l4/GII.4/CUHK-NS-**316
3364	VPI	KM5I4DBD	33B4	7774	12184, 16594, 21004, 25414, 29824, 34234, 38644	norovirus GII/Hu/HKG/20l4/GII.4/C0HK-NS-315
3365	VPI	KM268079	33B5	7775	12185, 16595, 21005, 25415, 29825, 34235, 38645	norovirus GII.4
3366	VPI	KJ7I0247	33BB	777B	12186, IB53B, 2I00B, 254IB, 2982B, 34236, 38646	norovirus **GII/Hu/ZA/20l2/GII.Pe_GII.4** Sydney 20l2/JohannBsburg98l4
3367	VPI	KJ685405	3367	7777	12187, 16597, 21007, 25417, 29827, 34237, 38647	norovirus Hu/GII/BGIC0282/20ll/BGD

3368	VPI	KF42B7BB	3368	7778	12188, IB598, 21008, 25418, 29828, 34238, 38B48	norovirus Hu/GII.4/NIHICI3/20II/USA
33B9	VPI	KF0B0DD9	33B9	7779	12189, IB59B, 21009, 25419, 29829, 34239, 3864 9	**norovirus Hu/GII.4/NSWII4H/2DI2/AU**
3370	VPI	KF05999B	3370	7780	12190, IBBOO, 21010, 25420, 29830, 34240, 38B50	norovirus **Hu/GII.4/ACTD675/20I2/AU**
3371	VPI	HF952I30	3371	7781	12191 **16601.** 21011, 25421, 29831, 34241, 3865I	norovirus Hu/GII.4/C000079I8/20II/UK
3372	VPI	KC409302	3372	7782	12192. IBB02, 21012, 25422, 29832, 34242, 38B52	norovirus Hu/GII/20477/20IO/VNM
3373	VPI	JX45B908	3373	7783	12193, IBB03, 21013, 25423, 29833, 34243, 38653	norovirus Hu/GII.4/Sydn ey/NSW05I4/20I2/AU
3374	VPI	JX445IBB	3374	7784	12194. IBB04, 21014, 25424, 29834. 34244, 38B54	**norovirus Hu/GII.4/AlbertaEI204/20IO/CA**
3375	VPI	HQ6930 90	3375	7785	12195, IBB05. 2IDI5, 25425, 29835, 34245, 38655	**norovirus Hu/GII.4/TH-S597/THA/2006**
337B	VPI	JN400BII	337B	778B	**12196.** IBBOB, **21016.** 25426, 29836, 34246, 38656	norovirus Hu/GII-4/CGMHI3/2007/TW
3377	VPI	JN400B0B	3377	7787	12197, I6B07, 21017, 25427, 29837, 34247, 38B57	norovirus Hu/GII-4/CGMHII/2006/TW
3378	VPI	JQBI35I7	3378	7788	12198, IBB08, 21018, 25428, 29838, 34248, 3868 58	norovirus Hu/GII.4/WA2IOZ/2007/AU
3379	VPI	JQ478409	3379	7789	12199, IBBQ9. 21019, 25429, 29839, 34249, 3868 59	norovirus **Hu/GII.4/Minerva/200G/USA**
3380	VPI	GQ85B4B0	3380	77B0	12200, 16610, 21020, 25430, 29840, 34250, 38660	norovirus Hu/GII.4/Beijing/55I84/2008/CHN
3381	VPI	GQ856449	3381	7791	12201, I6BII, 21021, 25431, 29841, 34251, 38661	norovirus **Hu/GII.4/Beijing/54I25/2007/CHN**
3382	VPI	EU92I344	3382	7792	12202, **16612.** 21022, 25432, 29842. 34252. 38662	norovirus Hu/Pune/PCI5/200G/India
3383	VPI	AB54I290	3383	7793	12203, **16613.** 21023, 25433. 29843. 34253, 38663	norovirus Hu/GII-4/Miyazaki2/2007/JP
3384	VPI	GQ845322	3384	7794	12204, 16614, 21024, 25434, 29844, 34254, 38664	**norovirus Hu/GII.4/VIC3B63/2007/AU**

3385	VPI	AB22092I	3385	7795	12205, 16615. 21025, 25435, 29845, 34255, 38665	naravirus Hu/Chiba/04-I050/2005/JP
3386	VPt	KX5I422I	3386	7796	12206, 16616, 21026, 25436, 29846, 34256, 38666	norovirus GII.4
3387	VPI	KY48627I	3387	7797	12207. 16617, 2ID27, 25437, 29847, 34257, 38667	norovirus Gil
3388	VPI	KP78469 2	3388	7798	12208, 16618. 21028, 25438, 29848, 34258, 38668	norovirus GII/Hu/ZAF/20ll/GII.P4JII.4/ JohannBsburg /7028
3389	VPI	KX37I604	3389	7799	12209, I66IB, 21029, 25439, 29849, 34259, 38G69	norovirus GII.4
339D	VPI	KX354079	3390	7800	12210, 16620, 21030, 25440, 29850, 34260, 38670	norovirus GII.4
3391	VPI	KX354028	3391	7801	12211, IB62I, 21031, 25441, 29851, 34261, 38671	norovirus GII.4
3392	VPI	KX353983	3392	7802	12212, 16622, 21032, 25442, 29852, 34262, 38672	norovirus GII.4
3393	VPI	A89725II	3393	7803	12213. 16623. 21033, 25443, 29853. 34263. 38673	norovirus Hu/GII.4/Akital/20l2/JP
3394	VPI	AB972478	3304	7804	12214, 16624, 21034, 25444, 29854, 34264. 38674	norovirus Hu/GII.4/Fukui3/20l2/JP
3395	VPI	KT780382	3395	7805	12215. 16625. 21035, 25445, 29855, 34265, 38675	norovirus Hu/GII.4/C0HK-NS-555/HKG/2DI5
3396	VPI	KT033905	3396	7806	12216, 16626. 21036, 25446. 29856, 34266, 38676	norovirus Hu/Gll.4/SPHCII83/20I2/CHN
3397	VPI	KR904207	3397	7807	12217. 16627. 21037. 25447, 29857, 34267. 38677	norovirus Gil
3398	VPI	KJ678I5I	3398	7808	12218, 16628, 21038. 25448, 29858, 34268, 38678	norovirus Hu/GII.4/Beijing/PK0PH-07-02/inpatient/20l3/CHN
3399	VPI	KJ678143	3399	7809	12219, 16629, 21039, 25449. 29859, 34269. 38679	norovirus Hu/GIU/Beijing/PKUPH-05-OI/inpatient/2013/CHN
3400	VPI	KP698927	3400	7810	12220, 16630. 21040, 25450, 29860, 34270, 38680	norovirus GII.4
3401	VPI	LC005730	3401	7811	12221. 16631, 21041, 25451, 29861, 34271, 38681	norovirus GII/Hu/JP/20l3/GII.4/yl2-V849-2

3402	VPI	LC0057I4	3402	78I2	I2222, IBB32, 2I042. 25452, 298B2. 34272, 38682	narovirus GII/Hu/JP/2011/GiL4/y!0-V5ZB-B
34D3	VPI	KP24IB0B	3403	78I3	I2223, I6G33, 2I043, 25453, 29863, 34273, 38683	naravirus GII.4
34D4	VPI	KM9S293S	3404	78I4	I2224, I6634, 2I044, 25454. 29864, 34274, 38684	narovirus **GII/Hu/HKG/2DI4/GII.4/CUHK-NS-345**
34D5	VPI	KM5I4058	3405	78I5	I2225, I6635, 2I045, 25455, 29865. 34275, 38685	nomvirus **GII/Hu/HKG/2014/GIIMUHK-NS-312**
3406	VPI	KMI98580	340B	78IB	I2226. I6636, 2I046, 25456, 2B866, 34276, 38686	naravirus Hu/GII/I0223/20D9/VNM
3407	VPI	KMI98537	3407	78I7	I2227, I6B37, 2I047, 25457, 29867, 34277, 38687	narovirus Hu/GII/f D137/20DB/VNM
34D8	VPI	KFI77450	3408	78I8	I2228, I6638, 2I048, 25458, 29868. 34278, 38688	narovirus Hu/GII.4/3450GI58/AUS/20l2
3409	VPI	KF0Q8243	3409	78I9	I2229. IB639, 2I049, 25459, 29869, 34279, 38689	naravirus Hu/Gil.4/ variant Sydney 2012/FRA
34I0	VPI	KF429782	34I0	7820	I2230, I6640, 2I050, 25460, 29870, 34280, 38690	norovirus Hu/GII.4/NIHICI.3/20I0/0SA
34II	VPI	KFOBOIOI	34II	782I	I223I, I664I, 21051. 25461, 29871, 34281, 38691	**norovipus Hu/GII.4/NSW7B7K/2DI2/AU**
34I2	VPI	KF0B003B	34I2	7822	12232, IB642, 21052, 25462, 29872, 34282, 38692	norovirus **Hu/GII.4/NSW74GS/ZDI2/AU**
34I3	VPI	KF0B007I	34I3	7823	12233, 16643, 21053, 254B3, 29873, 34283. 38693	naravirus Hu/GII.4/NSW59BJ/20I2/AU
34I4	VPI	KFDBDD5B	34I4	7824	12234, 16644, 21054, 25464, 29874, 34284, 38694	norovirus **Hu/GII.4/NSW483T/ZDIZ/AU**
34I5	VPI	JX43983B	34I5	7825	12235, 16645. 21055, 254B5, 29875, 34285, 38695	norovirus HU/GII/SGDUII 835/K0R/20II
34IB	VPI	HF052I2B	34IB	782B	12236, 1664B, 21056, 25466, 29876, 34286, 38696	norovirus Hu/GII.4/C000079I6/20II/UK
34I7	VPI	KC40B273	34I7	7827	12237, 16647, 21057. 25467. 29877, 34287, 38697	norovirus Hu/GII/20IB6/20D9/VNM
34I8	VPI	KC409242	34I8	7828	12238, 16648, 21058, 25468, 29878, 34288, 38B98	naravirus Hu/GII/I0406/20ID/VNM

3419	VPI	JX445IB7	3419	7829	12233, IBB49, 21059, 254B9, 2B879, 3428B, 38B99	norovirus Hu/GII.4/AlbertaEI0B5/201i/CA
3420	VPI	JX445I5B	342B	7830	12240, IBB50, 2I0B0, 25470, 29880, 342B0, 387D0	noravirus **Hu/GII.4/AlbBrtaEI498/ZD0B/CA**
3421	VPI	GQ85B458	3421	7831	12241, 16651, 21061, 25471, 29881, 34291, 38701	narovirus **Hu/GII.4/Beijing/55IG2/2008/CHN**
3422	VPI	AB54I299	3422	7832	12242, I6B52, 21062, 25472, 29882, 34292, 38702	noravirus Hu/GII-4/Miyazaki8/2008/JP
3423	VPI	AB54II95	3423	7833	12243, IBB53, 2I0B3, 25473, 29883, 34293, 38703	noravirus **Hu/GII-4/2008a_ORF2-3/JP**
3424	VPI	AB504322	3424	7834	12244, 16654, 21064, 25474, 2B884, 34294, 38704	noravirus Hu/GII.4/Hirashima/l08/2007/JPN
3425	VPI	EU87B8B2	3425	7835	12245, 16655, 21065, 25475, 2B885, 34295, 387D5	narovirus Hu/GGII.4/Cairol/2006/EGY
3426	VPI	EU87B8BI	342B	783B	12246, 16656, 21066, 2547B, 29886, 34296, 38706	noravirus **Hu/GGII.4/0ijon-E2703/Z008/FRA**
3427	VPI	AB294792	3427	7837	12247, IB657. 21067, 25477, 29887, 34297, 38707	noravirus Hu/GII-4/Kimitsu/QBII46/200B/JP
3428	VPI	AB303932	3428	7838	12248, IB658, 21068, 25478, 29888, 34298, 38708	noravirus **Hu/GGII.4/DenHaagOOI/Z003/NL**
3429	VPI	LCI77BBD	3423	7833	12249, IB659, 2IBB3, 25479, 29889, 34299, 38709	narovirus GII.4
343D	VPI	KXB088B6	343D	7840	12250, IBB60, 21070, 25480, 2389B, 34300, 38710	narovirus GII.4
3431	VPI	KX37IB03	3431	7841	12251, 16661, 21071, 25481, **29891.** 343BI, 38711	noravirus GII.4
3432	VPI	KX354D8B	3432	7842	12252, I6B62, 21072, 25482, 23832, 34302, 38712	noravirus GII.4
3433	VPI	KX354080	3433	7843	12253, I6B63, 21073, 25483, 29893, 343B3, 38713	noravirus GII.4
3434	VPI	KX354D54	3434	7844	12254, IB664, 21074, 25484. 23834, 34304, 38714	noravirus GII.4
3435	VPI	KX354D4I	3435	7845	12255, I6BB5, 21075, 25485, 29895, 34305, 38715	narovirus GII.4

343B	VPI	KX354B29	343B	784B	12256, IBBBB, 2107B, 2548B, 2989B, 343DB. 387IB	norovirus GII.4
3437	VPI	KX353377	3437	7847	12257, IBBB7, 21077, 25487, 23837, 34307, 38717	norovirus GII.4
3438	VPI	KX3539G5	3438	7848	12258, IBB68, 21078, 25488, 23838, 34308, 38718	norovirus GII.4
3430	VPI	KU3III58	3439	7849	12253, IBBBB, 21079, 25489, 29899, 34309, 38719	norovirus Hu/GII.4/AlbErtaEI350/20I4/CA
344D	VPI	AB3744D8	3440	7850	I22B0, IBB70, 21080, 25490, 29900. 34310. 38720	norovirus Hu/GII.4/T272/clade 200Gb
3441	VPI	KR3D4221	3441	7851	I22BI. 16671, 21081, 25491, 29901, 34311, 38721	norovirus GiI
3442	VPI	AB9337G5	3442	7852	12262, IG672, 21082. 25492. 23902, 34312, 38722	norovirus Hu/Gli.4/Aichi5/20II/JP
3443	VPI	AB9337BI	3443	7853	12263, I6G73, 21083, 25493, 29903. 34313, 38723	norovirus Hu/GII.4/0saka4/20II/JP
3444	VPI	AB333748	3444	7854	12264, IG674. 2ID84. 25494, 29904, 34314, 38724	norovirus Hu/GII.4/EhimB5/20II/JP
3445	VPI	EU32I38G	3445	7855	12265, IG675, 21085, 25495, 29905, 34315, 38725	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/PunE-PC43
344G	VPI	KP24432I	344G	785B	12266. IB676, 21086, 25496. 29906, 34316, 38726	norovirus Hu/GIl.4/PA59/20I2/ITA
3447	VPI	KPB98923	3447	7857	12267, IB677, 21087, 25497, 29907, 34317, 38727	norovirus GII.4
3448	VPI	KP24I3Q5	3448	7858	12268, IG678, 21088, 25498, 29908, 34318, 38728	norovirus GII.4
3443	VPI	KPI76393	3443	7859	12269, 16G79, 21089, 25499, 29B09, 34318, 38729	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-341
3450	VPI	KP09G330	3450	78B0	12270, 16680. 21090, 25500, 29910. 34320, 38730	norovirus Hu/GII/HKG/20!4/GII.4/C0HK-NS-377
3451	VPI	KM982953	3451	78GI	12271, 16681. 21091, 25501, 29911. 34321, 38731	norovirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-365
3452	VPI	KM98293G	3452	78B2	12272, 16682, 21092, 25502, 29912, 34322, 38732	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-340

3453	VPI	KM5I4D73	3453	7863	12273, 16683, 21093, 25503, 29913, 34323, 38733	norovirus **GII/Hu/HKG/20I4/GII.4/CUHK-NS-330**
3454	VPI	KM2B808B	3454	7864	12274, 16684, 21094, 25504, 29914, 34324, 38734	norovirus GII.4
3455	VPI	KMI98552	3455	7865	12275, 16685, 21095, 25505, 29915, 34325, 38735	norovirus Hu/GII/20154/2009/VNM
345B	VPI	KJ7I6358	3456	7866	12276, 16686, 21096, 25506, 29916, 34326, 38736	norovirus Hu/GII.4/Beijing
3457	VPI	KJ649702	3457	7867	12277, 16687, 21097, 25507, 29917, 34327, 38737	norovirus **GII/Hu/HKG/20I4/GII.4/CUHK-NS-244**
3458	VPI	KF429778	3458	7868	12278, 16688, 21098, 25508, 29918, 34328, 38738	norovirus **Hu/GII.4/NIHICIB.I/2DI2/USA**
3459	VPI	KF060II3	3459	7869	12279, 16689, 21099, 25509, 29919, 34329, 38739	norovirus Hu/GII.4/NSW868I/20I2/AU
34GD	VPI	KFD6DID6	3460	7870	12280, 16690, 21100, 25510, 29920, 34330, 38740	norovirus **Hu/GII.4/NSW82GF/2DII/AU**
34GI	VPI	KF060I00	3461	7871	12281, 16691, 21101, 25511, 29921, 34331, 38741	norovirus Hu/GII,4/NSW783R/20II/AO
34GZ	VPI	KF060069	3462	7872	12282, 16692, 21102, 25512, 29922, 34332, 38742	norovirus **Hu/GII.4/NSW584J/20II/AU**
3463	VPI	KF060055	3463	7873	12283, 16693, 21103, 25513, 29923, 34333, 38743	norovirus **Hu/GII.4/NSW4GBJ/20II/AU**
34G4	VPI	KF0B0D28	3464	7874	12284, 16694, 21104, 25514, 29924, 34334. 38744	norovirus **Hu/GII.4/NSW295G/20I2/AU**
3465	VPI	KF060022	3465	7875	12285, 16695, 21105, 25515, 29925, 34335, 38745	norovirus **Hu/GII.4/NSW23I7/2DII/AU**
3466	VPI	KC5I7376	3466	7876	12286, 16696, 21106, 25516, 29926, 34336, 38746	norovirus Hu/GII-4/Taoyuan/CGMH6G/20I2/TW
3467	VPI	KC5I7374	3467	7877	12287. 16697, 21107, 25517. 29927, 34337. 38747	norovirus Hu/GII-4/Taoyuan/CGMH64/20I2/TW
34G8	VPI	KC4D93D8	3468	7878	12288. 16698, 21108. 25518, 29928, 34338, 38748	norovirus Hu/GII/30II2/200B/VNM
3469	VPI	KCI75393	3469	7879	I228B, 16699, 21109, 25519, 29929, 34339, 38749	norovirus Hu/Norwalk/20033/2009/VNM

3470	VPI	**JX45eG23**	347B	7880	12290. IB700, 21110. 25520, 2993D, 34340, 38750	narovirus Hu/BII.4/SG40B5-08/2007/SB
3471	VPI	JQ7B8I58	3471	7881	12291, 16701. 2IIII, 25521, 23331, 34341, 38751	narovirus Hu/GII.4/5M/USA/Z0D4
3472	VPI	JQ6I3566	3472	7882	I22B2, IB702, 21112, 25522, 29932, 34342, 38752	narovirus Hu/Bll.4/NSW567H/20I0/A0
3473	VPI	AB54I287	3473	7883	12293, 16703, 21113, 25523. 29933, 34343. 38753	narovirus Hu/GII-4/Miyazakil3/2008/JP
3474	VPI	AB50432D	3474	7884	12294, IB704, 21114, 25524, 23334, 34344, 38754	narovirus Hu/GII.4/Hirashima/3l/2006/JPN
3475	VPI	KU683733	3475	7885	12235, 16705. 21115, 25525. 23335, 34345, 38755	noravirus GII.4
3476	VPI	KX354I46	347B	788B	12296, I670B, 2IIIB, 25526, 29936, 34346, 38756	narovirus GII.4
3477	VPI	KX354D75	3477	7887	12297, 16707, 21117, 25527, 29937, 34347, 38757	narovirus GII.4
3478	VPI	KX354072	3478	7888	12298, 16708, 21118, 25528, 23938. 34348. 38758	narovirus GII.4
3479	VPI	KX354060	3473	7883	12299, 16709, 21113, 25523, 29939. 34349, 38759	narovirus GII.4
348D	VPI	KX353959	348B	7890	12300, 16710, 21120, 25530. 23340. 34350, 387B0	narovirus GII.4
3481	VPI	KX353954	3481	7891	12301, 16711, 21121, 25531, 23341, 34351, 387BI	noravirus GII.4
3482	VPI	ABB72529	3482	7892	12302, 16712, 21122, 25532, 23342, 34352, 38762	narovirus Hu/GII.4/Hirashima2/20l2/JP
3483	VPI	AB3725D4	3483	7893	12303, 16713, 21123, 25533, 23343. 34353. 38763	narovirus Hu/GII.4/GII4-NGI343/20ll/JP
3484	VPI	AB9725D3	3484	7894	12304, 16714, 21124, 25534, 23344. 34354, 38764	narovirus Hu/GII.4/GII4-NGI3l5/2DII/JP
3485	VPI	KP244322	3485	7895	12305. 16715, 21125, 25535, 23345, 34355, 38765	noravirus Hu/Gll.4/PA39/20I2/ITA
3486	VPI	LC0I87BB	348B	789B	12306, 16716, 21126, 2553B, 23346, 3435B, 38766	noravirus Hu/Gll.4/Aichi368-I4/20I4

3487	VPI	KP096345	3487	7897	12307. 16717. 21127. 25537. 29947, 34357. 38767	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-399
3488	VPI	KM982939	3488	7898	12308, 16718, 21128, 25538. 29948. 34358, 38768	norovirus GII/Hu/HKG/20l4/GII.4/C0HK-NS-347
3488	VPI	KMI98588	3489	7899	I23D9, 16719, 21129, 25539, 29949, 34359, 38769	norovirus Hu/GII/10037/2000/VNM
3490	VPI	KM198544	3490	7900	12310, 16720, 21130. 25540, 29950, 34360, 38770	norovirus Hu/GII/C24l8/20IO/VNM
3491	VPI	KMI98522	3491	7901	12311. IB72I. 21131, 25541, 29951. 34361, 38771	norovirus Hu/GII/20150/2009/VNM
3492	VPI	KMI98508	3492	7902	12312, 16722, 21132, 25542, 29952, 34362, 38772	norovirus Hu/GII/2Q066/2009/VNM
3493	VPI	KJ7IB3B7	3493	7903	12313. 16723, 21133. 25543, 29953, 34363, 38773	norovirus Hu/GII.4/Beijing
3494	VPI	KFI77440	3494	7904	12314. 16724, 21134, 25544, 29954, 34364, 38774	norovirus Hu/GII.4/32973745/AUS/20l2
3495	VPI	KF0B0117	3495	7905	12315, 16725, 21135, 25545, 29955, 34365, 38775	norovirus Hu/GII.4/NSW9I7I/20l2/AU
3496	VPI	KF0G0I04	3496	7906	12316, 16726, 21136. 25546. 29956. 34366, 38776	norovirus Hu/GII.4/NSW820J/20ll/AO
3497	VPI	KF0B0095	3497	7907	12317, 16727, 21137, 25547, 29957, 34367, 38777	norovirus Hu/GII,4/NSW7I88/20l2/AU
3498	VPI	KF0B0084	3498	7908	12318, 16728, 21138, 25548, 29958, 34368, 38778	norovirus Hu/GII,4/NSW6BDC/20ll/AO
3499	VPI	KF0B0082	3499	7909	12319. 16729, 21139, 25549, 29959, 34369, 38779	norovirus Hu/GII.4/NSWG3BQ/20l2/AU
3500	VPI	KF0G0079	3500	7910	12320, 16730, 21140, 25550, 29960, 34370, 38780	norovirus Hu/GII,4/NSW623B/20ll/AU
35DI	VPI	KF0B0058	3501	7911	12321, 16731, 21141, 25551, 29961, 34371, 38781	norovirus Hu/GII.4/NSW5047/20ll/AU
3502	VPI	KF060039	3502	7912	12322, 16732, 21142, 25552, 29962, 34372, 38782	norovirus Hu/GII.4/NSW3522/2OI2/A0
3503	VPI	KF0G0030	3503	7913	12323, 16733, 21143, 25553, 29963, 34373, 38783	norovirus Hu/GIL4/Sutherland/NSW3IIA/20l2/AU

3504	VPI	JX439829	3504	7914	12324, 16734, 21144, 25554, 29964, 34374, 38784	norovirus Hu/GII/SBaull034/KOR/20IO
3505	VPI	KC409282	3505	7915	12325, 16735, 21145, 25555, 29965, 34375, 38785	noravirus Hu/GII/20230/200B/VNM
350B	VPI	KC409259	350G	7916	12326, 16736, 21146, 25556, 29966, 34376, 38786	noravirus Hu/GII/20I62/20D9/VNM
3507	VPI	JX450B5e	3507	7917	12327, IB737, 21147, 25557, 299B7, 34377, 38787	noravirus Hu/GII.4/SG40IO-OI/20II/SG
3508	VPI	JX459B58	3508	7918	12328, IB738, 21148, 25558, 23968, 34378, 38788	noravirus Hu/GII.4/SG4009-DI/20II/SG
3509	VPI	JX459595	3509	7919	I232B, 16733, 21149, 25559, 29969, 34379, 38789	noravirus Hu/GII.4/SG40I3-09/2004/SG
3510	VPI	JQBI35B0	3510	7920	12330, 16740, 21150, 25560, 29970, 34380, 38790	noravirus Hu/GII.4/NSW445E/20IO/AU
3511	VPI	J0BI3545	3511	7921	12331, **16741.** 21151, 255BI, 29971, 34381, 38791	**noravirus Hu/GII.4/NSW673P/20IO/AU**
3512	VPI	AB54I288	3512	7922	12332, 16742, 21152, 25562, 29972, 34382, 38792	narovirus Hu/GII-4/Miyazakil/2007/JP
3513	VPI	AB54I247	3513	7923	12333, 16743, 21153, 25563, 23973, 34383, 38793	noravirus Hu/GII-4/Fukui4/2007/JP
3514	VPI	E0839585	3514	7924	12334, 16744, 21154, 255B4, 29974, 34384, 38794	narovirus Hu/GII/B Beijing/274/20 D5/CHN
3515	VPI	AY58802I	3515	7925	12335, 16745, 21155, 25565, 29975, 34385, 38795	narovirus Hu/NLV/Oxford/BGSG/2003/OK
35IB	VPI	KX5I4I88	35IB	7926	I233B, IB746, 21156, 2556B, 2997B, 3438B, 3879B	noravirus GII.4
3517	VPI	KX354I0I	3517	7927	12337, IB747, 21157, 255B7, 29977, 34387, 38797	noravirus GII.4
3518	VPI	KX354023	3518	7928	12338. 16748, 21158, 25568, 29978, 34388, 38798	noravirus GII.4
3519	VPI	KX353B79	3513	7929	12339, 16743, 21159, 255B9, 29979, 34389, 38799	narovirus GII.4
3520	VPI	AB97249I	3520	7930	12340, I675D, **21160.** 25570, 29080, 34390, 38800	noravirus Hu/GII.4/Sakai5/20I2/JP

