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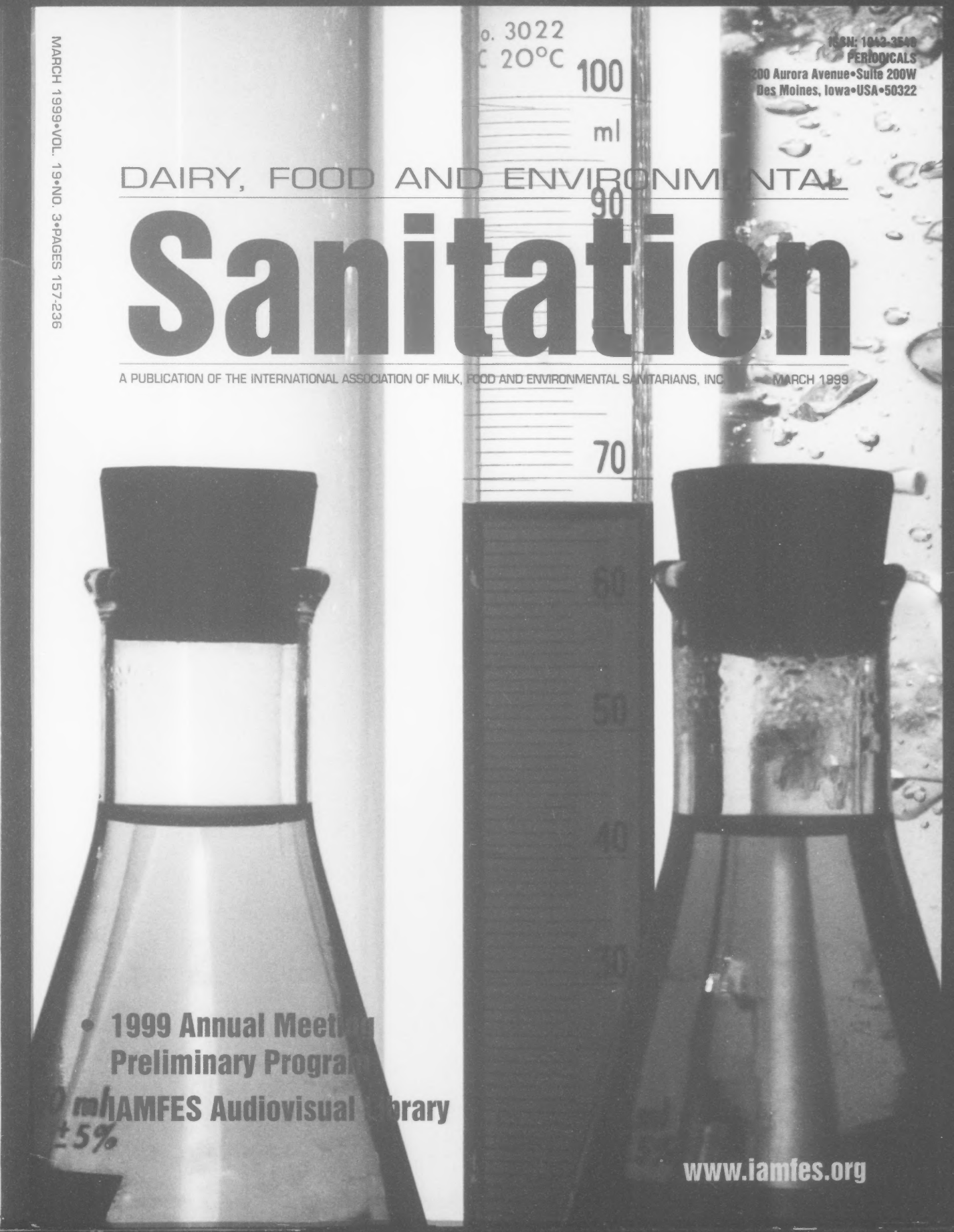
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. — MARCH 1999



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Departments

Extras

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Be part of the excitement – Items donated last year included California wine, a Carolina sweet grass basket, food safety videos, Tennessee Smoked Country Ham, a gift certificate from Omaha Steaks International and imported cigars. Donations are accepted from individuals and groups.

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1999

August 1-4

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2000

August 6-9

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August 5-8

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VIEWS

FROM YOUR PRESIDENT

By ROBERT E. BRACKETT
IAMFES President

"So you want to host the IAMFES Annual Meeting"

Each year your Executive Board receives offers and invitations by local affiliates to host the IAMFES Annual Meeting. Individual IAMFES Members likewise suggest various meeting locations which seem appealing, but which may not have a local affiliate. It is one of the duties of your Executive Board to sort through all these different choices and invitations and come up with locations that best meet the needs of IAMFES and its Members. In this month's column, I would like to share with you some of the factors that are considered when an Annual Meeting site is chosen.

The first thing I would like to point out is that the needs of IAMFES have changed drastically over the past decade or so. Some Members remember the days when IAMFES met at university campuses or in hotels located in small to medium size cities. Although those small, intimate locations were wonderful in their day and added to the family atmosphere for which IAMFES meetings are known, those days are gone. In the past decade, IAMFES has grown to the point where college campuses and small cities can no longer provide the facilities required.

The most obvious requirement for the IAMFES Annual Meeting is the actual meeting venue. In the recent past, IAMFES has held the Annual Meetings in large hotels. In most cases, the hotels have had sufficient meeting space to accommodate our needs. Last year, however, our Annual Meeting took place in a convention center adjoining the hotel. Although we would ideally like to convene our sessions in the hotel, growth in our Annual Meetings may in the future force us into considering the use of convention centers. What are our needs? We typically look for a facility that has sufficient meeting space to accommodate at least 4 concurrent technical sessions, a 20,000 sq. ft. ballroom for our exhibit hall and awards banquet. In addition, we require 12 to 15 smaller meeting rooms in which to hold PDG and committee meetings.

A second equally important requirement for our Annual Meeting is adequate lodging for our attendees. At first glance, this may seem like an easy task. After all, there seems to be many nice hotels in most cities. However, it is more complicated than simply picking out a nice looking hotel. Details that must be considered include:

- **Size:** We require 600+ sleeping rooms. Because hotels need rooms for their "normal" business, we look for hotels with a minimum of 800 rooms. In the past, we've tried to keep our group in a single hotel. However, this may not be possible in the future as our meetings grow. So, several closely located hotels may also be considered.
- **Proximity to meeting rooms:** In past years we were fortunate to be able to hold our meetings in hotels that also offered convention facilities. Again, our expected growth may not allow this in the future. One should also keep in mind that convenience is also important. Meeting rooms that are very spread out make it difficult for attendees to get to their sessions.
- **Room rate:** Your IAMFES Executive Board and staff have always tried to obtain the most affordable housing possible. However, room rates in acceptable hotels have risen drastically in recent years and are anticipated to continue to rise in future years. It must also be kept in mind that there are often many "hidden" costs that affect our Members and must be taken into account. For example, some hotels

offer free parking or airport shuttle service whereas others may have steep charges for the same services. Although it is also advantageous to some of our Members if alternate or lower priced housing is available nearby, we must be careful about promoting such alternate hotels. In most cases, we have negotiated lower room rates and free meeting rooms with the understanding that our group will book a minimum number of rooms. If that minimum is not met, IAMFES will be expected to pay surcharges or penalties.

- **Food Service:** IAMFES also takes into consideration the quality and affordability of meals available to attendees. Not only are the hotel restaurants considered, but the availability and location of off-site eating facilities. Such facilities are especially important to families with children.

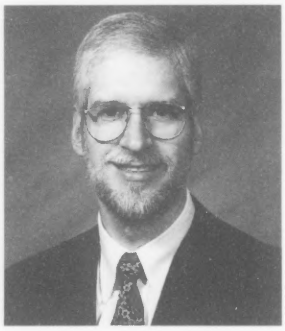
The IAMFES Annual Meeting is primarily a scientific and professional meeting. However, that is not to say that there should not also be FUN involved. In fact, IAMFES has maintained a tradition of having its Annual Meeting being family and fun-oriented and intends to remain that way. So, it should come as no surprise that the availability of recreation facilities, entertainment, and exciting local attractions is important in the selection of a meeting site.

Finally, the enthusiasm and willingness of the local affiliate to host the Annual Meeting is also important to the selection of a meeting site. However, affiliates should not be dissuaded by thinking that hosting the meeting is burdensome. In fact, the amount of effort required of local affiliates is quite minimal compared to past years. The primary responsibility of the local affiliate is to...well... serve as hosts! They are there to make attendees feel welcome, answer questions regarding local attractions, and provide local hospitality. The IAMFES staff handles virtually all other aspects of the meeting, leaving local Members more time to enjoy the sessions and fellowship. It should also be pointed out that the lack of a local affiliate need not preclude the selection of a particular location as a meeting site. It is possible for IAMFES to use professional meeting planners or groups of Members from other locations to undertake the role as "hosts."

Your IAMFES Executive Board appreciates and welcomes suggestions for future Annual Meetings. I am hopeful that this brief summary of requirements will enable you to better serve your Association by suggesting optimum meeting sites.

COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
IAMFES Executive Director

"What additional services could be offered by the Association to make your Membership more valuable?"

Last month in this column, we reviewed the results of the Member survey as it related to the proposed name change. Today, I would like to expand on answers received when the following question was asked, "What additional services could be offered by the Association to make your Membership more valuable?" As you might imagine, a wide range of responses was received, but there were some common themes.

Four common topics related to (1) holding regional seminars or workshops, (2) improved Web site offerings, (3) assistance with employment searches, and (4) content of *Dairy, Food and Environmental Sanitation (DFES)*. Many of the responses to the question were about *DFES*, and understandably so. *DFES* is our monthly communication tool to keep IAMFES Members informed about Association news and to provide articles of interest to our diverse Membership. Comments ranged from wanting more technical information to less theory; from having practical application articles and Members' experience type of articles to presenting more dairy research; and from covering regulatory issues to publishing food safety articles in everyday language (no charts, graphs or tables). As you can see, these responses indicate a variety of readers with a variety of interests and that translates into our diversity of Members!

The comments regarding *DFES* and our publications are certainly timely, but they need further study before changing the direction of *DFES*. We continually strive to offer articles with a variety of topics to appeal to a Membership with broad interests. We are also quite interested in receiving articles for publication that address the needs of our Members and we welcome your submission of manuscripts for consideration for publication.

Another area of interest for our Members is the ability to receive additional educational opportunities in addition to the Annual Meeting. Regional seminars and workshops were mentioned often in the responses. This is an area we have studied and we are attempting to increase our offerings. In the past couple of years, we offered a stand-alone workshop on HACCP resources in two locations. Last fall, we were heavily involved with the ILSI Conference for Microbial Data Collection, Analysis, and Application. Currently, an IAMFES workshop is scheduled for April 12 and 13 in Washington, D.C. It is titled, "An Insider's Look at Microbial Risk Assessment." We are working to expand our educational offerings to enable us to reach out to IAMFES Members who are looking for additional learning opportunities. Your input for course offerings is welcome. If you have ideas and/or a proposal, please contact our office.

The IAMFES Web site was mentioned frequently in responses. "More information on the Web site" was one request. If you haven't visited the Web site recently, please stop by at www.iamfes.org for a new look. Early in January, we uploaded an entirely, re-worked Web site. There is more than four times the amount of information

about IAMFES on the site now than was previously available. Information about the Association, our Annual Meeting, workshops, journals, Membership and more! Please take time to look it over and refer a colleague to the Web site to learn more about IAMFES. We will continue to make additions and improvements to the Web site as time and resources are available. Members from around the globe can now obtain IAMFES information 24 hours a day.

Another topic that came up more than once was for IAMFES to offer assistance in employment searches. This is an area that we can make improvements on and options have been discussed. Currently, we offer to place advertisements in *DFES* at no charge for individual Members who are searching for employment. Employers searching to fill positions may place advertisements in *DFES*, but must pay for the ad space. We hope to expand our ability to assist both employers and Members looking to fill positions and find positions through our Web site. We have some details to work out before we are ready to move this direction, but for timeliness of information, the Web site can't be beat!

I hope this summary gives you additional insight to IAMFES Members and their thoughts. The Executive Board is always looking for ways that we can improve our offerings to Members that help us meet our mission of "Providing food safety professionals worldwide with a forum to exchange information on protecting the food supply." The diversity of IAMFES Members is shown by the many primary job responsibilities and fields of work of the respondents. Even though we are a diverse Membership, we maintain a common goal of "Advancing Food Safety Worldwide."

Now, I would be remiss if I didn't point out that the preliminary program for the IAMFES 86th Annual Meeting is printed in this issue of *DFES*. Please take time to review the program and make your plans now to be in attendance this year in Dearborn, Michigan. The program is excellent and all encompassing for issues of food safety and the latest scientific advances in food microbiology. Our sincere thanks to Jeffrey Farber, Program Committee Chairperson and to this year's Committee Members who devoted their expertise and many hours of their time to assemble the program. We look forward to seeing you this August in Dearborn!

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Surveillance for *Escherichia coli* and Other Pathogens in Retail Premises

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SUMMARY

Verotoxin-producing *Escherichia coli* O157 (VTEC) is very uncommon in cattle and foods in Northern Ireland. It is responsible for a small number of human cases each year, but this number has increased since 1995. *E. coli* O157 has not yet been isolated by the Public Health Laboratory from food in the region. However, in 1995, non-O157 *E. coli* were isolated over twice as frequently from ready-to-eat plant products as from other foods (n = 9720).

Surveys of raw and cooked meats and food contact surfaces (n = 642) showed that butchery practices were generally good, although the possibility of cross-contamination is real. Around 10% of raw minced beef and burgers contained < 10^3 CFU/g *E. coli*. Cooked meats and cutting surfaces were generally free from high numbers of *E. coli* and indicator organisms. Over half of aprons and cloths contained < 10^4 coliforms or *E. coli* per eluate. Fewer than 30% were free of *E. coli*. Butchers' aprons and cloths should be targeted in hygiene training to reduce the likelihood of outbreaks of serious food-borne disease.

INTRODUCTION

The contamination of food with *E. coli* O157 is of increasing concern internationally. This serotype was recognized as a cause of hemorrhagic colitis and bloody diarrhea in 1982/3 *(5, 12)* although it was earlier isolated from a California woman with bloody diarrhea in 1975 *(38)*. There is circumstantial epidemiological evidence that it may possibly be traced to Argentina and Chile ten years earlier and may have entered the northern hemisphere with meat imported from South America *(18)*. Argentina presently has the world's highest frequency (22/100,000 children of 6 to 48 months) of hemolytic uremic syndrome (HUS), although most cases are not associated with the *E. coli* O157:H7 serotype *(30)*. A high occurrence of non-O157 shiga-like toxin-producing strains of *E. coli* has also been reported in Brazil *(16)*.

Since 1983, verotoxin-producing strains of *E. coli* (VTEC) have been identified as the cause of increasing numbers of cases of serious human illness. One of a number of large outbreaks in Scotland *(45)* resulted in 20 deaths, and a massive outbreak in Japan affected more than 9000 people *(7, 21, 39)*. In England and Wales, 90% of VTEC cases are sporadic *(39)*. *E. coli*

TABLE 1. Occurrence of *E. coli* in ready-to-eat food products

Food	Number sampled	Number (%) containing *E. coli*
Beef products	1200	27 (2.25)
Chicken products	1224	34 (2.77)
Ham products	1147	22 (1.92)
Pork products	615	6 (0.98)
Plant products	558	29 (5.20)
Turkey products	425	12 (2.8)
All foods	9720	214 (2.20)

O157:H7 is the serotype predominantly associated with serious illness, but other serotypes and coliforms have been reported to cause similar disease *(28, 47)*. The morbidity and mortality are markedly higher than for other serotypes, and the sequelae of infection are both more serious and more common than for most foodborne pathogens. Young children and elderly people are at particular risk of developing hemolytic uremic syndrome or thrombotic thrombocytopenic purpura (TTP). Antibiotic therapy is generally not helpful and there is some evidence that certain antibiotics may raise the likelihood of HUS and adverse outcomes by increasing the release of verotoxins from bacterial cells *(57, 58)*. Up to 10% of patients may develop these complications. Some die, and a small number may require hospital care for many months afterwards because of renal impairment or other sequelae *(30, 31)*.