3521	VPI	AB9724B9	3521	7931	12341, 16751, 2IIBI, 25571, 20981, 34391, 38801	norovirus Ho/BII.4/Aomori5/20l2/JP
3522	VPI	LCIDI8I9	3522	7932	12342. IB752, 2IIB2, 25572, 29982, 34392, 38802	norovirus GH/Hu/Jp/2DI2/GII.4/sl2DJ53
3523	VPI	KT202795	3523	7933	12343, IB753, 2IIB3, 25573, 29983, 34393, 38803	norovirus Gil
3524	VPI	ABB33742	3524	7934	12344, IB754, 21164. 25574, 29984, 34394, 38804	norovirus Hu/GII.4/Nagano2/2009/JP
3525	VPI	AB933722	3525	7935	12345, IB755, 21165, 25575, 23385, 34395, 38805	norovirus Hu/GII.4 **/EhimE3**/2DII/JP
352B	VPI	KJ678I38	352B	793B	I234B. IB75B, 21166. 25576, 29986, 34396, 38806	norovirus Hu/GII.4/Beijing/PKUPH-02-05/inpatient/20l3/CHN
3527	VPI	KP2443I7	3527	7937	12347, 16757, 21167, 25577, 29987, 34397, 38807	norovirus Hu/GII.4/PR328/20I3/ITA
3528	VPI	KPB9899 25	3528	7938	12348, 16758, 21168, 25578, 29988. 34398. 38808	norovirus GII.4
3529	VPI	LCD05727	3529	7939	12349, 16759, 2IIB9, 25579, 29989, 34399, 38809	norovirus GII/Hu/JP/2DI2/GII.4/yl2-V78D-l
3530	VPI	LC0IBB03	3530	7940	12350, 16760, 21170, 25580, 29990. 34400. 38810	norovirus Hu/JP/20B4/GII.4/Sakai/0l-inpationt8-29d-2
3531	VPI	LC0I6599	3531	7941	12351, 16761, 21171, 25581, 29991, 34401. 38811	norovirus Hu/JP/2DD4/GII.4/Sakai/DI-inpatient6-2d
3532	VPI	KP233587	3532	7942	12352. 16762, 21172, 25582, 29992, 34402, 38812	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-457
3533	VPI	KPI7B402	3533	7943	12353. IB7B3, 21173, 25583, 29993, 344B3. 38813	norovirus Hu/GII/HKG/20l4/GII.4/CUHK-NS-415
3534	VPI	KJIBB287	3534	7944	12354, IB764, 21174, 25584, 23394, 34404, 38814	norovirus GII/Hu/JP/20lO/GII.P4JII.4/Shimada/ASC9G
3535	VPI	KM19848D	3535	7945	12355, IB765, 21175, 25585, 29995, 34405, 38815	norovirus Hu/GII/IOIIG/2009/VNM
353B	VPI	KJ7IB357	353B	794B	I235B, IB7B6, 21176. 2558B, 29996. 344B6, 388IB	norovirus Hu/GII.4/Beijing
3537	VPI	KJ7IB354	3537	7347	12357, IB7B7, 21177, 25587, 23397, 34407, 38817	norovirus Hu/GII.4/Beijing

3538	VPI	KJB854D3	3538	7948	12358, IB7B8, 21178. 25588, 29998, 34408, 38818	norovirus Hu/GII/8GIC0204/20II/BGD
3539	VPI	KFDB0I08	3539	7949	12359, IB7B9, 21179, 25589, 29999, 34409, 38819	norovirus Hu/GII.4/NSW838I/20I2/AU
354D	VPI	KF0BDDB9	354D	7950	I23B0, IB77D, 21180, 25590, 30000. 34410, 38820	norovirus Hu/GII.4/NSW783I/20II/AU
3541	VPI	KFDBDDQ4	3541	7951	12361. 16771. 21181, 25591. 30001, 34411, 38821	norovirus Hu/GII.4/NSW078G/20I2/AU
3542	VPI	KFOBOOOG	3542	7952	12362, 16772, 21182, 25592, 30002, 34412, 38822	norovirus Hu/GII.4/NSW097K/20I2/AU
3543	VPI	KC5I737I	3543	7953	12363, 16773, 21183, 25593, 30003, 34413, 38823	norovirus HU/GII -4/NEW Taipei/CGMHBI/2012/TW
3544	VPI	JX459B57	3544	7954	I23G4, IB774, 21184, 25594, 3D004, 34414, 38824	norovirus Hu/GII.4/SG4002-I2/20I0/SG
3545	VPI	JX459G5B	3545	7955	12365, 16775, 21185, 25595, 30005, 34415, 38825	norovirus Hu/GII.4/SG4054-08/20IO/SG
3546	VPI	JX445I52	354B	795B	I23B6, 16776, 21186, 25596, 3000B, 344IB, 3882B	norovirus Hu/GII.4/AlbertaEII3I/2004/CA
3547	VPI	JDBI3553	3547	7957	I23G7, 16777, 21187, 25597, 30007. 34417, 38827	norovirus Hu/GII.4/NSWI8BM/20I0/A0
3548	VPI	JQBI3521	3548	7958	12368, 16778, 21188, 25598, 30008, 34418, 38828	norovirus Hu/GII.4/NSW3IID/2008/AU
3549	VPI	HO005298	3549	7959	12369, 16779, 21189, 25599, 30009, 34419, 38829	norovirus Hu/II.4/2849738/HK/2009
3550	VPI	HQ0D529B	3550	79B0	12370, 16780, 21190, 25600, 30010, 34420, 38830	norovirus Hu/II.4/285B357/HK/2009
3551	VPI	HM802555	3551	79BI	12371, 16781, 21191, 25B0I, 30011, 34421, 38831	norovirus Hu/GII.4/Hong Kong/C0050I30/2005/CHN
3552	VPI	GQ246801	3552	79B2	12372, 16782, 21192, 25602, 30012, 34422, 38832	norovirus Hu/GGII.4/Dijon/E4032/2009/FRA
3553	VPI	AB5D43D8	3553	79B3	12373, 16783, 21193. 25603. 30013, 34423, 38833	norovirus Hu/GII.4/Hiroshima/44/2004/JPN
3554	VPI	DQ369797	3554	79B4	12374, 16784, 21194, 25604, 30014, 34424, 38834	norovirus Hu/Guangzhou/NVgzOI/CHN

3555	VPI	LCI77BBI	3555	7965	12375, IB785, 21105. 25B05, 30015, 34425, 38835	noravirus GII.4
355B	VPI	LCI754BB	355B	79B6	12376, IB78B, 21196. 25606, 30016, 34426, 38836	norovirus Hu/GII/JP/20l6/GII,PIB_GII.4_ Sydney20l2/Kawasakil94
3557	VPI	KX354I37	3557	79B7	12377, 16787. 21197. 25B07, 30017, 34427, 38837	noravirus GII.4
3558	VPI	KX35403B	3558	7968	12378, 16788, 21198, 25608, 30018, 34428, 38838	norovirus GII.4
355B	VPI	KX3540II	3559	7969	12379, IB789, 2IB9, 25609, 30019, 34429, 38839	norovirus GII.4
356D	VPI	LCI53IZ2	35BD	7070	12380, 16790, 21200, 25610, 30020, 34430, 38840	noravirus GII/Hu/JP/2016/GII.PI6_GII.4_ Sydney20l2/0CI6023
35BI	VPI	KRI3I777	35BI	7971	12381, 16791. 21201, 25611, 30021, 34431, 38841	norovirus GII/Hu/IN/20ll/GII.P4_GII.4_ New0rlBans20Q9/Pune-I!2370
35BZ	VPI	AB9337B4	35B2	7972	12382. 16792, 21202, 256I2, 30022, 34432, 38842	norovirus Hu/GII.4/Dsakal/20ll/JP
35B3	VPI	LCDIBBOQ	3563	7973	12383, 16793, 21203, 25613. 30023, 34433. 38843	norovirus Hu/JP/2004/GII.4/Sakai/OI-inpatient6-26d
35B4	VPI	KJ433B7D	35B4	7974	12384. IB794, 21204, 25BI4, 30024, 34434, 38844	norovirus I3-AV-I-I0/20I2/GII.4
35B5	VPI	KPI7B395	35B5	7975	12385. 16795, 2I2D5, 25615, 30025, 34435, 38845	noravirus Hu/GII/HKG/2DI4/GII.4/CUHK-NS-352
35BB	VPI	KMB82947	35BB	7976	I238B, IB79B, 21206, 25616, 30026, 34436, 38846	noravirus GII/Hu/HKG/20I4/GII.4/CUHK-NS-358
35B7	VPI	KJB854I4	35B7	7977	12387, 16797, 21207, 25617. 30D27, 34437. 38847	norovirus Hu/GII/BGIC0004/20IO/BGD
35B8	VPI	KFOBOO93	35B8	7978	12388. 16798, 21208, 25618, 30028, 34438, 38848	norovirus Hu/GII.4/NSW7H7/20I2/AU
35BB	VPI	KC45B070	35B9	7979	12389, 16799, 21209, 25GI9, 30020, 34439, 38849	norovirus Hu/GII.4/VPII72/Shanghai/20l2/CHN
357D	VPI	KC409299	3570	7980	12390, 16800, 21210, 25G20, 30030, 34440, 38850	norovirus Hu/GII/20457/2010/VNM
3571	VPI	JX984947	3571	7981	12391, 16801, 21211, 25621, 30031, 34441, 38851	noravirus Hu/GII.4/GZ20IO-L32/Guangzhou/CHN/20IO

3572	VPI	KCI75385	3572	7982	I2392. IG8B2, **2I2I2.** 25G22, 3B032, 34442, 38852	norovirus Hu/Norwalk/10368/2010/VNM
3573	VPI	JQ6I35G3	3573	7983	I23B3. IB8G3, 2I2I3, 25G23, 30033, 34443, 38853	**nOrOvir us Hu/GII.4/NSW3039/20IO/AU**
3574	VPI	JQGI3558	3574	7984	I2394, IG8D4, 2I2I4, 25G24, 3DD34, 34444, 38854	narovirus Hu/GII.4/NSW68ll/20l0/A0
3575	VPI	GG85G45I	3575	7985	I2395, IG8D5, 2I2I5, 25625, 3GD35, 34445, 38855	**nOpDvirus Hu/GII.4/Beijing/54B5l/2DD7/CHN**
3576	VPI	D04I9908	357B	798G	I2396, I68D6, 2I2IG, 25626, 30036, 34446, 38856	norovirus Hu/Beijing/CR2932/2004/CHN
3577	VPI	KX5I4354	3577	7987	I2397, IB807. 2I2I7, 25627, 30037, 34447, 38857	narovirus GII.4
3578	VPI	KX354062	3578	7988	I2398, I6808, 2I2I8, 25628, 30038, 34448, 38858	narovirus GII.4
3578	VPI	ABB72532	3579	7989	I2399, I6809, 21213, 25629, 30039, 34449, 38859	narovirus Hu/GII.4/Shimane2/20l2/JP
358D	VPI	KT2D279G	358D	799D	12400, 16810, 21220, 25630, 30040, 34450, 388G0	norovirus Gil
358I	VPI	AB93375I	358I	799I	12401, **16811.** 21221, 25631, 30041, 34451, 38861	narovirus Hu/GII.4/Hiroshima5/2009/JP
3582	VPI	KM5I4078	3582	7992	12402, 16812, 21222, 25632, 30042, 34452, 38862	norovirus **GII/Hu/HKG/20l4/GII.4/CUHK-NS-**335
3583	VPI	KMIB85B9	3583	7993	12403, **16813.** 21223, 25633, 30043, 34453, 38863	norovirus Hu/GII/10235/2009/VNM
3584	VPI	KF768522	3584	7994	12404, 16814, 21224, 25634, 30044, 34454, 38864	norovirus Hu/Gll.4/P63/20I2/Gothenburg/Sweden
3585	VPI	KFBG0I2B	3585	7995	12405, 16815, 21225, 25635, 30045, 34455, 38865	norovirus Hu/GII.4/NSW959S/20l2/AU
3586	VPI	KFOGOIO2	358B	799G	12406, 16816, 21226, 25636, 30046, 34456, 388G6	norovirus Hu/GII.4/NSW8IIC/20l2/AU
3587	VPI	KFDBDD88	3587	7997	12407, 16817, 21227. 25G37, 30047, 34457, 38867	norovirus Hu/GII.4/NSWG79Q/20ll/AU
3588	VPI	KFDGDD25	3588	7998	12408, 16818, 21228, 25638, 30048, 34458, 38868	norovirus Hu/GII.4/NSW270F/20l2/AU

3589	VP1	KC5I7378	3589	7999	12409. 16819. 21229, 25B39. 30049, 34459, 38869	norovirus Hu/GII-4/New Taipei/CGMHG8/2012/TW
359D	VP1	JX45BB4D	359D	8BDB	12410, IB820, 21230, 25B40. 30050, 344B0, 38870	norovirus Hu/GI!4/SG4070-07/2009/SG
35BI	VPI	JQBI35I2	3591	8DDI	12411, 16821 21231, 25B4I, 3005! 344G! 38871	norovirus Hu/GI!4/WAI45Y/2007/AU
3592	VPI	HQDD5299	3592	8D02	12412, 16822, 21232, 25642. 30052, 344B2, 38872	norovirus Hu/I!4/220I480/1/20I0
3593	VPI	AB54I3I2	3593	8003	12413, IB823, 21233, 25B43, 30053, 34463, 38873	norovirus Hu/GII-4/Niigata2/2008/JP
3594	VPI	AB54I275	3594	8004	12414, IB824, 21234, 25644, 30054, 344B4, 38874	norovirus Hu/GII-4/Iwate5/2007/JP
3595	VPI	AB30333D	3595	8005	12415, IB825, 21235, 25645, 30055, 34465, 38875	norovirus Hu/BGII.4/HeerlBnDD3/2DD3/NL
3596	VPI	AY485B42	359B	800B	12416, IB826, 2I23B, 25B4B, 30056, 34466, 38876	human calicivirus NLV/GII/LangenlOBI/2002/DE
3597	VPI	KX5I4343	3597	8007	12417, 16827, 21237, 25B47, 30057, 34467, 38877	norovirus GII.4
3598	VPI	KX5I4274	3598	8008	12418, 16828, 21238, 25B48, 30058. 34468, 38878	norovirus GII.4
3599	VPI	KX5I4I75	3599	8009	12419, 16829, 21239, 25B49, 30059, 3446B, 38879	norovirus GII.4
3BDD	VPI	KX354093	3B00	8010	12420, 16830, 21240, 25B50, 300B0, 34470, 38880	norovirus GII.4
3601	VPI	KX354003	3B0I	8011	1242! 1683! 2124! 2565! 3006! 3447! 38881	norovirus GII.4
36D2	VPI	KRI3I778	3B02	8DI2	12422, 16832, 21242, 25652, 30062, 34472, 38882	norovirus GII/Hu/IN/20ll/GI!P4JI!4_ New0rleans2009/PunB-IIG686
36D3	VPI	AB9724B8	3B03	8013	12423, 16833, 21243, 25653, 30063, 34473, 38883	norovirus Hu/GI!4/Aomori3/2012/JP
3BD4	VPI	KR9D4222	3B04	8014	12424, 16834, 21244, 25654, 30064, 34474, 38884	norovirus Gil
3BD5	VPI	KP244320	3B05	8015	12425, 16835, 21245, 25655. 30065, 34475. 38885	norovirus Hu/GI!4/PA33D/20ll/ITA

3606	VPI	KP2443I5	3606	8016	12426, 16836. 21246, 25656, 30066, 34476, 38886	norovirus Hu/GII.4/PR784l/20ll/ITA
3607	VPI	KP2443I4	3607	8017	12427, 16837, 21247, 25657. 30067, 34477, 38887	norovirus HU/GII.4/PRI147I/20II/ITA
3608	VPI	KM268078	3608	8018	12428. 16838, 21248, 25658, 30068, 34478, 38888	norovirus GII.4
3609	VPI	KM19S555	3609	8019	12429, 16839, 21249, 25650, 30069, 34479, 38889	norovirus Hu/GII/C2035/20IO/VNM
3610	VPI	KF06DII5	3BI0	8020	12430, 16840, 21250, 25660, 30070, 34480, 38890	norovirus Hu/GII.4/NSW906P/20I2/AU
3611	VPI	KF0600I8	3611	8021	12431, 16841, 21251, 25661. 30071. 34481. 38891	norovirus Hu/GII.4/NSW2024/20I2/AU
3612	VPI	KC5I7365	3612	8022	12432. 16842. 21252. 25662, 30072, 34482, 38892	norovirus Hu/GII-4/Taoyuau/CGMH55/20I2/TW
3613	VPI	KC5I7360	3613	8023	12433, 16843, 21253, 25663, 30073. 34483, 38893	norovirus HU/GII-4/NEW TaipEi/CGMH50/20ll/TW
3614	VPI	JX846928	3614	8024	12434, 16844. 21254, 25664, 30074, 34484, 38894	norovirus Hu/GII.4/NIHIC9/20ll/USA
3615	VPI	JX459904	3BI5	8025	12435, 16845, 21255, 25665, 30075, 34485, 38895	norovirus Hu/GII.4/Doonside/NSW536l/20ll/AU
3616	VPI	JX459B49	3616	8026	12436, 16846, 21256, 25666, 30076, 34486, 38896	norovirus Hu/GII.4/SG406l-IO/2009/SG
3617	VPI	JX459643	3617	8027	12437. 16847, 21257, 25667, 30077, 34487, 38897	norovirus Hu/GII,4/SG4044-09/2009/SG
3618	VPI	JX459602	3618	8028	12438, 16848, 21258, 25668, 30078, 34488, 38898	norovirus Hu/GII.4/SG4009-0B/2006/SG
3619	VPI	LCI77655	3619	8029	12439, 16840, 21259, 25669, 30079. 34489. 38899	norovirus GII.4
3620	VPI	KP784698	3620	8030	12440, 16850, 21260, 25670, 30080, 34490, 38900	norovirus GII/Hu/ZAF/20I2/GII.P4_GII.4/ Johannesburg/ BW
3621	VPI	KX354I04	3621	8031	12441, 16851, 21261, 25671, 30081, 34491, 38901	norovirus GII.4
3622	VPI	KR9042II	3622	8032	12442. 16852. 21262, 25672, 30082. 34492, 38902	norovirus GiI

3623	VPI	AB933743	3B23	8033	12443. 16853, 21263, 25673, 30083, 34493, 38903	norovirus Hu/GII.4/Nagana4/2008/JP
3B24	VPI	LN854572	3B24	8D34	12444, 16854, 21264, 25674, 30084, 34494, 38904	naravirus BH/Hu/NL/20I2/BII.4/Nijmegen02
3B25	VPI	KP2443i	3B25	8035	12445, 16855. 21265, 25675, 30085, 34495, 38905	norovirus Hu/GII.4/PA278/20II/ITA
3B2B	VPI	KF768470	3B2B	8036	12446, 16856, 21266, 25676, 30086, 34496, 38906	norovirus Hu/GII.4/P2/20I2/GothBnburg/SwEd en
3B27	VPI	KC45B073	3B27	8037	12447, 16857, 21267, 25677, 30087, 34497, 38907	norovirus Hu/BII.4/VPI45l/Shanghai/2DIZ/CHN
3628	VPI	KC45B072	3B28	8038	12448, 16858, 21268, 25678, 30088, 34498, 38908	norovirus Hu/GII.4/VPI28l/Shanghai/20l2/CHN
3B2B	VPI	JX45BG22	3B29	8039	12449. 16859, 21269. 25679, 30089, 34499, 38909	norovirus Hu/GII.4/SG4052-08/2007/SG
3B3D	VPI	KX5I4290	3B3D	8040	12450, 16860, 21270, 25B80, 30090, 34500, 38910	norovirus GII.4
3B3I	VPI	KP784695	3B3I	8041	12451. 16861, 21271, 25681, 30091, 34501. 38911	norovirus GII/Hu/ZAF/20I2/GII.P4_GII.4/Em pangEni/ 9G 93
3B32	VPI	KXB088B5	3B32	8042	12452. 16862, 21272, 25682, 30092, 34502, 38912	norovirus GII.4
3B33	VPI	AB972500	3B33	8043	12453. 168G3, 21273, 25B83, 30093, 34503, 38913	norovirus Hu/GII.4/GII4-HK02/20II/JP
3B34	VPI	KT033902	3B34	8044	12454, IB864, 21274, 25684. 30094, 34504, 38914	norovirus Hu/GII.4/SPHC2048/20I2/CHN
3B35	VPI	KR9D422Q	3B35	8045	12455, 16865, 21275, 25B85, 30095, 34505, 38915	norovirus GII
3B3B	VPI	LN854566	3B36	8046	12456, 16866, 21276, 25686, 30096, 34506, 38916	norovirus GII/Hu/NL/20I4/GII.4/Groningen0l
3B37	VPI	KP2443I3	3637	8047	12457, 16867, 21277, 25687. 30097, 34507, 38917	norovirus Hu/GII,4/PRG876/20IO/ITA
3638	VPI	KP0BB342	3638	8048	12458, IB868, 21278, 25688. 30098, 34508, 38918	norovirus Hu/GII/HKG/20I4/GII.4/CUHK-NS-396
3B33	VPI	KM514D67	3636	8049	12459, 16869, 21279, 25689. 30099, 34509, 38919	norovirus GII/Hu/HKG/ZOI4/GII.4/CUHK-NS-322

3640	VPI	KFQ6Q04B	3640	8050	12460, 16870. 21280, 25690, 30100, 34510, 38820	norovirus Hu/GII.4/NSW43ID/20ll/AU
3G4I	VPI	KF059998	3641	8051	12461, 16871, 21281, 25691, 30101, 34511, 38921	norovirus Hu/GII.4/NSWDDBG/ZOI2/AU
3G42	VPi	JX439833	3642	8052	12462, 16872, 21282, 25692, 30ID2, 34512, 38922	norovirus HU/GII/SB UUII40B/K0R/20I0
3G43	VPI	JQ6I3548	3643	8053	12463, 16873, 21283. 25693, 30103, 34513. 38923	norovirus Hu/GII.4/NSW0336/2DI0/A0
3G44	VPI	JN5B5867	3644	8054	12464. 16874, 21284, 25694, 30104, 34514, 38B24	norovirus HU/GII .4/NBW Orleans/2010/USA
3G45	VPI	A8G29944	3645	8055	12465, 16875, 21285, 25695, 30105, 34515, 38925	norovirus Hu/Tokyo/I0-I443/20IO/JPN
3B4G	VPI	AB54II92	3646	8056	12466, 16876, 2I28B. 25696, 30106, 345IB, 38926	norovirus Hu/GII-4/2007b_ORF2-3/JP
3647	VPI	AB5Q43I4	3647	8057	IZ467, 16877. 21287, 25697, 30107, 34517, 38927	norovirus Hu/GII.4/HiroshimB/59/2005/JPN
3G48	VPI	KX5I4350	3648	8058	12468, 16878, 21288, 25698, 30108. 34518, 38B28	norovirus GII.4
3649	VPI	KX514342	3649	8059	12469, 16879, 21289, 25699, 30109, 34519, 38929	norovirus GII.4
3650	VPI	KX5I4280	3650	8060	12470, 16880. 21290, 25700, 30110, 34520, 38930	nnrovirus GII.4
3651	VPI	LCI77654	3651	8061	12471, 16881. 21291, 25701, 30111. 34521, 38931	norovirus GII.4
3652	VPI	KX354026	3652	8062	12472, 16882. 2IZ92, 25702, 30112, 34522, 38932	norovirus GII.4
3653	VPI	KR9042I8	3653	8063	12473, 16883, 21293, 25703, 30113, 34523, 38933	norovirus Gil
3654	VPI	KJ678I50	3654	8064	12474, 16884, 21294, 25704, 30114, 34524, 38934	norovirus Hu/GII.4/Beijing/PKUPH-D7-OI/inpatiBnt/2013/CHN
3655	VPI	KJ678I48	3655	8065	12475. 16885, 21295, 25705, 30115, 34525, 38935	norovirus Hu/GII.4/Beijing/PKUPH-D5-06/inpatiEnt/20l3/CHN
3656	VPI	KP2443I6	3656	8066	12476, 16886, 21296, 25706, 30116, 34526. 38936	norovirus Hu/GII.4/PR9474/20ll/ITA

3657	VPI	KF06Q072	3657	8067	12477, 16887, 21297, 25707, 30117, 34527, 38937	norovirus Hu/GII.4/NSW59BM/20ll/AO
3658	VPI	JX439822	3658	8068	12478, 16888, 21298, 25708, 30118, 34528, 38938	norovirus Hu/GII/Seoull39l/K0R/20l0
3659	VPI	KC4639I0	3659	8069	12479, 16889, 21299, 25709, 30110, 34529, 38939	norovirus **Hu/GII.4/Dhio/B84/USA**
3660	VPI	JX45B65I	366D	8070	12480, 16890, 2I3D0, 257ID, 30120, 34530, 38940	norovirus Hu/GII.4/SG4075-I2/2009/SG
3661	VPI	AB54I3I4	3661	8071	12481, 16891, 21301, 25711, 30121, 34531, 38941	norovirus Hu/GII-4/Niigata3/2008/JP
3662	VPI	AB5D4323	3B62	8072	12482, 16892, 21302, 25712, 30122, 34532, 38942	norovirus Hu/GII.4/Hiroshim_/I09/2007/JPN
3663	VPI	KX353963	3663	8073	12483, 16893, 21303, 25713, 30123, 34533, 38943	norovirus GII.4
3664	VPI	KR9042I3	3664	8074	12484, 16894, 21304, 25714, 30124, 34534, 38944	norovirus GiI
3665	VPI	AB933745	3665	8D75	12485, IB895, 21305, 25715, 30125, 34535, 38945	norovirus Hu/GII.4/Aichi3/20IO/JP
366G	VPI	KPD9634I	3BBB	8076	12486, 16896, 2I3D6, 25716, 30I2B, 34536, 38946	norovirus **Hu/GII/HKG/2DI4/GII.4/CUHK-NS-395**
3667	VPI	KMII429I	3B67	8077	12487, 16897, 21307, 25717, 30127, 34537, 38947	**norovirus Hu/GII.4/SJTUHI/CHN/2DI4**
3668	VPI	KF06DID5	3668	8078	12488, 16898, 21308, 25718, 30128, 34538, 38948	**norovirus HU/GII.4/NSW824F/20I2/AU**
3669	VPI	KF06008I	36B9	8079	12489, IB899, 21309, 25719, 30129, 34539, 38949	norovirus Hu/GII,4/NSW628T/20I2/AU
367D	VPI	KFD599999	367D	8080	12490, 16900, 21310, 25720, 30130, 34540, 38950	**norovirus Hu/GII.4/NSW0D7P/2DI2/AU**
3671	VPI	JX644D36	3B7I	8081	12491, 16901, 21311, 25721, 30131, 34541, 38951	norovirus **Hu/GII.4/N94/20ll/HuZhou**
3672	VPI	JX459654	3672	8082	12492, 16902, 21312, 25722, 30132, 34542, 38952	norovirus Hu/GII,4/SG405I-08/20IO/SG
3673	VPI	JN4DD62I	3673	8083	12493, 16903, 21313, 25723, 30133, 34543, 38953	norovirus Hu/GII-4/CGMH23/20IO/TW