The factors surrounding the emergence of this organism have been discussed widely. *E. coli* O157:H7 is most commonly associated with beef, in particular undercooked hamburgers *(20, 39, 55)*. It has also been the cause of outbreaks associated with direct animal and human contact, apple juice *(3, 9, 13)*, fermented sausage *(8)*, dairy products *(19, 36, 44)*, water *(2, 27)*, plant products *(10)* and other foods *(33)*. The infectious dose is considered to be very low, perhaps less than ten bacteria1 *(5, 55)*. Fecal contamination from infected cattle, sheep and wild birds *(52)* appears to be the most common ultimate source of the organism, which can survive for long periods in feces *(53)*.

The number of human cases of *E. coli* O157 in Northern Ireland (NI, population: 1.66 million) has risen in 1997 (30 cases, 1.8 cases per 100,000 general population), but as with *Campylobacter* and other foodborne pathogens, the incidence remains lower than in the rest of the UK (Scotland, 1997: 8.2 per 100,000 *(45)*; England and Wales, 1997: 2.1 per 100,000 *(6, 30, 46)*. Many of the cases are sporadic and no food vehicle has been identified. Animal and environmental sources of infection have been suspected, but seldom positively identified.

A retrospective analysis of non-O157 *E. coli* from all foods examined in 1995 was undertaken to indicate the risk of eating contaminated ready-to-eat foods on retail sale (survey 1). Prompted by rising consumer concern, we undertook two surveys of butchers' shops in 1997. Survey 2 was initiated at the request of local authorities and designed to assess the scale of any problem with the organism in retail foods in Northern Ireland. Survey 3 was part of a larger national survey *(29)* which was designed to assess the occurrence of *E. coli* O157 and other pathogens and indicator organisms in UK butchery premises and to estimate the risk to the public of infection from this source.

MATERIALS AND METHODS

Survey 1

Almost ten thousand foods were examined for a range of pathogens and spoilage organisms, including *E. coli*, during 1995. The methodology is described in the description of survey 2 below. The results of a retrospective analysis of these examinations for *E. coli* are shown in Table 1. Testing for *E. coli* O157 was performed for only in cases of alleged food poisoning (n = 503). Water samples and microorganisms other than *E. coli* were not included in this analysis.

Survey 2

A survey of 124 raw and 125 cooked meats from 120 retail butchery premises was conducted between February and April 1997 in response to increasing public concern about *E. coli* O157. Environmental Health Officers (EHOs) visited various retail butchery premises and took samples of raw and cooked meats. No type of butchery premises was specifically excluded, and EHOs were instructed to take predominantly beef and lamb samples, as available. A small number of premises were sampled more than once. In contrast to the methods used in the PHLS/LACOTS survey *(29)* described later the isolation method for *E. coli* O157, used Dynabeads anti-*E. coli* O157.

E. coli and coliforms were enumerated by using a 3 × 3 multiple tube method according to BS 5763: part 8: 1985, except that Minerals Modified Glutamate Broth (MMGB) was used instead of lauryl sulphate tryptose broth, and Brilliant Green

Bile Broth (BGBB) was used instead of *E. coli* broth. All media were manufactured by Oxoid, England. This Most Probable Number (MPN) method enabled enumeration of *E. coli* without estimations based on the coliform count. *E. coli* was considered to be present if 2 out of 3 of MUG, indole and gas production were positive at 44 ± 0.25°C.

E. coli O157 enrichment culture was prepared by adding 25 g of meat to 225 ml of pre-incubated (42°C) Modified Tryptone Soya Broth (MTSB). Dynabeads anti-*E. coli* O157 were used according to the manufacturer's instructions for the isolation of *E. coli* O157 by immunomagnetic separation (IMS). MTSB was incubated at 42°C and 100 µl of Dynabeads was plated onto Cefixime Tellurite Sorbitol MacConkey (CT-SMAC) agar plates after 6 and 24 h. These plates were incubated at 37°C for 20 to 24 h. Plates were examined for non-sorbitol fermenting colonies; if these were present, five were subcultured onto MacConkey agar and incubated at 37°C overnight. Agglutination tests (Prolex, England) were performed on lactose positive, gram negative bacilli. These were then confirmed biochemically.

Survey 3

As part of a survey organized by LACOTS/PHLS *(29)*, butchers' premises where raw meats are processed and cooked meats are sold were visited between May and August, 1997 by EHOs, who took samples of meat and swabbed surfaces. Butchers who do not process raw meat, delicatessens, supermarkets, and similar establishments were excluded. Separate forms were used to record details of meat products and environmental samples.

At each premise, two samples (<100 g) were taken of raw and two of cooked ready-to-eat meats (including vegetarian burgers). Up to five environmental samples of surfaces and blades were selected. For each surface, two swabs were taken, one for indicator organisms and one for *E. coli* O157. Sterile 50 cm^2 foam sampling sponges with 5 ml neutralizing buffer (Technical Service Consultants Ltd. (TSC), England) were used to sample surfaces, except slicer blades, for which long-handled sterile jumbo foam swabs (TSC) were used for safety. If only one swab was received, this was cut in half; one half was examined for indicator organisms and the other for *E. coli* O157. Disposable sterile plastic templates (10 × 10 cm^2, TSC) were used to delineate the surface area swabbed so that the count per cm^2 could be calculated. The only balance pans sampled by swabbing were those used for raw meats. After sampling, surfaces were decontaminated with Dettox. If one of the environmental samples was not present, no other sample was substituted. An exception was aprons, which were sometimes taken instead of apron cloths that are worn by butchers on their belts and used for wiping surfaces; these cloths were not as widely used in NI as was expected based on their use in other UK regions. Where apron cloths were not available, butchers' aprons were sent to the laboratory in sealed bags to be destructively sampled. All samples were placed in sterile containers and transported to the laboratory in a cool box at a temperature less than 5°C.

Raw meat samples were examined for *Salmonella, Campylobacter*, *E. coli* and *E. coli* O157. Cooked meat samples were also examined for Total Aerobic Plate Count (TAPC), coliforms and *S. aureus*. Swabs from slicer blades, from balance pans, and from raw and cooked meat cutting surfaces were examined for coliforms, *E. coli*, *E. coli* O157 and *S. aureus*, as were aprons and apron cloths.

Surface sponge swabs of cutting surfaces were prepared in 90 ml Maximum Recovery Diluent (MRD) and stomached. Decimal dilutions were prepared and examined for coliforms, *E. coli* and *S. aureus*. Counts were calculated per cm^2. The sponge swab to be examined for *E. coli* O157 was added to 90 ml MTSB and stomached. These broths were incubated at 42°C and examined at 6 and 24 h.

Swabs from slicer blades were transported in 10 ml Swab Resuscitation Medium (SRM). Decimal dilutions were prepared and tested for coliforms, *E. coli* and *S. aureus*, and the counts per swab were calculated. The other swab was transported in MTSB and examined for *E. coli* O157 as previously described.

One half of each apron cloth or similar area cut from an apron was added to 225 ml of SRM and stomached. Decimal dilutions were prepared and tested for coliforms, *E. coli* and *S. aureus*; the counts per sample eluate were calculated. The other half was added to 225 mL MTSB and examined for *E. coli* O157 as already described.

TAPC was determined by adding 25 g of sample to 225 ml MRD, spiral plating on Plate Count Agar (PCA) plates, incubation at 30°C for 48 h, and counting with an IUL Countermat automatic colony counter.

E. coli, *E. coli* O157, and coliform enumerations were performed as in survey 2.

S. aureus was examined by BS 5763: Part 7: 1983 but with the use of both a spiral and a spread Baird-Parker agar plate to achieve the required level of sensitivity.

Salmonella was examined using a method based on BS5763: Part 4: 1993, as follows, 25 g of meat was added to 225 ml buffered peptone water (BPW), homogenized by stomaching, and incubated at 37 ± 1°C for 18 to 24 h. Pre-enrichment culture (100 µl) was sub-inoculated into 10 ml Rappaport Vassiliadis Soya Peptone broth (RVS) and incubated at 42 ± 1°C for 18 to 24 h, 1 ml was than inoculated into 10 ml selenite cystine broth and incubated at 37 ± 1°C for 18 to 24 h. Both enrichment broths were subcultured onto Xylose Lysine Desoxycholate (XLD) and modified Brilliant Green agar (BGA) and incubated at 37°C for 20 to 24 h. Biochemical (Triple Sugar Iron slope; urea slope; MacConkey agar; API 20E, bioMeriéux, England) and serological (polyvalent and monovalent anti-O, anti-H and anti-Vi sera, Prolab, England) tests were used to identify suspect colonies.

TABLE 2a. Cooked meats — coliform and *E. coli* counts

		CFU/g											
		Not detected		< 20		20- < 10^2		10^2- < 10^3		10^3- < 10^4		≥10^4	
Sample	n	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*
Beef pie	28	26	27			2	1						
Beef, sliced	44	31	41	6	1	2	1	3	1	2			
Beef, burger	1	1		1									
Chicken	4	3	4			1							
Pork, sliced	25	19	23	1	1	3	1	1				1	
Ham	1	1	1										
Lasagne	9	9	9										
Sausage	4	4	4										
Sausage roll	4	4	4										
Turkey	5	5	5										
	125	103	118	8	2	8	3	4	1	2	0	1	0

Campylobacter was examined by the Exeter method *(24)*. This involved adding 25 g of meat to 225 ml Exeter *Campylobacter* enrichment broth and incubating at 37 ± 1°C overnight. Incubation was then continued at 42 ± 1°C to give a total period of 46 ± 2 h. Enrichment broths were streaked onto *Campylobacter* blood free selective medium (modified CCDA Preston); plates were incubated microarobically. Suspect colonies were inoculated onto two blood agar plates, of which one was incubated microarobically and the other arobically, at 37 ± 1°C overnight. Colonies growing on the microarobically incubated plate were identified by testing for oxidase, hippurate, and latex agglutination (Oxoid, England).

The methods were based on British Standard methods and have been described elsewhere *(29)*.

RESULTS

Survey 1

E. coli, an indicator of potential contamination with *E. coli* O157, was found over twice as frequently in ready-to-eat plant products than in beef and most other meat products except chicken (Table 1). The majority of these plant products were pre-packed retail and salad bar salads containing a variety of vegetables and sometimes mayonnaise. Pork products contained *E. coli* less frequently than other ready-to-eat foods. The percentage of samples containing *E. coli* differed significantly between food products (χ^2 = 24.8 on 5 d.f., P = 0.00015). Many ready-to-eat food types could not easily be categorized because of unspecified or mixed components. These are included in "all foods" (the sum of the categories already listed plus unspecified/mixed foods) and may have contained one or more of the categories above, although they were not double-counted in these categories. Products were examined for *E. coli* O157 only in food poisoning investigations; the organism was not found in any of 503 samples.

TABLE 2b. Raw meats — coliform and *E. coli* counts

		CFU/g											
		Not detected		< 20		20 - < 10^2		10^2 - < 10^3		10^3 - < 10^4		≥10^4	
Sample	n	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*	Coliforms	*E. coli*
Beef	19	6	16	1	1	3		2		3	1	4	1
Beef burger	4	1	1		3	1		2					
Beef, minced	86	21	63	9	15	14	4	18	2	12	1	2	1
Lamb	1	1	1										
Pork	9	2	4	1	3	1	2	3		1		1	
Sausage	5	1	2			1	2	2				1	1
	124	32	87	11	22	20	8	27	2	16	2	8	3

TABLE 3a. Cooked meats — total aerobic plate count

		CFU/g						
Sample	n	< 10^2	10^2 - < 10^3	10^3 - < 10^4	10^4 - <10^5	< 10^5 - < 10^6	10^6 - < 10^7	≥10^7
Beef, sliced	39	1	-	7	11	12	1	6
Ham, sliced	25	2	1	6	5	6	-	3
Poultry, sliced	6	-	-	1	2	3	-	-
Pies/pasties	22	15	1	3	-	2	1	-

Survey 2

Table 2a shows that most cooked meats had no coliforms or *E. coli*, in contrast to raw meats, in which these counts were sometimes high (Table 2b).

The 125 cooked meat samples (Table 2a), consisted of 73 beef samples (58.4%), 25 pork samples, and 27 other cooked meats (chicken, turkey, ham, lasagne, sausage and sausage roll). *E. coli* was not detected in 118 of 125 cooked meats. Low numbers of *E. coli* were detected in 3 samples of sliced beef and 2 samples of sliced pork (5.6 % of all samples).

Of 124 raw meat samples (Table 2b), 109 were beef (87.9%) and some of the 5 sausage samples may have contained beef. *E. coli* was not detected in 87 of the 124 samples. In products in which it was detected (29.8% of total), only 7 (5.6% of all samples) were contaminated at a level above 100 CFU/g. Minced beef constituted almost 70% of raw meats sampled, and for this reason *E. coli* was found most frequently in this product. *E. coli* O157 was not detected in any sample.

Survey 3

Forty-nine butchers' shops were visited once only, and 393 samples were taken. The numbers of samples taken were: raw meat (97), cooked meat (92), raw meat cutting surfaces (49), cooked meat cutting surfaces (42), weighing balance pans (40), slicer blades (49) and apron/apron cloths (24). The results are shown in Tables 3 through 8.

E. coli O157, *Salmonella* and *Campylobacter* were not detected in any of the samples examined. Coliforms, *E. coli* or *S. aureus* were not detected on any of 40 balance pans sampled. Approximately 10% of raw minced beef and burgers contained over 10^3 CFU/g *E. coli*, and more than 50% of aprons and cloths contained over 10^4 coliforms or *E. coli* per eluate. Fewer than 30% were free of *E. coli*.

Slicer blades were found to be generally satisfactory, but a small number were contaminated. Cutting surfaces for cooked products were

TABLE 3b. Cooked meats — coliforms

		CFU/g				
Sample	n	ND	< 20	20 - < 10^2	10^2 - < 10^3	≥10^3
Beef, sliced	39	21	6	5	1	5
Ham, sliced	25	17	3	1	2	2
Poultry, sliced	6	4	1	1	-	-
Pies/pasties	22	21	1	-	-	-

TABLE 3c. Cooked meats — *E. coli*

		CFU/g				
Sample	n	ND	< 20	20 - < 10^2	10^2 - < 10^3	≥10^3
Beef, sliced	39	36	1	-	1	1
Ham, sliced	25	24	1	-	-	-
Poultry, sliced	6	6	-	-	-	-
Pies/pasties	22	22	-	-	-	-

TABLE 3d. Cooked meats — *S. aureus*

		CFU/g				
Sample	n	ND	< 20	20 - < 10^2	10^2 - < 10^3	≥10^3
Beef, sliced	39	37	-	1	-	1
Ham, sliced	25	24	1	-	-	-
Poultry, sliced	6	6	-	-	-	-
Pies/pasties	22	21	-	1	-	-

(n=92)

ND, not detected

less contaminated than cutting surfaces for raw meats, but both sometimes had high numbers of indicator organisms.

DISCUSSION

Outbreaks caused by verotoxigenic *Escherichia coli* O157 have been extensively investigated in the UK *(3, 51)*. Highly sensitive methods exist for the detection of verotoxigenic *Escherichia coli* O157 and other serotypes *(14, 50)*. Authors have reported both the high prevalence of potentially toxigenic *E. coli* in a variety of products studied with DNA probes (17%) *(43)*, (17%) *(54)* and PCR (16%), and low prevalence (0.3%) *(22)* in products studied with conventional biochemical and immunological methods (0%) *(40)*, (0%) *(11)*, (1%) *(37)*, (0 and 2.4%) *(49)*.

The isolation of *E. coli* O157 from human, animal and food sources indicates that prevalence is low in Northern Ireland. Nevertheless, incidents of animal infection and of carcass and food contamination will occur occasionally. Market changes in the meat industry have required butchers to cater to more diverse tastes and thus to sell an increasing variety of meat and non-meat value-added products. These, and traditional meat cuts, are susceptible to cross-contamination from raw meat and may be undercooked, leading to human infection. The risks are not limited to retail butchers and may affect large commercial processors *(33)*. The absence of *E. coli* O157 in the high risk premises visited is encouraging and reflects a low occurrence nationally *(29)*. *E. coli* was rarely present in ready-to-eat meats, and high coliform and *S. aureus* counts were very uncommon. The numbers of indicator organisms and absence of evidence of cross-contamination with *Salmonella* and *Campylobacter* are also indications that these organisms contaminate red meat infrequently and that good hygienic practice generally is being observed by butchers. However, larger surveys using both cultural and molecular detection methods would

TABLE 4. Raw meats — *E. coli*

		CFU/g				
Sample	n	ND	< 20	20 - < 10^2	10^2 - < 10^3	≥10^3
Minced	22	9	6	2	3	2
Burger	39	17	10	6	2	4
Sausage	35	18	7	7	1	2
Beef	1	-	-	-	-	-

(n=97)

TABLE 5. Aprons/apron cloths

			CFU/eluate			
Organism	ND	< 20	20 - < 10^2	10^2 - < 10^3	10^3 < 10^4	≥10^4
Coliforms	2	-	4	1	2	15
E. coli	7	4	3	3	2	5
S. aureus	18	-	2	2	2	-

(n=24)

give greater assurance for infrequently occurring pathogens such as *E. coli* O157.

Presence of indicator organisms provides evidence of some risk of cross-contamination from environmental surfaces, as would be expected. The area of greatest concern is aprons and apron cloths. Only raw meat cutting surfaces were also frequently contaminated with *E. coli*, with the number of organisms lower than on aprons. Over half of aprons had more than 20 *E. coli* per eluate, and over half had more than 10^4 coliforms per eluate, which potentially could include VT-producers.

Previous unpublished survey results identified the chain mesh and cloth aprons of meat plant workers as carriers of high counts of bacteria. The apron collects organic and microbial contamination from many pieces of meat, and the body temperature of the wearer enables bacteria to grow well even in a chilled working environment. It will probably be necessary for the working butcher to change disposable aprons and cloths frequently to avoid this cross-contamination hazard. If VTEC organisms become more prevalent in meat, their transmission between products via aprons is likely. It has been shown that the infectious dose of O157 VTEC may be 10 CFU/g food *(55)* or lower *(4)*, and this could cause illness in many individuals. Of 109 samples of raw beef/burger/mince in survey 1, 29 (26.6%) contained *E. coli*, although most counts were very low. Of 37 raw and 6 cooked meat samples containing *E. coli*, only five raw meats had *E. coli* counts grater than 1000 CFU/g (Table 2).

Because a hazard exists even with low levels of *E. coli* O157, occasional contamination of some foods with low numbers of VTEC may be epidemiologically more important than growth to higher numbers in fewer foods. This is unlike most other food pathogens, for which the ingestion of higher numbers is generally required for infection or intoxication. Meat contamination is influenced mainly by the hygienic standards during slaughter, in particular the cleanliness of the hide and the process of hide-pulling. The proportion of contaminated carcasses probably relates to the incidence of human disease more closely than the numbers of bacteria causing contamination. Parameters such as temperature that are used in Hazard Analysis Critical Control Point (HACCP) monitoring are of less relevance for specific pathogens (presence/absence) than for total counts (growth). The most important factor in preventing contamination with VTEC is the skill and practices of the meat plant personnel. For VTEC in raw meat, therefore, HACCP may be difficult to monitor effectively.

Immunomagnetic separation methods (IMS) *(41)* may be used to enhance the concentration of organisms such as *E. coli* O157. These were used in survey 1 but not in survey 2, because of concerns about interference by fats in some of the meat products to be examined. Workers in France found no classical *E. coli* O157:H7 in a survey of 250 foods but did find a small number of related atypical phenotypes. These workers reported that the fatty matrix of cheeses may interfere with the settling of immunomagnetic beads, allowing their aspiration during washing steps and resulting in false-negative results *(49)*. Other reported causes of reduced sensitivity include non-specific binding of non-target bacteria to beads *(48)* and reaction inhibition when PCR is used *(17, 56)*. It has been demonstrated that enrichment and selective plating using 100 µl, but not 10 µl of broth, is as sensitive in recovering *E. coli* O157 as immunomagnetic separation methods, but is less selective *(15)*.

TABLE 6. Slicer blades

	CFU/swab					
Organism	ND	< 20	20 - < 10^2	10^2 - < 10^3-	10^3 <10^4	≥10^4
Coliforms	26	4	6	3	1	4
E. coli	43	3	3	-	-	-
S. aureus	48	-	-	-	1	-

(n=49)

TABLE 7. Cutting surfaces for cooked products

	CFU/cm^2					
Organism	ND	< 20	20 - < 10^2	10^2 - < 10^3-	10^3 - <10^4	≥10^4
Coliforms	32	4	4	1	-	1
E. coli	37	3	1	-	-	1
S. aureus	-	-	-	-	-	-

(n=42)

TABLE 8. Cutting surfaces for raw meats

	CFU/cm^2					
Organism	ND	< 20	20 - < 10^2	10^2 - < 10^3-	10^3 <10^4	≥10^4
Coliforms	36	8	4	5	1	6
E. coli	35	5	7	-	-	3
S. aureus	-	-	-	-	-	-

(n=49)

Conventional tests for *E. coli* will not detect *E. coli* O157 because most strains are unable to ferment sorbitol, produce β-glucuronidase, or grow at 44°C. *E. coli* O157 would be detected only as a coliform in many screening tests. Given its increasing prevalence, this serotype should now be sought specifically. Although non-O157 *E. coli* serotypes that produce verotoxins and other VT-producing coliforms have been shown to cause illness, *E. coli* O157:H7 is a much more common pathogen in Western countries. Non-O157 organisms are responsible for only a small number of verocytotoxin-mediated illnesses *(28, 50)*.

Between 1989 and 1993, only 1 to 2 reports of clinical *E. coli* O157 isolations were made each year in Northern Ireland *(35)*. During 1995, there were seven sporadic cases of human infections. In 1996 and 1997, there were 14 and 25 notifications of human *E. coli* O157 infections *(34.)* In 1997 there were 30 cases. In the 1995 food survey, most cooked meat products had an *E. coli* prevalence of about 2%. *E. coli* O157 was not found in foods associated with food poisoning when these were examined using Sorbitol McConkey agar (detection limit, 20 CFU/g).

Our results for non-VT producing *E. coli* indicate that the risk of infection from ready-to-eat plant products may have been underestimated. *E. coli* were found in plant products such as salad vegetables, prepared salads, and mayonnaise salads over twice as often as in most meat products. Survival and growth of *E. coli* O157 has been reported on salad vegetables, particularly those not refrigerated *(1)*. Recent isolations from alfalfa sprouts and radishes confirm this. In the massive Japanese outbreak affecting many thousands of people, meals including uncooked ingredients such as radishes were temperature abused, which allowed the pathogen to reach high numbers before consumption. Salad products commonly have high aerobic plate counts and coliform counts that can be reduced by only 1 to 2 log units even when hypochlorite is added to the wash water *(23, 26)*. The importance of using VTEC-free seeds or heat-treated sprouts is emphasized by a study that showed that VTEC was present in the inner tissues of radish sprouts and was resistant to disinfection with $HgCl_2$ *(25)*. Attention should be given to the hygiene of vegetable growing and preparation and not just to meat.

In a local survey using IMS and Enzyme Linked ImmunoSorbent Assay (ELISA), only 2.2% of cattle feces contained *E. coli* O157 strains. Although high prevalence was detected on a single farm, carcass contamination in abattoirs was rare *(32)*. This reflects the low regional incidence of

human *E. coli* O157 infection. These results indicate that, although *E. coli* O157 does not frequently contaminate raw or cooked meats or the environment, coliforms and *E. coli* as indicators of fecal cross-contamination are not uncommon. Experience in Scotland *(45)* and elsewhere shows that outbreaks may occur in an explosive manner once VTEC enters high-risk premises.

An editorial in the British Medical Journal has stated, "The prevention of outbreaks of *Escherichia coli* O157 may rest principally on the judicious application of the time honored principles of public health rather than on research," *(42)*. These mundane principles are of the greatest benefit in preventing outbreaks in the near future and their widespread application is of more importance than sophisticated fundamental, epidemiological and molecular research after illness has occurred. Nevertheless, fulfilling hygiene recommendations does not guarantee freedom from pathogens *(29)*.

In conclusion, *E. coli* O157 is very uncommon in cattle and foods in Northern Ireland, and causes a low but increasing number of human illnesses each year. Although hygiene standards appear generally to be satisfactory, if *E. coli* O157 becomes more common in raw foods, outbreaks must be expected. On the basis of these surveys, butchery practices appear generally to be adequate, but the possibility of cross-contamination is real. Hygiene training of abattoir and butchery workers, and monitoring of Good Manufacturing Practice, should be priorities in preventing the dissemination of *E. coli* O157. Butchers' aprons and cloths should be targeted to improve hygiene and reduce the likelihood of outbreaks of foodborne disease. The higher-than-expected isolation of *E. coli* from ready-to-eat plant products requires further investigation to determine whether this represents a risk of infection with verocytotoxin-producing organisms.

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Survival of Enterococci and Coliforms in Baby Swiss Cheese during Different Stages of Manufacture and Storage

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SUMMARY

Ten strains of enterococci were characterized for survival in Baby Swiss cheese after exposure to representative stresses from the manufacture process. In the first study, enterococci and coliforms were injected into unripened Baby Swiss cheese, which was then ripened and stored at either 4°C or 10°C. In study 2, enterococci survival in 23% salt brine + 2% whey was determined. Finally (study 3), enterococci were sequentially exposed to 150 mM lactic acid (pH 5.2) and brining, followed by exposure to conditions of ripening in Baby Swiss cheese. In study 1, enterococci and coliforms significantly increased ($P<0.05$) in number during ripening. During the subsequent 12 weeks of storage at two temperatures (4°C or 10°C), enterococci survived without any significant changes in number, but the coliform population was significantly reduced ($P<0.05$) at both temperatures. In study 2, after about 1 log CFU/g decrease in the first 12 h, enterococci survived in 23% salt brine for 14 days at 10°C without any significant changes in cell concentration. In study 3, even after the additional sequential acid and brine stresses were applied, enterococci survived ripening, as in study 1. Exposure to lactic acid significantly enhanced subsequent enterococci survival in 23% salt brine. In all studies, the dominant *Enterococcus* isolates were *E. faecium* Biotype 1 and *E. faecalis* Biotype 2. Overall, enterococci survived the model manufacture stresses, grew during ripening of Baby Swiss cheese, and survived during storage at 4°C or 10°C. Their presence in Baby Swiss cheese could indicate contamination at any of several manufacturing steps.

INTRODUCTION

The genus *Enterococcus* consists of over 20 species, of which *E. faecalis* and *E. faecium* are the most common ones isolated from food *(10)*. Ingham, et al. *(11)* suggested that enterococci may be a more useful sanitation indicator than coliforms for finished product testing of some cheeses. Aleksandreva *(1)* reported that a thorough washing and disinfection of all product contact surfaces significantly reduced the number of enterococci in dairy products. Although enterococci are widely distributed in nature via fecal contamination, they may gain entry into dairy products such as Swiss cheese through milk, water supplies, equipment, and insanitary/unhygienic conditions of production and handling *(9)*.

The presence of enterococci in dairy products suggests direct or indirect fecal contamination *(4, 9)*. Studies need to be done to clarify how the manufacture process and storage of dairy products contribute to survival or growth of enterococci. In a previous study *(20)*, we reported that before the dairy industry could widely accept entero-

cocci as an indicator for sanitation and quality, it was important to (1) determine the typical prevalence of enterococci in dairy products, (2) understand their ability to survive and grow in dairy products, and (3) optimize methodology for enumeration. This study found that enterococci were more prevalent than coliforms in retail Swiss cheese; it was therefore suggested that enterococci could be more easily correlated with sanitary conditions during processing and with environmental conditions during storage. Swiss cheese was studied for two reasons. First, Quality Assurance personnel at the University Wisconsin-Madison dairy plant were having problems correlating the currently used indicator group, coliforms, to quality problems occurring after manufacture and storage. Second, microbiological, physical, and chemical characteristics make Swiss cheese more susceptible to problems than cheeses with lower pH and moisture content, and different ripening procedures. We concluded that a step-by-step analysis of survival/growth of enterococci during the manufacture and storage of Swiss cheese must be done to thoroughly understand the relationship(s) among prevalence of enterococci, sanitary quality, and storage conditions *(20)*.

Swiss cheese has no internationally recognized definition that differentiates it from other varieties. The body and texture correspond to those of hard or semi-hard cheeses. Swiss-type cheeses were originally manufactured in Emmen Valley in Switzerland. Emmentaler, commonly referred to as Swiss cheese, is the best known Swiss-type cheese. Gruyére and Appenzeller are other types of Swiss-type cheese *(8)*. In the United States, the Code of Federal Regulations (CFR) has a standard of identity for Swiss cheese (Title 21, Section 133.95) and the manufacture of Swiss cheese (Title 21, Section 133.196). The standard of identity allows the manufacturer to produce a more consistent product. Although there is a standard of identity in the United States for Swiss cheese, the manufacture process has multiple steps and many variations *(2)*. The manufacturing steps considered here include setting the milk, cutting the curd, draining whey and re-hydrating curds, cooking, pressing, cooling, brining, packaging and sealing, warm room treatment, and ripening for flavor *(14)*. Compared with Swiss cheese, Baby Swiss cheese is manufactured by a process that involves a mesophilic starter and a lower cook temperature for a longer time *(8, 14)*.

The study reported here was conducted to characterize the survival and/or growth of enterococci in Baby Swiss cheese. We compared enterococci and coliforms inoculated just before ripening at 22 ± 1°C and storage at either of two temperatures. Storage temperatures studied were adequate and abusive (4°C or 10°C) refrigeration temperatures. We then developed a model system for two sequential stresses involved in the manufacture of Baby Swiss cheese: lactic acid development and brining. Enterococci were exposed to these stresses before being inoculated into Baby Swiss cheese, which was then ripened.

MATERIALS AND METHODS

The following studies were conducted: (1) survival of enterococci and coliforms (indigenous and inoculated) during ripening and storage of Baby Swiss cheese, (2) survival of enterococci during brining and during acidification plus brining in laboratory media, and (3) survival of enterococci during acidification plus brining in laboratory media, followed by ripening in Baby Swiss cheese.

Samples

Unripened 10-pound Baby Swiss cheese wheels were obtained from the University of Wisconsin-Madison dairy plant for the first study. The cheese wheels had a pH of 5.9 and contained 36.6% moisture, 0.7% salt, and 34% fat, as determined by microwave drying, chloride specific electrode measurements, and modified Babcock methods, respectively *(17)*. Blocks weighing 20-pounds of the same cheese were obtained for the third study. The cheese blocks were at pH 5.7 and contained 38.1% moisture, 0.5% salt, and 32% fat, determined as described for the 10-pound wheels.

Sample preparation and presumptive enumeration methods for coliforms and enterococci

Samples from un-inoculated and inoculated cheeses were obtained using a 20 mm (diameter) sterile trier with the cheese at both ends aseptically trimmed to obtain an 11-g sample plug. Each sample was diluted 1:10 with 0.1% (w/v) peptone (Difco Laboratories, Detroit, MI) water, homogenized for 2.0 minutes using a stomacher (Seward Model 400, London, UK), and diluted as appropriate using 0.1% peptone water. After sampling was complete, the sampling holes were sealed with a mixture of petroleum jelly and wax *(10, 17)*.

Presumptive enterococci were enumerated, in duplicate, using Kanamycin Esculin Azide agar (KEA; Oxoid, Ogdensburg, NY) pour plates, and incubation at 37 ± 1°C for 18 to 24 h. Presumptive coliforms were enumerated using Coliform Count Petrifilms (Petrifilm: 3M, St. Paul, MN) and incubation at 32 ± 1°C for 18 to 24 h. Isolates with the dominant representative morphology were obtained for each enterococci and/or coliform positive sample and identified as described by Parks and Ingham *(20)*.

Preparation of inocula

The organisms were obtained from the American Type Culture Collection (ATCC, Rockville, MD) and Centers for Disease Control and Prevention (CDC, Atlanta, GA) culture collections, and from isolates obtained in our retail Swiss cheese survey *(20)*. Because the organisms would be introduced as one suspension in a cocktail fashion, the selected organisms were screened for antagonistic activity for closely related bacteria within each of two respective groups, enterococci and coliforms.