3B74	VP1	AB54I2BD	3B74	8084	12494, 16904, 21314, 25724, 30134, 34544, 38954	norovirus Hu/GII-4/Hakkaidal/2007/JP
3B75	VP1	KX5I434I	3B75	8085	12495, 16905, 21315, 25725. 30135, 34545, 38955	norovirus GII.4
3B7B	VP1	KX5I4253	3B7B	8086	12496, 16906, 21316, 25726, 30136, 34546, 38956	norovirus GII.4
3B77	VPI	KX5I4I95	3B77	8087	12497, 16907, 21317, 25727, 30137, 34547, 38957	norovirus GII.4
3B78	VPI	KX3540IG	3B78	8088	12498, 16908, 21318, 25728, 30138, 34548, 38958	norovirus GII.4
3B79	VPI	KM245073	3679	8089	12499, 16909, 21319, 25729, 30139, 34549, 38959	norovirus 09-81-2/2009/GII.4/NEw0rleans/2009
3680	VPI	LN8545G7	3680	8090	12500. 16910. 21320, 2573D, 30140. 34550, 38960	norovirus GII/Hu/NL/20l4/GII.4/GroningEn02
3B8I	VPI	JN4006I9	3681	8091	12501. 16911, 21321. 25731, 30141, 34551, 38961	norovirus Hu/GII-4/CGMH2l/20IO/TW
3B82	VPI	KFDBD052	3682	8092	I25D2, 16912, 21322. 25732, 30142. 34552. 38962	norovirus Hu/GII.4/NSW45l2/20l2/A0
3B83	VPI	KF0600I4	3683	8093	12503, 16913. 21323, 25733. 30143, 34553, 38963	norovirus Hu/GII.4/NSWI627/20l2/A0
3684	VPI	KC5I7375	3684	8094	12504. 16914, 21324, 25734, 30144, 34554. 38964	norovirus Hu/GII-4/Taoyuan/CGMH65/2QI2/TW
3B85	VPI	JX644039	3685	8095	12505, 16915. 21325. 25735, 30145, 34555, 38965	norovirus Hu/GII.4/NI0l/20ll/HuZhou
3B8B	VPI	JX64403I	3686	8096	12506, 16916. 21326, 25736, 30146. 34556, 38966	norovirus Hu/GII.4/N76/20IO/HuZhou
3B87	VPI	HMI9I773	3687	8097	12507, 16917, 21327, 25737, 30147, 34557, 38967	norovirus Hu/Il.4/220066I/HK/20I0
3B88	VPI	AB504309	3688	8098	12508. 16918, 21328, 25738, 30148. 34558, 38968	norovirus Hu/GII.4/Hiroshima/48/2004/JPN
3B89	VPI	KX5I42IB	3689	8099	12509. 16919, 21329, 25739, 30149, 34559, 38969	norovirus GII.4
3690	VPI	KX5I42I2	3690	8100	12510. I692D. 21330. 25740, 30150, 34560. 38970	norovirus GII.4

3691	VPI	KX354I38	3691	8101	12511. 16921. 21331, 25741. 30151. 345BI. 38971	nnrovirus GII.4
3B9Z	VPI	AB933747	3B92	8102	12512. IB922, 21332, 25742, 30152, 345B2, 38972	norovirus Hu/GII.4/Dsaka5/2DD9/JP
3693	VPI	KJ955493	3B93	8103	12513, IB923, 21333, 25743. 30153. 345B3, 38973	nnrovirus JB031230049/Nanshan/0B/IZ/20l2/SZ/CHN
3694	VPI	KJB7815 3	3694	8104	12514. IB924, 21334. 25744, 3DI54, 34564. 38974	norovirus Hu/GII.4/BBijing/PK0PH-O7-04/inpatiBnt/20l3/CHN
3695	VPI	KC456071	3695	8105	12515. 16925, 21335, 25745, 30155, 34565, 38975	nnrovirus Hu/GII.4/VPIZI4/Shanghai/20l2/CHN
3696	VPI	KCI75384	3696	8106	12516, 16926. 2I33B, 25746, 30156, 345B6, 3897B	nnrovirus Hu/Norwalk/10328/2010/VNM
3697	VPI	J06I356I	3697	8107	12517, IB927, 21337, 25747. 30157, 34567, 38977	norovirus Hu/GII.4/NSW234D/2DI0/A0
3698	VPI	KJ678I45	3698	8108	12518, 16928. 21338. 25748. 30158, 34568, 38978	norovirus Hu/GII.4/B-ijing/PKUPH-05-03/inpatient/20l3/CHN
3699	VPI	KF060II6	3699	8109	12519, 16929, 21339, 25749, 30159, 345B9, 38979	norovirus Hu/GII.4/NSW9I6G/20l2/AU
370D	VPI	KC5I7362	3700	8110	12520. IB930, 21340, 2575D, 30160, 34570, 38980	norovirus Hu/GII-4/Taoyuan/CGMH52/20l2/TW
37DI	VPI	JXB44038	3701	8111	12521, 16931, 21341, 25751, 30161, 34571, 38981	norovirus Hu/GII.4/NI00/20ll/HuZhou
3702	VPI	AB5043I3	3702	8112	12522, 16932, 21342, 25752, 30IB2, 34572, 38982	nnrovirus Hu/GII.4/Hiroshima/58/2D05/JPN
3703	VPI	KX5I436I	3703	8113	12523, IB933. 21343, 25753, 30163, 34573, 38983	norovirus GII.4
3704	VPI	KX5I433B	3704	8114	12524, 16934, 21344, 25754, 30IB4, 34574. 38984	norovirus GII.4
3705	VPI	KX5I4203	3705	8115	12525. 16935, 21345, 25755, 30165, 34575, 38985	norovirus GII.4
3706	VPI	KP784693	3706	8116	I252B, IB93B, 2I34B, 2575B, 30166. 34576. 38986	norovirus GII/Hu/ZAF/20ll/GII.P4_GII.4/EmpangEni/8501
3707	VPI	AB933734	3707	8117	12527, 16937, 21347, 25757. 30167, 34577, 38987	norovirus Hu/GII.4/Aomori5/2009/JP

3708	VPI	KFDB0041	3708	8118	12528, IB938, 21348, 25758, 30IB8, 34578, 38988	norovirus Hu/GII.4/NSW3B3M/2Q12/AU
3709	VPI	JX989074	3709	8119	12529, IB939, 21349, 25759, 30IB9, 34579, 38989	norovirus Hu/GII.4/GZ20IO-L87/Guangzhou/CHN/20II
3710	VPI	JN4D0B24	3710	8120	12530, IB940, 21350, 257B0, 30170, 34580, 38990	norovirus Hu/GII-4/CGMH2B/20IO/TW
3711	VPI	E087B894	3711	8121	12531, 16941, 21351, 257BI, 30171, 34581, 38991	norovirus Hu/GGII.4/Dijon-EI50I/2006/FRA
3712	VPI	KX5I4I73	3712	8122	12532, IB942. 21352, 257B2, 30172, 34582, 38992	norovirus GII.4
3713	VPI	KX353989	3713	8123	12533, IB943, 21353, 257B3, 30173, 34583, 38993	norovirus GII.4
3714	VPI	KX353962	3714	8124	12534, IB944, 21354, 257B4, 30174, 34584, 38994	norovirus GII.4
3715	VPI	AB9725I5	3715	8125	12535, IB945, 21355, 257B5, 30175, 34585, 38995	norovirus Hu/GII.4/Iwate2/20I2/JP
37IB	VPI	KT033904	37IB	8I2B	I253B, IB94B, 2I35B, 257BB, 30I7B, 3458B, 3899B	norovirus Hu/GII.4/SPHCII34/20I2/CHN
3717	VPI	KM982942	3717	8127	12537, IB947, 21357, 257B7, 3DI77, 34587, 38997	norovirus GII/Hu/HKG/2DI4/GII.4/CUHK-NS-350
3718	VPI	KJB854I7	3718	8128	12538, IB948, 21358, 257B8, 30178, 34588, 38998	norovirus Hu/GII/BGIC0270/20II/BG0
3719	VPI	KC907392	3719	8129	12539, IB949, 21359, 25769. 30179, 34589, 38999	synthetic construct
3720	VPI	KC5I7377	3720	8I3D	12540, IB950, 2I3B0, 25770, 30180, 34590, 39000	norovirus Hu/GII-4/Taoyuan/CGMH67/20I2/TW
3721	VPI	KC5I7368	3721	8131	12541, IB95I, 21361, 25771, 30181, 34591, 39001	norovirus Hu/GII-4/New Taipei/CGMH58/20I2/TW
3722	VPI	AB54I3I0	3722	8132	12542, 16952, 21362, 25772, 30182, 34592, 39002	norovirus Hu/GII-4/Niigata1/2D08/JP
3723	VPI	EF535854	3723	8133	12543, IB953, 2I3B3, 25773, 30183, 34593, 39003	norovirus Hu/Guangzhou/NV-VPI/2D06/China
3724	VPI	KX5I4368	3724	8134	12544, 16954, 21364, 25774, 30184, 34594, 39004	norovirus GII.4

3725	VPI	KX5I435I	3725	8135	12545, 16955, 21365. 25775, 30185, 34595, 39005	norovirus GII.4
3726	VPI	KC5I7372	3726	8136	12546, 16956, 21366, 25776, 30186, 34596, 39006	norovirus Hu/GII-4/New Taipei/CGMH62/20I2/TW
3727	VPI	JN4006I3	3727	8137	12547, 16957, 21367, 25777, 30187, 34597, 39007	norovirus Hu/GII-4/CGMHI5/2007/TW
3728	VPI	KX5I429I	3728	8138	12548, 16958, 21368, 25778, 30188, 34598, 39008	norovirus GII.4
3729	VPI	KX5I42I9	3729	8139	12549, 16959, 21369, 25779, 30189, 34599, 39009	norovirus GII.4
3730	VPI	AB933668	3730	8140	I255D, 16960, 21370, 25780, 30190, 34600, 39010	norovirus Hu/GII.4/0saka4/20I0/JP
3731	VPI	KJ678I49	3731	8141	12551, 16961, 21371. 25781. 30191, 34601. 39011	norovirus Hu/GII.4/Beijing/PKUPH-05-07/inpatient/20I3/CHN
3732	VPI	KP2443I8	3732	8142	12552, 16962, 21372, 25782, 30192, 34602, 39012	norovirus Hu/GII.4/PA288/20II/ITA
3733	VPI	KX5I4362	3733	8143	12553, 16963, 21373, 25783. 30193, 34603, 39013	norovirus GII.4
3734	VPI	KX5I4329	3734	8144	12554, 16964, 21374, 25784, 30194, 34604, 39014	norovirus GII.4
3735	VPI	KJ678I52	3735	8145	12555, 16965. 21375, 25785. 30195, 34605, 39015	norovirus Hu/GII.4/Beijmg/PKUPH-07-03/inpatient/20I3/CHN
3736	VPI	KX5I4352	3736	8146	12556. 16966, 21376, 25786, 30196, 34606, 39016	norovirus GII.4
3737	VPI	KX5I4339	3737	8147	12557, 16967. 21377, 25787. 30197. 34607, 39017	norovirus GII.4
3738	VPI	KR904238	3738	8148	12558, 16968, 21378, 25788, 30198, 34608, 39018	norovirus Gil
3739	VPI	KJ7I0245	3739	8149	12559, 16969, 21379, 25789, 30199, 34609, 39019	norovirus Gil
3740	VPI	KX5I4298	3740	8150	12560, 16970. 21380, 25790. 30200, 34610, 39020	norovirus GII.4
3741	VPI	KX5I4269	3741	8151	12561. 16971. 21381. 25791, 30201, 34611, 39021	norovirus GII.4

3742	VPI	KX5I4I7B	3742	8I52	I2562, IB972, 2I382. 25792. 3B2B2, 346I2, 39022	norovirus GII.4
3743	VPI	KX5I4289	3743	8I53	I2563. I6973, 2I383. 25793, 3D203. 346I3, 39D23	norovirus GII.4
3744	VPI	KX5I4288	3744	8I54	I25B4. I6974, 2I384, 25794. 302D4, 346I4, 39024	noravirus GII.4
3745	VPI	KX5I4268	3745	8I55	I2565, I6975, 2I385, 25795. 302D5, 34GI5, 39025	norovirus GII.4
3746	VPI	JX459653	3746	8I56	I25B6, I6976, 2I38B, 25796, 30206. 346I6. 39026	norovirus Hu/GII.4/SG40I4-04/20IO/SG
3747	VPI	KX5I4359	3747	8I57	I2567. I6977, 2I387. 25797, 302D7, 346I7, 39027	norovirus GII.4
3748	VPI	KX5I4296	3748	8I58	I25G8, I6978. 2I388, 25798, 30208, 34618, 39028	norovirus GII.4
3748	VPI	KX5I4284	3749	8I59	12569, 16979, 21389, 25799, 30209, 3461B, 39029	norovirus GII.4
375D	VPI	KX5I4245	375D	8I6D	12570, 16980, 21390, 25800, 30210, 34620, 39030	norovirus GII.4
375I	VPI	KX5I4327	375I	8I61	12571, 16981, 21391, 25801, 30211, 34621, 39031	norovirus GII.4
3752	VPI	KX5I43QI	3752	8162	12572, 16982, 21392, 25802, 30212, 34622, 39032	norovirus GII.4
3753	VPI	KX5I4299	3753	8I63	12573, 16983, 2I393, 25803, 30213, 34623, 39033	norovirus GII.4
3754	VPI	KX5I4277	3754	8I64	12574. 16984, 21394, 25804, 30214, 34624, 39034	norovirus GII.4
3755	VPI	KX5I42I3	3755	8I65	12575, 16985, 21395, 25805, 30215, 34625, 39035	norovirus GII.4
3756	VPI	KT033903	3756	8I66	12576, 16986. 21396, 25806, 30216, 34626. 39036	norovirus Hu/GII.4/SPHC27I5/2DI2/CHN
3757	VPI	HM625866	3757	8I67	12577, 16987, 21397, 25807, 30217, 34627, 39037	norovirus HU/GII.4/PECS/HUN4322/20I0/H0N
3758	VPI	KX5I43I9	3758	8IB8	12578. 16988, 21398, 25808, 30218, 34628, 39038	norovirus GII.4

3759	VP1	KX5143II	3759	81B9	12579. IB989, 21399. 25809. 30219, 34B29, 39039	norovirus GII.4
3760	VP1	KX5142BB	37B0	8170	12580, IB990. 21400, 25810, 30220, 34B30. 3904D	norovirus GII.4
37BI	VPI	KX5I4235	37BI	8171	12581, 16991, 21401, 25811, 30221, 34631, 39041	norovirus GII.4
37B2	VPI	KX354II5	37B2	8172	12582, 16992, 21402, 25812, 30222, 34B32, 39042	norovirus GII.4
37B3	VPI	KM272334	37B3	8173	12583, IB993, 21403. 25813, 30223, 34B33. 39043	norovirus Hu/GII.4/gg-l2-08-04/20l2/KR
37B4	VPI	KX354IIB	37B4	8174	12584, 16994, 21404, 25814, 30224, 34B34, 39044	norovirus GII.4
37B5	VPI	KX5I4I72	37B5	8175	12585, 16935. 21405, 25815, 30225, 34635, 39045	norovirus GII.4
37BB	VPI	KX354II4	37BB	8I7B	12586, 16996, 21406, 258IB, 30226, 34636, 39046	norovirus GII.4
37B7	VPI	KX5I4295	37B7	8177	12587, 16997, 21407, 25817, 30227, 34637. 39047	norovirus GII.4
37B8	VPI	KX5I4242	37B8	8178	12588, 16998, 21408, 25818. 30228, 34638, 39048	norovirus GII.4
37B9	VPI	KX5I4224	37B9	8179	12589, 16999. 21409, 25819, 30229, 34639, 39049	norovirus GII.4
3770	VPI	KX5I42B2	3770	8180	12590, 17000, 21410, 25820, 30230, 34640, 39050	norovirus GII.4
3771	VPI	KX354I39	3771	8181	12591, 17001, 21411, 25821, 30231, 34641. 39051	norovirus GII.4
3772	VPI	KX5I42I5	3772	8182	12592. 17002, 21412, 25822, 30232, 34642, 39052	norovirus GII.4
3773	VPI	KX5I43B7	3773	8183	12593, 17003, 21413, 25823, 30233, 34643, 39053	norovirus GII.4
3774	VPI	KX5I4243	3774	8184	12594, 17004, 21414, 25824, 30234, 34644, 39054	norovirus GII.4
3775	VPI	KX35399B	3775	8185	12595, 17005, 21415, 25825, 30235, 34645, 39055	norovirus GII.4

377G	VP1	DQ078820	377B	8I8B	I259B. I7D0B. 2I4IB. 2582B, 3023B, 34B4B. 3905B	norovirus Hu/BII.4/Sydney9l7J/020/AO
3777	VP1	AB933738	3777	8187	12597, 17007, 21417, 25827, 30237, 34B47, 39057	norovirus Hu/GII.4/Niigata5/2009/JP
3778	VP1	EU780734	3778	8188	12598, 17008, 21418, 25828, 30238, 34648, 39058	norovirus Hu/GGII.4/Valencia/2004/ES
3779	VPI	KP064096	3779	8189	12599, 17009, 21419, 25829, 30239, 34649, 39059	norovirus GI.3
378D	VPI	KC473548	3780	8190	12600, 17010, 21420, 25830, 30240, 3465D, 39060	norovirus Hu/GI/HuzhouNIO/2008/CHN
3781	VPI	AB684698	3781	8ISI	12601. 17011, 21421, 25831, 30241, 34651, 390BI	norovirus Hu/GI/46-2/Tokyo/l977/JPN
3782	VPI	AF538B79	3782	8192	I2B02, 17012. 21422, 25832, 30242, 34652, 390B2	human calicivirus NLV/**BoxEr**/2001/OS
3783	VPI	JQ743332	3783	8193	12603, 17013, 21423, 25833, 30243, 34B53, 390G3	norovirus Hu/GI.2/1999
3784	VPI	GB85B47B	3784	8194	12604, 17014. 21424, 25834, 30244, 34B54. 39064	norovirus Hu/GII.4/Beijing/54IOB/2DD7/GHN
3785	VPI	JNBD3244	3785	8195	12605, 17015. 21425. 25835, 30245, 34655, 39065	norovirus Hu/GI.3/S29/2008/Lilla Edet/Sweden
3786	VPI	AB078335	378G	819B	12606, 17016, 21426, 2583B, 3D24B, 34656, 39066	Norwalk-like virus
3787	VPI	GU2997GI	3787	8187	12607, 17017, 21427, 25837, 30247, 34657, 39067	norovirus Hu/GI.8/2008890321/2008/US
3788	VPI	AJ277BIB	3788	8198	12608. 17018, 21428, 25838, 3D248, 34658, 39068	human calicivirus HB/NLV/Whiterose/BB/UK
3789	VP1	GQ85G4G2	3789	8199	12609, 17019, 21429, 25839, 30249, 34659, 39069	norovirus Hu/GII.4/Beijing/53G7l/20D7/CHN
379D	VPI	AF4358Q7	379Q	8200	12610, 17020, 21430, 25840, 30250, 34660, 39070	human calicivirus NLV/C59/99
3791	VPI	KX396056	3791	8201	12611, 17021, 21431, 25841, 30251, 34661, 39071	primate norovirus
3792	VPI	ABI875I4	3792	8202	12612, 17022, 21432, 25842, 30252, 34662, 39072	norovirus Hu/GI/Otofuke/1979/JP

3793	VPI	L074I8	3793	8203	I2BI3, I7B23, 21433, 25843. 30253. 34BB3, 39073	Southampton virus
3794	VPI	FJ5I5294	3794	8204	12614. 17024. 21434, 25844, 30254, 34BB4. 39074	norovirus Hu/GI.2/Leuven/2003/BEL
3795	VPI	KJ79OI98	3795	8205	I2GI5, 17025. 21435, 25845, 3D255, 34665, 39075	bat norovirus
3796	VPI	KF3062I2	379B	820G	I2GI6, I702B, 21436, 25846. 3025B, 346BB, 39076	norovirus Hu/GI.2/Jingzhnu/20I340I/CHN
3797	VPI	KM4GI694	3797	8207	12617. 17027, 21437, 25847, 30257, 34B67, 39077	norovirus II-FJ-5/20II/GII.P7/GII.B
3798	VPI	AB03S780	3798	8208	12618, 17028, 21438, 25848, 3D258, 346B8, 39B78	Norwalk-like virus
3799	VPI	AY038599	3799	8209	12619. 17029, 21439, 25849, 30259, 34669, 39079	human calicivirus NLV/VA97207/I997
38DD	VPI	AY054299	3800	8210	12620, 17030, 21440, 25850, 30260. 34670, 39080	human calicivirus NLV/ IdahO Falls/378/1996/OS
38DI	VPI	AFI95848	3801	8211	12621, 17031. 21441. 25851. 3D261, 34671, 39081	human calicivirus strain Hu/NLV/AmstErdam/98-I8/I998/NET
3802	VPI	AB303927	3802	8212	12622, 17032, 21442, 25852. 30262, 34672, 39082	norovirus Hu/GGII.4/0tr EchtD58/200I/NL
3803	VPI	AY038B00	3803	8213	12623, 17033, 21443, 25853, 30263, 34673, 39083	human calicivirus NLV/VA98387/I998
3804	VPI	AF080554	3804	8214	12624, 17034, 21444, 25854, 30264, 34674, 39084	Norwalk-like virus sp.
3805	VPI	AB234778	3805	8215	12625, 17035, 21445, 25855, 30265. 34B75, 39085	norovirus Hu/GII-4/Matsudo/02I07I/2002/JP
380B	VPI	AB303022	380B	82IB	12626, I703B, 21446, 25856. 30266, 34676, 39086	norovirus Hu/GGII.4/TieI00I/I995/NL
3807	VPI	AY532I28	3807	8217	12627. 17037, 21447, 25857, 30267, 34677, 39087	norovirus Hamburg048/I997/GE
3808	VPI	AY532II3	3808	8218	12628, 17038, 21448, 25858, 30ZB8, 34B78, 39088	norovirus Freiburg253/I998/GE
3809	VPI	EU0784DB	3809	8219	I2G29, 17039, 21449, 25859, 302B3, 34B79, 39089	norovirus Hu/Richmond/I994/OSA

3810	VPI	AF472B23	38IB	822B	I2B3B. I7B40, 2I45B. 258BB, 3B270, 34B8D, 33B3B	human calicivirus NLV/DIJ0NI7I/96
3811	VPI	AF427II4	3811	8221	12631, 17041, 21451, 258BI, 3D271, 34B81, 33031	human calicivirus NLV/Frankfurt(0der)/I70/99/DE
3812	VPI	AY532II4	3812	8222	I2B32, 17042, 21452, 258B2, 3B272, 34B82, 33032	nornvirus Erlangenl95/I997/GE
3813	VPI	KF8D65B5	3813	8223	I2B33, 17043, 21453, 258B3, 3D273, 34B83, 39B93	nnravirus Hu/GII.4/patient_C/2DI0/USA
3814	VPI	JD4784D7	3814	8224	I2B34, 17044, 21454, 258B4, 3B274, 34B84, 33094	nornvirus Hu/Gll.4/I397/0SA
3815	VPI	AB303B23	3815	8225	I2B35, 17045, 21455, 258B5, 30275, 34B85, 3B095	nnrovirus Hu/GGII.4/DenHaagOI5/2000/NL
3816	VPI	AF427I2D	38IB	822B	I2B3B, I704B, 2I45B, 258BB, 3027B, 34688, 39036	human calicivirus NLV/BeEskaw/I24/00/0E
3817	VPI	AY532I34	3817	8227	I2B37, 17047, 21457, 258B7, 3B277, 34687, 33097	norovirus Hamburg23B/I337/GE
3818	VPI	AY532IIB	3818	8228	I2B38, 17048, 21458, 258B8, 3B278, 34B88, 33038	nnrovirus Dresden245/I997/GE
38IB	VPI	AY532II2	3813	8223	12639, 17043, 21453, 258B3, 30273, 34B89, 33039	nornvirus Freiburg024/I337/GE
382D	VPI	KX5I4275	382B	823B	I2B40, I7D50, 21460, 25870, 30280, 34630, 33IBB	narovirus GII.4
3821	VPI	KF8B65I0	3821	8231	12641, 17051, 21461, 25871, 30281, 34691, 39101	narovirus Hu/GII,4/patiBnt_C/20IO/USA
3822	VPI	EUB784ID	3822	8232	12642, 17052, 21462, 25872, 30282, 34B92, 33102	norovirus Hu/GCanyon/2002/OSA
3823	VPI	AF427I23	3823	8233	12643. I7D53, 21463, 25873, 30283. 34633, 33IB3	human calicivirus NLV/Berlin/435/BO/OE
3824	VPI	AY532I35	3824	8234	I2B44. 17054, 21464, 25874, 30284, 34694, 39104	norovirus Hamburg3l6/I338/GE
3825	VPI	AY532I25	3825	8235	12645, 17055, 21465, 25875, 30285, 34695, 39105	narovirus Bochum224/I398/GE
382B	VPI	AJ277BIB	382B	823B	12646, 17056, 21466, 2587B, 30286, 34696, 33106	human calicivirus HU/NLV/Symgreen/95/OK

3827	VPI	AFD8055G	3827	8237	I2B47, 17057, 2I4B7, 25877, 30287, 34697, 39107	Norwalk-like virus sp.
3828	VPI	AF080550	3828	8238	I2B48, 17058, 2I4B8, 25878, 30288, 34B98, 39108	Norwalk-like virus sp.
3829	VPI	EU078407	3829	8239	I2B49, 17059, 2I4B9, 25879, 30289, 34699, 39109	norovirus Hu/Houston/1995/USA
3830	VPI	AB08378I	3830	8240	I2B50, 17060, 21470, 25880, 30290, 34700, 39110	Norwalk-like virus
3831	VPI	AF427I22	3831	8241	I2651, 17061, 21471, 25881, 30291, 34701, 39111	human calicivirus NLV/BBrlin/491/OO/DE
3832	VPI	AY532I33	3832	8242	12652, 17062, 21472, 25882, 30292, 34702, 38112	norovirus Hamburgl89/I997/GE
3833	VPI	AY532I3I	3833	8243	12653, I70B3, 21473, 25883, 30293, 34703, 39113	narovirus Hamburgl39/IB97/GE
3834	VPI	AY532I2I	3834	8244	I2B54, 17064, 21474, 25884, 30294, 34704, 39114	norovirus Bochum03l/I997/GE
3835	VPI	AY532II5	3835	8245	12655, 17065, 21475, 25885, 30295, 34705, 39115	norovirus DrEsdenl53/I997/GE
383B	VPI	KF806530	383B	824B	12656, I7D6B, 21476, 25886. 30296, 3470B, 39116	norovirus Hu/GII.4/patient_B/20IO/USA
3837	VPI	KF8065I3	3837	8247	12657, 17067, 21477, 25887, 30297, 34707, 39117	norovirus Hu/GII.4/patient_C/20IO/USA
3838	VPI	AY74I8I1	3838	8248	12658, I70B8, 21478, 25888, 30298, 34708, 39118	narovirus Hu/NLV/DresdBnl74/pOS-Norll/1997/GE
3839	VPI	AY532I22	3839	8249	I2B59, 17069, 21470, 25889, 302B9, 34709, 39119	narovirus Bachuml08/I997/GE
3840	VPI	AY532I20	3840	8250	I2B60, 17070, 21480, 25890, 30300, 34710, 39120	noravirus Bochum026/I997/GE
3841	VPI	AY532III	3841	8251	12661. 17071, 21481, 25891, 30301, 34711, 39121	norovirus Freiburg057/1997/GE
3842	VPI	AF080558	3842	8252	I2B62, 17072, 21482, 25892, 30302, 34712, 39122	Norwalk-likE virus sp.
3843	VPI	KF806508	3843	8253	I2B63, 17073, 21483, 25893, 30303, 34713, 39123	noravirus Hu/GII.4/patient_C/2DI0/USA