TABLE 1. Cultures selected for a cocktail inoculum

Enterococci	Coliforms
Isolate # 118 *Enteracaccus faecalis* Biatype 1	*Escherichia cali* ATCC 25922
Isolate # 152 *Enterococcus faecium* Biatype 1	*Escherichia cali* ATCC 4351
Isolate # 155 *Enterococcus faecalis* Biotype 3	*Citrabacter amalonaticus* ATCC 25405
Isolate # 167 *Enterococcus durans* Biotype 2	*Enterabacter cloacae* ATCC 29893
Isolate # 171 *Enteracaccus faecium* Biotype 2	*Enterabacter aeragenes* ATCC 13048
Enterococcus faecalis Biotype 2 ATCC 19948	*Klebsiella pneumoniae* ATCC 29016
Enterococcus faecium Biatype 1 CDC 1916-77	Isolate # 141 *Klebsiella pneumaniae*
Enterocaccus faecalis Biotype 1 ATCC 19433	Isolate # 173 *Klebsiella oxytaca*
Enteracaccus faecium Biotype 1 ATCC 6569	
Enterocaccus faecalis Biatype 1 ATCC 29212	

The screening procedure consisted of a spot-on-lawn technique *(5, 18)*. The selected organisms were streaked onto Brain Heart Infusion (BHI: Difco Laboratories Detroit, MI) for enterococci and Nutrient agar (Difco) for coliforms and were then incubated at 37 ± 1°C for 18 to 24 h or at 32 ± 1°C for 18 to 24 h, respectively. After incubation, a suspension (1.0 McFarland concentration in 0.1% peptone water) was made of each organism, after which the organisms were streaked onto BHI or Nutrient agar to achieve a confluent lawn of growth. Prior to 24 ± 1 h incubation (at the same temperatures), the streaked plates had 0.005 ml from each of the other suspensions within the respective group pipeted onto the surface at identified locations. Immediately following incubation, the plates were illuminated to observe any zones of clearing, which indicate antagonism. Only non-antagonistic organisms within the same group were selected for a cocktail inoculation.

Each organism within the enterococci and coliforms groups (Table 1) was streaked onto either BHI or Nutrient agar, incubated, and suspended again in 0.1% peptone water. A composite suspension was made by combining 0.5 ml from each suspension, within the group, in a single sterile tube. Each composite suspension was standardized (~10^8 CFU/ml) by slowly adding 0.1 ml of composite suspension to fresh 0.1% peptone water until an absorption at 625 nm of 0.09 to 0.10 units was obtained on the spectrophotometer (Spectronic 20: Milton Roy Rochester, NY). After standardization, the suspension was diluted 1:100, using 0.1% peptone water to reach the final desired concentration (~10^6 CFU/ml). This procedure was repeated for three trials per group. Cells in each composite suspension were enumerated by appropriate decimal dilutions in 0.1% peptone water, plating in duplicate, and incubating as already described.

In study 1, each of six (two sets of three per group) unripened Baby Swiss cheese wheels for each group had two adjacent holes horizontally bored into them, with a 1.0 ml sterile pipet used per injection, after which 0.1 ml of the cocktail was injected with a sterile syringe into one of the two holes. This procedure was repeated nine times per cheese wheel. Indigenous cell concentrations for enterococci and coliforms were obtained from un-inoculated areas within each wheel.

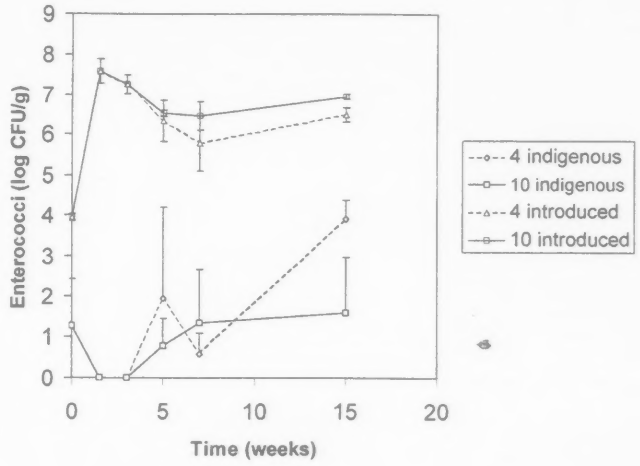
Ripening, storage, and sampling in study 1

After inoculation, cheese wheels were ripened at 22 ± 1°C with 75 ± 5% relative humidity for three weeks *(14)*. Samples were obtained at 10 days and 21 days from three randomly chosen wheels per group for un-inoculated and inoculated cheese. At the completion of ripening, three wheels per group were stored at 4 ± 1°C and three other wheels per group were stored at 10 ± 1°C for twelve weeks. Samples were then obtained from un-inoculated and inoculated cheese after 2, 4, and 12 weeks storage at 4°C or 10°C.

Sequential manufacture stresses: brining and acid + brining + ripening

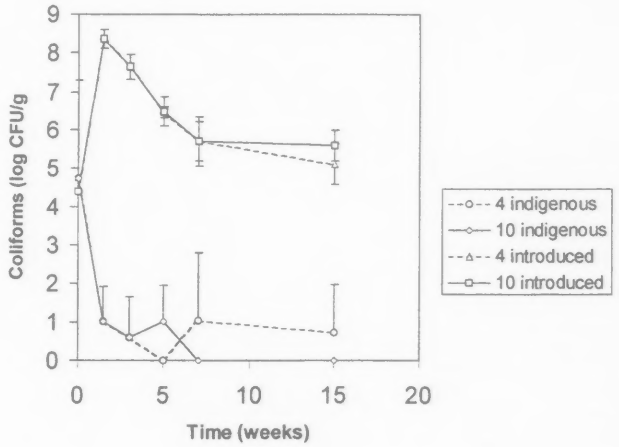
Three trials each were conducted for studies 2 and 3. First, 1.0 ml of an undiluted enterococci cocktail (made

Figure 1. Enterococci concentrations (indigenous and introduced) in Baby Swiss cheese during ripening and storage[a]



[a]The ripening period was for 3 weeks and was followed by 12 weeks storage at 4°C or 10°C. The threshold of detection was 1 log CFU/g.

Figure 2. Coliform concentrations (indigenous and introduced) in Baby Swiss cheese during ripening and storage[b]



[b]The ripening period was for 3 weeks, and was followed by 12 weeks storage at 4°C or 10°C. The threshold of detection was 1 log CFU/g.

as described) was added to 100 ml each of sterile brine containing 12, 18, and 23% (w/v) NaCl (Sigma Chemical, St. Louis, MO) supplemented with 2% (v/v) pasteurized whey *(13, 23)* obtained from the University of Wisconsin-Madison dairy plant. The inoculated brines were stored for 14 days at 10 ± 1°C. After an initial sampling at time zero, samples were taken at 12 h, 24 h, 36 h, 48 h, 4 days, 7 days, and 14 days. Enterococci were enumerated using duplicate plates of KEA (pour plate) and BHI (spread plate) agar, with incubation at 37 ± 1°C for 18 to 24 h.

Acidified Tryptic Soy broth (100 ml TSB: Difco) was prepared by adding lactic acid to a concentration of 150 mM/l (Sigma) *(21, 22)* and adjusting pH to 5.2 ± 0.05 at 25°C with 10 N HCl (Sigma). The enterococci cocktail (1.0 ml) was added to achieve a concentration of ~10^6 CFU/ml, and the inoculated medium was incubated anaerobically in a jar (Becton Dickinson, Cockeysville, MD) at 17 ± 1°C for 25 ± 1 h *(14, 15)* to simulate the reduced O_2 environment in Baby Swiss cheese. After incubation, enterococci were enumerated as already described, and the TSB was then centrifuged (11,400 × g at 20°C) in a Marathon Model 21 K centrifuge (Fisher Scientific, Pittsburgh, PA) for 15 minutes. Following centrifugation, the cells were re-suspended in 100 ml 23% NaCl brine supplemented with 2% pasteurized whey and incubated for 24 ± 1 h at 10 ± 1°C to simulate brining of Baby Swiss cheese. At the conclusion of incubation, enterococci were enumerated again.

In study 3, the enterococci cocktail was introduced into the acidified TSB, incubated, and enumerated. After centrifugation, the cells were re-suspended in 23% NaCl brine supplemented with 2% pasteurized whey, incubated, and enumerated. The samples were centrifuged, the cells were re-suspended in 10 ml 0.1% Peptone water, and 0.1 ml of this suspension was injected into unripened Baby Swiss cheese blocks. Once enterococci were inoculated into cheese, they were enumerated using duplicate plating on KEA, and the

TABLE 2. Dominant indigenous and introduced enterococci (species and Biotype) and coliforms (species) recovered from Baby Swiss cheese during ripening and storage[c]

Storage Temperature	Indigenous Enterococci	Introduced Enterococci
4°C	*E. faecium* 1 (60)	*E. faecalis* 2 (75)
10°C	*E. faecalis* 2 (75)	*E. faecalis* 2 (75)
Storage Temperature	**Indigenous Coliforms**	**Introduced Coliforms**
4°C	*Enterobacter aerogenes* (75)	*Escherichia coli* (50)
10°C	*Klebsiella pneumoniae* (50)	*Enterobacter aerogenes* (75)

[c]Numbers in parentheses indicate percentage of isolates for a given bacterial group.

Table 3. Survival of enterococci in various salt brine concentrations

Interval	12%#		18%		23%	
	BHI	KEA	BHI	KEA	BHI	KEA
	Log CFU/ml	Log CFU/ml	Log CFU/ml	Log CFU/ml	Log CFU/ml	Log CFU/ml
Zero	6.41 ^{a1*}	6.40 ^{a1}	6.41 ^{a1}	6.40 ^{a1}	6.41 ^{a1}	6.40 ^{a1}
12 h	5.83 ^{b1}	5.78 ^{b1}	5.89 ^{b1}	5.74 ^{b2}	5.77 ^{b1}	5.67 ^{b1}
24 h	5.84 ^{b1}	5.72 ^{b1}	5.78 ^{b1}	5.54 ^{b2}	5.65 ^{b1}	5.33 ^{b2}
36 h	5.73 ^{b1}	5.62 ^{b1}	5.61 ^{b1}	5.58 ^{b1}	5.60 ^{b1}	5.60 ^{b1}
48 h	5.47 ^{b1}	5.48 ^{b1}	5.49 ^{b1}	5.57 ^{b1}	5.44 ^{b1}	5.43 ^{b1}
4 days	5.89 ^{b1}	5.71 ^{b2}	5.96 ^{b1}	5.72 ^{b2}	5.85 ^{b1}	5.65 ^{b2}
7 days	5.82 ^{b1}	5.62 ^{b2}	5.78 ^{b1}	5.53 ^{b1}	5.73 ^{b1}	5.45 ^{b2}
14 days	5.71 ^{b1}	5.51 ^{b2}	5.78 ^{b1}	5.66 ^{b2}	5.70 ^{b1}	5.60 ^{b1}

*Time at 10±1°C.

#Concentration (w/v) of sodium chloride. Brines also contained 2% (v/v) pasteurized whey.

*Different letter superscripts within a column indicate statistically significant differences

($P < 0.05$) in mean (n = 3) log CFU/ml. For a given combination of brine concentration and time, different numerical superscripts indicate statistically significant differences in mean (n = 3) log CFU/ml for BHI vs. KEA media.

TABLE 4. Enterococci survival in acidified TSB and subsequent brining[a]

Time	BHI (Log CFU/ml)	KEA (Log CFU/ml)
Inoculation into TSB + Lactic Acid	5.82	5.83
End of Lactic Acid Exposure	5.68	5.67
End of Brine Exposure	5.43	5.37

[a]The survival of enterococci in TSB + 150 mM lactic acid (25±1 h at 17±1°C) followed by 23% (w/v) NaCl brine + 2% (v/v) pasteurized whey (24±1 h at 10±1°C).

Values are mean (n = 3) log CFU/ml determined by using BHI and KEA agar methods.

cheese blocks were ripened as previously described. Samples for enterococci enumeration were taken after 10 and 21 days of ripening.

Statistical analysis

CFU/g or CFU/ml for each sample was transformed to log CFU/g or log CFU/ml using the protocol of Jarvis *(12)*. Transformed data were analyzed on the Minitab statistical package (11.21 Minitab, Inc., State College, PA) *(3)*. In all three studies, the paired Student's *t*-test was used to compare the mean (n = 3) CFU/g or CFU/ml obtained from different samples for each pair of sampling intervals. Again, using the Student's *t*-test, method pairs for each interval were compared using the mean values (n = 3) for concentrations of inoculated and indigenous enterococci and coliforms. In study 1, a paired Student's *t*-test was also used to compare the results obtained with different storage temperatures for each microbial group. In study 2, the same test was performed on data from each pair of sampling intervals to compare the effects of different salt concentrations for each group. Additionally, Student's *t*-test was performed on data from studies 2 and 3 to determine whether acid adaptation enhanced enterococci survival in brine *(7)*.

RESULTS AND DISCUSSION

Based upon the results of our retail Swiss cheese survey *(20)*, we explored the ability of enterococci to survive and grow in Baby Swiss cheese. Because indicator organisms are normally not part of the natural flora present, the organisms provide information on the sanitary practices during Swiss cheese manufacture, several steps of which may be detrimental to survival of indicator organisms. The first of these steps is lactic acid production by the starter cultures. With lactic acid production, the pH drops to a predetermined value (5.2), and the cheese is moved to an environment (22 ± 1°C warm room), which allows an adjunct culture, *Propionibacterium freudenreichii* subsp. *shermanii*, to multiply and produce metabolic products including propionic acid, acetic acid, and CO_2, the last of which results in characteristic eye development. After the cheese is ripened, it is refrigerated, which allows for further curing until it is distributed for sale. The pH reportedly increases to 5.85 ± 0.5 after several months of chilled storage *(6, 8, 14, 15)*.

In study 1, we compared the growth, survival, or decline of enterococci and coliforms during ripening and storage at two temperatures in Baby Swiss cheese. Storage temperatures studied were 4 and 10°C, which represent adequate and abusive refrigeration temperatures over a 12- week period.

Indigenous enterococci concentration was initially 1.27 log CFU/g, and, as the study proceeded, it decreased to less than 10 CFU/g during the three-week ripening (Fig. 1). After ripening and during storage, the enterococci concentration increased to 3.91 log CFU/g and 1.59 log CFU/g after 12 weeks storage at 4 and 10°C, respectively. Indigenous enterococci concentration increased significantly ($P < 0.05$) between 4 and 12 weeks during 4°C storage, yet there were no significant changes at 10°C storage temperature. The inoculated enterococci concentration increased significantly ($P < 0.05$) during the first 10 days of ripening and stabilized at 7.27 log CFU/g at the completion of ripening (Fig. 1). Once the cheese was ripened, it was stored at 4 and 10°C; no significant ($P < 0.05$) changes were observed in cell concentration during the 12 weeks storage at either temperature.

Initial indigenous coliform concentration was 4.74 log CFU/g, and, just as with indigenous enterococci, this decreased during ripening (Fig. 2). But, unlike indigenous enterococci concentration, indigenous coliform concentration remained near the threshold of detection (1 log CFU/g) throughout storage at 4 and 10°C for 12 weeks. The inoculated coliforms behaved similarly to enterococci (Fig. 2). After the introduction of coliforms into Baby Swiss cheese, cell concentration significantly increased ($P < 0.05$) during the first 10 days of ripening. At the end of ripening, coliform concentration was 7.65 log CFU/g, a concentration similar to that of introduced enterococci. Unlike introduced enterococci, which had no significant changes in concentration during the storage period at 4 and 10°C, the coliform concentration decreased significantly ($P < 0.05$) during the 12-week storage period at both 4 and 10°C. There was no significant difference ($P < 0.05$) between the two storage temperatures in terms of coliform survival.

The enterococci and coliforms (indigenous and introduced) recovered from Baby Swiss cheese were identified using API 20 STREP and API 20E systems (bioMerieux Vitek, Hazelwood, MO). For the indigenous enterococci, *E. faecalis* Biotype 2 and *E. faecium* Biotype 1 were the dominant isolates identified, while the dominant inoculated enterococci were *E. faecalis* Biotype 2. These results confirm the findings of Hartman et al. *(10)*. Indigenous coliforms identified represented two of the four genera in the group: *Enterobacter aerogenes* and *Klebsiella pneumoniae*. Of the inoculated coliforms, *E. coli* and *Enterobacter aerogenes* were the most often recovered. Thus, *Citrobacter* spp. and *Klebsiella* spp. were not isolated (Table 2).

In study 2, enterococci survival in brine, and in lactic acid followed by brine was studied. Because the confirmation of presumptive enterococci requires growth in BHI broth with 6.5% salt, the survival of enterococci in brine was not surprising *(10)*. In the industrial manufacture process for Swiss cheese, a 1% to 2% moisture loss from the cheese occurs during brining. To model this moisture migration into the brine, the brine, in this experiment, was supplemented with 2% pasteurized whey. Because prolonged use of brine in cheese-making may result in dilution of NaCl, two non-saturated brines were also tested in addition to saturated (23% NaCl) brine *(13, 23)*.

As seen in Table 3, a significant ($P < 0.05$) proportion of enterococci did not survive the initial osmotic shock and subsequent 12 h of storage in any of the brines tested. After the initial 12 h, cell concentration remained stable and significant ($P < 0.05$) changes did not occur. Because of the osmotic stress of the salt brine, enterococci were enumerated on selective (KEA) and non-selective (BHI) media to determine the degree of stress or injury.

Cell concentrations, as determined on KEA, were for a period comparable to those obtained using non-selective BHI, but counts on KEA were statistically lower ($P < 0.05$) than BHI after 4 days, 12 h, and 24 h for 12, 18, and 23% brines, respectively. After the difference became significant between KEA and BHI, no consistent statistical patterns were observed. Of the inoculum strains, predominant survivors in brine were *E. faecium* Biotype 1 and *E. faecalis* Biotype 2. These results suggest that brine may be a significant route by which enterococci enter Baby Swiss cheese during the manufacture process.

In the second part of study 2, enterococci were sequentially exposed to lactic acid and brine, as seen in Table 4. Again, the dominant isolates, *E. faecium* Biotype 1 and *E. faecalis* Biotype 2, were similar to those in the preceding brine experiment. There were no significant ($P < 0.05$) changes in concentration or differences between BHI and KEA methods. Results of this experiment showed that a significant proportion of enterococci contaminating the cheese milk may survive acid production by the starter culture and subsequent brining.

In study 3, enterococci concentration decreased by about 0.2 log CFU/ml during exposure to acidified TSB, decreased by about 0.2 log CFU/ml during exposure to brining (23% brine), and then increased by over 2 log CFU/g during ripening in Baby Swiss cheese. As in study 1, *E. faecium* Biotype 1 and *E. faecalis* Biotype 2 were the predominant inoculum strains recovered. As previously mentioned, enterococci may survive acid production by the starter culture and subsequent brining. In fact, exposing enterococci to the acidified TSB resulted in a statistically significant increase ($P < 0.05$) in survival in 23% brine (study 3) compared with survival of cells directly transferred into brine (study 2). This acid-adaptation effect is similar to that reported by Leyer and Johnson *(16)* for *Salmonella typhimurium*.

Demarigny et al. *(6)* stated that enterococci were the subdominant organisms during ripening, with *Propionibacterium freudenreichii* subsp. *shermanii* present at a cell concentration of ~10^9 CFU/g *(8)* but that, during storage, enterococci will reach ~10^6 CFU/g in Swiss cheese. Nath and Kostak *(19)* also reported that enterococci concentration increased during ripening. Our results confirm these earlier findings. The results of study 3, combined with those of study 1, strongly suggest that enterococci that contaminate cheese milk at a step as early as during starter culture growth will be present in detectable numbers in ripened and stored Baby Swiss cheese. Thus, the presence of large numbers of enterococci can result from contamination occurring at any of several steps prior to refrigerated storage. Improper refrigeration during storage may also result in high enterococci concentrations, although we did not investigate this possibility in the present study.

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SCIENCE-BASED, UNIFIED APPROACH NEEDED TO SAFEGUARD THE NATION'S FOOD SUPPLY

Outdated food safety laws and a fragmented federal structure serve as barriers to improving protection of the nation's food supply from contamination or other hazards, according to *Ensuring Safe Food From Production to Consumption*, a new congressionally mandated report from a committee of the Institute of Medicine and the National Research Council. Federal officials should adopt a science-based approach that helps them prevent, identify, and target the largest threats. Arcane safety laws must be repealed and one individual should be appointed to provide a single point of leadership to implement a comprehensive plan that pulls together efforts currently spread across at least 12 federal agencies.

"The United States has some of the attributes of an effective food safety system, but it lacks a central authority and is hampered by old laws that don't allow flexible responses to today's threats," said Committee Chair John C. Bailar III, Chair of the Department of Health Studies at the University of Chicago. "As the challenges to ensuring safe food change and grow more complex, it is crucial that we rethink how to address the greatest threats to human health."

"As the challenges to ensuring safe food change and grow more complex, it is crucial that we rethink how to address the greatest threats to human health."

Some 9,000 deaths and 81 million illnesses each year have been attributed to consumption of contaminated food in the United States. Increasing reliance on minimally processed fresh fruits and vegetables, emergence of new strains of foodborne bacteria, the centralization and growth of large food distributors, consumer preference for ready-to-eat foods, and a growing number of people at high risk for severe or fatal foodborne illnesses have placed new stresses on the system in recent years. Currently, federal agencies responsible for food safety often lack coordination and consistency in their missions, policies, regulations and enforcement practices, are not well-integrated with state and local activities, and are too driven by responding to crises rather than by planning ways to prevent them, the report says.

The report made the following recommendations.

- The food safety system should be based on science. With limited resources to address safety issues, regulatory priorities should be supported by strong scientific evidence that aims at prevention when possible, and identifies and addresses the greatest threats, including microbiological pathogens, naturally occurring toxins, allergens, food additives, agricultural chemicals, environmental contaminants, animal drug residues, excessive consumption of some dietary supplements, and improper methods of handling and preparing food.

Congress should establish a unified, central framework for managing food safety programs, headed by one official with control of resources for all federal food safety activities. This person would have responsibility for management of foodborne disease outbreaks, setting standards for food safety, inspection, monitoring, disease surveillance, risk assessment, regulation enforcement, research, and education.

Although many members of the committee believe that the best arrangement would be to establish a single food safety agency, federal officials may be able to address the needs identified in the report through other organizational structures. All options meeting the criteria of an effective system should be carefully reviewed before the final organizational structure is determined.

- Congress should change federal statutes so that inspection, research, and enforcement are based on scientifically supportable assess-

ments of risk. Some outmoded safety statutes, such as the visual inspection system for meat and poultry, may even detract from protection efforts by diverting resources from implementation of science-based inspection reforms.

At a minimum, Congress should no longer require inspection of each animal carcass, as required by laws controlling meat and poultry inspection.

Congress also should mandate a single set of regulations for all foods, and should specify that foods be imported only from countries with food inspection systems deemed equivalent to that of the United States. Additional resource should be devoted to prevention and to implementing the Hazard Analysis Critical Control Point system used by the US Department of Agriculture and the Food and Drug Administration to detect or control for potential hazards at each step, from raw material to the finished product.

- A comprehensive national food safety plan should be developed. The plan should support research aimed at prevention and detection of risks, and include surveillance needed to monitor changes in the food supply or consumption that might pose new risks.

It should further integrate federal efforts with state and local activities, while addressing the distinctive hazards associated with Americans increasing reliance on imported foods.

The current food safety system has evolved piecemeal over the past century in response to changes in the food supply. Although efforts have been made to modernize it – most recently with the President's National Food Safety Initiative of 1997- such efforts take only the first steps toward an effective national approach, the report says.

Although the Food and Drug Administration issued a Food Code in 1993 with recommended standards for handling food, it has not yet been adopted by many state or local authorities. The federal government should mandate adherence to minimum standards for food products and processes the committee said, and allocate adequate funding to help support state and local food safety activities.

The Institute of Medicine is a private, non-profit organization that provides health policy advice under a congressional charter granted to the National Academy of Sciences. The National Research Council is the principal operating arm of the National Academy of Sciences and the National Academy of Engineering. The study was sponsored by US Department of Agriculture's Agricultural Research Service.

Highlights of the Executive Board Meeting
January 24 – 25, 1999
Dearborn, Michigan

Following is an unofficial summary of Executive Board actions from the IAMFES Executive Board Meeting:

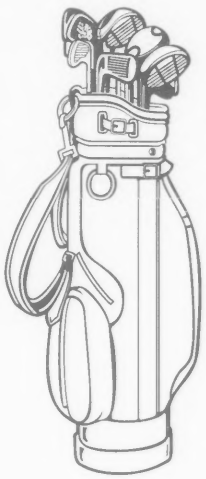
Approved the following:

- Minutes of October 31 – November 2, 1998 Executive Board Meeting.
- Minutes of October 31 – November 2, 1998 Executive Sessions.
- Request for specific *JFP* abstracts to be posted on the Internet.

Discussed the following:

- E-mail votes taken since the November Executive Board Meeting.
- Communication Update: Journals on schedule. *JFP* transition to Allen Press going well. New Web site now activated.
- Membership Update: Membership numbers improving. Early renewal discount working well.
- Advertising Update: Sales continue to improve.
- Financial Update: November 1998 financial statements were reviewed. Ahead of budget for first quarter, FY 99.
- Staffing Update: Reviewed staff assignments. Tamara Kuhn replaced Carol Mouchka.
- Revision of Board member position descriptions.
- Policy and Procedures Manual – update plan.
- Committee Chairperson and Member Appointments for 1999-2000.
- Scientific Editor appointments and terms.
- Revision of booklet "Procedures to Investigate Foodborne Illness."
- Formation of an IAMFES HACCP Task Force.
- Request to form a PDG for Retail Food HACCP-TQM.
- FSTEA project and IAMFES' involvement – Education Task Force.
- Board Member attendance at Affiliate meetings.
- Affiliate Newsletter – winter 1999.
- Formation of new IAMFES Affiliates.
- Issues relating to changing IAMFES to International Association for Food Protection.
- Reviewed Constitution and Bylaws changes relating to name change.
- Member survey results.
- Reviewed logo concept and design.
- Local Arrangements Committee updates on 1999 Annual Meeting.
- Program Committee report for 1999 Annual Meeting.
- Proposed Workshops for 1999 Annual Meeting.
- Dr. Fritz Kaferstein to deliver the Ivan Parkin Lecture.
- Discount registration plan for Michigan Affiliate Members to attend the 1999 IAMFES Annual Meeting.
- Awards nominations.
- Planning for 2000, 2001 and 2002 Annual Meetings; future Annual Meeting sites.
- Workshop "An Insider's Look at Microbial Risk Assessment" April 12 and 13 in Washington, D.C.
- Agreement with IAFIS on 3-A Sanitary Standards.
- National Food Safety Alliance.
- NSF-Food Safety Conference – post-conference report.
- Co-sponsorship of Food Micro 99, Japan PC 2000, and ASAE 2000.

Next Executive Board meeting: April 17–19, 1999, Des Moines, Iowa.



IAMFES ANNUAL MEETING GOLF TOURNAMENT AT INKSTER VALLEY GOLF CLUB

Sunday, August 1, 1999

6:00 a.m. – 2:00 p.m.

Bus leaves the hotel at 6:00 a.m.

Come early and enjoy 18 holes of golf!

FORE! Best-Ball Golf Tournament

A swinging good time at the newest golf course in the area — the Inkster Valley Golf Club. You don't even need to know how to play to win a prize. Golf, transportation, breakfast, lunch and prizes all included in your registration fee.

Join your friends and colleagues in a round of golf; call the IAMFES office at 800.369.6337; 515.276.3344; Fax us at 515.276.8655 to request a registration form or see page 226 in this issue of *DFES*.

Companies:

Are you looking for a way to promote your company at the IAMFES Annual Meeting? IAMFES is looking for sponsorship support of this event. If you will consider providing quality prizes (or cash prizes) for the IAMFES Golf Tournament, we would like to hear from you. Call David Tharp at the phone numbers listed above for more details.

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R. Wayne Urbonas
Granny's Poultry Co-op
Winnipeg, Manitoba

PUERTO RICO

Rolando J. Gonzalez
Univ. of Puerto Rico at Mayaguez
Mayaguez

SWEDEN

Charlotta Engdahl Axelsson
Dafgards Ab
Kallby

THAILAND

Araya Charoensupaya
Gate Gourmet
Bangkok

UNITED STATES

ARKANSAS

John B. Trafford
Gold Star Dairy
Little Rock

CALIFORNIA

Jennylynd A. James
Boskovich Farms, Inc.
Oxnard

Dominic Marlia
California Day-Fresh Foods Inc.
Glendora

Jo M. Oliveira
Saputo, Tulare

COLORADO

Ann W. Linn
Boulder County Health Dept.
Boulder

DISTRICT OF COLUMBIA

John Schulz
Marriott International
Washington

FLORIDA

Thomas J. Young
Florida's Natural Growers
Lake Wales

GEORGIA

James P. Folsom
University of Georgia
Athens

Khosrow Mottahed
Fresh Express
Fayetteville

Norman Stern
USDA-ARS
Athens

ILLINOIS

Robert E. Farmer
Rich Products Corp., Niles

Kenneth A. Molfese
Vita Food Products Inc.
Tinley Park

Debbie S. Muskopf
Land-O-Sun Dairies
O'Fallon

IOWA

Thomas D. Schremser
Universal Industries, Inc.
Cedar Falls

KANSAS

Kristen L. Bell
Excel Corporation
Wichita

MARYLAND

Roger L. Leilich
Maryland DHMH
Baltimore

MASSACHUSETTS

Margaret Mary Cyr
Gene-Trak Systems
Hopkinton

MINNESOTA

Sharon Stewart
Univ. of Minnesota-Crookston
Crookston

NEW YORK

Ron Stubbs
Fairbank Farms
Ashville

OREGON

Jeff Murray
Diane's/Mission Foods
McMinnville

SOUTH DAKOTA

Paula Kaothien
So. Dakota State University
Brookings

TEXAS

Michael Soulek
FOODPRO
San Antonio

VIRGINIA

Janell R. Kause
USDA-FSIS-OPHS-ERAD
Springfield

WASHINGTON

Karen Muddaugh
Bunge Foods
Seattle

Ken Visser
Bellevue

WISCONSIN

Craig S. Amici
The Coburn Co., Inc.
Whitewater

Bill Caspary
International Bioflavors, Inc.
Oconomowoc

Walter P. Heil, Jr.
Foremost Farms USA
Defere

Dan Larson
VNE Corporation
Janesville

Mike Shoop
Stainless Products
Somers

WYOMING

Nola L. Evans
Wyoming Dept. of Agriculture
Laramie

UpDates

Osmonics Names Roger S. Miller Senior Vice President Sales and Marketing

Roger S. Miller has been promoted to Senior Vice President Corporate Sales and Marketing at Osmonics Inc., in Minnetonka, MN. Formerly Vice President of Marketing and Strategy, Miller will also continue to develop corporate strategy and oversee all marketing efforts.

Since mid-1998, Miller has also served as Acting General Manager for the Standard Equipment and Pumps Global Business Unit (GBU). He will step down from that position, which will be filled by Ed Fierko.

Miller joined Osmonics in 1993 as a Product Manager for pumps, after holding key management positions with several local manufacturing concerns. He received his bachelor's degree in business management and industrial engineering from North Dakota State University.

Angele St-Yves New Director of the Food Research and Development Centre

A pioneer in the field of agri-food is taking charge of the Food Research and Development Centre (FRDC), as Agricultural Engineer Angele St-Yves becomes the third Director of the FRDC. Ms. St-Yves was formerly the Director of the Soil and Crops Research and Development Centre in St. Foy.

The first woman to direct an Agriculture and Agri-Food Canada research centre, the first woman to lead the Ordre des agronomes du Quebec (Order of Agrologists of Quebec) and the first woman head of the Association des Ingenieurs en Genie rural du Quebec, Ms. St-Yves has received honors that include the 1995 and 1997 Agcellence Awards and the 1996 Quebec Interprofessional Council Award and became a Commandeure de l'Ordre du Merile agronomique (Commander of the Agronomic Merit Order) in 1994, as well as Commandeure de l'Ordre du Merile agricole, Tres Grand Merile Special (Commander of the Agricultural Merit Order, Greater Special Merit), in 1989.

Rich Products Corporation Announces Kamesh Ellajosyula Appointment

Kamesh Ellajosyula was appointed as Project Leader-Mirobiology, Research and Development for Rich Products Corporation, Buffalo, NY. Ellajosyula's appointment was announced by Cecelia Marshall, Assistant Director. Ellajosyula's responsibilities currently include providing technical leadership in microbiology and food safety to support Research and Development, Quality Assurance, and manufacturing plants. He will plan and execute microbiology projects as well as manage the corporate research and development microbiology laboratory.