3844	VP1	AF4257BB	3844	8254	I2BB4, 17074, 21484, 25894, 30304, 34714, 39124	human calicivirus NLV/Dillingen 259/OI/DE
3845	VP1	AJ583B72	3845	8255	I2BB5, 17075, 21485, 25895, 303D5, 34715, 39125	Norwalk virus
3846	VP1	AY532IIB	384B	825B	I2BBB, I707B, 2I48B, 2589B, 3030B, 347IB, 39I2B	norovirus Bachum024/I998/GE
3847	VP1	AFD80552	3847	8257	I2BB7, 17077, 21487, 25897, 30307, 34717, 39127	Norwalk-like virus sp.
3848	VP1	KX5I4I77	3848	8258	I2BB8, 17078, 21488, 25898, 30308, 34718, 39128	norovirus GII.4
3849	VP1	KF80B5I4	3849	8259	I2BB9, 17079, 21489, 25899, 30309, 34719, 39129	norovirus **Hu/GII.4/patient_C/2DI0/USA**
3850	VP1	AB3D3B25	3850	82B0	I2B70, 17080. 21490, 25900, 30310, 34720, 39130	norovirus **Hu/GGII.4/Leeuwarden043/2000/NL**
3851	VP1	KF80B534	3851	82BI	I2671, 17081, 21491, 25901, 30311, 34721, 39131	norovirus **Hu/GII.4/patient_B/20IO/USA**
3852	VP1	KF80B5I9	3852	82B2	12672, I7D82, 21492, 25902, 30312, 34722, 39132	norovirus Hu/GII.4/patient>5mo/20I0/0SA
3853	VP1	AB303924	3853	82B3	12673, 17083, 21493, 25903, 30313, 34723, 39133	norovirus Hu/GGII.4/WaddinxvBenOIG/2000/NL
3854	VP1	DQ975270	3854	82B4	12674, 17084, 21494, 25904, 30314, 34724, 39134	norovirus Hu/GII-4/0saka/l998/JPN
3855	VP1	AF4I4424	3855	82B5	12675, 17085, 21495, 25905, 30315, 34725, 39135	Nnrwalk-like virus NLV/Miami Beach/326/1995/OS
3856	VP1	LCD489B4	385B	82BB	I267B, I708B, 2I49B, 2590B, 30316, 34726, 3913B	norovirus Hu/GII/3-2I5/TokyD/l995/JPN
3857	VP1	ABB847D5	3857	82B7	I2B77, 17087, 21497, 25907, 30317, 34727, 39137	norovirus Hu/GII/53-l/TokyD/l980/JPN
3858	VP1	KF8DB523	3858	82B8	12678, 17088, 21498, 25908, 30318, 34728, 39138	norovirus Hu/GII.4/patient>5mo/20IO/USA
385B	VP1	AY532I29	3859	82B9	I2B79, 17089, 21499, 25909, 30319, 34729, 39139	norovirus Hamburgl35/I998/GE
38B0	VP1	AY532I24	38B0	8270	I2B80, 17090, 21500, 25910, 30320, 34730, 39140	norovirus Bochum220/I997/GE

3861	VPI	KX5I43D9	3861	8271	12681, 17091, 21501, 25911, 30321, 34731, 39141	norovirus GII.4
3862	VPI	KX5I4308	3862	8272	12682, 17092, 21502, 25912, 30322, 34732, 39142	norovirus GII.4
3863	VPI	KX5I4283	3863	8273	12683, 17093, 21503, 25913, 30323, 34733, 39143	norovirus GII.4
3864	VPI	KX5I4I94	3864	8274	12684, 17094, 21504, 25914, 30324, 34734, 39144	norovirus GII.4
3865	VPI	KY424340	3865	8275	12685, 17095, 21505, 25915, 30325, 34735, 39145	norovirus GII.4
3866	VPI	LC0I66D6	3866	8276	12686, 17096, 21506, 25916, 30326, 34736, 39146	norovirus Hu/JP/20D4/GII.4/Sakai/0l-inpatiEnt8 -54d-l
3867	VPI	FJ537I36	3867	8277	12687, 17097, 21507, 25917, 30327, 34737, 39147	norovirus Hu/GII.4/CHDC3967/I988/0S
3868	VPI	AY532II7	3868	8278	12688, 17098, 21508, 25918, 30328, 34738, 39148	norovirus DrEsden267/I997/GE
3869	VPI	KX5I4279	3869	8279	12689, I709B, 21509, 25919, 30329, 34739, 39149	norovirus GII.4
387D	VPI	LCDI6602	387D	8280	12690, 17100, 21510, 25920, 30330, 34740, 39150	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpatient8-29d-l
3871	VPI	AFI45896	3871	8281	12691, 17101. 21511, 25921, 30331, 34741, 39151	cambErwEll virus
3872	VPI	AB684704	3872	8282	12692, 17102, 21512, 25922, 30332, 34742, 39152	norovirus Hu/GII/52-2/Tokyo/I980/JPN
3873	VPI	JX40I279	3873	8283	12693, 17103, 21513, 25923, 30333, 34743, 39153	norovirus Hu/GII.4/CI27/GF/I978
3874	VPI	G0389627	3874	8284	12694, 17104, 21514, 25924, 30334, 34744, 39154	synthetic construct
3875	VPI	AF425763	3875	8285	12695, 17105, 21515, 25925, 30335, 34745, 39155	human calicivirus NLV/BErlin/159/98/DE
3876	VPI	AY532I27	3876	8286	12696, 17106, 21516, 25926, 30336, 34746, 39156	norovirus Bochum339/I997/GE
3877	VPI	AY532II8	3877	8287	12697, 17107, 21517, 25927, 30337, 34747, 39157	norovirus Dresden3I9/IB97/GE

3878	VP1	KX5I4326	3878	8288	I2B08, 17108, 21518, 25828, 30338, 34748, 30158	norovirus BII.4
3878	VP1	KX5I426 4	3879	8289	I2B99, 17109. 21510, 25020, 30339, 34740, 3915 9	norovirus BII.4
388D	VP I	KX5 I4 I7 I	388D	8200	12700, 17110. 21520, 25030, 30340, 34750, 30IB0	norovirus BII.4
388!	VP I	KX5I4I70	3881	8291	12701, I7III, 21521, 25031, 30341, 34751, 39IBI	norovirus GII.4
3882	VPI	KF80653 3	3882	8202	12702, 17112. 21522, 25932, 30342, 34752, 30IB2	norovirus Hu/GII.4/patientJ/2BIO/0SA
3883	VPI	KF806528	3883	8293	12703, 17113, 21523, 25933, 30343, 34753, 39IB3	norovirus Hu/GII.4/patient_B/20IO/USA
3884	VPI	KF8DB527	3884	8294	12704, 17114. 21524. 25034. 30344, 34754, 39IB4	narovirus Hu/GII.4/patientJ/20IO/USA
3885	VPI	KX5I426I	3885	8285	12705, 17115. 21525, 25935, 30345, 34755, 30IB5	norovirus GII.4
388G	VPI	ABB84720	3886	820B	I270B, I7IIB. 2I52B, 25936. 3034B. 34756, 30I6B	norovirus Hu/GII/64-3/Tokya/l083/JPN
3887	VPI	LCDIBB05	3887	8207	12707, 17117. 21527, 25037, 30347, 34757, 39IB7	norovirus Hu/JP/20B4/GII.4/Sakai/0l-inpatient8-28d-4
3888	VPI	KF80B528	3888	8208	12708, 17118. 21528. 25938, 30348, 34758. 39168	norovirus Hu/GII,4/patient_B/20IO/USA
3880	VPI	JXD2328B	3889	8209	12700, 17119, 21529, 25030, 30340, 34750, 30IB0	norovirus Hu/GII.4/CHDC51BI/IB74/USA
3890	VPI	FJ537I37	3890	8300	12710, 17120, 21530, 25040, 3D350, 34760, 39170	norovirus Hu/GII.4/CHDC4l08/l087/US
3801	VPI	X7B7IB	3891	8301	12711, 17121. 21531, 25041, 30351, 34761, 30171	caliciviridaB
3892	VPI	KX5I4328	3892	8302	12712, 17122, 21532, 25042, 30352, 347B2, 3BI72	norovirus GII.4
3893	VPI	KX5I420I	3893	8303	12713, 17123, 21533, 25043, 30353, 34763, 39173	norovirus GII.4
3894	VPI	AB985442	3894	8304	12714, 17124, 21534. 25944, 30354. 347B4, 30174	norovirus Hu/GII/2-4G /TokyD/l987/JPN

3895	VPl	LC0IBB04	3895	8305	12715. 17125, 21535, 25945, 30355, 347B5, 39175	norovirus Hu/JP/2004/GII.4/Sakai/0l-inpatiBnt8 -29d-3
3896	VPl	KF80B532	389B	830B	I27IB, 17126. 2I53B, 2594B, 30356, 347BB, 39I7B	norovirus Hu/GII.4/patient_B/20IO/USA
3897	VPl	FJ537I38	3897	8307	12717, 17127, 21537, 25947, 30357, 347B7, 39177	norovirus Hu/GII.4/CHDC487l/l977/US
3898	VPt	AY030098	3898	8308	12718, 17128, 21538, 25948, 30358. 347B8, 39178	human calicivirus Hu/ NLV/ GII/ MDI34-7/I987/0S
3899	VPl	AY532I30	3899	8309	12719, 17129, 21539, 25949, 30359, 34769, 39179	norovirus Hamburgl37/I997/GE
39D0	VPl	KX5I4286	3900	83I0	12720. 17130, 21540, 25950, 303B0, 34770, 39180	norovirus GII.4
390I	VPl	KX5I4202	390I	83II	12721, 17131, 21541, 25951, 30361. 34771, 39181	norovirus GII.4
39DZ	VPl	0Q358208	3902	83I2	12722, 17132, 21542, 25952. 30362, 34772, 39182	synthetic construct
3903	VPl	AF4I4425	3903	83I3	12723, 17133, 21543, 25953, 30363, 34773, 39183	Norwalk-like virus NLV/ Burwash Landing/331/1995/US
3904	VPl	KX5I4348	3904	83I4	12724, 17134, 21544, 25954, 30364, 34774, 39184	norovirus GII.4
3905	VPl	KX5I4287	3905	83I5	12725, 17135, 21545, 25955, 30365, 34775, 39185	norovirus GII.4
3906	VPl	KX5I4I83	390B	83IB	12726, 17136, 21546, 25956, 30366, 34776, 39186	norovirus GII.4
3907	VPl	KX5I4I74	3907	83I7	12727, 17137, 21547, 25957, 30367, 34777. 39187	norovirus GII.4
3908	VPl	KF42979I	3908	83I8	12728. 17138, 21548, 25958. 30368, 34778, 39188	norovirus Hu/GII.4/NIHICI.5/20ll/OSA
3909	VPl	AF427II5	3909	83I9	12729, 17139, 21549, 25959, 30369, 34779, 39189	human calicivirus NLV/Ludwigslust/218/99/DE
39I0	VPl	KX5I43I4	39I0	8320	12730, 17140, 21550, 25960, 30370. 34780. 39190	norovirus GII.4
39II	VPl	KX5I4208	39II	832I	12731, 17141. 21551, 25361. 30371. 34781, 39191	norovirus GII.4

39I2	VPI	KX5I42DB	3912	8322	12732, 17142, 21552, 259B2, 3D372, 34782, 39192	norovirus GII.4
39I3	VPI	KX5I4I98	3913	8323	12733, 17143, 21553, 259B3, 3D373, 34783, 39IB3	norovirus GII.4
3BI4	VPI	KX5I4I9I	3914	8324	12734, 17144, 21554, 25964, 3D374, 34784, 39194	norovirus GII.4
33I5	VPI	KX5I4I87	3915	8325	12735, 17145, 21555, 259B5, 3D375, 34785, 39195	norovirus GII.4
39IB	VPI	KX5I4I80	39IB	832B	I273B, 17146, 21556, 259BB, 30376, 3478B, 33I3B	norovirus GII.4
33I7	VPI	GU5982I3	3917	8327	12737, 17147, 21557, 25367, 30377, 34787, 39137	synthetic construct
3918	VPI	KX5I43B5	3918	8328	12738, 17148, 21558, 259B8, 3D378, 34788, 33198	norovirus GII.4
3919	VPI	KX5I4304	3919	8329	12733, 17143, 21559, 25969, 30379, 34789, 39199	norovirus GII.4
3920	VPI	KX5I43D2	3920	8330	12740, 17150, 2I5B0, 25970, 30380, 34790, 39200	norovirus GII.4
3921	VPI	KX5I4207	3921	8331	12741, 17151. 21561, 25971, 30381, 34791, 392DI	norovirus GII.4
3922	VPI	KX5I4I92	3922	8332	12742, 17152, 21562, 25972, 30382, 34792, 39202	norovirus GII.4
3923	VPI	KF8D6525	3923	8333	12743, 17153, 21563, 25973, 30383. 34793, 33203	norovirus Hu/GII.4/patient_B/20IO/USA
3924	VPI	KC4B2I95	3924	8334	12744, 17154, 21564, 25974. 30384, 34794, 39204	norovirus Hu/GII.4/IT00/ITA
3925	VPI	AF427IIB	3925	8335	12745, 17155, 21565, 25975, 3D385, 34795, 39205	human calicivirus NLV/Ludwigslust/22l/99/DE
392B	VPI	KX514337	392B	833B	12746, 17156, 21566, 25976. 30386, 3479B, 39206	norovirus GII.4
3927	VPI	KX5I4255	3927	8337	12747, 17157, 21567, 25977, 30387, 34797, 39207	norovirus GII.4
3928	VPI	KX5I42ID	3928	8338	12748, 17158, 21568, 25978, 30388, 34798, 39208	norovirus GII.4

3929	VPI	KX5I4I82	3929	8339	12749. 17159. 2I5B9, 25979. 3D389, 34799, 39209	noravirus GII.4
393D	VPI	AF4257G4	3930	8340	12750, I7IB0, 21570, 25980, 3D390, 34800, 39210	human calicivirus NLV/Berlin/238/98/DE
3931	VPI	KX5I4355	3931	8341	12751, I7IBI, 21571, 25981, 30391. 34801. 39211	noravirus GII.4
3932	VPI	KX5I4345	3932	8342	12752, 17162, 21572, 25982, 30392, 34802, 39212	narovirus GII.4
3933	VPI	KX5I4204	3933	8343	12753, 17163. 21573, 25983, 30393, 34803, 39213	narovirus GII.4
3934	VPI	KF7I249 2	3934	8344	12754, 17164, 21574, 25984, 30394, 34804, 39214	noravirus Hu/GII.4/NIHICI.8/2DI2/USA
3935	VPI	DQ078829	3935	8345	12755, 17165, 21575, 25985, 30395, 34805, 39215	noravirus Hu/GII.4/Sydney348/970/A0
3936	VPI	KX5I4370	393B	834B	I275B, 171GB. 2I57B, 25986. 30396, 34806, 39216	narovirus GII.4
3937	VPI	KX5I4332	3937	8347	12757, 17167, 21577, 25987, 30397. 34807, 39217	narovirus GII.4
3938	VPI	KX5I427G	3938	8348	12758, 17168, 21578, 25988, 30398, 34808, 39218	narovirus GII.4
3939	VPI	KX5I425G	3939	8343	12759, 17169. 21579. 25989, 30399, 34809, 39219	noravirus GII.4
394D	VPI	KX5I42D9	394D	8350	12760, 17170, 21580, 25990, 30400, 34810, 39220	noravirus GII.4
3941	VPI	KX5I42D5	3941	8351	12761, 17171, 21581, 25991, 30401, 34811, 39221	norovirus GII.4
3942	VPI	KX5I4200	3942	8352	12762. 17172, 21582, 25992, 30402, 34812, 39222	noravirus GII.4
3943	VPI	KX5I4I9B	3943	8353	12763, 17173, 21583, 25993, 30403, 34813, 39223	norovirus GII.4
3944	VPI	AB985437	3944	8354	12764, 17174, 21584, 25994, 30404, 34814, 39224	norovirus Hu/GII/2-37/Tokyo/I987/JPN
3945	VPI	KF7I249 4	3945	8355	12765, 17175, 21585, 25995, 30405, 34815, 39225	norovirus Hu/GII.4/NIHICI.7/20I2/USA

334B	VPI	KX5I43I5	394B	835B	12766, 17176, 21586, 25996, 304D6, 34816, 33226	norovirus GII.4
3947	VPI	KX5I4IB9	3947	8357	12767, 17177, 21587, 25937, 30407, 34817, 33227	norovirus GII.4
3948	VPI	KX5I4I7B	3948	8358	12768, 17178, 21588, 25998, 30408, 34818, 39228	norovirus GII.4
394B	VPI	KX5I436O	3949	8359	12769, 17179, 21589, 25999, 3D409, 34819, 39229	norovirus GII.4
395D	VPI	KX5I4347	3950	83B0	12770, 17180, 21590, 26000, 30410, 34820, 39230	norovirus GII.4
395I	VPI	ABB84B75	3351	8361	12771, 17151St. 21591, 26001, 30411, 34821, 39231	norovirus Hu/GII/2l-5/Mya/l975/JPN
3952	VPI	KX5I43B9	3952	8362	12772, 17182, 21592, 2B002, 30412, 34822, 39232	norovirus GII.4
3953	VPI	KX5I43ID	3953	83B3	12773, 17183, 21593, 2B003, 30413, 34823, 39233	norovirus GII.4
3954	VPI	KX5I4I85	3954	83B4	12774, 17184, 21594, 2B004, 30414, 34824, 39234	norovirus GII.4
3955	VPI	KX5141S1	3955	8365	12775, 17185, 21595, 2B0D5, 30415, 34825, 39235	norovirus GII.4
395B	VPI	KF7I2493	395B	8366	12776, 17186, 21596, 26006, 30416. 34826, 39236	norovirus Hu/Gll.4/NIHICI.I0/20I2/USA
3957	VPI	FJ4IIIBB	3357	8367	12777, 17187, 21597, 26007, 30417, 34827, 39237	norovirus Hu/GII.4/Wellington/l995/USA
3B58	VPI	AF427I2I	3358	83B8	12778, 17188, 21598, 26008, 30418, 34828, 39238	human calicivirus NLV/KoenigswusterhausEn/l30/00/0E
3959	VPI	KF42978 7	335B	8363	12779, 17189, 21590, 26009, 30419, 34829, 39239	norovirus Hu/Gll.4/NIHIC28.5/20I2/USA
39BD	VPI	A8933728	3960	8370	12780, 17130, 21600, 26010, 30420, 34830, 39240	norovirus Hu/GII.4/Akita5/2D09/JP
39BI	VPI	KX5I434B	3361	8371	12781, 17191. 21601, 2BDII, 30421, 34831, 39241	norovirus GII.4
39B2	VPI	KX5I4249	3362	8372	12782, 17192, 2IBD2, 26012, 30422, 34832, 39242	norovirus GII.4

3963	VPI	KF4297B0	39B3	8373	I2783. I7I93, 2I603, 260I3, 30423, 34833, 39243	noravirus Hu/GII.4/NIHIC28.4/ZDI2/USA
3964	VPI	AB303929	39B4	8374	I2784, I7I94, 21B04, 2B0I4. 30424, 34834, 3B244	norovirus Hu/GGII.4/EmmenE006/2002/NL
30B5	VPI	KX5I43B3	39B5	8375	I2785, I7I95, 2IB05, 260I5, 30425, 34835, 39245	noravirus GII.4
3966	VPI	KX5I4357	39B6	8376	I2786, I7I96. 2IB06. 260I6, 30426, 34836, 3924B	noravirus GII.4
30B7	VPI	KX5I4240	39B7	8377	I2787, 17197. 2IB07, 2B0I7, 30427, 34837, 39247	noravirus GII.4
3968	VPI	AF4I44I7	39B8	8378	12788, 17198, 2IB08, 2B0I8, 30428, 34838, 39248	Narwalk-liko virus NLV/UK3-I7/I2700/I992/GB
30B9	VPI	KX5I4303	3969	8379	12789, 17199, 2IB09, 2B0I9, 30429, 34839, 39249	noravirus GII.4
3970	VPI	KX5I4273	3970	8380	12790, 17200, 2IBID, 2B020, 30430, 34840, 39250	noravirus GII.4
397I	VPI	KX5I4323	397I	838I	12791, 17201, 2IBII, 2B02I, 30431, 34841, 39251	noravirus GII.4
3972	VPI	KX5I43B4	3972	8382	12792, 17202, 2IBI2, 26022, 30432, 34842, 39252	noravirus GII.4
3973	VPI	KX5I4338	3973	8383	12793, 17203, 21613, 2B023, 3D433, 34843, 3B253	noravirus GII.4
3974	VPI	KX5I43IE	3974	8384	12794, 17204, 21614, 2B024, 30434, 34844, 39254	noravirus GII.4
3975	VPI	KX5I4356	3975	8385	12795, 17205, 21615, 26025, 30435, 34845, 39255	noravirus GII.4
3976	VPI	KX5I4349	397B	8386	12796, I720B, 21616, 26026, 3D43B, 3484B, 3B25B	noravirus GII.4
3977	VPI	KX5I42I7	3977	8387	12797, 17207, 21617, 26D27, 30437, 34847, 39257	norovirus GII.4
3978	VPI	KX5I4324	3978	8388	12798, 17208, 21618. 26028, 30438. 34848, 39258	noravirus GII.4
3979	VPI	KX5I430B	3979	8389	12799, 17209. 21619. 2602B, 30439, 34849, 39259	noravirus GII.4

3980	VPI	ABI8B0B3	308D	8390	12800, 17210, 2IB20, 2B030, 30440, 34850, 392BD	norovirus Hu/0C02I98/2002/JP
seal	VPI	AF4DB793	3981	8301	12801, 17211. 21621. 2B03I, 30441, 34851, 39261	nornvirus GiI
3982	VPI	KX5I4223	3B82	8392	12802. 17212, 21622, 26032, 30442, 34852, 39262	norovirus GII.4
3983	VPI	KX5I43I8	3983	8393	12803, 17213, 21623, 26033, 30443, 34853, 39263	norovirus GII.4
3984	VPI	ABI8BDB5	3984	8304	12804, 17214, 21624, 2B034. 30444, 34854, 392B4	norovirus Hu/0C02202/2002/JP
3985	VPI	KX5I4307	3985	8395	12805, 17215, 2IB25, 2B035, 30445, 34855, 39265	norovirus GII.4
3986	VPI	LC048948	398B	839B	12806, 17216. 21626, 2603B, 30446, 3485B, 39266	norovirus Hu/GII/3-I57/Tokya/I994/JPN
3987	VPI	LCD48908	3987	8397	12807, 17217, 21627, 26037, 30447, 34857, 39267	norovirus Hu/GII/3-G4/Tokyo/I993/JPN
3988	VPI	KX5143I2	3988	8398	12808, 17218. 21628, 26038, 30448, 34858, 39268	norovirus GII.4
3989	VPI	KX5I4237	3989	8399	12809, I72I9, 21629. 26030, 30449, 34859, 39269	nornvirus GII.4
3990	VPI	DQ4I0907	3990	8400	12810. 17220, 21630, 26040, 3D450, 34860, 39270	nornvirus Hu/BEijing/CR2905/2004/CHN
399I	VPI	JN975543	3991	8401	I28I1 17221, 21631, 26041. 30451. 348BI, 39271	murinE norovirus
3902	VPI	JN97554I	3992	8402	12812, 17222, 21632, 2B042, 30452. 34862, 30272	murine norovirus
3993	VPI	KFII3526	3993	8403	12813, 17223, 2IB33, 2B043, 30453, 34863, 39273	murine norovirus
3994	VPI	KFII3527	3994	8404	12814, 17224, 21634, 26D44, 30454, 34864, 39274	murine norovirus
3995	VPI	KM458057	3995	8405	12815, 17225, 21635, 26045, 30455, 34865, 39275	murine norovirus
399G	VPI	ABBB2855	399B	840B	12816. 17226. 21636, 26046, 30456, 34866, 39276	norovirus Hu/GII.2/0CD6008-3/2006/JP

3997	VPI	AB80999 7	3337	84B7	I28I7, I7227, 2IB37, 2BB47, 30457, 348B7. 39277	norovirus Hu/GII.I3/03N3798/2009/NP
3398	VPI	AB8I0DDI	3338	84B8	I28I8, I7228, 2IB38, 2B048, 3D458, 348B8, 39278	nornvirus Hu/GII.I3/ION3922/20IO/NP
3999	VPI	AB8DB332	3939	8403	I28I3, I7223. 2IB33, 2BB4S. 30453, 348B9, 39279	narovirus Hu/GII.I3/09N372I/2009/NP
4DD0	VPI	AYI3B7BI	4BBB	84ID	I2820, I7230, 2IB40, 2B050, 304B0, 34870, 3B280	human calicivirus NLV/ M7/ 1999/ US
4DBI	VPI	KF8DB495	4GBI	84II	I282I, 17231. 21641, 2B05I, 304BI, 34871, 39281	norovirus Hu/GII.4/patient_A/20IO/USA
4DD2	VPI	KF80B5B3	4BB2	84I2	12822, 17232, 2IB42, 2B052, 3D4B2, 34872, 39282	narovirus Hu/GII.4/patient_A/20IO/OSA
4BG3	VPI	KF7I25GB	4BB3	84I3	12823, 17233, 2IB43, 2B053, 304B3, 34873, 39283	norovirus Hu/Gll.4/NIHICI.I2/20I2/USA
4BD4	VPI	KF7I2507	4GB4	84I4	12824, 17234, ZIB44, 2B054, 304B4, 34874, 33284	narovirus Hu/Gll.4/NIHICI.II/20I2/0SA
4DD5	VPI	JX4BI28I	4BB5	84I5	12825, 17235, 2IB45, 2BB55, 304B5, 34875, 39285	narovirus Hu/Gll/T09l/TN/I976
4DDB	VPI	KF8BB526	4BBB	84IB	I282B, I723B, 2IB4B, 2BB5B, 304BB, 3487B, 3328B	narovirus Hu/GIU/patientJ/2010/USA
4DD7	VPI	KF806500	40B7	84I7	12827, 17237, 2IG47, 2B057, 3D4B7, 34877, 33287	norovirus Hu/GII.4/patient_A/20IO/OSA
4DBB	VPI	KF80B438	4DD8	84I8	12828, 17238, 2IB48, 26058, 304B8, 34878, 33288	norovirus Hu/GII.4/patient_A/20IO/USA
4DD3	VPI	KF42976 8	40D3	84I9	12823, 17233, 2IB4B, 2B059, 3D4B9, 34879, 39289	norovirus Hu/Gll,4/NIHICI.I3/20I2/USA
4DIB	VPI	KF8DB49B	4BIB	8420	12830, 17240, 2IB50, 2B0B0, 30470, 34880, 39290	norovirus Hu/GII.4/patient_A/20IO/USA
40II	VPI	KF8DB499	4DII	842I	12831, 17241, 21651, 2B06I, 30471, 34881, 39291	norovirus Hu/Gll.4/patient_A/20!0/USA
4BI2	VPI	KF8DB497	40I2	8422	12832, 17242, 21652, 26062, 30472, 34882, 39292	narovirus Hu/Gfl.4/patient_A/2D1D/USA
4BI3	VPI	JNB99046	4BI3	8423	12833, 17243, 21653, 26D63, 3D473, 34883, 39293	narovirus Hu/Gl.5/E57/UG/I975