A native of Hyderabad, India, Ellajosyula's did his undergraduate studies at Andhra Pradesh Agriculture University, India, where he received his BS in agriculture science in 1994. In 1998, he received his MS in food science from The Pennsylvania State University. Ellajosyula also studied chemical treatments to destroy *E. coli* O157:H7 on foods. He developed a prediction equation for the destruction of *E. coli* O157:H7 in Lebanon bologna. He also developed a microbiologically safe process for fermented meat products.

Ellajosyula's was the 1997 recipient of the William Rosskam Memorial Academic Scholarship and the Frank and Nina Cobb Scholarship. He currently is a Member of the International Association of Milk, Food and Environmental Sanitarians, in Des Moines, the Institute of Food Technologists in Chicago, and the American Society for Microbiology in Washington, D.C.

MilkPEP Board Announces New Management Structure

The National Fluid Milk Processor Education Program (MilkPEP) Board announced a restructuring of management to oversee the Milk Mustache campaign.

This change involves a realignment of responsibility among those currently working on the program, and is in response to recent recommendations by the Office of the Inspector General. In the process of restructuring, the MilkPEP board worked closely with the USDA's Agricultural Marketing Services.

Under the new plan, Kurt Graetzer, who was formerly MilkPEP Executive Director, will assume Chief Executive Officer responsibilities for all program

activities and will report directly to the MilkPEP Board. In addition, he will be supported by Ron Rubin, who has been named Chief Financial Officer for the program; Wayne Watkinson, who continues his duty as the Board's outside legal counsel; and Pauline Cougot as Executive Assistant.

New VMAC Chairman

Keith E. Sterner, D.V.M., is the new Chairman of the Food and Drug Administration's (FDA's) Veterinary Medicine Advisory Committee (VMAC).

Dr. Sterner is a graduate of Michigan State University. He is co-owner of a mixed animal practice in Ionia, MI, treating mainly food animals. Dr. Sterner has been a member of VMAC since 1997 where he has represented the large animal specialty. He is a member of the American Veterinary Medical Association, the American Association of Bovine Practitioners, the National Mastitis Council, and the United States Animal Health Association, and other organizations. Dr. Sterner is Past President, American Association of Bovine Practioners; Past President, National Mastitis Council; member, AVMA Task Force on Responsible Antimicrobial Use; Vice Chair, AVMA Council on Education; and past member, AVMA Drug Availability Committee. In 1991, the American Association of Bovine Practitioners honored Dr. Sterner as "Bovine Practitioner of the Year," and Michigan State University College of Veterinary Medicine presented him with the Distinguished Alumnus Award.

Label Required on Foods and Dietary Supplements Containing Ingredients with Stimulant Laxative Effects in California

In 1987, the California Department of Health Services' Food and Drug Branch (FDB) began receiving sporadic complaints of gastrointestinal disturbances from consumers of "dieter's" teas containing senna. Communication with the US Food and Drug Administration revealed 67 consumer complaints between 1982 to 1992 from individuals who had drunk "dieter's" teas. First time consumers generally complained of unexpected abdominal cramps and diarrhea, at times severe and lasting several days.

Repeat consumers complained of persistent abdominal pains, muscle weakness, electrolyte disturbances, and impaired bowel function.

Between 1992 and 1994, FDB learned of four deaths (one in California) in otherwise healthy young women who reportedly drank senna containing teas for months to years before they died. FDB asked the Department's Environmental Health Investigations Branch (EHIB) for assistance in evaluating these deaths. An EHIB's evaluation concluded that it would be difficult to determine that the teas caused these deaths, but the teas could exacerbate low blood potassium (hypokalemia). Potential consequences of hypokalemia include muscle weakness, permanent kidney damage, and life-threatening cardiac arrhythmias. Two of these four deaths resulted from cardiac arrhythmias during episodes of hypokalemia. Even though teas and dietary supplements may contain levels of sennosides A and B in the range of OTC stimulant laxative drugs, they can be sold as foods if their intended use is for flavor, nutrition, or aroma (food uses) and not to diagnose, cure, rriitigate, treat, or prevent diseases (drug uses).

The use of senna as flavorings in food is limited to the minimum quantity required to produce the intended physical or technical effect. Federal law limits the use of senna in dietary supplements to levels that do not present a significant or unreasonable risk of illness or injury. But there are no specific upper limits for either use.

On January 1, 1997, the Department adopted emergency regulations requiring a label statement on foods and dietary supplements containing any amount of aloe, buckthorn, cascara, frangula, rhubarb root, or senna. These regulations were finalized on March 1, 1998, and require a label statement on the package of any food or dietary supplement sold in California.

Davis Calvin Wagner Sanitarian Award

The American Academy of Sanitarians announces the Annual Davis Calvin Wagner Award. The Award will be presented during the Annual Educational Conference of the National Environmental Health Association. The Award consists of a plaque and a $500 honorarium.

The deadline for receipt of nominations is April 15, 1999.

For further information, contact Dr. John G. Todd, P.H., Chairman, Davis Calvin Wagner Award, 17309 Fletchall Drive, Poolesville, MD 20837.

New Meat and Poultry Inspection System Greatly Reduces Threat of *Salmonella*

Agriculture Secretary Dan Glickman announced that the nation's new, science-based, prevention-oriented meat and poultry inspection system has greatly reduced the incidence of *Salmonella* in some raw meat and poultry. The announcement comes as nearly 3,000 small plants nationwide prepared to implement the new system, called "HACCP," on January 25.

"By using modern science as our guide, we are succeeding in reducing the threat of foodborne illness for American families," Glickman said in remarks to the US Poultry and Egg Association's annual convention in Atlanta. "And President Clinton's plan for additional investments in cutting-edge food safety research and even more science-based inspections will lead to even more gains in our fight to ensure a safe food supply."

Salmonella is a potentially deadly bacteria that sickens as many as 3.8 million Americans each year. The preliminary findings represent nine months of data collection in nearly 300 large plants that implemented the Hazard Analysis and Critical Control Point (HACCP) system in Jan. 1998.

The first data released for ground beef samples showed 7.5 percent testing positive for *Salmonella* prior to January, 1998 and only 4.3 percent testing positive after HACCP implementation, a decline of over 40 percent.

The new data for chicken and pork continue positive trends reported several months ago. Of

chicken carcasses, 20.0 percent tested positive for *Salmonella* before HACCP implementation, compared to 10.7 after implementation. That's a decline of nearly 50 percent. And 8.7 percent of swine tested positive prior to HACCP versus 6.2 percent after HACCP implementation, a decrease of more than 25 percent. There is insufficient data to draw conclusions about other categories of meat.

The science-based HACCP inspection system requires plants to identify critical points along their production lines and ensure that practices at those points minimize bacterial contamination and growth. HACCP took effect in January 1998 at the nation's 300 largest plants.

Small plants, those with between ten and 499 employees will come under HACCP on Jan. 25, 1999. Very small plants, those with fewer than ten employees, will implement HACCP in Jan. 2000.

Under HACCP, the federal government sets strict limits for the incidence of *Salmonella* allowed on raw meat or poultry. The nine month data indicate that 89 percent of HACCP plants for which there are adequate data meet or exceed the government's *Salmonella* performance standards. Plants that did not meet the standards were required to take immediate corrective measures.

Second Progress Report on *Salmonella* Testing for Raw Meat and Poultry Products

The US Department of Agriculture's Food Safety and Inspection Service (FSIS) is releasing a progress report on its first 9 months of testing for *Salmonella* in large meat and poultry plants. The Agency released its first progress report, covering the first 6 months of testing, in September 1998. The 9-month progress report, which covers February 1, 1998, through October 31, 1998, presents data for three product classes: broilers, swine, and ground beef.

Although results are still considered preliminary, and the data are insufficient to generalize across the industry, *Salmonella* prevalence in each of these three products was lower after Hazard Analysis and Critical Control Point (HACCP) implementation than in baseline studies conducted before HACCP implementation. In addition, the majority of plants are complying with the *Salmonella* performance standards. The results are encouraging in light of the Agency's goal to reduce, to the extent possible, pathogens that can cause foodborne illness.

Consumers should continue to properly handle, prepare, and store all meat, poultry, and egg products in order to guard against foodborne illness.

The performance standards for *Salmonella* represent the first time USDA has set microbial standards for raw products on such a broad scale and is the first step towards a greater reliance on performance standards for specific pathogens. *Salmonella* was selected as the target pathogen because it is one of the most common causes of foodborne illness, it is present at varying frequencies on all types of raw meat and poultry products, and it can easily be tested for in a variety of products.

FSIS is presenting the results of the first 9 months of testing in the 174 large meat and poultry plants for which sufficient data are available that is, broilers, swine, and ground beef. "Sufficient" is defined as having completed sample sets from 10 or more establishments.

Results indicate that *Salmonella*, found on 20 percent of broiler carcasses in pre-HACCP baseline studies, was found on 10.7 percent of broiler carcasses after implementation. For swine, *Salmonella* was found on 8.7 percent of carcasses in pre-HACCP baseline studies, and 6.2 percent of carcasses after HACCP implementation. In ground beef, *Salmonella* was found in 7.5 percent of samples in pre-HACCP baseline studies, and 4.3 percent of samples after HACCP implementation. Caution should be used in comparing these data because the sampling protocols, seasonal periods, and the number of plants vary among the testing phases. Nevertheless, summary data indicate a general trend toward lower percentages of products that are positive for *Salmonella* compared to the baseline studies.

Results also indicate that most plants for which sample sets have been completed have met standards. Product-specific compliance was 91 percent for broilers, 83 percent for swine, and 90 percent for ground beef. Plants failing to meet the performance standard were formally notified and required to take immediate action, consistent with the regulations, to comply with the requirements.

A more detailed report on *Salmonella* testing data in large plants will be available after data from the first year of sampling are analyzed.

Field Studies Begin on New, Improved Tests to Identify Major Bacterial Food Pathogens

A US Department of Agriculture scientist who has developed faster and more reliable tests to identify major bacterial food pathogens is now using these tests in large-scale field studies to show that they'll work on live animals.

Irene V. Wesley, a microbiologist with USDA's Agricultural Research Service in Ames, IA, developed several tests to identify bacteria that may cause human illness. These tests use a gene multiplying technique called polymerase chain reaction (PCR) to recognize the pathogens in animal, human and food samples

in less than eight hours. Current culturing techniques can take up to two weeks.

Every year, 6.5 to 33 million people in the United States come down with foodborne illnesses. The estimated medical costs and productivity losses from these illnesses range from $6 to $34 billion.

"Added to the tragic human toll, the food industry loses money and product reputation through embargoes, recalls, and voluntary destruction of products," says Floyd P. Horn, ARS Administrator. "Expanding research to identify major bacterial pathogens is an important element of President Clinton's National Food Safety Initiative – a commitment to improving food safety all the way from the farm to the table."

Wesley is based at the ARS National Animal Disease Center in Ames, IA. ARS is USDA's chief scientific research agency. The USDA carries out the President's food safety initiative along with the Food and Drug Administration, Centers for Disease Control and Prevention, and the US Environmental Protection Agency.

Campylobacter is a normal inhabitant of livestock and poultry, but in humans it may cause disease. *C. jejuni* is one of the most frequent causes of bacterial food poisoning. Each year, four million infections occur in humans in the United States, according to the CDC. This adds up to four times more illness from *Campylobacter* than from *Salmonella*.

C. coli, another type of *Campylobacter* is often found in pigs, but rarely causes human illness in the United States. *C. coli* is so closely related to *C. jejuni* that it takes highly specific tests to differentiate between them. Wesley's PCR test is one of the newest ways to distinguish between them. She and colleagues are currently using the PCR test to detect *Campylobacter*, especially *C. coli* in pigs.

In a current project, funded by USDA's Food Safety and Inspection Service, researchers with ARS, Iowa State University, and North Carolina State University are tracking the spread of *Campylobacter* and other bacteria in pigs from the nursery stage to slaughter. The study, which includes eight farms and two slaughterhouses, compares two different ways of raising hogs in Iowa and North Carolina. Results of the study will be used to determine which farm management practices reduce foodborne pathogens.

Another PCR test stands ready to check for the presence of *Listeria monocytogenes*. *Listeria* has been found in a range of food products, dairy, liquid whole eggs, red meat, poultry, seafood, and vegetables. Identifying *L. monocytogenes* quickly is critical to ensure that our nation has the safest food supply.

Compounds in Horseradish May Keep Food Fresher

Some people love putting a dollop of horseradish on their steamy roast beef. As it turns out, this natural taste-maker may also be a useful food preservative.

Agricultural Research Service Food Technologist Henry Fleming and Oklahoma State University Food Chemist Brian Shofran proved both horseradish and mustard oil pack a punch against *Listeria*, *E. coli*, *Staphylococcus aureus* and other food pathogens you definitely don't want in your sandwich. That's because these condiments contain a pungent chemical with the unsavory name allyl isothiocyanate (AITC). Mustard oil has 93 percent AITC, but has a milder flavor than horseradish which, has 60 percent AITC. Shofran did the research as a graduate student under Fleming. Shofran is now an analytical chemist at OSU's Food & Agricultural Products Center.

In 1989, USDA issued a "zero tolerance" policy for *Listeria monocytogenes*, but consumers demand that foods rely less on man-made preservatives. This research fits in with the trend of seeking natural substitutes for chemical preservatives in the food industry.

Many scientists have investigated allicin, a natural microbe inhibitor found in garlic. If Fleming and Shofran's work is borne out by others' research, their savory spices could join the natural arsenal against malevolent microbes.

Formation of the International Association of Fish Inspectors (IAFI)

A new international body for sharing information and promoting cooperation among fish inspectors around the world is being formed! The Canadian Food Inspection Agency (CFIA) has taken on a coordinating role in the creation of the International Association of Fish Inspectors (IAFI). IAFI is currently being incorporated as a federal not-for-profit association with its first start up meeting to be planned later this year.

The IAFI will be an open organization with representatives from government, industry, academia, and public and private organizations in fishing, fish processing and fish consuming nations around the world.

The association will facilitate an exchange of information, ideas and methodologies, encourage collaboration between fish inspection colleagues, and promote research and education in fish and seafood inspection. A Web site is under construction and should be available by the end of February.

IAFI originated at an international fish conference in Toronto, Ontario, Canada in September of 1997. A steering committee was developed with members extending from the UN Food and Agriculture Organization, the US, New Zealand, Thailand, Mozambique, the UK and Canada.

In its present time, the committee has produced a charter, mission, and vision for the association, and proposed bylaws have been drafted.

The committee is presently conducting a membership drive for anyone interested in participating in the association. The initial IAFI meeting is proposed to be held in the inaugural meeting on October 4 and 5, 1999 in Halifax, Nova Scotia, Canada.

To request more information or to request an application for membership regarding the International Association of Fish Inspectors, please E-mail IAFI@em.agr.ca.

DNA Database Fingers Food Pathogen

The persistence of a Cornell University researcher and the prompt use of his unique database are credited for helping limit the death toll in a recent outbreak of *Listeria monocytogenes*, a virulent foodborne pathogen.

Between Oct. 1998 and Feb. 2, 1999, 11 people died nationally; three of them in New York State and more than 70 became ill as a result of eating food contaminated with a rare strain of the bacterium, called type E. The efforts of Martin Wiedmann, a Cornell Food Science research associate, led the Center for Disease Control (CDC) in Atlanta to determine the cause of the outbreak. As a result, a major food-processing company voluntarily made what some have estimated to be the largest food recall in American history.

"The credit for much of this action goes to Wiedmann," says Dale L. Morse, Director of the Division of Infectious Diseases at the New York State Department of Health. "I wonder if the outbreak could have been recognized so quickly or even if it would have been recognized at all," he says.

"Because of Martin's effort, we were able to link seven cases together early, clarify that there was an outbreak of a certain strain, identify it and where it came from early. Without this effort, the strain may never have been identified."

Listeria's ability to kill is greater than that of the bacteria *E. coli* O157:H7, *Salmonella*, and *Campylobacter* combined. In 1998, according to the CDC, the *E. coli* strain caused 70 deaths out of an estimated 10,000 to 20,000 cases of foodborne illness nationally. By comparison, in 1998 *L. monocytogenes* caused 250 deaths out of a total of 1,100 infections.