4DI4	VPI	AM2B34I8	40I4	8424	I2834, I7244. 2IB54. 2B0B4, 30474, 34884, 39294	norovirus Hu/GI/BabbacDmbe/I99G/GBR
4DI5	VPI	KT732278	40I5	8425	I2835, I7245. 2IB55, 2B0B5, 30475, 34885, 39295	norovirus GI.5
40IB	VPI	KT732277	40IB	842B	I283B, I724B, 2IB5B, 2B0BB, 3047B, 3488B, 39296	naravirus GI.5
4DI7	VPI	KJ402295	40I7	8427	I2837, I7247, 2IB57, 2B0B7, 30477, 34887, 39297	norovirus Hu/GI.5/Siklos-HUN5407/20I3/HON
4DI8	VPI	AF4I440G	40I8	8428	IZ838, I7248, 2IB58, 2B0B8, 30478, 34888, 39298	Narwalk-like virus NLV/Appalachicola Bay/3I8/I995/0S
4DIB	VPI	AB039774	40I9	8429	I2839, I7249, 2IB59, 26069, 30479, 34889, 39299	Narwalk-like virus
402D	VPI	KPQG4095	4020	8430	I2840, I7250, 2IBB0. 2B070, 30480, 34890, 39300	norovirus GI.2
402I	VPI	AB0456Q3	402I	843I	I284I, I725I, 2IGBI, 2B07I, 30481, 34891, 39301	Norwalk-iike virus
4D22	VPI	AF397905	4022	8432	I2842, I7252. 2IBB2, 2B072, 30482, 34892, 39302	human calicivirus NLV/Schwerin 003/00/DE
4023	VPI	AF4I4420	4023	8433	I2843, I7253, 2IBB3, 2B073, 30483, 34893, 39303	Narwalk-like virus NLV/Honolulu/3I4/I994/0S
4D24	VPI	AF427II9	4024	8434	I2844. I7254, 2IB64, 26074, 30484, 34894, 39304	human calicivirus NLV/Pirna/IIO/OO/DE
4025	VPI	AB0443BB	4025	8435	I2845, I7255, 2I665, 26075. 30485, 34895, 39305	Nurwalk-like virus
4D26	VPI	AB032758	402B	843B	I2846, I725B, 2IBBB, 2B076, 30486. 34896, 39306	chitta virus
4027	VPI	AB039775	4027	8437	I2847, I7257, 2I6B7, 2B077, 30487, 34897, 39307	Norwalk-like virus
4028	VPI	AF4I44I8	4028	8438	I2848, 17258, 2IB68, 2B078, 30488, 34898, 39308	Norwalk-iike virus NLV/Westaver/302/1994/US
4029	VPI	AF4257B9	4029	8439	I2849, I7259, 2IBB9, 2B079, 30489, 34899, 39309	human calicivirus NLV/Wiasbaden 294/OI/DE
4030	VPI	AF4I442I	4030	8440	I2850, I7260, 2I670, 26080, 30490, 34900, 393I0	Norwalk-like virus NLV/Port Canaveral/301/1994/US

403I	VPI	AF4I44I6	403I	844I	I285I, I72BI, 2IB7I, 2BB8I, 30491, 34901. 3B3II	NDrwalk-like virus NLV/Miami/8I/I98E/US
4032	VPI	AF4I44I9	4032	8442	I2852, I72B2, 2I672, 2BB82. 30432, 34902. 393I2	Norwalk-like virus NLV/Richmond/283/1994/US
4033	VPI	AF425767	4D33	8443	I2853, I7263, 2IB73. 26083. 30493, 34903, 39313	human calicivirus NLV/Dillingen 39I/0I/0E
4034	VPI	0Q093065	4034	8444	I2854, I72B4, 2IB74, 26B84. 30494, 34904, 393I4	Norwalk virus
4035	VPI	KJI94507	4035	8445	I2855, I7265, 2I675, 2BB85, 30495, 34305, 39315	nnrovirus Hu/GII/Amsterdam/3/1995
4036	VPI	KP06409	4036	8446	12856, 17266, 21676. 26086, 30496, 34906, 39316	nnrovirus GII.I2
4037	VPI	AB303926	4037	8447	12857, 17267, 21677. 26087. 30497, 34907. 39317	nnrovirus Hu/BGII.4/SchiedamOI8/2GOI/NL
4038	VPI	K09851G6	4038	8448	12858, 17268, 21678, 26D88, 30498, 34908, 39318	norovirus GII.4
4039	VPI	JNB99045	4039	8449	12859, 17269, 21679, 26089, 30499, 34909, 39319	narnvirus Hu/GI.6/HK60/CN/I977
4040	VPI	EF547395	4040	8450	12860, 17270, 21680, 26090. 3D500, 34910, 39320	nornvirus Hu/0saka/00032I/2000/JP/3006
404I	VPI	AY502008	404I	845I	12861, 17271, 21681. 26091, 30501. 34911, 39321	nnrovirus GI
4D42	VPI	AY502007	4042	8452	12862. 17272, 21682, 26092, 30502, 34912, 39322	nornvirus GI
4043	VPI	KC998959	4043	8453	12863, 17273, 21683, 26093, 30503, 34913, 39323	nnrovirus Hu/GI.6/TCH-099/0SA/2003
4044	VPI	BQ856464	4044	8454	12864, 17274, 21684, 26034. 30504, 34314, 33324	narnvirus Hu/GII.4/Beijing/55063/2007/CHN
4045	VPI	GD8564G3	4045	8455	12865, 17275, 21685, 26095, 30505, 34915, 39325	nnrovirus Hu/GII.4/BBijing/53S37/2007/CHN
4046	VPI	KM036372	4046	845B	12866, 17276, 21686, 26036, 30506, 34316, 39326	nornvirus Hu/BI.Pb/GI.B/Kaohsiung/14-A-7/2BI4/TW
4047	VPI	AF538678	4047	8457	12867, 17277, 21687, 26097, 30507, 34317. 33327	human calicivirus NLV/VA497/I999/0S

4048	VPI	KC294I98	4048	8458	I2868, 17278, 2IB88, 2B098, 30508. 349I8, 39328	norovirus rat/GI/KSI2/I305/DNK
4049	VPI	KT732280	4049	8459	I2869, 17279, 2IB89, 2B0B9. 305D9. 349I9, 39329	norovirus GI.6
4050	VPI	LCI0I822	4050	8460	I2870, I7280. 2IB90, 2BI00, 305I0, 34920, 39330	norovirus GI/Hu/Jp/20I3/GI,B/sI30I47
405!	VPI	KP40745I	405I	846I	I287I, I728I, 2IB9I. 26I0I. 305II, 34921, 3933I	norovirus GI
4052	VPI	LN854564	4052	8462	I2872, I7282. 2I692. 26ID2. 305I2, 34922, 39332	norovirus GI/Hu/NL/2012/GI.B/Groningen
4053	VPI	J0388274	4053	84B3	I2873, I7283, 2IB93, 26I03, 305I3, 34923, 39333	norovirus Hu/GI.G/Kingston/ACTI60D/20IO/AU
4054	VPI	KP027330	4054	8464	I2874, I7284, 2IB94, 26I04, 305I4, 34924, 39334	norovirus **Hu/GI.PB/GI.B/Changhua/14-BC-**I/20I4/TW
4055	VPI	AF093797	4055	8465	I2875, I7285, 2IB95, 2BI05, 305I5, 34925, 39335	Norwalk virus
4056	VPI	AB8I0006	4056	846B	I2876, I7286, 2IB9B, 26I06, 305I6, 34926, 39336	norovirus Hu/GII.I3/ION444I/20IQ/NP
4057	VPI	LCI0I825	4D57	8467	12877, 17287, 21697, 26107, 30517. 34927, 39337	norovirus GI/Hu/Jp/2D02/GI.5/0C020I80
4058	VPI	AB08I723	4058	8468	12878, 17288, 21698, 2BI08, 30518, 34928, 39338	Norwalk-like virus
4059	VPI	JN005886	4059	8469	12879, 17289, 21699, 26109, 30519, 34929, 39339	norovirus Hu/GI.7/TCH-0B0/0SA/2003
4060	VPI	AB758449	40B0	8470	12880, 17290, 21700, 26110, 30520, 34930, 39340	norovirus Hu/GI.7/2009/Miyagi/JP
406I	VPI	KXB07729	40BI	847I	12881, 17291, 21701, 26111. 30521, 34931, 39341	norovirus Hu/USA/201I/GI.P7_GI.7/CS5567
4062	VPI	JN899243	4062	8472	12882, 17292, 21702. 26112, 30522, 34932, 39342	norovirus **Hu/GI.7/Providencel9I/20IO/USA**
4063	VPI	AB8I0004	4063	8473	12883, 17293, 21703, 26113, 30523, 34933, 39343	norovirus Hu/GII.I3/ION4358/20IO/NP
4064	VPI	JNI83I63	4D64	8474	12884, 17294, 21704, 26114, 30524, 34934, 39344	norovirus Hu/GI.4/SI4/2008/LillaEdet/Sweden

4065	VPI	EU3738I5	4065	8475	12885. 17295. 2I7D5, 26115. 30525, 34935, 39345	norovirus Hu/GII/LuckBnwalde591/2DD2/DE
4066	VPI	KC473547	4066	8476	I288B, I729B, 21706, 2BIIB, 30526, 34936, 39346	norovirus Hu/GI/HuzhDuNII/2008/CHN
4067	VPI	GQ266692	4067	8477	12887, 17297, 21707, 26117, 30527, 34937, 39347	norovirus Hu/Zuerich/P4dl/2007
4068	VPI	GQ266693	40B8	8478	12888, 17298, 2I7D8, 26118. 30528, 34938, 39348	norovirus Hu/Zuerich/P4d28l/2007
4069	VPI	EU0D4673	4QB9	8479	12889, 17299, 21709, 26119, 30529. 34939, 39349	murine norovirus GV/CR3/2005/USA
4070	VPI	AB60I769	4D70	8480	12890, 17300, 21710, 2BI2D, 3D530, 34940, 39350	murine norovirus
4071	VPI	EU004676	4D7I	8481	12891, 17301, 21711, 26121, 30531, 34941, 39351	murine norovirus GV/CR6/2005/USA
4072	VPI	JQ237823	4072	8482	12892. 17302, 21712. 26122. 30532, 34942, 39352	murine norovirus GV/CRB/20D5/USA
4073	VPI	DQ223043	4073	8483	12893, 17303, 21713, 26123, 30533, 34943, 39353	murine norovirus 4
4074	VPI	JX048594	4074	8484	12894, 17304, 21714, 26124, 30534, 34944, 39354	murine norovirus
4075	VPI	GQ26669I	4075	8485	12895, 17305, 21715, 26125, 30535, 34945, 39355	norovirus Hu/Zuerich/P3dB83/2008
4076	VPI	GQ266690	407B	8486	I289B, 17306, 21716, 26126, 30536, 3494B, 39356	norovirus Hu/Zuerich/P3dl/200E
4077	VPI	JNI83I64	4077	8487	12897, 17307, 21717, 26127, 30537, 34947, 39357	norovirus Hu/GI.3/S26/2DD8/Lilla Edet/Sweden
4078	VPI	AB809995	4078	8488	12898, 17308, 21718, 26128, 30538, 34948, 39358	norovirus Hu/GII.I3/09N3779/20D9/NP
4079	VPI	KT732275	4D79	8489	12899, 17309, 21719, 26129, 30539, 34949, 39359	norovirus GII.I7
4080	VPI	AB8Q9938	4080	8490	12900, 17310, 21720, 26130, 30540, 34950, 393B0	norovirus Hu/GII.I3/09N38IB/2009/NP
4081	VPI	AB809B84	4081	8491	12901, 17311. 21721, 26131, 3D541, 34951, 39361	norovirus Hu/GII.I3/09N354G/2009/NP

4082	VPI	KT732276	4082	8492	I2902. 17312, 21722, 2BI32, 30542, 34952, 393B2	norovirus GII.17
4083	VPI	AB8I0009	4083	8493	12303, 17313, 21723, 2BI33, 30543. 34953, 393B3	nopovipus Hu/GII.I3/ION4488/20IO/NP
4084	VPt	KM46I690	4084	8494	I2904, 17314, 21724, 2BI34. 30544, 34354, 39364	noravirus 08-AG-I/20D8/GILP7/G1I.B
4085	VPI	JN400BI8	4085	8495	12905, 17315, 21725, 2BI35, 30545, 34355, 39365	noravirus Hu/GII-4/CGMH20/2009/TW
4086	VPI	JQB53095	408B	849B	I290B, 17316, 21726, 26136, 30546, 34958, 333BB	norovirus Hu/0I/0RY/2008
4087	VPI	JNI83IBI	4087	8497	12307, 17317, 21727, 2BI37, 30547, 34357, 39367	noravirus Hu/GI.7/S24/2008/lilla Edet/Sweden
4088	VPI	KT906670	4088	8498	12308, 17318, 21728, 2BI38, 30548, 34958, 333B8	noravirus GII.I7
408B	VPI	KT906671	4089	8499	12909, 17313, 21729, 26139, 3054S, 34359, 39369	norovirus GII.17
4090	VPI	AB8I00I3	409D	8500	12310, 17320, 21730, 2BI4B, 3055B, 343B0, 33370	norovirus Hu/GII.I3/ION4555/20IO/NP
409I	VPI	E009B5ID	409I	850I	12311 17321. 21731, 26141. 30551, 343BI, 33371	norovirus Hu/noravirus/GII-4/CeglEdl603/2002/H0N
4092	VPI	E009B5I3	4092	8502	12312, 17322, 21732, 2BI42, 30552, 34962, 33372	norovirus Hu/norovipus/GII-4/Pecs2967/20Q7/H0N
4093	VPI	E0B9B5I4	4093	85D3	12313, 17323, 21733, 26143, 3D553, 343B3, 33373	norovirus Hu/norovirus/GII-4/Kapuvar3D29/2007/H0N
4094	VPI	EUB9G5I2	4094	8504	12914, 17324, 21734, 2BI44, 30554. 34964, 39374	norovirus Hu/ norovirus/ GII-4/Mosonmagyarovar2594/2006/H0N
4095	VPI	K03IIIBI	4095	8505	12915, 17325, 21735, 2BI45, 30555, 349B5, 39375	norovirus Hu/GI.7/AlbertaEI404/20I2/CA
409B	VPI	KXB0773D	409B	850B	12916, I732B, 2I73B, 26146, 3055B, 349B6, 39378	norovirus Hu/USA/2DI4/GI.P7_GI.7/GA5043
4097	VPI	E009B507	4097	85B7	12917. 17327. 21737, 2BI47, 30557, 34967, 39377	norovirus Hu/norovirus/GII-4/Kiskunhalasl264/2002/HUN
4098	VPI	AB8I0007	4098	85B8	12918, 17328. 21738, 26148, 30558, 34968, 39378	norovirus Hu/GII.I3/ION4487/20IO/NP

4099	VPI	AB809989	40B9	850B	12913, 17323, 21733, 2BI43, 30559, 34BB3, 39373	norovirus Hu/GIU3/D3M3B83/2DDB/NP
4100	VPI	AB8I0000	4ID0	8510	12320, 17330, 21740, 2BI50, 305B0, 34970, 39380	norovirus Hu/GII.I3/ION33I7/20IO/NP
4101	VPI	AB809999	4IBI	8511	12921, 17331, 21741, 2BI5I. 305BI, 34971, 39381	narovirus Hu/GII.I3/IDN3B52/ZDID/NP
4102	VPI	FJ6B250I	4102	8512	12322, 17332, 21742, 2BI52, 3B5B2, 34972, 39382	norovirus dog/BVI.I/HK0_Ca035F/2B07/HKB
4103	VPI	FJB92500	4103	8513	12923, 17333, 21743, 2BI53, 3D5B3, 34373, 33383	narovirus dag/GVI.I/HKO_Ca026F/2007/HKG
4104	VPI	AB03I0I3	4104	8514	12924, 17334, 21744, 2BI54, 3B5B4, 34974, 39384	human calicivirus NLV/Aichi/I24-89/JP
4105	VPI	K0253442	4105	8515	12925, 17335, 21745, 2BI55, 305B5, 34975, 33385	norovirus GI.I
4106	VPI	EF547392	4I0B	85IB	I232B, I733B, 2I74B, 2BI5B, 305BB, 3497G, 3338B	narovirus Hu/Maizuru/0305I2/2003/JP/4B5B
4107	VPI	KT943503	4107	8517	I2B27, 17337, 21747, 2BI57, 305B7, 34377, 39387	norovirus TFI/USA/2008
4108	VPI	AY5020IB	4ID8	8518	12328, 17338. 21748, 2BI58, 3D5B8, 34378, 39388	norovirus BI
4109	VPI	K025344B	41B9	8513	12929, 17339, 21749, 2BI5S, 305B9, 34979, 39383	norovirus GI.I
4110	VPI	K0253445	4110	852B	12930, 17340, 21750, 2BIBD, 33570, 34380, 33330	norovirus GI.I
4111	VPI	KF039735	4111	8521	12931, 17341, 21751, 2BIBI, 30571, 34981, 39391	narovirus Hu/GI.I/CHA3A007/2008/USA
4112	VPI	KF03B732	4112	8522	12932, 17342, 21752, 2BIB2, 30572, 34382, 3B3B2	norovirus Hu/GI.I/CHA5AOIO/2009/OSA
4113	VPI	KF03B734	4113	8523	12333, 17343, 21753, 2BIB3, 30573, 34983, 39393	norovirus Hu/GI.I/CHAGAOI4/2009/OSA
4114	VPI	KF039729	4114	8524	12334, 17344, 21754, 2BIG4, 30574, 34984, 33394	norovirus Hu/GI.I/CHAGA007/20IO/USA
4115	VPI	KF033737	4115	8525	12935, 17345, 21755, 2BIB5, 30575, 34385, 33335	norovirus Hu/BI.I/CHABA003_2003IID4/2009/USA

4116	VPI	KF03873I	4IIB	852B	I293B, I734B, 2I75B, 2BIBB, 3057B, 3498B, 3939B	norovirus Hu/GI.I/CH4X0533/2D09/USA
4117	VPI	KT732279	4117	8527	12937, 17347, 21757, 2BIB7, 30577, 34987, 39397	norovirus Gl.l
4118	VPI	FJ384783	4118	8528	12938, 17348, 21758, 2BIB8, 30578, 34988, 39398	norovirus Hu/GU/P7-587/2007/Stromstad/Sweden
4119	VPI	E0085522	4119	8529	12939, 17349, 21759, 2BIB9, 30579, 34989, 39399	norovirus Hu/GI.I/MussBls/MI0nov2004/Foto/Sweden
4120	VPI	L23828	4120	8530	12940, 17350, 2I7B0, 2BI70, 30580, 34990, 39400	Norwalk virus
4121	VPI	KX7B4843	4121	8531	12941, 17351, 2I7BI, 2BI7I, 3D581, 34991, 39401	norovirus Gil
4122	VPI	KX7B484I	4122	8532	12942, 17352, 2I7B2. 2BI72, 30582, 34992, 39402	norovirus Gil
4123	VPI	KX7E4840	4123	8533	12943, 17353, 2I7B3, 2BI73, 30583, 34993, 39403	norovirus Gil
4124	VPI	KT8B4B87	4124	8534	12944, 17354, 2I7B4, 2BI74, 30584, 34994, 39404	norovirus Gil
4125	VPI	KX7B4842	4125	8535	12945, 17355, 2I7B5, 2BI75, 30585, 34995, 39405	norovirus Gil
4I2B	VPI	KT8B4B85	4I2B	853G	I294B, I735B, 2I7BB, 2GI7B, 3058B, 3499B, 3940B	norovirus Gil
4127	VPI	KT8B4B84	4127	8537	12947, 17357, 2I7B7, 2BI77, 30587, 34997, 39407	norovirus Gil
4128	VPI	KX7B483B	4128	8538	12948, 17358, 2I7B8, 2BI78, 30588, 34998, 39408	norovirus Gil
4129	VPI	KX7B4845	4129	8539	12949, I735B, 2I7B9, 2BI79, 30589, 34999, 39409	norovirus Gil
4130	VPI	KX7B4837	4130	8540	12950, I73B0, 21770, 2BI80, 30590, 35000. 39410	norovirus Gil
4131	VPI	KX7B4838	4131	8541	12951, I73GI, 21771, 2BI8I, 30591, 35001, 39411	norovirus Gil
4132	VPI	K0B870IB	4132	8542	12952, I73B2, 21772, 2BI82, 30592, 35002, 39412	norovirus Gil

4133	VPI	KUB87DI5	4133	8543	12353, I73B3, 21773, 2BI83, 30593, 35003, 39413	noravirus Gil
4134	VPI	KUG870I3	4134	8544	12954, I73B4, 21774, 2BI84, 30594, 35004, 39414	norovirus GII
4135	VPI	KX7G4839	4135	8545	12355, I73B5, 21775, 2BI85, 30535, 35005, 33415	noravirus Gil
4136	VPI	KX764844	4I3B	854B	I235B, I73BB, 2I77B, 2BI8B, 3059B, 3500B, 39416	noravirus GII
4137	VPI	KT8B4B8B	4137	8547	12357, I73B7, 21777, 2BI87, 30537, 35007, 33417	noravirus Gil
4138	VPI	KUB87DI2	4138	8548	12358, I73B8, 21778, 2BI88, 30598, 35008, 39418	noravirus Gil
4139	VP!	KU6870I8	4139	8543	12959, I73B3, 21779, 2BI83, 30599, 35003, 33419	noravirus Gil
4I4D	VPI	KUB8702I	4140	8550	I29B0, 17370, 21780, 26190, 30600, 35010, 39420	noravirus Gil
4141	VPI	KUB87020	4141	8551	12961, 17371, 21781, 26191, 30BDI, 35011, 33421	noravirus Gil
4142	VPI	KUB870I4	4142	8552	12362, 17372, 21782, 2BI92, 30B02, 35DI2, 33422	narovirus Gil
4143	VPI	KUB87019	4143	8553	I29B3, 17373, 21783, 26193, 30B03, 35013, 39423	norovirus Gil
4144	VPI	KUB87DI7	4144	8554	I29B4, 17374, 21784, 2BI94, 30B04, 35014, 39424	noravirus Gil
4145	VPI	KU687024	4145	8555	12965, 17375, 21785, 26195, 30605, 35015, 39425	norovirus Gil
4I4B	VPI	KUB87022	4I4B	855B	I296B, 17376, 2I78B, 2BI96. 3060B, 35016, 39426	norovirus Gil
4147	VPI	KUB87D23	4147	8557	12367, 17377, 21787, 26137, 30607, 35017, 33427	norovirus Gil
4148	VPI	KX7B4847	4148	8558	12368, 17378, 21788, 26138. 30608. 35018. 33428	norovirus Gil
4149	VPI	KX7B484B	4149	8559	12969, 17379, 21789, 26199, 30609, 35019, 39429	norovirus Gil

4I5D	VPI	KX764833	4150	85B0	12970. 17380, 21790. 2B200. 30BI0, 35020, 39430	norovirus GiI
4151	VPI	KX764834	4151	85BI	12971, 17381, 21791, 2B20I, 3DBII, 35021, 39431	norovirus GiI
4152	VPI	KU687027	4152	85B2	12972, 17382, 21792, 2B202, 30BI2, 35022, 39432	norovirus GiI
4153	VPI	KX7B4835	4153	85B3	12973, 17383, 21793, 2B203, 30BI3, 35023, 39433	norovirus GiI
4154	VPI	KX764832	4154	85B4	12974, 17384, 21794, 2B204, 30BI4, 35024, 39434	norovirus GiI
4155	VPI	K0687025	4155	85B5	12975, 17385, 21795, 2B205, 30BI5, 35025, 39435	norovirus GiI
4I5B	VPI	KUB8702B	4I5B	85BB	I297B, I738B, 2I79B, 2B20B, 30BIB, 3502B, 3943B	norovirus GiI
4157	VPI	KUB87Q28	4157	85B7	12977, 17387, 21797, 2B207, 30BI7, 35027, 39437	norovirus GiI
4158	VPI	KX7B483I	4158	85B8	12978, 17388, 21798, 2B208, 30BI8, 35028, 39438	norovirus GiI
4159	VPI	JN2223BB	4159	85B9	12979, 17389, 21799. 2B209, 30BI9, 35029, 39439	norovirus Hu/GI.G/DK/2010
4IG0	VPI	KM3866679	4IB0	8570	12980, I739D, 21800, 2B2I0, 30B20, 35030, 39440	norovirus 07-AC-I/2007/GII.P22/GII.5
4IGI	VPI	AY549I5B	4IBI	8571	12981, 17391, 21801, 26211. 30B21, 35031, 39441	bovine Enteric calicivirus
4IG2	VPI	AY549IB3	4IB2	8572	12982, 17392, 2I8D2, 26212, 30622, 35032, 39442	bovine enteric calicivirus
4IB3	VPI	AY549I59	4IB3	8573	12983, 17393, 21803. 26213, 30623, 35033, 39443	bovine enteric calicivirus
4IG4	VPI	AY549IBB	4IB4	8574	12984, 17394. 21804, 26214, 30624, 35034, 39444	bovine enteric calicivirus
4IG5	VPI	AF320II3	4IB5	8575	12985, 17395, 21805, 26215, 30625, 35035, 39445	Norwalk-like virus
4IBG	VPI	AY549I53	4IBB	857B	12986, 17396, 21806, 26216, 30626, 35036. 39446	bovine enteric calicivirus

4167	VPI	AY543I57	4IB7	8577	12987. 17397, 21807, 2B2I7, 30B27, 35037, 33447	bovine enteric calicivirus
4IB8	VPI	AY543I58	4168	8578	12988, 17338, 21808, 26218, 30628, 35038, 39448	bovine enteric calicivirus
41GB	VPI	AY543IB5	4IG9	8579	12989, 17399, 21809, 26219, 30629, 35039, 39449	bovine enteric calicivirus
4I7B	VPI	AY543IG7	4170	8580	12990, 17400, 21810, 26220, 30630, 35040, 39450	bovine enteric calicivirus
4171	VPI	AY549I54	4171	8581	12991, 17401, 21811, 26221, 30G31, 35041, 39451	bovine enteric calicivirus
4172	VPI	AY543I55	4172	8582	12992, 17402, 21812, 26222, 30632, 35042, 39452	bovine enteric calicivirus
4173	VPI	AF320G25	4173	8583	12993, 17403, 21813, 26223, 30B33, 35043, 39453	Norwalk-like virus
4174	VPI	AY274820	4174	8584	12994, 17404, 21814, 26224, 3D634, 35044, 39454	Norwalk-like virus
4175	VPI	AF542083	4175	8585	12935, 17405, 21815, 2B225, 30635, 35045, 33455	bovine enteric calicivirus
4I7B	VPI	E07343B7	4176	8586	12996, I740B, 21816, 26226, 30636, 35046, 39456	norovirus Bo/GIII/B3B9/2003/BEL
4177	VPI	AYI2B474	4177	8587	12997, 17407, 21817, 26227, 30637, 35047, 39457	Norwalk-like virus
4178	VPI	JXI45B50	4178	8588	12998, 17408, 21818, 26228, 30638, 35048, 39458	norovirus Gill
4173	VPI	AY549IBI	4179	8583	12999, 17409, 21819, 26229, 30639, 35049, 39459	bovine enteric calicivirus
4180	VPI	AY543IG4	4180	8590	13000, 17410. 21820, 26230, 3064D, 35050, 39460	bovine enteric calicivirus
4181	VPI	AYI2G47G	4181	8591	13001, 17411, 21821, 26231, 30641, 35051, 39461	Norwalk-like virus
4182	VPI	E0734305	4182	8592	13002, 17412, 21822, 26232. 30642. 35052. 39462	norovirus Bo/GIII/BVI5/2007/BEL
4183	VPI	E07343BG	4183	8593	13003, 17413, 21823, 26233, 30643, 35053, 39463	norovirus Bn/GIII/BV24/2007/BEL