Wiedmann has been collecting samples of the bacterium *L. monocytogenes* for seven years and identifying each strain's unique genetic fingerprint. Every month the New York State Health Department sends him up to six strains, which he identifies and adds to a database. He also receives *Listeria* strains from tainted food sent by the New York State Department of Agriculture and Markets and strains isolated from animals from the New York State Veterinary Diagnostic Laboratory. Wiedmann has developed a *Listeria* database of nearly 800 strains. Until last October's outbreak of the disease called listeriosis, neither Wiedmann nor Kathryn Boor, Cornell Assistant Professor of Food Science, appreciated the true value of the *Listeria* fingerprint database. "We were collecting molecular fingerprints with the goal of learning more about the diversity and basic biology of *L. monocytogenes* strains, but we did not fully anticipate the role that this database could have in immediate human health applications," says Boor.

Typically, there are up to six cases of listeriosis a month in New York State, normally caused by different strains of *L. monocytogenes*. But late last October, Wiedmann received 15 samples of *Listeria* – more than double the normal amount. The samples were sent to Mary S. Bodis, a research support specialist in the laboratory of Carl A. Batt, Cornell Professor of Food Science, for ribotyping, a method of determining genetic fingerprints.

Seven of the 15 samples had identical genetic fingerprints, meaning that the same strain had caused the illness in seven people. Wiedmann sent the information to the New York State Health Department and the CDC. The federal agency also had noticed a rise in the number of *Listeria* cases, but until Wiedmann's fingerprints, they didn't know which strain to look for.

The CDC traced the latest outbreak to consumption of hot dogs and was able to locate and test one of the contaminated products. It was found to be positive for the *L. monocytogenes* Type E strain. The contaminated hot dogs had been made by Bil Mar Foods, of MI, a subsidiary of Sara Lee Corp. Bil Mar Foods immediately issued a voluntary recall. "This is a convergence of basic science and a real-world application. Before, we were collecting the molecular fingerprints of the strains for research purposes. Clearly, now, we're on an exciting track," says Boor.

Prior to using DNA-based identification, food samples had to be collected and examined for the presence of bacteria. The researchers then used process of elimination to categorize the organisms in an attempt to find which one was linked to the disease, a process that took many weeks. Now, thanks to ribotyping and other methods, such

as polymerase chain reaction, the identification and typing processes have been greatly speeded up.

Says Boor, "It would have taken longer to make the link. Martin's finding pointed the CDC in the right direction, shortened the length of the time to find the strain. To implicate *Listeria* so fast and to find food bearing the same strain still in the system was fantastic."

Making Transgenic Milk More Digestible

Hope may be in sight for roughly 70% of the adult population who can't stomach milk. These people often suffer upsets after ingesting milk products because of the presence of the milk sugar lactose. Although low-lactose milk products are available in supermarkets, they are costly to produce and make milk processing more complex. Now, a team of French scientists has found a simpler way of producing low-lactose milk, engineering a transgenic animal to produce a lactose-digesting enzyme in its mammary glands so that the troublesome sugar is removed from the milk before it ever leaves the animal.

Lactose intolerance results from low levels of an intestinal enzyme called lactase-phlorizin hydrolase, which breaks down lactose into more digestible sugars. Low levels of this enzyme can result in the accumulation of undigested lactose in the small intestine, which brings on gastrointestinal symptoms ranging from queasiness to severe diarrhea and dehydration. Jean-Nol Freund and coworkers decided to use a transgenic approach that might be used one day to produce cows capable of secreting a lactose-digesting enzyme in their milk glands. By engineering transgenic mice to express the rat gene for intestinal lactase-phlorizin hydrolase in their mammary glands during lactation, they found that they could significantly reduce the levels of milk lactose. Before the milk ever leaves the mouse, the rat enzyme removes 50-85% of the lactose, resulting in milk that is indistinguishable in its nutritive value, viscosity, and fat and protein content from the standard variety. The taste test for the bovine version is eagerly anticipated.

Reprinted from *Nature Biotechnology, Research paper p. 160-164, Research news p. 135.*

Media Advisory — CFIA Extends Restriction of Guatemalan Raspberries

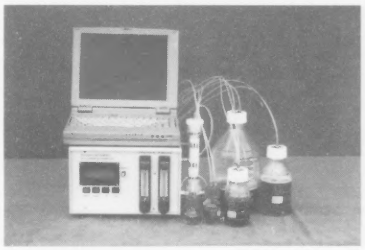
The Canadian Food Inspection Agency (CFIA) will continue to restrict imports of Guatemalan raspberries until further notice. The CFIA decided to extend an earlier import restriction after a recent visit to Guatemala. CFIA and Health Canada officials recommended improvements to that country's production and inspection system.

The agency first stopped imports last fall after the berries were identified as the likely source of *Cyclospora cayetanensis* outbreaks in Southern Ontario. Infection by the water-borne parasite causes acute abdominal pain, diarrhea, fatigue and loss of appetite but responds quickly to medical treatment and is not considered life-threatening to healthy people.

The CFIA will review the import restriction when Guatemala implements recommended improvements.

FoodSafety.gov — A New Web site Established

Www.FoodSafety.gov is a "gateway" Web site designed to help the public find government food safety information more readily on the Web. The site provides links to food safety-related Web sites from federal, state and local government agencies. "www.FoodSafety.gov" is one of the initiatives of the May 1997 National Food Safety Initiative Report to the President. This site was developed by FDA's Center for Food Safety and Applied Nutrition (CFSAN) in consultation with USDA's Food Safety Inspection Service (FSIS).



Columbus Instruments

Inexpensive Respirometer for Waste Water, Soil or Sludge

Oxymax Model ER-10 is Columbus Instruments' new single gas (O_2 or CO_2) respirometer. It is a table-top model that can be used in a field laboratory (trailer, van) for soil, compost, sludge or waste water respiration measurements.

ER-10 can simultaneously measure 1 to 10 liquid or solid samples, from 50 ml to 10 liter in volume. The patented principle of measurement, which involves air sampling from the head space of the sample chamber, circulating it through the gas analyzer and returning back to the sample chamber without any contact with the sample, assures that the gas analyzer cannot be easily contaminated. Calibration of O_2 gas analyzer is done automatically and periodically with ambient air, removing the need for expensive, precisely-mixed gas bottles while respirometers equipped with the CO_2 analyzer need to be calibrated once a year. Results of measurements are presented in mg O_2/h or as an accumulated (total in mg) value of oxygen consumed from the beginning of the experiment. Samples are continuously aerated with adjustable air flow except for the short time interval when a particular sample is being measured by the gas analyzer. For solid samples (moist soil or compost) which are prone to water loss, an optional condensing air dryer is available. Water vapor is returned to each chamber as water droplets, restoring the sample's moisture content.

Sample measuring time can be operator set or the ER-10 can automatically adjust measuring time depending on the current respiration rate of each sample, as more active samples require shorter measuring times. As a result the Oxymax Model ER-10 has a wide sensitivity range. It can measure oxygen consumption or CO_2 production of samples having a relatively low activity of 0.05 mg O_2/h utilizing a 10 minute measuring time interval or samples with higher activity can be measured in shorter time intervals.

The ER-10 Respirometer has its own microprocessor and can operate without a computer and either print the results on an external printer or send the data to a desktop or laptop computer via an RS-232 interface. Software for PC allows transfer of ASCII files to a spreadsheet for real-time graphical and numerical data presentation.

Columbus Instruments, Columbus, OH

Reader Service No. 245

Fume Enclosure Work Station

The Misonix FE-2620 Fume Enclosure is a work station that removes fumes and vapors from the work area and conforms to all OSHA requirements. Compact (26"W × 16"D × 19"H) and portable, it is ideal for use in Food or Pharmaceutical R&D or testing, where a small footprint is important. Clear acrylic panels allow for 360° visibility and the entire front width opens for a wide access area. Air flow rates are adjustable from 0 to130 FPM.

The unit can accommodate a variety of easily replaceable filters to handle the most difficult contaminants. An electrostatic prefilter, supplied with the unit, collects dust down to 0.5 microns.

Scientific Marketing Services, Farmingdale, NY

Reader Service No. 246

Sigma Introduces Serum-Free Media for the Growth of Human Embryonic Kidney 293 Cells

Sigma announces the availability of a new line of serum-free, low-protein media for the growth of human embryonic kidney 293 (HEK-293) cells.

Testing indicated faster cell growth when compared to DME: F12 media supplemented with 5 percent fetal bovine serum and other comparable formulations.

The HEK-293 media are produced at Sigma's new, fully validated, cGMP cell culture manufacturing facility. In keeping with Sigma's expansion of capabilities to include large-scale commercial production, all HEK-293 formulations are available in both testing and production batch sizes up to 10,000 liters of liquid or 200,000 liter-equivalents of powder. In addition, customization options are available through Sigma's Research and Development unit, which closely works with customers to tailor formulations to meet specific needs.

Sigma, St. Louis, MO

Reader Service No. 247

AcroWell™ Filter Plate from Pall Gelman Laboratory

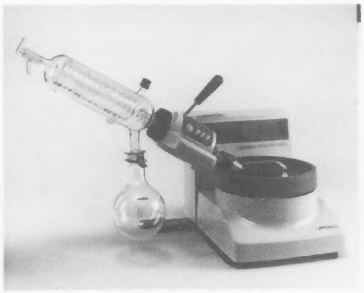
The new AcroWell filter plate with GHP membrane is a chemically-resistant filter plate that provides extremely low background in fluorescence-based assays. The new plate is recommended for high throughput cell- and bead-based fluorescent screening assays, and is ideal for use in automated instrumentation.

The plate is constructed with a bottom layer of hydrophobic PTFE that protects the upstream membrane and acts as a barrier to passive flow. Small holes in the PTFE membrane in the center of each well allow fluid to pass under applied vacuum. The holes are small enough to prevent liquid flow until vacuum is applied, allowing longer incubations with the wells filled with solution. The double-layer membranes are sealed to the bottom of the plate using a proprietary sealing technology that eliminates crosstalk between wells.

The AcroWell filter plate has been designed with robotic handling systems in mind, although it can also be used for manual filtration. The plate's rigid single-piece construction meets the design recommendations of the Society for Biomolecular Screening. The plates are stackable with or without the lid in place, and fit most standard vacuum manifolds.

Gelman Sciences, Ann Arbor, MI

Reader Service No. 248



Labconco Corporation

Labconco Rotary Evaporator

The Labconco Rotary Evaporator features reliable, straightforward operation with innovative, lab-friendly features.

The controls are on a soft-touch key pad located high on the front for easy accessibility and to prevent risk of splash from solvent spills or the bath. A digital LED display permits monitoring of rotation speed, bath temperature and optional vapor temperature. The sparkless, high torque motor is belt driven and rotates glassware from 0-250 rpm. The lift is controlled manually from the front of the unit by a trigger-action handle.

The stainless steel bath is insulated by a thermoset polyester housing and a rubber trim ring, preventing risk of burn and serving as a shock absorber for glassware. The water bath temperature ranges from ambient to 100°C and the optional oil bath temperature ranges from ambient to 180°C. A safety limiter turns the bath off automatically if it should run dry. The bath is separate from the drive so it may be repositioned to accommodate different size flasks.

The glassware is positioned up front for easy accessibility. Condenser styles include diagonal, vertical, reflux, and Dewar with one liter evaporating and receiving flasks. Two and three liter flasks and coated glassware are also available.

Labconco Corporation, Kansas City, MO

Reader Service No. 249

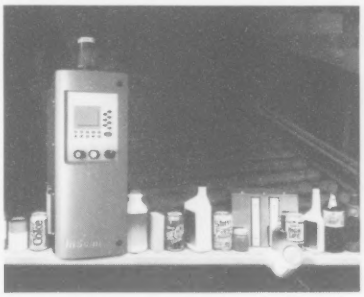
Non-Contact Thermometer from Ryan Instruments

The non-contact thermometer provides instantaneous response to surface temperature measurement of an object or area. The unit comes in two models, the laser guided model for pinpointing the exact location of measurement and the nonlaser guided model for measuring larger areas. The non-contact thermometer has a wide temperature range, -67° to 260°F (-55° to 126°C), an accuracy of ± 2% of full scale, and a 1 second response time. If you are involved in food preparation, the thermometer can be used in many areas including rotary cooker temperatures, mixers, baking ovens and infrared ovens. Often the food service/restaurants/fast food chains use the unit to check meat cooking temperatures, grill/griddle temperatures, and soups and beverages. General uses of the non-contact thermometer include monitoring of HVAC systems, boiler hot spots, refrigerator coils, and hot bearings to name a few. In addition, this unit may be used to perform energy audits.

The Ryan non-contact thermometer is a hand-held, battery-operated sensor. It has pocket-size portability, C/F switch and is easy to use, simply point at the desired target and press the "on" button for a temperature reading –no contact is ever needed.

Ryan Instruments, Redmond, WA

Reader Service No. 250



Thermedics Detection Inc.

InScan® Digital X-Ray Imaging Family of Systems

InScan® 100 Fill Level/Net Content System assures proper net content of containers. The InScan 200 Foreign Material Detection System detects metal, stone, glass and other objects in almost any type of package. InScan 300 Package Integrity Analysis System for small packages provides package integrity information, including the presence or absence, and location of various components in packages. All InScan systems provide high speed, non-contact, nondestructive inspection of 100% of containers on a production line, at up to 520 ft/min (159 m/min) or 2400 containers per minute.

Thermedics Detection Inc., Chelmsford, MA

Reader Service No. 251

New TempTaleP Pulp Monitor Introduced by Sensitech Inc.

Sensitech Inc. introduces a time and temperature monitor designed specifically for the produce industry, the TempTaleP. As the newest member of Sensitech's TempTale family of continuous monitoring products, the TempTale is a multiple use probe unit used to record pulp temperatures of produce while in transit and storage.

"Proper shipping and storage environments are essential for maintaining the quality of produce," explains Nancy Soisson, Director of Marketing. "By using the TempTaleP, produce companies can compare pulp temperatures to container temperatures, identify where problem areas exist and use the information to assist in determining product quality, remaining shelf-life, and claims resolution."

Developed in partnership with customers in the produce industry, TempTaleP is a single-sensor unit that provides the ability to continually monitor core temperatures of fruits and vegetables. Red and green LED's located on the front of the monitor provide visible go/no-go alarms, alerting the user to out-of-range temperature events measured by TempTaleP's stainless steel probe. TempTaleP utilizes a thin probe design that helps to minimize damage to the produce when being inserted and removed. Measuring temperatures between the range of -4°F to 158°F (-20°C to 70°C), the TempTaleP maintains a probe sensor accuracy reading of +/-1°F between the ranges of 32°F to 122°F.

Sensitech Inc., Beverly, MA

Reader Service No. 252

Ecolab Recognizes the Worker as a Critical Control Point

As much as 30 percent of all foodborne contamination is a direct result of insufficient personal hygiene. That means hand and boot washing are key components of a plant's effective food safety program. Ecolab's new EcoCare™ personnel hygiene program helps plants reduce the risk of contaminating the foods and beverages they process.

A critical control point is a step or procedure at which control can be applied to eliminate or reduce a food safety hazard. "By this definition, the worker is clearly a critical control point, and the EcoCare program is designed to help processors reduce food safety hazards," says Keith Kennedy, Ecolab's Director of Marketing.

EcoCare includes a complete line of hand cleaners and sanitizers, doorway sanitizing systems and state-of-the-art touchless dispensers combined with valuable worker training. Ecolab's doorway system should be installed in doorways leading into the production plant floor to provide an automatic sanitizing spray or sanitizing foam blanket for worker's boots and shoes and the wheels of plant equipment. Touchless handcleaning and hand sanitizing dispensers ensure that workers use the correct amount of soap and sanitizer and eliminate conventional dispensers' potential for spreading germs. The systems feature color-coded bilingual labels with easy-to-understand icons.

Many production floor employees are unaware of the invisible nature of deadly microorganisms. They may not be sure whether they have scrubbed long enough to kill all the bacteria on their hands or understand the importance of eliminating contaminants from their boots and plant equipment wheels.

The EcoCare program has five levels of soaps and sanitizers that are gentle to the skin and meet USDA criteria. Unique packaging ensures that the soaps, sanitizers and lotions remain contaminant-free.

"Improvement in food quality and food safety are achieved by understanding and controlling every possible source of microbiological contamination. Point-of-use, notouch dispensers take hand sanitizers out to the worker on the process floor, where they're needed most," says Kennedy.