4184	VPi	AYI26475	4184	8594	13004, 17414. 21824, 26234, 30644, 35054, 39464	Norwalk-like virus
4185	VP1	AF542D84	4185	8595	13005, 17415, 21825, 26235, 30645, 35055, 39465	bovine enteric calicivirus
4186	VP1	KC695807	4186	8596	13006, 17416, 21826, 26236, 30646, 35056, 39466	norovirus Hu/GII.4/Sydney/NSW05l4/20l2/AO
4187	VP2	AGL984I5	4187	8597	13007, 17417, 21827, 26237, 30647, 35057, 39467	norovirus Hu/Gll/KL45/MY/I978
4188	VP2	AGL984I7	4188	8598	13008, 17418, 21828, 26238, 30648, 35058, 39468	norovirus Hu/Gll/T09l/TN/I97G
4188	VP2	AFI08232	4189	8599	13009, 17419, 21829, 26239, 30649, 35059, 39469	norovirus Hu/Gl/I0360/20IO/VNM
4190	VP2	AFID8235	4190	86QQ	13010, 17420, 21830, 2624D, 30650, 35060, 39470	norovirus Hu/GII/10DD2/2D03/VNM
4191	VP2	AFID8238	4191	8601	13011, 17421, 21831, 26241, 30G51, 35061, 39471	norovirus Hu/GII/10003/2009/VNM
4192	VP2	AFI0824I	4192	8G02	13012, 17422, 21832, 26242, 30652, 35062, 39472	norovirus Hu/GII/10012/2009/VNM
4193	VP2	AFID8244	4193	8603	13013, 17423, 21833, 26243, 30653, 35063, 39473	norovirus Hu/GII/10037/2009/VNM
4194	VP2	AFJ3852Q	4194	8604	13014, 17424, 21834, 26244, 30654, 35064, 39474	norovirus Hu/Gll.4/CH0G519I/I974/0SA
4195	VP2	AFX7I657	4195	8605	13015, 17425, 21835, 26245, 30655, 35065, 39475	norovirus Hu/Gll.3/HK7I/I978/CHN
4196	VP2	AFX7I66D	4196	8606	13016, 17426, 21836, 26246, 30656, 35066, 39476	norovirus Hu/Gll.2/KLI03/I978/MYS
4197	VP2	AFX7I666	4197	8607	13017, 17427, 21837, 26247, 30657, 35067, 39477	norovirus Hu/Gll.6/CHDC4073/I984/USA
4198	VP2	AFX7IG69	4198	8608	13018, 17428, 21838, 26248, 30658, 35068. 39478	norovirus Hu/GII.4/NIHIC9/20II/USA
4199	VP2	AFX8II22	4199	8609	13019, 17429, 21839, 26249, 30659, 35069, 39479	norovirus Hu/Norwalk/I0034/2D09/VNM
42DQ	VP2	AFX8II25	42GD	8610	13020, 17430, 21840, 26250, 30660, 35070, 39480	norovirus Hu/Norwalk/I005l/20D9/VNM

42DI	VP2	AFX8II3I	4201	8BII	13021, I743I, 2I84I, 2B25I, 3DBBI, 35071, 39481	nnravirus Hu/Norwalk **/IOOB2/2DDe**/VNM
4202	VP2	AFX8II34	4202	8BI2	13022, 17432, 21842, 2B252, 30BB2, 35072, 39482	norovirus Hu/Norwalk **/IDD74/2DQ9**/ VNM
4203	VP2	AFX8II37	4203	8BI3	13023, 17433, 21843, 2B253, 30BB3, 35073, 39483	norovirus Hu/Norwalk/10075/2009/VNM
42D4	VP2	AFX8II40	4204	8BI4	13024, 17434, 21844, 26254. 30BB4, 35074. 39484	norovirus Hu/Norwalk/10078/2009/VNM
4205	VP2	AFX8II43	4205	8BI5	13025. 17435, 21845, 2B255. 30BB5, 35075, 39485	norovirus Hu/Norwalk/I007B/2D09/VNM
4206	VP2	AFX8II49	420B	8BIB	I302B, I743B. 2I84B, 2B25B, 30666, 35076. 39486	norovirus Hu/Norwalk/IOII4 **/2DOe**/ VNM
4207	VP2	AFX8II52	4207	8BI7	13027, 17437, 21847, 26257, 3D667, 35077, 39487	norovirus Hu/Norwalk/IOII6/200e/VNM
4208	VP2	AFX8II55	4208	8BI8	13028, 17438, 21848, 2B258, 306B8, 35078, 39488	norovirus Hu/ Norwalk**/1DI29/2D09** /VNM
4209	VP2	AFX8II58	4209	8BI9	13029, 17439, 21849, 26259. 306B9, 35079, 39489	norovirus Hu/Norwalk/IOI3B/200B/VNM
4210	VP2	AFX8IIB4	4210	8B20	13030, 17440, 21850, 26260, 30670, 35080, 39490	norovirus Hu/Norwalk/10145/2009/VNM
4211	VP2	AFX8II73	4211	8B2I	13031, 17441. 21851, 2626!, 30671, 35081, 39491	norovirus Hu/Norwalk/10160/2009/VNM
4212	VP2	AFX8II79	4212	8B22	13032, 17442, 21852, 262B2, 30672, 35082, 39492	norovirus Hu/Norwalk/10163/2009/VNM
4213	VP2	AFX8II82	4213	8B23	13033, 17443. 21853. 262B3, 30673, 35083, 39493	norovirus Hu/Norwalk/10169/2009/VNM
4214	VP2	AFX8II85	4214	8B24	13034, 17444. 21854, 26264. 30674, 35084, 39494	norovirus Hu/Norwalk/IOI73/20D9/VNM
4215	VP2	AFX8II88	4215	8B25	13035, 17445, 21855. 262B5, 30675. 35085, 39495	norovirus Hu/Norwalk/IOI7B/20D9/VNM
42IB	VP2	AFX8II9I	42IB	8B2B	13036, 17446, 21856. 262B6, 30676, 3508B, 39496	norovirus Hu/Norwalk/10177/2009/VNM
4217	VP2	AFX8II94	4217	8B27	13037, 17447, 21857, 26267. 30677, 35087, 39497	norovirus Hu/Norwalk/IOI79/2009/VNM

4218	VP2	AFX8II97	4218	8B28	I3D38, 17448. 21858, 2B2B8. 3DB78, 35088, 39498	norovirus Hu/Norwalk/10182/2009/VNM
4219	VP2	AFX8I2DD	4219	8B29	13039, 17449, 21859, 2B2B9, 30B79, 35089, 39499	norovirus Hu/Norwalk/IDiS3/2DD9/VNM
422D	VP2	AFX8I203	422D	8B30	13040, 17450, 2I8B0, 2B270, 30B80, 35090, 39500	norovirus Hu/Norwalk/IOI94/2QOO/VNM
4221	VP2	AFX8I20B	4221	8B3I	I3041, 17451, **21861.** 2B27I, 30B81, 35091, 39501	norovirus Hu/Norwalk/IQI99/2009/VNM
4222	VP2	AFX8I2D9	4222	8B32	13042, 17452. 2I8B2, 2B272, 30B82, 35092, 39502	norovirus Hu/Norwalk/I0203/2009/VNM
4223	VP2	AFX8I2I2	4223	8B33	13043, 17453, 2I8B3, 2B273, 30B83, 35093, 39503	norovirus Hu/Norwalk/10204/2009/VNM
4224	VP2	AFX8I2I5	4224	8B34	I3044, 17454, 2I8B4, 2B274, 30B84, 35094, 39504	norovirus Hu/Norwalk/10222/2009/VNM
4225	VP2	AFX8I2I8	4225	8B35	13045, 17455, 2I8B5, 2B275, 30B85, 35095, 39505	norovirus Hu/Norwalk/10223/2009/VNM
422B	VP2	AFX8I22I	422B	8B3B	I304B, I745B, 2I8BB, 2B27B, 30B8B, 3509B, 3950B	norovirus Hu/Norwalk/10235/2009/VNM
4227	VP2	AFX8I224	4227	8B37	13047, 17457, 21867, 2B277, 30B87, 35097, 39507	norovirus Hu/Norwalk/I023B/2009/VNM
4228	VP2	AFX8I227	4228	8B38	13048, 17458, 21868, 2B278, 30688, 35098, 39508	norovirus Hu/Norwalk/10238/2009/VNM
4229	VP2	AFX8I230	4229	8B39	13049, 17459, 21869, 26279, 30689, 35099, 39509	norovirus Hu/Norwalk/I0247/2009/VNM
423D	VP2	AFX8I233	4230	8B40	13050. 17460, 21870, 26280, 30690, 35100, 39510	norovirus Hu/Norwalk/10255/2000/VNM
4231	VP2	AFX8I239	4231	8B4I	I3051, 17461, 21871, 26281, 30691, 35101, 39511	norovirus Hu/Norwalk/I0296/20IO/VNM
4232	VP2	AFX8I242	4232	8B42	13052, 17462, 21872, 26282, 30692, 35102, 39512	norovirus Hu/Norwalk/10313/2010/VNM
4233	VP2	AFX8I245	4233	8B43	13053, 17463, 21873, 26283, 30693, 35103, 39513	norovirus Hu/Norwalk/I0325/20IO/VNM
4234	VP2	AFX8I248	4234	8B44	13054, 17464, 21874, 26284, 30694, 35104, 39514	norovirus Hu/Norwalk/10328/2010/VNM

4235	VP2	AFX8I25I	4235	8645	13055, 17465, 21875, 26285, 30695, 35105, 3051 5	narovirus Hu/Narwalk/10368/2010/VNM
4236	VP2	AFX81254	4236	8646	13056, 17466, 21876, 26286, 30696. 3510 6, 39516	noravirus Hu/Norwalk/I0378/201Q/VNM
4237	VP2	AFX8I257	4237	8647	13057, 17467, 21877, 26287, 30697, 3510 7, 3951 7	narovirus Hu/Norwalk/I0386/2010/VNM
4238	VP2	AFX8I26D	4238	8648	13058, 17468, 21878, 26288, 30698, 3510 8, 3951 8	norovirus Hu/Norwalk/20008/2009/VNM
4239	VP2	AFX8I263	4239	8649	13059, 17469, 21879, 26289, 30699, 35109, 3951 9	norovirus Hu/Norwalk/20010/2009/VNM
4240	VP2	AFX8I269	424D	865D	13060, 17470, 21880, 26290, 30700, 35110, 39520	narovirus Hu/Norwalk/200I6/2009/VNM
4241	VP2	AFX8I272	4241	8651	13D6I, 17471, 21881, 26291, 3070 I, 3511 1 3952 I	norovirus Hu/Norwalk/20019/2009/VNM
4242	VP2	AFX81275	4242	8652	13062, 17472, 21882, 26292, 30702, 35112, 39522	noravirus Hu/Norwalk/2D033/20Q9/VNM
4243	VP2	AFX8I278	4243	8653	13063, 17473, 21883, 26293, 30703. 35113, 39523	norovirus Hu/Narwalk/20035/2D09/VNM
4244	VP2	AFX8I28I	4244	8654	13064, 17474, 21884, 26294, 30704, 3511 4, 39524	noravirus Hu/Norwalk/20044/2009/VNM
4245	VP2	AFX8I284	4245	8655	13065, 17475, 21885, 26295, 30705, 3511 5, 3952 5	narovirus Hu/Norwalk/20047/2009/VNM
4246	VP2	AFX8I287	4246	8656	13066, 17476, 2188 6, 26296, 30706, 3511 6, 39526	narovirus Hu/Norwalk/2006G/2009/VNM
4247	VP2	AFX8I290	4247	8657	13067, 17477, 21887, 26297, 30707, 3511 7, 39527	norovirus Hu/Narwalk/20067/2009/VNM
4248	VP2	AFX8I293	4248	8658	13068, 17478, 2188 8, 26298, 30708, 3511 8, 3952 8	noravirus Hu/Narwalk/20069/2009/VNM
4249	VP2	AFX8I296	4249	8659	1306 9, 17479, 2188 9, 26299, 30709, 3511 9, 39529	norovirus Hu/Norwalk/20092/2009/VNM
425D	VP2	AFX8I299	425D	8660	13070, 17480, 21890, 26300, 30710, 3512 0, 39530	narovirus Hu/Narwalk/20093/2009/VNM
4251	VP2	AFX8I3D2	4251	8661	13071, 1748 I, 2189 I, 26301, 30711. 3512 I, 3953 I	noravirus Hu/Narwalk/20094/2009/VNM

4252	VP2	AFX8I305	4252	8G62	I3072, I7482, 2I832, 26302, 3G7I2, 35I22, 39532	norovirus Hu/Norwalk/20II8/2009/VNM
4253	VP2	AFX8I3D8	4253	86G3	I3D73. I7483. 2I893. 263D3, 3Q7I3, 35I23, 39533	norovirus Hu/Norwalk/20I22/2009/VNM
4254	VP2	AFX8I3II	4254	8G64	I3D74. I7484, 2I894, 263D4, 3D7I4, 35I24. 33534	norovirus Hu/Norwalk/20123/2009/VNM
4255	VP2	AFX8I3I4	4255	8665	I3Q75. I7485, 2I835, 26305, 307I5, 35I25, 39535	norovirus Hu/Norwalk/20I28/2009/VNM
425G	VP2	AFX8I3I7	425G	8666	I307G, I7486, 2I896, 26306, 307I6, 35I26, 39536	narovirus Hu/Nnrwalk/20135/2009/VNM
4257	VP2	AFX8I320	4257	8667	I3077, I7487, 2I837, 26307, 307I7, 35I27, 39537	narovirus Hu/Narwalk/20I3B/2009/VNM
4258	VP2	AFX8I323	4258	8668	I3078, 17488, 2I838, 26308, 30718, 35128, 33538	norDvirus Hu/Norwalk/20I40/20D9/VNM
425B	VP2	AFX8I32G	425B	8663	13073, 17483, 2I893, 26303, 30713, 35I29, 39539	norDvirus Hu/Norwalk/20I42/2009/VNM
42G0	VP2	AGE89434	42GD	867Q	13080, I7490, 21300, 26310, 30720, 3513O, 39540	norovirus Hu/GII/IOIOI/2009/VNM
426I	VP2	AGE89437	42GI	867I	13081, 17431, 2I90I, 26311, 30721, 35I3I, 3354I	norovirus Hu/GII/10127/2009/VNM
42G2	VP2	AGE8B44D	42G2	8672	13082, 17492, 21902, 263I2, 30722, 35132, 33542	norovirus Hu/GII/I0370/20I0/VNM
4263	VP2	AGE89443	42G3	8673	13083, 17433. 21303, 26313, 3D723, 35133, 33543	norovirus Hu/GII/10405/2010/VNM
42G4	VP2	AGE89449	4264	8674	13084, 17494, 21304, 2G3I4, 30724, 35I34, 39544	norovirus Hu/GII/fD411/2010/VNM
4265	VP2	AGE89455	42G5	8675	13085, 17435, 21305, 2G3I5, 30725, 35135, 33545	norovirus Hu/GII/20048/2009/VNM
42GG	VP2	AGE89458	4266	8676	13086, 17436. 2I906. 2G3I6. 30726. 35136, 33546	norovirus Hu/GII/2D064/2D09/VNM
42G7	VP2	AGE8B4BI	4267	8677	13087, 17437, 21907, 2637, 30727, 35137, 39547	norovirus Hu/GII/20079/2009/VNM
42G8	VP2	AGE834G4	4268	8678	13088, 17498, 21908, 2G3I8, 30728, 35138, 39548	norovirus Hu/GII/20107/2009/VNM

4269	VP2	AGE89467	4269	8679	13089, I74B9. 21909, 26319, 30729, 35139, 39549	norovirus Hu/GII/20108/2009/VNM
427D	VP2	AGE8947D	427D	8680	13090, 17500, 21910, 26320, 30730, 35140, 39550	norovirus Hu/GII/20144/2009/VNM
4271	VP2	AGE89473	4271	8681	13091, 17501, 21911. 26321, 30731, 35141, 39551	norovirus Hu/GII/20146/2009/VNM
4272	VP2	AGE89476	4272	8682	13092, 17502, 21912. 26322, 30732, 35142, 39552	norovirus Hu/GII/20150/2009/VNM
4273	VP2	AGE89479	4273	8683	13093, 17503, 21913, 26323, 30733, 35143, 39553	norovirus Hu/GII/20151/2009/VNM
4274	VP2	AGE89482	4274	8684	13094, 17504, 21914, 26324, 30734, 35144, 39554	norovirus Hu/Gll/20153/2009/VNM
4275	VP2	AGE89485	4275	8B85	13095, 17505, 21915, 26325, 30735, 35145, 39555	norovirus Hu/GII/20154/2009/VNM
4276	VP2	AGE89488	4276	8686	13096, 17506, 21916, 26326, 30736, 35146, 39556	norovirus Hu/GII/20156/2009/VNM
4277	VP2	AGE8949I	4277	8687	13097, 17507, 21917, 26327, 30737, 35147, 30557	norovirus Hu/GII/20159/2009/VNM
4278	VP2	AGE89494	4278	8688	13098, 17508, 21918, 26328, 30738, 35148, 39558	norovirus Hu/GII/20161/2009/VNM
4279	VP2	AGE89497	4279	8689	13099, 17509, 21919, 26329, 30739. 35149. 39559	norovirus Hu/Gll/20I62/2D09/VNM
4280	VP2	AGE895DD	4280	8690	13100. 17510, 21920, 26330, 30740, 35150, 39560	norovirus Hu/GII/20164/2009/VNM
4281	VP2	AGE895D3	4281	8691	13101, 17511. 21921, 26331, 30741, 35151, 39561	norovirus Hu/GII/20171/2009/VNM
4282	VP2	AGE895D6	4282	8692	13102, 17512, 21922, 26332, 30742, 35152, 39562	norovirus Hu/GII/20172/2009/VNM
4283	VP2	AGE89509	4283	8693	13103, 17513, 21923. 26333, 30743, 35153, 39563	norovirus Hu/GII/20173/2009/VNM
4284	VP2	AGE895I2	4Z84	8694	13104, 17514, 21924. 26334, 30744, 35154, 39564	norovirus Hu/GII/20176/2009/VNM
4285	VP2	AGE895I5	4285	8695	13105, 17515, 21925, 26335, 30745. 35155. 39565	norovirus Hu/GII/20180/2009/VNM

428G	VP2	AGE895I8	428B	8B9B	13106. I75IB, 2I92B, 2B33B, 3074B, 35I56. 39566	norovirus Hu/GII/20182/2009/VNM
4287	VP2	AGE8952!	4287	8B97	13107, 17517, 21927, 2B337, 30747, 35I57, 395B7	norovirus Hu/GII/20184/2009/VNM
4288	VP2	AGE89524	4288	8B98	13108, I75I8. 21928, 26338, 30748. 35158, 39568	norovirus Hu/GII/20185/2009/VNM
4289	VP2	AGE89530	4289	8B99	13109. I75I9, 2I929, 26339, 30749, 35I59, 395B9	norovirus Hu/GII/20189/2009/VNM
4290	VP2	AGE89533	4230	8700	13110. 17520, 21930, 26340, 30750, 35I60, 39570	norovirus Hu/GII/20190/2009/VNM
4291	VP2	AGE89536	4291	8701	13111, I752I, 21931, 2B34I, 30751, 35I6I, 39571	norovirus Hu/GII/20192/2009/VNM
4292	VP2	AGE89539	4292	8702	13112, 17522, 21932, 26342, 3D752, 35IB2, 39572	norovirus Hu/GII/20196/2009/VNM
4293	VP2	AGE89542	4293	8703	13113, 17523, 21933, 26343, 30753, 35IB3, 39573	norovirus Hu/GII/20198/2009/VNM
4294	VP2	AGE89545	4294	8704	13114. 17524, 21934, 26344, 30754, 35IB4, 39574	norovirus Hu/GII/20202/2009/VNM
4295	VP2	AGE89548	4295	8705	13115. 17525, 21935, 2B345, 30755, 35IB5, 39575	norovirus Hu/GII/20205/2009/VNM
429B	VP2	AGE8955I	429B	870B	13116, I752B, 2I93B, 26346, 30756, 35I66, 39576	norovirus Hu/GII/2020G/2009/VNM
4297	VP2	AGE89554	4297	8707	13117, 17527, 21937, 2B347, 30757, 35IB7, 39577	norovirus Hu/GII/20208/2009/VNM
4298	VP2	AGE89557	4298	8708	13118. 17528. 21338, 2B348, 30758, 35I68, 33578	norovirus Hu/GII/202I5/20Q9/VNM
4299	VP2	AGE895B0	4299	8709	13119, 17529, 21939, 2B349, 30759. 35169, 39579	norovirus Hu/GII/20217/2009/VNM
430D	VP2	AGE895B3	4300	8710	13120, 17530, 21940, 26350, 30760, 35170, 3B580	norovirus Hu/GII/20229/2009/VNM
4301	VP2	AGE895BB	4301	8711	13121. 17531, 21941, 2B35I, 307BI, 35171, 39581	norovirus Hu/GII/20230/2009/VNM
4302	VP2	AGE895B9	4302	8712	13122, 17532, 21942, 2B352, 307B2, 35172, 39582	norovirus Hu/GII/20233/2009/VNM

4303	VP2	AGE89572	4303	8713	13123. 17533, 21943. 26353, 30763. 35173. 39583	norovirus Hu/GII/20248/2009/VNM
43D4	VP2	AGE89578	4304	8714	13124, 17534, 21944, 26354, 30764, 35174, 39584	norovirus Hu/Gli/20263/2009/VNM
43D5	VP2	AGE8958I	4305	8715	13125, 17535, 21945, 26355, 30765, 35175. 39585	norovirus Hu/GII/2027l/2009/VNM
4306	VP2	AGE89587	4306	8716	13126, 17536, 21946, 26356, 30766, 35176. 39586	norovirus Hu/GII/20302/2009/VNM
4307	VP2	AGE89590	4307	8717	13127. 17537, 21947, 26357, 30767, 35177, 39587	norovirus Hu/GII/20344/2009/VNM
4308	VP2	AGE89593	4308	8718	13128, 17538, 21948, 26358, 30768, 35178, 39588	norovirus Hu/GII/20350/2D09/VNM
4309	VP2	AGE89596	4309	8719	13129, 17539, 21949, 26359, 30769, 35179, 39589	norovirus Hu/GII/20357/2009/VNM
4310	VP2	AGE89599	4310	8720	13130. 17540, 21950, 26360, 30770, 35180, 39590	norovirus Hu/GII/20365/20ID/VNM
4311	VP2	AGE89602	4311	8721	13131. 17541, 21951, 26361, 30771, 35181, 39591	norovirus Hu/GII/20373/2DI0/VNM
4312	VP2	AGE89605	4312	8722	13132, 17542, 21952, 26362, 30772, 35182, 39592	norovirus Hu/GII/20407/2010/VNM
4313	VP2	AGE896D8	4313	8723	13133, 17543, 21953, 26363, 30773, 35183, 39593	norovirus Hu/GI!/2D4f 3/2DI0/VNM
4314	VP2	AGE896II	4314	8724	13134. 17544, 21954, 26364, 30774, 35184, 39594	norovirus Hu/GII/20424/2010/VNM
4315	VP2	AGE896I4	4315	8725	13135, 17545, 21955, 26365, 30775, 35185, 39595	norovirus Hu/GII/20448/2010/VNM
4316	VP2	AGE896I7	4316	8726	13136, 17546, 21956, 26366, 30776, 35186, 39596	norovirus Hu/GII/20457/2010/VNM
4317	VP2	AGE89620	4317	8727	13137, 17547, 21957, 26367, 30777, 35187, 39597	norovirus Hu/GII/20460/2010/VNM
4318	VP2	AGE8B623	4318	8728	13138, 17548, 21958, 2B368, 30778, 35188, 39598	norovirus Hu/GII/20469/2010/VNM
4319	VP2	AGE89626	4319	8729	13139, 17549, 21959, 26360, 30779, 35189, 39599	norovirus Hu/GII/20477/2010/VNM

4320	VP2	ABE89G29	432D	8730	13140, 17550, 2I9BD, 2B370, 30780, 35190, 39B00	norovirus Hu/GII/20478/2010/VNM
4321	VP2	AGE89B35	4321	8731	13141, 17551, 2I961, 2B37I, 30781, 35191, 39B0I	norovirus Hu/GII/30026/2009/VNM
4322	VP2	AGE89G38	4322	8732	13142, 17552, 21962, 2B372, 30782, 35192, 39B02	norovirus Hu/GII/30040/2009/VNM
4323	VP2	AGE89B4I	4323	8733	13143, 17553, 2I9B3, 2B373, 30783, 35193, 39B03	norovirus Hu/GII/30045/2009/VNM
4324	VP2	AGE89644	4324	8734	13144, 17554, 2I9B4, 2B374, 30784, 35194, 39B04	norovirus Hu/GII/30112/2009/VNM
4325	VP2	AGE89647	4325	8735	13145, 17555, 219B5, 2B375, 30785, 35195, 39605	norovirus Hu/GII/30113/2009/VNM
432B	VP2	AGE8965D	432B	873B	13146, 17556, 21966, 26376, 30786, 35196, 39606	norovirus Hu/GII/30129/2009/VNM
4327	VP2	AGE89653	4327	8737	13147, 17557, 21967, 26377, 30787, 35197, 39B07	norovirus Hu/GII/30199/2009/VNM
4328	VP2	AGE89G5B	4328	8738	13148, 17558, 21968. 26378, 30788, 35198, 39608	norovirus Hu/GII/3020I/2009/VNM
4329	VP2	AGE89B59	4329	8739	13149, 17559, 21960, 26379, 30780, 35199, 39609	norovirus Hu/GII/30206/2009/VNM
433D	VP2	AGE89B62	433G	8740	13150, 17560, 21970, 26380, 30790, 35200, 39610	norovirus Hu/GII/30207/2009/VNM
4331	VP2	AGE89B65	4331	8741	13151, 17561, 21971, 26381, 30791, 35201, 39611	norovirus Hu/GII/302II/2009/VNM
4332	VP2	AGE89GG8	4332	8742	13152, 17562, 21972, 26382, 30792, 35202, 39612	norovirus Hu/GII/30212/2009/VNM
4333	VP2	AGE89B7I	4333	8743	13153, 17563, 21973, 26383, 30793, 35203, 39613	norovirus Hu/GII/30257/2009/VNM
4334	VP2	AGE89G74	4334	8744	13154, I75B4, 2IB74, 26384, 30794, 35204, 39614	norovirus Hu/GII/302G6/2009/VNM
4335	VP2	AGE99BQ4	4335	8745	13155, I75B5, 21975, 26385, 30795, 35205, 39GI5	norovirus Hu/GII.4/NIHIC4.I/20II/USA
433B	VP2	AGE99GD7	433B	874B	13156. I75B6, 21976, 26386, 30796, 35206, 396IB	norovirus Hu/GII.4/CII0/I978/GUF

4337	VP2	AGK363I2	4337	8747	13157, 17567, 21977, 2B387, 30797, 35207, 39617	norovirus Hu/GII.4/20I99/2009/VNM
4338	VP2	AGK3B3I5	4338	8748	13158, I75B8, 21978, 2B388, 30798, 35208, 39BI8	norovirus Hu/GII.4/2040B/20IO/VNM
4339	VP2	AGM332Q9	4339	8749	13159, I75B9, 21979, 2B389, 3D799, 35209, 39619	norovirus Hu/GI.I/CHA7A009/2OIO/0SA
4340	VP2	AGM332I5	4340	8750	**13160.** 17570, 21980, 26390, 3D800, 35210, 39B2D	norovirus **Hu/GI.I/CHA6AD03_2DD9ID2B/20D3/USA**
4341	VP2	AGM332I8	4341	8751	13161, 17571, 21981, 2B39I, 30801, 35211, 39B2I	norovirus **Hu/GI.I/CHA2AOI4/2008/USA**
4342	VP2	AGM3322I	4342	8752	**13162.** 17572, 21982, 2B392, 30802, 35212, 39622	norovirus Hu/GI.I/CHA6A007/2DI0/0SA
4343	VP2	AGM33224	4343	8753	**13163.** 17573, 21983, 26393, 30803, 35213, 39623	norovirus Hu/GI.I/CHA9A004_20II04I9/20II/0SA
4344	VP2	AGM33227	4344	8754	**13164.** 17574, 21984, 2B394, 30804, 35214, 39624	norovirus Hu/GI.i/CH4X0533/2009/USA
4345	VP2	AGM3323D	4345	8755	**13165.** 17575, 21985, 26395, 30805, 35215, 39625	norovirus Hu/GI.I/CHA5AOIO/2009/OSA
434B	VP2	AGM33233	434B	875B	13166, 17576, 21986, 26396, 30806, 35216. 39626	norovirus Hu/GI.I/CHA9AD04_20il042B/20II/0SA
4347	VP2	AGM3323B	4347	8757	13167. 17577, 21987, 2B397, 30807, 35217, 39627	norovirus Hu/GI.I/CHA6A0I4/20D9/0SA
4348	VP2	AGM33239	4348	8758	13168, 17578, 21988, 2G398, 30808, 35218, 39628	norovirus Hu/GI.I/CHA3A007/20D8/USA
4349	VP2	AGM33242	4349	8759	13169, 17579, 21989, 26399, 30809, 35219, 39629	norovirus Hu/GI.I/CHA7A0II/20IO/OSA
435D	VP2	AGM33245	4350	87BD	**13170.** I758D, 21990. 26400, 30810, 35220, 39630	norovirus Hu/GI.I/CHABA003_2009II04/2009/USA
4351	VP2	AGTI778G	4351	87BI	13171, 17581, 21991, 26401, 30811, **35221. 39631**	norovirus Hu/GU/8MolIIL/I972/USA
4352	VP2	AGTI7793	4352	87B2	13172, 17582, 21992, 2B402, 30812, 35222, 39B32	norovirus Hu/GI.I/8W/I9G8/USA
4353	VP2	AGT1779B	4353	87B3	13173, 17583, 21993, 2B403, 30813, 35223, 39633	norovirus **Hu/GII.4/NIHICI3/20II/USA**

4354	VP2	AGTI7799	4354	8764	13174. 17584. 21994, 26404. 30814, 35224, 39634	norovirus **Hu/GII.4/NIHICI.I3/2DIZ/USA**
4355	VP2	AGTI7804	4355	8765	13175, 17585. 21995, 26405, 30815, 35225, 39635	narovirus Hu/GI.I/8McIII/IS73/USA
435G	VP2	AGTI78Q7	4356	8766	13176, 17586, 21096, 26406, 30816, 35226, 39636	norovirus **Hu/GI.I/BCKIIIc/1974/USA**
4357	VP2	AGTI78I0	4357	8767	13177, 17587, 21997, 26407, 30817, 35227, 39637	norovirus **Hu/GI.I/8UIIIf/I973/USA**
4358	VP2	AGTI78I4	4358	8768	13178, 17588, 21998, 26408, 30818, 35228, 39638	norovirus Hu/GII,4/NIHICI7.I/20I2/USA
4359	VP2	AGTI7820	4359	8769	13179, 17589, 21999, 26409, 30819, 35229, 39639	**norovirus Hu/GII.4/NIHICf8.f/20I2/USA**
43GD	VP2	AGTI7824	4360	8770	13180, 17590, 22000, 26410, 30820, 35230, 39640	narovirus **Hu/GII.4/NIHICI.3/2DID/USA**
43GI	VP2	AGTI7827	4361	8771	13181. 17591, 22001, 26411, 30821, 35231, 39641	narovirus **Hu/GI.I/8K/I979/USA**
4362	VP2	AGTI783I	4362	8772	13182, 17592, 22002, 26412, 30822, 35232, 39642	narovirus Hu/GII.4/NIHIC28.5/20I2/USA
43B3	VP2	AGTI7837	4363	8773	13183, 17593, 22003. 26413, 30823, 35233, 39643	norovirus **Hu/GI.I/8MC/I978/USA**
43G4	VP2	AGTI7843	4364	8774	13184. 17594, 22004, 26414, 30824, 35234, 39644	narovirus **Hu/GII.4/NIHICI.5/ZDII/USA**
4365	VP2	AGX85887	4365	8775	13185, 17595, 22005, 26415, 30825, 35235, 39645	norovirus Hu/GII.4/NIHICI7.8/20I3/0SA
4366	VP2	AGX85893	4366	8776	13186, 17596, 22006, 26416, 30826, 35236, 39646	narovirus Hu/GII,4/NIHICIJ0/20I2/USA
4367	VP2	AGX85896	4367	8777	13187, 17597, 22007, 26417, 30827, 35237, 39647	norovirus Hu/GII.4/NIHICI.7/20I2/USA
4368	VP2	AGX85905	4368	8778	13188, 17598, 22008, 26418, 30828, 35238, 39648	norovirus Hu/GII.4/NIHIC27.2/20I2/USA
4369	VP2	AGX859I4	4369	8779	13189, 17599. 22009, 26419, 30829, 35239, 39649	norovirus Hu/GII.4/NIHICI.I4/2DI2/USA
4370	VP2	AGX859I7	4370	8780	13190, 17600, 22010. 26420, 30830, 35240, 39650	narovirus Hu/GII.4/NIHICI7.B/20I2/USA

4371	VP2	AGX85923	4371	8781	13191. I7B0I, 2201I, 2B42I. 30831, 3524I, 39B5I	norovirus Hu/Gll.4/NIHIC28.3/20I2/USA
4372	VP2	AGX8592B	4372	8782	I3I92, I7B02, 22012, 2B422, 3D832, 35242, 39652	norovirus Hu/Gll.4/NIHICII.3/20I3/USA
4373	VP2	AGX85932	4373	8783	13193, I7B03, 22013, 2B423. 30833, 35243, 39B53	norovirus Hu/Gll.4/NIHICI.I2/20I2/0SA
4374	VP2	AGX85935	4374	8784	13194, I7B04, 22014, 2B424, 30834, 35244, 39B54	norovirus Hu/Gll.4/N!HICI.II/20I2/USA
4375	VP2	AHI59I55	4375	8785	13195, I7B05, 22015, 2B425, 30835, 35245, 39B55	norovirus Hu/GII.6/HS245/20IO/USA
437B	VP2	AHI59I58	437B	878B	I3I9B, I7B0B, 220IB, 2B42B, 3083B, 3524B, 39B5B	norovirus **Hu/GII.4/HSZ3Z/20I2/USA**
4377	VP2	AHI59IB0	4377	8787	I3I97, I7B07, 22017, 2B427. 30837, 35247, 39B57	norovirus Hu/GII.2/HS255/20ll/USA
4378	VP2	AHI59IB3	4378	8788	I3I98, I7B08, 22018, 2B428, 30838, 35248, 39658	norovirus Hu/GII.4/HS288/20I2/0SA
4379	VP2	AHI59IBB	4379	8789	I3I99, I7609, 22019, 26429, 30839, 35249, 39659	norovirus Hu/GII.4/HS66/200l/USA
438D	VP2	AHX22D2B	4380	8790	13200, I760, 22020, 26430. 30840, 35250, 39660	norovirus Hu/GII/BGIC0Z82/20ll/BGD
438I	VP2	AHX22D29	4381	8791	13201, I7BII, 22021, 2B43I, 30841, 35251, 39661	norovirus Hu/GII/BGIC039l/Z0IZ/BGD
4382	VP2	AHX22D33	4382	8792	13202, 17612, 22022, 26432, 30842, 35252, 396B2	norovirus Hu/Gll/BGIG00BG/Z0ll/BBD
4383	VP2	AHX22D3B	4383	8793	13203. I763, 22023, 26433, 30843, 35253, 396B3	norovirus Hu/GII/BGIC024l-3Z/20ll/BGD
4384	VP2	AHX22D39	4384	8794	13204. I764. 22024, 2B434, 30844, 35254, 39B64	norovirus Hu/Gll/BGIC0398/20I2/BGD
4385	VP2	AHX22D42	4385	8795	13205, I765, 22025, 2B435, 30845, 35255, 39B65	norovirus Hu/Gll/BGIC0405/20I2/BG0
4386	VP2	AHX22D48	438B	879B	13206. I766, 2202B, 2B436, 3084B, 35256, 30666	norovirus Hu/GII/BGIC0004/20ID/BG0
4387	VP2	AHX22D5I	4387	8797	13207, 17617, 22027, 2B437, 30847, 35257, 39BB7	norovirus Hu/GII/BGIC024l-33/20ll/BGD

4388	VP2	AHX22D55	4388	8798	13208, **17618.** 22028, 2B438, 30848, 35258, 39BB8	norovirus Hu/GII/BGIC0270/20ll/BGD
4389	VP2	AII02849	4389	8799	13209, I7BI9, 22029, 26439, 30849, 35259, 39669	norovirus Hu/GII/C2H-45/20ll/VNM
4390	VP2	AKE07I0I	4390	8800	13210, 17620, 22030, 26440, 30850, 35260, 39670	norovirus Gil
4391	VP2	AKE07I04	4391	8801	13211, 17621, 22031, 26441, 30851, 35261, 39671	norovirus Gil
4392	VP2	AKE07I07	4392	8802	13212, 17622, 22032, 2B442, 30852, 35262, 39672	norovirus Gil
4393	VP2	ALE30B34	4393	8803	13213, 17623, 22033, 26443, 30853, 35263, 39673	norovirus Gil
4394	VP2	ALE30B3B	4394	8804	13214, I7B24, 22034, 2B444, 30854, 35264, 39B74	norovirus Gil
4395	VP2	BAR42290	4395	8805	13215, 17625, 22035, 26445, 30855, 35265, 39675	norovirus Hu/GII/JP/20l5/GII,PI7_GIIJ7/Kawasaki308
439B	VP2	BAR47BI7	4396	880B	13216, 17626, 22036, 2B44B, 30856, 3526B, 39B76	norovirus Hu/GII/JP/2DI4/GII.PI7_GII.I7/Nagano7-I
4397	VP2	BARB37IB	4397	8807	13217, 17627, 22037, 2B447, 30857. 352B7, 39677	norovirus Hu/GII/JP/20l3/GII.PI7_GII.I7/Saitama5203
4398	VP2	BARB37I9	4398	8808	13218, 17628. 22038, 26448, 3D858, 35268, 39678	norovirus Hu/GII/JP/20l3/GII.PI7_GII.I7/Saitama5309
4399	VP2	BARB3722	4399	8809	13219, 17629, 22039, 26449, 30859, 35269, 39679	norovirus Hu/GII/JP/20l4/GII.PI7_GII.I7/Nagano8-I
44D0	VP2	BASD2084	4400	8810	13220, 17630, 22040, 26450, 30860, 35270, 39680	norovirus Hu/GII/JP/20l5/GII.Pe_GII.4/0saka/0SF78
4401	VP2	CRL4B953	4401	8811	13221, 17631, 22041, 26451, 30861, 35271, 39681	norovirus GI/Hu/NL/20ll/GI.4/Groningen
4402	VP2	CRL4695B	4402	8812	13222, 17632, 22042, 26452, 30862, 35272, 39682	norovirus GI/Hu/NL/20l2/GI.6/GroningBn
4403	VP2	CRL4695B	4403	8813	13223, 17B33, 22043, 26453, 30863, 35273, 39683	norovirus GII/Hu/NL/20l2/GII.4/GroningBn
44D4	VP2	CRL4B9B2	4404	8814	13224, I7B34, 22044, 26454, 30864, 35274, 39684	norovirus GII/Hu/NL/20I4/GII.4/Groningen0I

44D5	VP2	CRL4G965	4405	8815	13225, I7G35, 22045. 2G455. 308G5, 35275, 39G85	noPDvipus BII/Hu/NL/ZOI4/GII.4 **/GrDningBnD2**
44DB	VP2	CRL46968	440G	88IG	I322G, I7G3G. 22046, 2645G, 308GG, 3527G, 3[illegible]G8G	norOviPUs GII/Hu/NL/20I4/GII.6/Groningen
4407	VP2	CRL4B37I	4407	8817	13227. I7G37, 22047, 2G457, 308G7, 35277, 39G87	nOrOviPus GtI/Hu/NL/2014/GII.21/Graningen
4408	VP2	CRL46974	4408	8818	13228, I7G38, 22048, 2G458, 30868, 35278. 39688	norovirus GII/Hu/NL/20I4/GII.2/Groningen
4409	VP2	CRL4G977	4409	8819	13229, 17639, 22049, 26459, 30869, 35279, 39689	narovirus GII/Hu/NL/2Dt2/GII.4/NijmegenDI
4410	VP2	CRL4G980	4410	8820	13230, 17G40, 22050, 2G460. 30870. 35280. [illegible]9690	norovirus GII/Hu/NL/20l2/GIi.4/NijmegBn02

Legend to Table 1: Column I: protein name (according to NCBI or Genbank entry); Column 2: NCBI or Genbank Accession No.; Column 3 ("A"): SEQ ID NOs of amino acid sequence; Column 4 ("B"): SEQ ID NOs of wild type coding sequences; Column 5 ("C"): SEQ ID NOs of optimized ending sequence.

Claims:

1. Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof.

2. The artificial nucleic acid according to claim 1, wherein the at least one encoded polypeptide is selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

3. The artificial nucleic acid according to claim 1 or 2, wherein the at least one encoded polypeptide is selected from the group consisting of Norovirus non-structural proteins NSI/NS2, NS3, NS4, NS5, NSB, NS7, Norovirus capsid protein VPI and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

4. The artificial nucleic acid according to any one of claims 1 to 3, wherein the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus, genogroup II Norovirus, genogroup III Norovirus, genogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived from a Norovirus selected from the group consisting of a Bl.l to GI.I7 Norovirus, Gll.l to GII.24 Norovirus, Glll.l to GIII.4 Norovirus, GIV.I to GIV.4 Norovirus and GV.I to GV.4 Norovirus; more preferably, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of GI.l Norovirus and GII.4 Norovirus, even more preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 CIN-I Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2DI2 Norovirus.

5. The artificial nucleic acid according to any one of claims 1 to 4, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VPI or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

6. The artificial nucleic acid according to any one of claims 1 to 5, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VPI and/or a fragment or variant thereof.

7. The artificial nucleic acid according to any one of claims 1 to 6, wherein the at least one encoded polypeptide comprises

(i) at least one of the amino acid sequences according to any one of SED ID NDs: l-44ID; and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%. 57%, 58%, 50%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 60%, **70%.** 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 70%, **80%.** 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 80%, 90%, 91%. 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the amino acid sequence represented by any one of SED ID NDs: 1-4410; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

8. The artificial nucleic acid according to any one of claims 1 to 7, wherein the at least one coding region comprises

(i) at least one of the nucleic acid sequences according to any one of SED ID NOs: 44II-39G9D, 39713-39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%. 58%, 59%, 60%, 61%, 62%, 63%, 64%. 65%, 66%, 67%. 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%. 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%. 95%, 96%, 97%, 98%. or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 4411-39690, 39713-39746: and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SED ID NOs: 4411-39690, 39713-39746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SED ID NOs: 1-4410; and/or

(iv) an orthologue or a paralogue of any one of SED ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

9. The artificial nucleic acid according to any one of claims 1 to 8, wherein the artificial nucleic acid is monocistronic, bicistronic or multicistronic.

10. The artificial nucleic acid according to any one of claims 1 to 9, wherein the artificial nucleic acid is monocistranic and wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins as defined in any one of claims 1 to 9, or a fragment or variant thereof.

11. The artificial nucleic acid according to any one of claims 1 to 9, wherein the artificial nucleic acid is bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one Norovirus protein as defined in any one of claims 1 to 9, or a fragment or variant of any one of these proteins, wherein the at least two polypeptides are preferably different polypeptides.

12. The artificial nucleic acid according to any one of claims 1 to 11. wherein the artificial nucleic acid is an RNA. preferably an mRNA.

13. The artificial nucleic acid according to any one of claims 1 to 12, wherein the artificial nucleic acid comprises a 5'-cap structure.

14. The artificial nucleic acid according to any one of claims 1 to 13, wherein the G/C content of the coding region of the mRNA sequence is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the codon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased or maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

15. The artificial nucleic acid according to any one of claims 1 to 14, wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%. 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 30%, 91%. 92%, 93%, 94%, 95%, 96%. 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 882I-I323D, 2646I-3969D, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738. 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: I323I-I764D, or a fragment or variant of any of these sequences; and/or

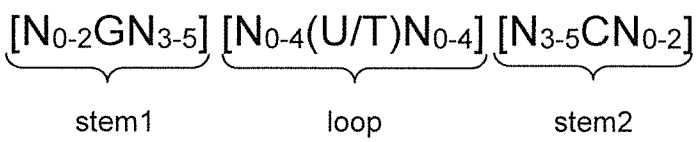
(iv) the artificial nucleic acid according to any one of the preceding claims, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%. 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SE0. ID NOs: I764I-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid according to any one of the preceding claims, wherein the at least one coding sequence comprisBS a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ. ID NOs: 22051-26460, or a fragment or variant of any of these sequences.

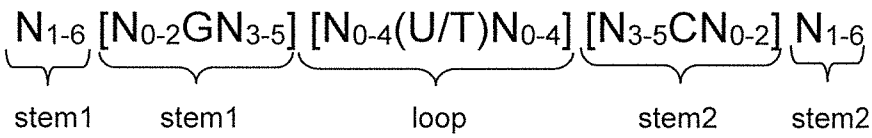
16. The artificial nucleic acid according to any one of claims 1 to 15, wherein the artificial nucleic acid comprises at least one histone stem-loop.

17. The artificial nucleic acid according to claim 16, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):



formula (II) (stem-loop sequence with stem bordering elements):



bordering element bordering element

wherein:

steml or stem2 bordering elements N_{1-6} is a consecutive sequence of 1 to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof;

steml [N0-2GN3-5] is reverse complementary or partially reverse complemeotary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and

wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;

loop sequence [N0-4(U/T)N0-4] is located between elements steml and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably nf 4 nucleotides;

wherein each N_{D-4} is independent from another a consecutive sequence of D to 4, preferably Of I to 3, more preferably of I to 2 N, wherein each N is independently from another selected from a nucleotide selected from A. U, T, G and C or a nucleotide analogue thereof; and

wherein U/T represents uridine, oΓ optionally thymidine;

stem2 [N_{3-5}CN_{0-2}] is reverse complementary or partially reverse complementary with element steml, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, moΓe preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to I, more preferably of I N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof: and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleotide guanosine in steml is replaced by cytidine;

wherein

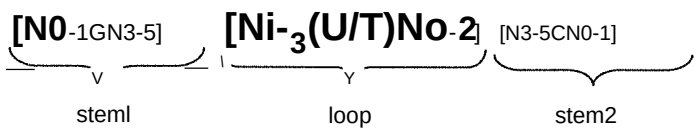
steml and stem2 aΓe capable of base pairing with each other

forming a reverse complementary sequence, wherein base pairing may occur between steml and stem2, or

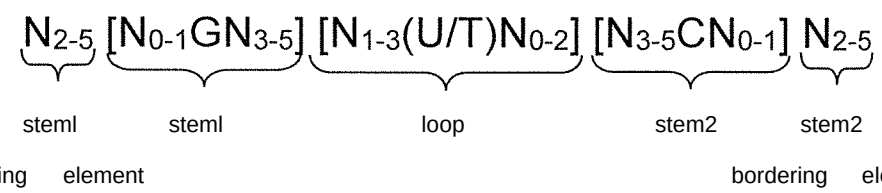
forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between steml and stem2.

18. The artificial nucleic acid according to claim 17, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (la) or (Ha);

formula (Ia) (stem-loop sequence without stem bordering elements):



formula (IIa) (stem-loop sequence with stem bordering elements):



IB. The artificial nucleic acid according to any one of claims IB to 18, wherein the at least one histone stem loop comprises a nucleic acid sequence according to SED ID NO: 33703 to SEQ ID NO: 33710, or a fragment or variant thereof.

20. The artificial nucleic acid molecule according to any one of claims 1 to 13, wherein the artificial nucleic acid comprises an untranslated region (UTR).

21. The artificial nucleic acid according to claim 20, wherein the artificial nucleic acid comprises a 3'-DTR.

22. The artificial nucleic acid according to claim 21, wherein the 3'-UTR comprises at least one heterologous 3'-UTR element.

23. The artificial nucleic acid according to claim 21 or 22, wherein the 3'-UTR comprises a poly(A) sequence and/or a poly(C) sequence.

24. The artificial nucleic acid according to claim 23, wherein the poly(A) sequence comprises 10 to 20D, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides, and/or the poly(C) sequence comprises 10 to 200, 10 to ID0, 20 to 70, 20 to B0 or 10 to 40 cytosine nucleotides.

25. The artificial nucleic acid according to any one of claims I to 24, wherein the at least one heterologous 3'-DTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment or a variant of said gene.

2B. The artificial nucleic acid according to any one of claims I to 25, wherein the at least one heterologous 3'-0TR element comprises a nucleic acid sequence derived from a 3'-0TR of a gene selected from the group consisting of an albumin gene, an a-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, or from a homolog, a fragment or a variant thereof.

27. The artificial nucleic acid according to any one of claims 1 to 2B, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of an a-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 33702, a hornolog, a fragment, or a variant thereof.

28. The artificial nucleic acid according to any one of claims 1 to 27, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence, which is derived from the 3'-0TR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-UTR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR nf a human albumin gene or from a variant thereof, even more preferably from the 3'-UTR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof.

29. The artificial nucleic acid according to any one of claims 1 to 28, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence according to the any one of SED ID NO: 39703 to SEO ID NO: 39708, or a hornolog. a fragment or a variant thereof.

30. The artificial nucleic acid according to any one of claims 1 to 29, wherein the artificial nucleic acid comprises a 5'-UTR.

31. The artificial nucleic acid sequence according to any one of claims 1 to 3D, wherein the 5'-UTR comprises at least one heterologous 5'-0TR element.

32. The artificial nucleic acid according to any one of claims 1 to 31, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably from a corresponding RNA sequence, or a hornolog, a fragment, or a variant thereof, preferably lacking the 5'TOP motif.

33. The artificial nucleic acid according to any one of claims 1 to 32, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-0TR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a hornolog, a fragment or a variant thereof, preferably lacking the STOP motif.

34. The artificial nucleic acid according to any one of claims 1 to 33, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL), preferably RPL32 or RPL35A, or from a gene selected from the group consisting of HSDI7B4, ATP5AI, AIGI, ASAHI, CDXGC or ABCB7 (MDR), or from a hornolog, a fragment or variant of any one of these genes, preferably lacking the 5'TOP motif.

35. The artificial nucleic acid according to any one of claims I to 34, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence according to SEQ 10 NO: 39691 to SEQ ID NO: 39B94, or a homolog. a fragment or a variant thereof.

3B. The artificial nucleic acid according to any one of claims I to 35 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7BpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus as described herein, preferably VPI, or a fragment or variant thereof.

c) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100. 40 to 80 or 5D to 70 adenosine nucleotides,

d) optionally a poly(C) tail, preferably consisting of 10 to 20D, 10 to 100. 20 to 70. 20 to B0 or 10 to 40 cytosine nucleotides, and

e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 33709 to SEQ ID NO: 39710.

37. The artificial nucleic acid according to any one of claims I to 3B comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VPI as described herein, or a fragment or variant thereof,

c) a 3'-0TR element comprising a nucleic acid sequence, which is derived from an oc-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 33701, or SEQ ID NO: 33702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to B0 or 10 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID ND: 39709 t0 SEQ 10 NO: 33710.

38. The artificial nucleic acid according to any one of claims I to 37, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NDs: 39713-39746, preferably a nucleic acid sequence according to any one of SEQ ID NOs: 3S7I6. 33721, 33729, 39734, 33738, 39725, or a fragment or variant of any of these sequences.

39. The artificial nucleic acid according to any one of claims I to 38, comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TDP gene, preferably comprising a nucleic acid sequence according to SEQ. ID ND: 3[illegible]9[illegible], or SEQ ID NO: 39B92, or a homolog, a fragment or a variant thereof,

c) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VPI as described herein, or a fragment or variant thereof,

d) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an albumin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID ND: 397D5, or SEQ ID ND: 397DG, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of ID to 2DD, [illegible]D to IDD, 4D to 8D or 5D to 7D adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of ID to 2DD, ID to IDO, 2D to 7D. 2D to BO or [illegible]D to 4D cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID ND: 3B709 to SEQ ID NO: 39710.

40. The artificial nucleic acid according to any one of claims I to 39. wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NDs: 397I3-3974B, preferably a nucleic acid sequence according to any one of SEO ID NOs: 397IG, 39721, 39729, 39734, 39738, 3B725, or a fragment or variant of any of these sequences.

41. The artificial nucleic acid according to any one of claims [illegible] to 40, wherein the coding region comprises a modified nucleic acid sequence.

42. The artificial nucleic acid according to any one of claims [illegible] to 41, wherein the at least one coding region comprises a nucleic acid sequence encoding a molecular tag and wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

43. Composition comprising at least one artificial nucleic acid as defined by any one of claims [illegible] to 42 and a pharmaceutically acceptable carrier.

44. The composition according to claim 43, wherein the at least one mRNA is complexed with one or mo[illegible]e catiooic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids.

45. The composition according to any one of claims 43 to 44, wherein the N/P ratio of the at least one mRNA to the one or more cationic or polycationic compounds is in the range of about D.I to 20, including a range of about 0.3 to 4, of about 0.5 to 2, of about 0.7 to 2 and of about 0.7 to 1.5.

4G. The composition according to any one of claims 43 to 45 comprising the at least one mRNA, which is complexed with one or more cationic or polycationic compounds, and at least one free mRNA.

47. The composition according to any one of claims 43 to 46, wherein the at least one complexed mRNA is identical to the at least one free mRNA.

48. The composition according to any one of claims 43 to 47, wherein the mRNA is complexed with one or more lipids, thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

43. The composition according to any one of claims 43 to 48, wherein the composition comprises at least one adjuvant.

5D. The composition according to any one of claims 43 to 43, wherein

a) the composition comprises a plurality or more than one of the mRNA sequences each defined in any one of claims 1 to 42; or

b) the composition comprises at least 2, 3, 4, 5, B, 7, 8, 3, ID, II, 12, 13, 14, 15, IB, 17, 18, 13, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 23, 3D, 31, 32, 33, 34, 35, 3B. 37, 38, 33, 4D, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 5D or more artificial nucleic acids as defined by any one of claims 1 to 42, wherein each of the at least 2, 3, 4, 5, B, 7, 8. 9, 1D, II, 12, 13, 14, 15, IB, 17, 18, 19. 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29. 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4B. 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in any one of claims 1 to 42, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VPI of a different Norovirus.

51. The composition according to any one of claims 43 to 50, wherein

a) wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus; and/or

b) the composition comprises at least 2, 3, 4, 5. B. 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4B, 47, 48. 49, 50 or more artificial nucleic acids as defined by any one of claims 1 to 42, wherein each of the at least 2, 3, 4, 5, B, 7, 8, 9, 10, II, 12, 13, 14, 15, IB, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 23. 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VPI and VP2, as defined in any one of claims 1 to 42, and/or a fragment or a variant of any one of these proteins.

52. The composition according to any one of claims 43 to 51, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycatianic compound and/or a polymeric carrier, preferably a cationic protein or peptide.

53. The composition according to any one of claims 43 to 52, wherein

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w); or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/ w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier: or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids

and/ or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

54. The composition according to any one of claims 43 to 53 wherein the composition comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in claims 1 to 42; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in claims 1 to 42; or

(iii) 2-10, 10-15, 15-20, 2D-50, 50-100 or 100-200 artificial nucleic acids as defined in claims 1 to 42;

and a pharmaceutically acceptable carrier, wherein preferably the artificial nucleic acid encodes a capsid protein VP1 derived from a Norovirus.

55. The composition according to any one of claims 43 to 54, wherein

(i) the artificial nocleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28. 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43. 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3. 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noraviruses; or

(v) the artificial nucleic acids are derived from a single GV Narovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noraviruses; or

(vi) the artificial nucleic acids are derived from a single GI Narovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Narovirus and/or GV Narovirus; or

(vii) the artificial nucleic acids are derived from a single GI Narovirus ar from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 ar more different GI Noraviruses and additionally from a single GII. GIII, GIV or GV Noravirus and/ or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17. 18. 19. 20, 21, 22, 23, 24, 25. 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38. 39. 40, 41, 42, 43, 44. 45, 46, 47, 48, 49, 50 and/or more GII, GIII, GIV or GV Noroviruses;

wherein preferably the artificial nucleic acids encode a capsid protein VP1 derived from a Norovirus.

56. The composition according to any one of claims 43 to 55, wherein

(i) the artificial nucleic acids are derived from a single GI.I Narovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17. 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. 28. 29. 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42. 43, 44, 45, 46. 47, 48, 49, 50 ar more different GI.I Noraviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17. 18, 19, 20, 21. 22, 23, 24. 25, 26. 27. 28, 29. 30, 31, 32, 33, 34, 35, 36, 37, 38, 39. 40, 41. 42. 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noraviruses; or

(iii) the artificial nucleic acids are derived from a single GI.I Norovirus and additionally from a single GII.4 Noravirus; or

(iv) the artificial nucleic acids are derived from a single GI.I Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18. 19, 20. 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44. 45, 46, 47, 48, 49, 50 or more different GI.I Noroviruses and additionally from a single GII.4 Noravirus ar from 2, 3, 4, 5. 6, 7, 8, 9, 10. 11. 12, 13, 14, 15, 16, 17, 18, 19. 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48. 49, 50 or more GII.4 Noroviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NO; 39713 to SED ID NO: 39746; and/ or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%. 60%. 61%. 62%. 63%, 64%, 65%. 66%. 67%, 68%. 69%, 70%, 71%. 72%,

73%, 74%, 75%, 7G%, 77%, 78%, 7996. 80%. 81%, 82%, 83%, 84%, 85%, 86%. 87%, 88%, 89%. 90%. 91%. 92%, 93%. 94%, 95%, 96%. 97%, 98%. or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NO: 39713 to SEfl 10 NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEfl ID NO: 39713 to SED ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SEfl ID NO; 39713 to SEQ ID NO: 39746: and/ 0r a fragment or variant of any of thesE sequences.

57. Polypeptide encoded by the artificial nucleic acid according to any one of claims 1 to 42.

58. Polypeptide according to any one of claims I to 42 comprising at least one protein selected from the group consisting of NSI/NS2, NS3, NS4, NS5, NS6, NS7, VPI, and VP2 derived from Norovirus, or a fragment or variant of any of these proteins, and at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VPI, or a variant thereof, wherein the C-terminal fragment consists of 3 to 2D amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VPI, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein NSI/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 2D amino acid residues.

59. The polypeptide according to any one of claims 57 to 58 comprising a molecular tag. wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an Etag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

6D. Composition comprising the polypeptide according to any one of claims 57 to 59, and a pharmaceutically acceptable carrier.

61. Vaccine comprising the artificial nucleic acid according to any one of claims I to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, and/or the composition according to claim 60.

62. The vaccine according to claim 61, wherein the artificial nucleic acid according to any one of claims I to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, or the composition according to claim 60 elicits an adaptive immune response.

63. The vaccine according to claim 61 to 62, wherein the vaccine further comprises a pharmaceutically acceptable carrier.

64. The vaccine according to any one of claims 61 to 63 further comprising an adjuvant.

65. The vaccine according to any one of claims GI to 64, wherein the vaccine is multivalent and comprises

(i) at least 2. 3, 4, 5, 6, 7, 8, 9, ID or more artificial nucleic acids as defined in claims I to 42; or

(ii) at least ID, 15, 2D or 5D artificial nucleic acids as defined in claims 1 to 42; or

(iii) 2-10, 10-15, 15-20, 20-50, 5D-I00 or ID0-2D0 artificial nucleic acids as defined in claims 1 to 43.

66. The vaccine according to any one of claims 61 to 65, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single Gil Norovirus or from 2, 3, 4, 5, G, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different Gil Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gill Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43. 44, 45, 46, 47. 48, 49, 50 or more different Gill Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3. 4, 5, 6, 7, 8, 9, ID, II, 12. 13, 14, 15, 16, 17, 18, 19, 2D, 21, 22, 23, 24. 25, 26. 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, G, 7, 8, 9, ID, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21. 22. 23. 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single Gil Norovirus, Gill Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, II. 12, 13, 14, 15, 16, 17, 18, IB, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D. 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5D or more different GI Noroviruses and additionally from a single Gil, Gill, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, II, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4D, 41, 42, 43, 44, 45. 46, 47, 48, 49, 50 or more Gil, Gill, GIV and/or GV Noroviruses.

67. The vaccine according to any one of claims 61 to 66, wherein

(i) the artificial nucleic acids are derived from a single Gl.l Norovirus nr from 2, 3, 4, 5, G, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 18, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 28, 3D, 31, 32, 33, 34, 35, 36, 37, 38, 38, 4D, 41, 42, 43, 44, 45, 4B, 47, 48. 48, 50 or more different Gl.l Norn-viruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, B, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 38, 4D, 41, 42, 43, 44, 45, 4B, 47, 48. 49, 5D or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single Gl.l Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single Gl.l Norovirus or from 2, 3, 4, 5, G, 7, 8, 8, ID, II, 12, 13, 14, 15, IB, 17, 18, 19, 2D, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 3D, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 4D, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 5D or more different Gl.l Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, G, 7, 8, 9, ID, II, 12, 13, 14, 15, IB, 17, 18, 19, 20, 21, 22, 23, 24, 25, 2B, 27, 28, 29, 30, 31, 32, 33, 34, 35, 3B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 4B, 47, 48, 49, 50 or more GII.4 Noroviruses.

G8. Kit or kit of parts comprising the artificial nucleic acid according to any one of claims I to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim B0 or the vaccine according to any one of claims Bl to G7, optionally comprising a liquid vehicle for solubilising, and optionally technical instructions providing information on administration and dosage of the components.

G9. The kit or kit of parts according to claim B8 comprising Ringer lactate solution.

70. The artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 5B, the polypeptide according to any one of claims 57 to 59, the composition according to claim B0, the vaccine according to any one of claims Bl to G7, or the kit or kit of parts according to claim B8 to B9 for use as a medicament.

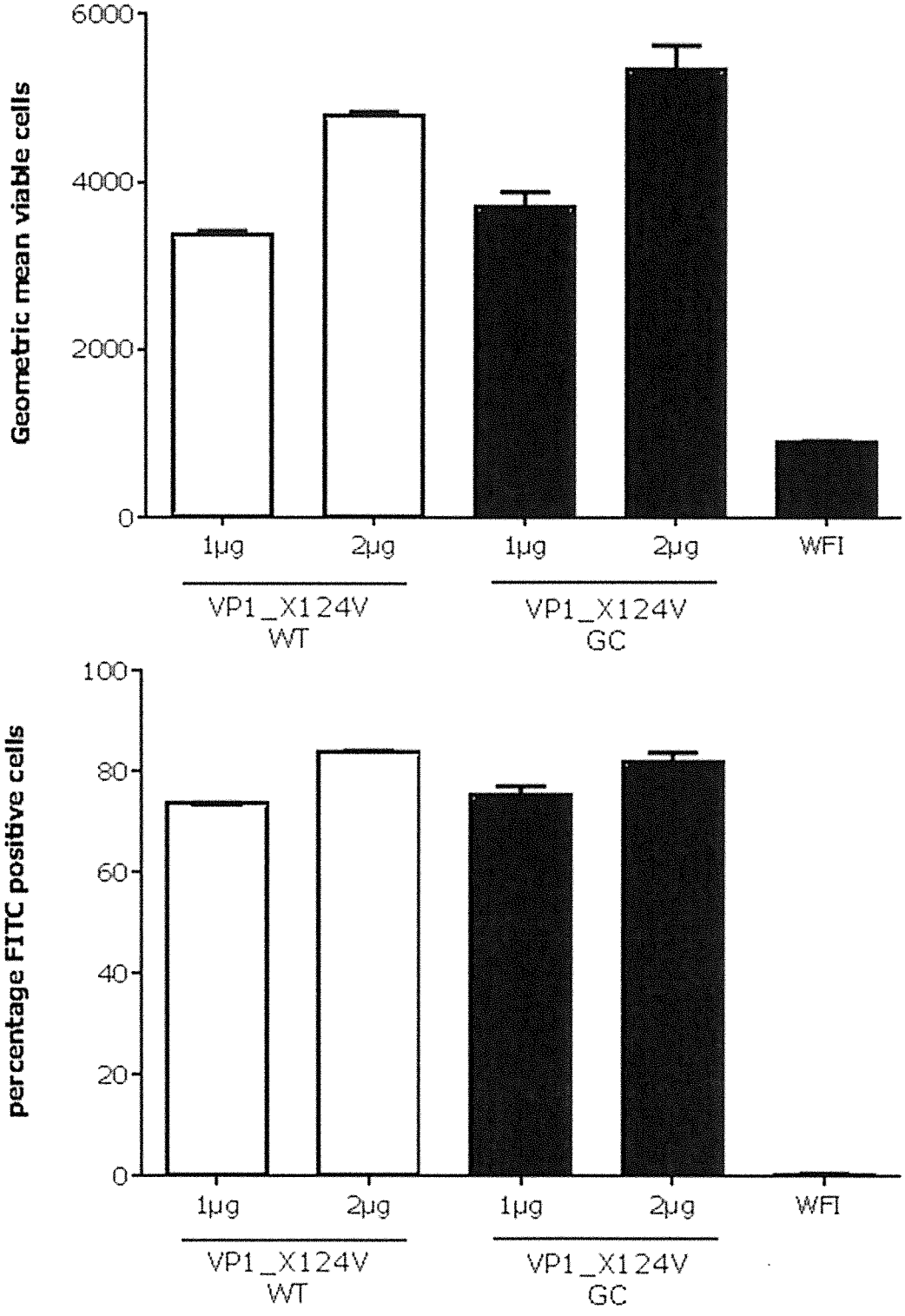
71. The artificial nucleic acid according to any one of claims I to 42, the composition according to any one of claims 43 to 5B, the polypeptide according to any one of claims 57 to 59, the composition according to claim GO, the vaccine according to any one of claims Bl to B7, or the kit or kit of parts according to claim B8 to B9 for use in the treatment or prophylaxis of an infection with Norovirus or a disorder related to an infection with Norovirus.

72. The artificial nucleic acid according to any one of according to any one of claims I to 42, the composition according to any one of claims 43 to 5B, the polypeptide according to any one of claims 57 to 59, the composition according to claim B0. the vaccine according to any one of claims Bl to G7, or the kit or kit of parts according to claim B8 to G9, wherein the artificial nucleic acid, the composition, the vaccine or the active component of the kit or kit of parts is administered by injection, preferably by needle-less injection, more preferably by jet injection.

73. The artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69 for use according to any one of claims 70 to 72, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient.

74. Method of treating or preventing a disorder, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69.

75. The method according to claim 74, wherein the disorder is an infection with Norovirus or a disorder related to an infection with Norovirus.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2µg
1µg
2µg
WFI
VP1_X124V WT
VP1_X124V GC
percentage FITC positive cells
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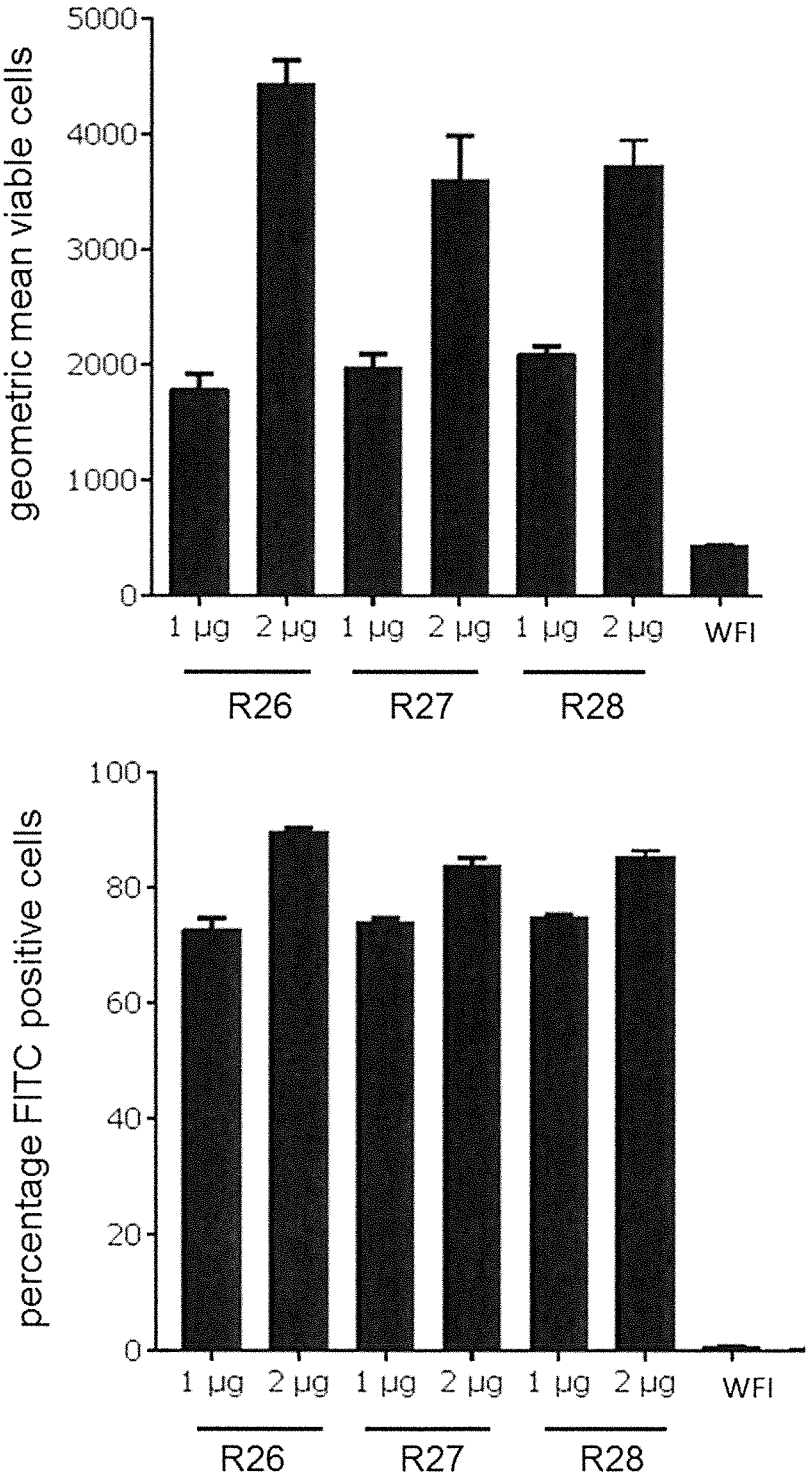
2µg
1µg
2µg
WFI
VP1_X124V WT
VP1_X124V GC

FIG. 1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4000
3000
2000
1000
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2 µg
1 µg
2 µg
1 µg
2 µg
WFI
R26
R27
R28
percentage FITC positive cells
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1 µg
2 µg
1 µg
2 µg
1 µg
2 µg
WFI
R26
R27
R28

FIG. 2

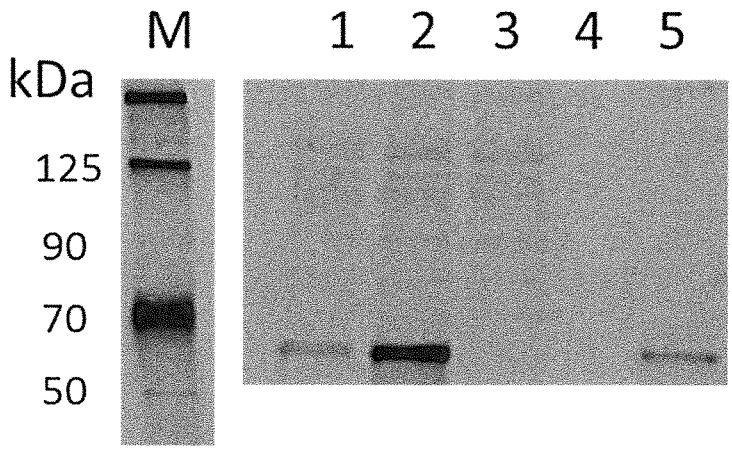
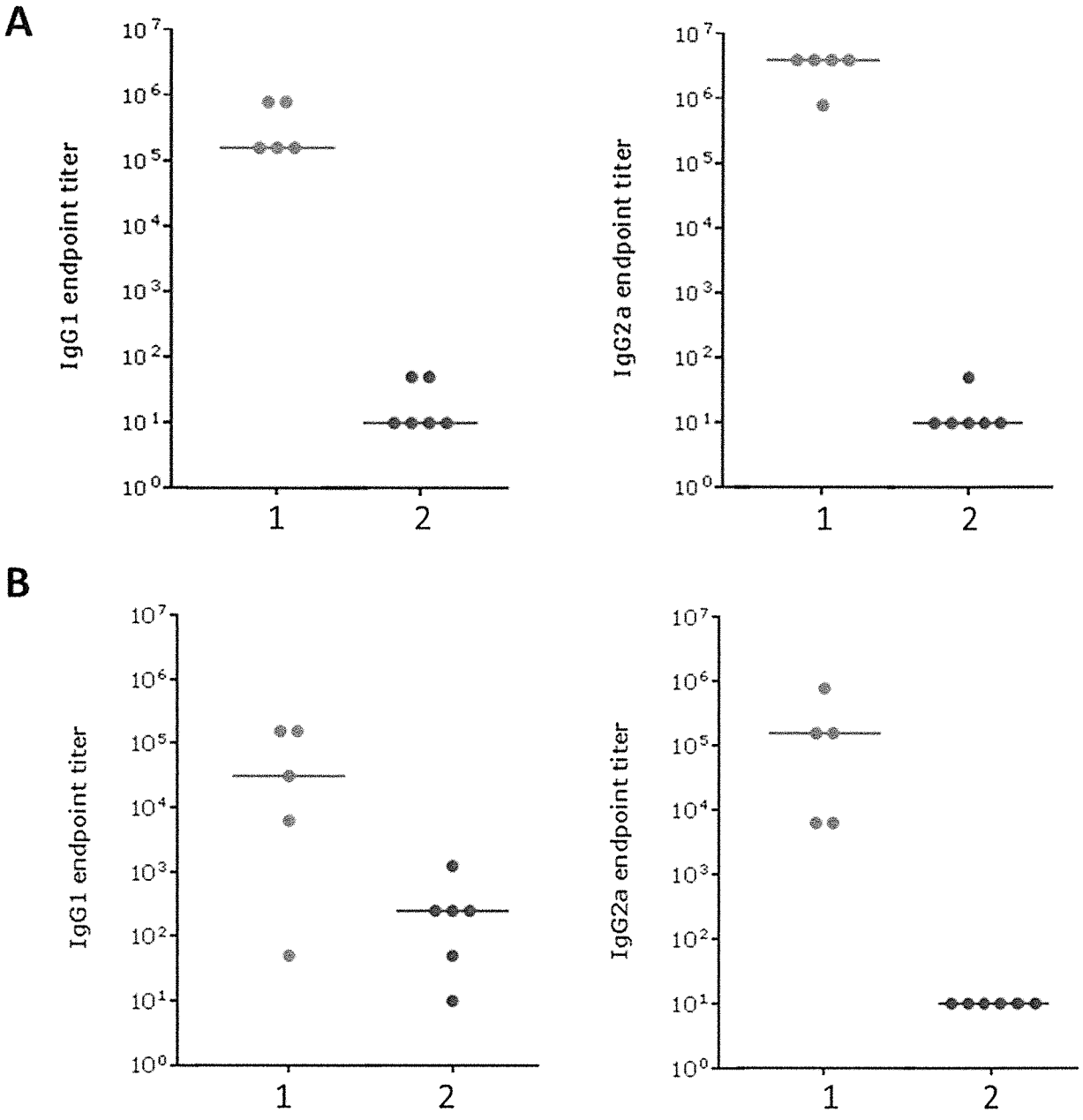


FIG. 3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IgG2a endpoint titer
B
IgG1 endpoint titer
IgG2a endpoint titer
1
2

FIG. 4

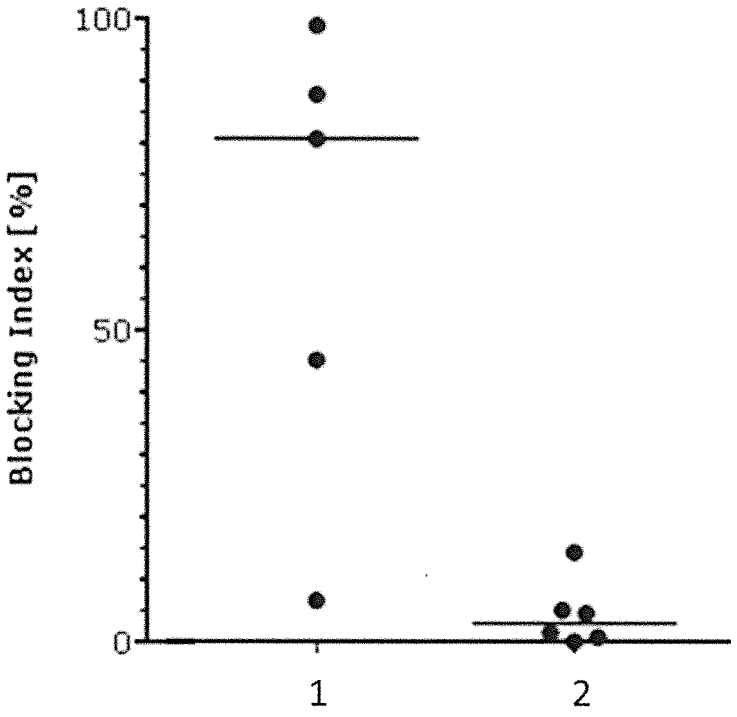
Blocking Index [%]
100
50
0
1
2

FIG. 5

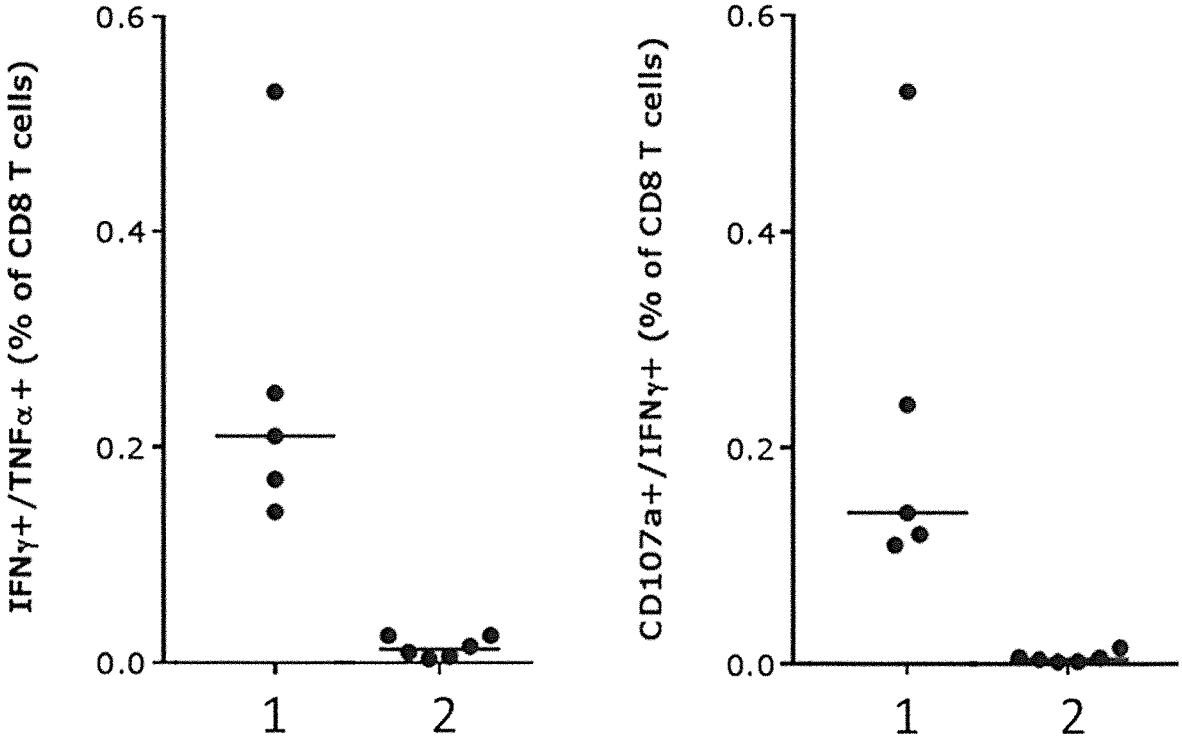
IFNγ+/TNFα+ (% of CD8 T cells)
0.6
0.4
0.2
0.0
1
2
CD107a+/IFNγ+ (% of CD8 T cells)
0.6
0.4
0.2
0.0
1
2

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/060673

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07K14/005
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE EMBL [Online] 16 January 2008 (2008-01-16) , "Norovirus Hu/Duan/Beijing/2006/China non-structural polyprotein gene, partial cds; and capsid protein VP1 and minor structural protein VP2 genes, complete cds.", XP002771799 , retrieved from EBI accession no. EM_STD: EU366113 Database accession no. EU366113 the whole document ----- -/-	1-15 , 57-63 ,68

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 July 2017	13/09/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Herrmann , Klaus

2

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/005799 A2 (NOVARTIS AG [CH] ; GEALL ANDREW [US] ; HEKELE ARMIN [US] ; MANDL CHRISTIA) 13 January 2011 (2011-01-13) paragraphs [0007] , [0024] page 18, line 15 page 36, lines 20, 23 -----	1-75
X	W0 2012/006377 A2 (NOVARTIS AG [CH] ; GEALL ANDREW [US] ; RAMSAUER KATRIN [AT] ; 0TTEN GI LLI) 12 January 2012 (2012-01-12) claim 1 page 19, line 15 page 1, line 5 -----	1-75
X	P. R. HARRINGTON ET AL: "Systemi c, Mucosal , and Heterotypi c Immune Inducti on in Mi ce Inocul ated wi t h Venezuel an Equi ne Encephal i t i s Repl i cons Expressi ng Norwal k Vi rus-Li ke Parti cl es" , JOURNAL OF VI ROLOGY. , vol . 76, no. 2 , 15 January 2002 (2002-01-15) , pages 730-742 , XP055336093 , US ISSN : 0022-538X, D0I : 10. 1128/JVI .76. 2 . 730-742 . 2002 abstract page 731 , l eft-hand col umn , l ast paragraph page 731 , r i ght-hand col umn , paragraph 3 -----	1-75
A	LJUNGBERG KARL ET AL: "Sel f -repl i cati ng al phavi rus RNA vacci nes" , EXPERT REVI EW OF VACC, EXPERT REVI EWS LTD, GB, vol . 14, no. 2 , 1 February 2015 (2015-02-01) , pages 177-194, XP008175780, ISSN : 1744-8395 , D0I : 10. 1586/14760584.2015 .965690 -----	1-75
A	D. BAI LEY ET AL: "Functi onal Analysi s of RNA Structures Present at the 3' Extremi t y of the Muri ne Norovi rus Genome: the Vari abl e Polypyrimi di ne Tract Pl ays a Rol e i n Vi ral Vi rul ence" , JOURNAL OF VI ROLOGY. , vol . 84, no. 6 , 6 January 2010 (2010-01-06) , pages 2859-2870, XP055388557 , US ISSN : 0022-538X, D0I : 10. 1128/JVI .02053-09 -----	1-75

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2017/060673

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-75 (partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-75 (partially)

Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, wherein the at least one encoded polypeptide comprises the amino acid sequence according to SEQ ID NO: 1, and/or a fragment or variant thereof; and subject-matter relating thereto.

2-4410. claims: 1-75 (partially)

Idem as subject 1 but limited to each of the nucleic acids encoding the amino acid sequences as in SEQ ID N0s:2-4410, respectively. Invention 2 is limited to subject-matter relating to SEQ ID N0:2, invention 3 to SEQ ID N0:3 etc. For practical reasons all claims have been assigned to all inventions.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/060673

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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