Ecolab Inc., St. Paul, MN

Reader Service No. 253

BusinessExchange

Employment Opportunities

ADVERTISING INDEX

IAMFES Audiovisual Library

DAIRY

D1010 The Bulk Milk Hauler: Protocol & Procedures—(8 minute videotape). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension-1990). (Rev. 1998)

D1020 Causes of Milkfat Test Variations & Depressions—(30 minute-140 slides-tape-script). This set illustrates the many factors involved in causing milkfat test variations or depressions in your herd, including feeding, management, stage of lactation, age of samples, handling of samples, and testing procedures. The script was reviewed by field staff, nutritionists, laboratory personnel and county extension staff. It is directed to farmers, youth and allied industry. (Penn State-1982)

D1030 Cold Hard Facts—This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association-1993) (Rev. 1998)

D1040 Ether Extraction Method for Determination of Raw Milk—(26 minute videotape). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA-1988) (Rev. 1998)

D1050 The Farm Bulk Milk Hauler—(30 minute-135 slides-tape-script). This set covers the complete procedure for sampling and collecting milk from farms. Each step is shown as it starts with the hauler entering the farm lane and ends when he leaves the milk house. Emphasis is on universal sampling and automated testing. Funds to develop this set were provided by The Federal Order #36 Milk Market Administrator. (Penn State-1982) (Rev. 1998)

D1060 Frozen Dairy Products—(27 minute videotape). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients; emphasis is on what to look for in a plant inspection. Everything from receiving, through processing and cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA-1987) (Rev. 1997)

D1070 The Gerber Butterfat Test—(7 minute videotape). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA-1990) (Rev. 1998)

D1080 High-Temperature, Short-Time Pasteurizer—(59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.-1986) (Rev. 1997)

D1100 Mastitis Prevention and Control—(2-45 minute videotapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Postmilking Teat Dip Protocols, Milk Quality, Milking Systems. (Nasco-1993)

D1110 Milk Plant Sanitation: Chemical Solution—(13 minute videotape). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed... alkaline wash, presence of chlorine and iodophor, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)

D1120 Milk Processing Plant Inspection Procedures—(15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre- and post-inspection meeting with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)

D1130 Pasteurizer – Design and Regulation– (16 minute videotape). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods-1990) (Rev. 1998)

D1140 Pasteurizer – Operation–(11 minute videotape). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods-1990) (Rev. 1998)

D1150 Processing Fluid Milk–(30 minute-140 slides-script-tape). It was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Rev. 1998)

D1170 3-A Symbol Council–(8 minute videotape). A video which was developed to make people in the dairy and food industries aware of the 3-A program and its objectives.

D1180 10 Points to Dairy Quality–(10 minute videotape). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk-receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance-1992) (Rev. 1998)

FOOD

F2010 Close Encounters of the Bird Kind–(18 minute videotape). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Rev. 1998)

F2020 Egg Handling & Safety–(11 minute videotape). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board-1997)

F2040 Food Irradiation–(30 minute videotape). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, overripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Rev. 1998)

F2050 Food Safe–Food Smart–HACCP & Its Application to the Food Industry– (2-16 minute videotapes). (1)-Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2)-Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Rev. 1998)

F2060 Food Safe–Series I–(4-10 minute videotapes). (1) "Receiving & Storing Food Safely," details for food-service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food-service Facilities and Equipment," outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Food-service Workers," provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Food-service Housekeeping and Pest Control," emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education-1991) (Rev. 1998)

F2070 **Food Safe—Series II**–(4-10 minute videotapes). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus,* (sauces) (2) *Salmonella,* (eggs) (3) *Campylobacter,* and (4) *Clostridium botulinum.* Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education-1991) (Rev. 1998)

F2080 **Food Safe—Series III**–(4-10 minute videotapes). More case histories of foodborne disease. This set includes (1) Hepatitis "A", (2) *Staphylococcus aureus* (meats), (3) *Bacillus cereus*, and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education-1991) (Rev. 1998)

F2090 **Food Safety: An Educational Video for Institutional Food-Service Workers**–(10 minute videotape). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (U.S. Department of Health & Human Services-1997)

F2110 **Food Safety is No Mystery**–(34 minute videotape). This is an excellent training visual for food-service workers. It shows the proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a food-service worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross-contamination, and storage of foods are included. (USDA-1987). Also available in Spanish. – (Rev. 1998)

F2120 **Food Safety: For Goodness Sake, Keep Food Safe**–(15 minute videotape). Teaches foodhandlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extension-1990) (Rev. 1998)

F2130 **Food Safety: You Make the Difference**–(28 minute videotape). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: handwashing, preventing cross-contamination, moving foods quickly through the danger zone, and hot/cold holding (Seattle-King County Health Department-1995)

F2140 **GMP Basics – Employee Hygiene Practices**–(20 minute videotape). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particulary hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories-1997)

F2150 **GMP: Personal Hygiene & Practices in Food Manufacturing**–(14 minute videotape). This video focuses on the personal hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State-1993)-(Available in Spanish and Vietnamese)

F2160 **GMP: Sources & Control of Contamination during Processing**–(20 minute videotape). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross-contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State-1995)

F2170 **The Heart of HACCP**–(22 minute videotape). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work environment. This video emphasizes the principles of primary concern to plant personnel such as critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratories Group-1994)

F2180 **HACCP: Safe Food Handling Techniques**–(22 minute videotape). The video highlights the primary causes of food poisoning and emphasizes the importance of self-inspection. An explanation of potentially hazardous foods, cross-contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a foodservice operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Foodservices Association-1990) (Rev. 1998)

F2190 **Is What You Order What You Get? Seafood Integrity**–(18 minute videotape). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Rev. 1998)

F2210 **Northern Delight–From Canada to the World**–(13 minute videotape). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Rev. 1998)

F2220 **Proper Handling of Peracidic Acid**–(15 minute videotape). Introduces paracidic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.

F2230 **Purely Coincidental**–(20 minute videotape). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats Company-1993.) (Rev. 1998)

F2240 **On the Front Line**–(18 minute videotape). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association-1993) (Rev. 1998)

F2250 **On the Line**–(30 minute videotape). This was developed by the Food Processors Institute for training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (Available in Spanish) The Food Processors Institute. 1993. (Rev. 1998)

F2260 **100 Degrees of Doom... The Time & Temperature Caper**–(14 minute videotape). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.-1987) (Rev. 1998)

F2270 **Pest Control in Seafood Processing Plants**–(26 minute videotape). Videotape which covers procedures to control flies, roaches, mice, rats and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations. (Rev. 1998)

F2280 **Principles of Warehouse Sanitation**–(33 minute videotape). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking-1993)

F2290 **Product Safety & Shelf Life**–(40 minute videotape). Developed by Borden Inc., this videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problems caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden-1987) – (Rev. 1997)

F2310 **Safe Food: You Can Make a Difference**–(25 minute videotape). A training video for food-service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning

and sanitizing, and handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional foodhandlers. (Tacoma-Pierce County Health Department-1990). (Rev. 1998)

F2320 **Safe Handwashing**—(15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology and Management-1991) (Rev. 1998)

F2330 **Sanitation for Seafood Processing Personnel**—(20 minute videotape). A training video suited for professional foodhandlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional foodhandler is introduced to a variety of sanitation topics including: (1) food-handlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross-contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Rev. 1998)

F2340 **Sanitizing for Safety**—(17 minute videotape). Provides an introduction to basic food safety for professional foodhandlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox-1990) (Rev. 1998)

F2350 **SERVSAFE® Serving Safe Food**—(4-20 minute videotapes). This video series illustrates and reinforces important food safety practices in an informative and entertaining manner. The material is presented in an easy to understand format, making it simpler for employees to learn and remember this essential information. Each video includes a leader's guide that provides all the information managers need to direct a productive training session. (Educational Foundation of the National Restaurant Association-1993) (Rev. 1998)

F2360 **SERVSAFE® Serving Safe Food Second Edition**—(6-10 minute videotapes). The program still covers all the major areas of food safety training, but there is an added emphasis on training employees to follow HACCP procedures. The second edition program includes an Employee Guide, Leader's Guide and six instructional videos. (Educational Foundation of the National Restaurant Association-1993)

F2370 **Supermarket Sanitation Program-"Cleaning & Sanitizing"**—(13 minute videotape). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees. (1989) (Rev. 1998)

F2380 **Supermarket Sanitation Program-"Food Safety"**—(11 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees. (1989) (Rev. 1998)

F2390 **Take Aim at Sanitation**—(8 minute videotape). This video features tips on food safety and proper disposal of single service items. Also presented is an emphasis on food contact surfaces as well as the manufacture, storage and proper handling of these items. (Foodservice and Packaging Institute, Inc.-1995). (Available in Spanish)

F2410 **Wide World of Food-Service Brushes**—(18 minute videotape). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989) (Rev. 1998)

F2420 **Your Health in Our Hands-Our Health in Yours**—(8 minute videotape). For professional foodhandlers, the tape covers the do's and don'ts of foodhandling as they relate to personal hygiene, temperature control, safe storage and proper sanitation. (Jupiter Video Production-1993). (Rev. 1998)

F2430 **Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant**–(20 minute videotape) A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laboratories Group-1996)

F2440 **Cleaning & Sanitizing in Vegetables Processing Plants: Do It Well, Do It Safely!**–(16 minute videotape) This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for processing plant as it is for washing dishes at home. (University of Wisconsin Extension-1996) (Available in Spanish)

ENVIRONMENTAL

E3010 **The ABCs of Clean–A Handwashing & Cleanliness Program for Early Childhood Programs**–For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association-1991)

E3020 **Acceptable Risks?**–(16 minute videotape). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.-1993) (Rev. 1998)

E3030 **Air Pollution: Indoor**–(26 minute videotape). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Rev. 1998)

E3040 **Asbestos Awareness**–(20 minute videotape). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.-1988) (Rev. 1998)

E3050 **Down in the Dumps**–(26 minute videotape). Garbage is no laughing matter. The fact is that we are running out of space to dump the vast amounts of waste we create each day. Since many of the former methods of disposal are environmentally unacceptable, what are we to do? The program examines the technological approaches to the garbage dilemma, including composting, resource recovery, and high-tech incinerators, and public reaction to the creation of new waste treatment facilities. (Films for the Humanities & Sciences, Inc.)

E3060 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)**–(22 minute videotape). Demonstrates the Ceriodaphnia 7-Day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Rev. 1998)

E3070 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)**–(15 minute videotape). A training tape that teaches environmental professionals about the Fathead Minnow Larval Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Rev. 1998)

E3080 **Fit to Drink**–(20 minute videotape). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to

remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and floculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.–1987)

E3090 **Food-Service Disposables: Should I Feel Guilty?**—(12 minute videotape). The video, produced by the Food-service & Packaging Institute, Inc., national trade association of manufacturers and suppliers of single service articles for food service and packaging, examines such issues as litter, solid waste, recycling, composting and protection of the earth's ozone layer, makes for an excellent discussion opener on the theme of conservation of natural resources (trees, fresh water and energy) and the environmental trade-offs (convenience, sanitation and family health) that source reduction necessarily entails. (Food-service & Packaging Institute, Inc.–1991)

E3110 **Garbage: The Movie**—(25 minute videotape). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Rev. 1998)

E3120 **Global Warming: Hot Times Ahead**—(23 minute videotape). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films–1995)

E3130 **Kentucky Public Swimming Pool & Bathing Facilities**—(38 minute videotape). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987). (Rev. 1998)

E3135 **Plastics Recycling Today: A Growing Resource**—(11:35 minute videotape). Recycling is a growing segment of our nation's solid waste management program. This video shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc.–1988)

E3140 **Putting Aside Pesticides**—(26 minute videotape). This program probes the long-term effects of pesticides and explores alternative pest-control efforts; biological pesticides, genetically-engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.)

E3150 **Radon**—(26 minute videotape). This program looks at the possible health implications of radon pollution, methods homeowners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.

E3160 **RCRA–Hazardous Waste**—(19 minute videotape). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)

The New Superfund. What It is & How It Works–A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:

E3170 **Tape 1–Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements**—(62 minute videotape). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process–long-term and permanent cleanup–is illustrated

step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.

E3180 **Tape 2–Changes in the Removal Process: Removal and Additional Program Requirements–** (48 minute videotape). The removal process is a short-term action and usually an immediate response to accidents, fires and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

E3190 **Tape 3–Enforcement & Federal Facilities—**(52 minute videotape). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARs) are explained.

E3210 **Tape 4–Emergency Preparedness & Community Right-to-Know—**(48 minute videotape). A major part of SARA is a free-standing act known as Title III: The Emergency Planning and Community Right-to-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency & hazardous chemical inventory and the toxic chemical release inventory.

E3220 **Tape 5–Underground Storage Tank Trust Fund & Response Program—**(21 minute videotape). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking–and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

E3230 **Tape 6–Research & Development/Closing Remarks—**(33 minute videotape). An important new mandate of the new Superfund is the technical provisions for research and development to create more permanent methods in handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.

E3240 **Sink A Germ—**(10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.–1986). (Rev. 1998)

E3250 **Waste Not: Reducing Hazardous Waste—**(35 minute videotape). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. Waste Not also looks at the obstacles to waste reduction, both within and outside of industry, and considers how

society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella films)

OTHER

M4010 Diet, Nutrition & Cancer—(20 minute videotape). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.

M4020 Eating Defensively: Food Safety Advice for Persons with Aids—(15 minute videotape). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC-1989)

M4030 Ice: The Forgotten Food—(14 minute videotape). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.); it documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association-1993)

M4040 Legal Aspects of the Tampering Case—(25 minute videotape). This was presented by Mr. James T. O'Reilly, University of Cincinnati School of Law at the fall 1986 Central States Association of Food and Drug Officials Conference. He emphasizes three factors from his police and legal experience-know your case, nail your case on the perpetrator, and spread the word. He outlines specifics under each factor. This should be of the greatest interest to regulatory sanitarians, in federal, state and local agencies. (1987)

M4050 Personal Hygiene & Sanitation for Food Processing Employees—(15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State-1993)

M4060 Psychiatric Aspects of Product Tampering—(25 minute videotape). This was presented by Emanuel Tanay, M.D. from Detroit, at the fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead to up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper proof containers are not the ultimate answer. (1987)

M4070 Tampering: The Issue Examined—(37 minute videotape). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro-1987)

International Association of Milk, Food and Environmental Sanitarians, Inc.
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Des Moines, Iowa 50322-2863, USA
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DAIRY

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- ❒ D1020 Causes of Milkfat Test Variations & Depressions
- ❒ D1030 Cold Hard Facts
- ❒ D1040 Ether Extraction Method for Determination of Raw Milk
- ❒ D1050 The Farm Bulk Milk Hauler
- ❒ D1060 Frozen Dairy Products
- ❒ D1070 The Gerber Butterfat Test
- ❒ D1080 High-Temperature, Short-Time Pasteurizer
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1110 Milk Plant Sanitation: Chemical Solution
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1130 Pasteurizer - Design and Regulation
- ❒ D1140 Pasteurizer - Operation
- ❒ D1150 Processing Fluid Milk
- ❒ D1170 3-A Symbol Council
- ❒ D1180 10 Points to Dairy Quality

ENVIRONMENTAL

- ❒ E3010 The ABCs of Clean – A Hand-washing & Cleanliness Program for Early Childhood Programs
- ❒ E3020 Acceptable Risks?
- ❒ E3030 Air Pollution: Indoor
- ❒ E3040 Asbestos Awareness
- ❒ E3050 Down in the Dumps
- ❒ E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)
- ❒ E3070 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)
- ❒ E3080 Fit to Drink
- ❒ E3090 Food-Service Disposables: Should I Feel Guilty?
- ❒ E3110 Garbage: The Movie
- ❒ E3120 Global Warming: Hot Times Ahead
- ❒ E3130 Kentucky Public Swimming Pool & Bathing Facilities
- ❒ E3135 Plastic Recycling Today: A Growing Resource
- ❒ E3140 Putting Aside Pesticides
- ❒ E3150 Radon
- ❒ E3160 RCRA – Hazardous Waste
- ❒ E3170 The New Superfund: What It is & How It Works–(1) Changes in the Remedial Process: Clean-up Standards & State Involvement Requirements
- ❒ E3180 The New Superfund: What It is & How It Works–(2) Changes in the Removal Process: Removal & Additional Program Requirements
- ❒ E3190 The New Superfund: What It is & How It Works – (3) Enforcement and Federal Facilities
- ❒ E3210 The New Superfund: What It is & How It Works – (4) Emergency Preparedness & Community Right-to-Know
- ❒ E3220 The New Superfund: What It is & How It Works – (5) Underground Storage Tank Trust Fund & Response Program
- ❒ E3230 The New Superfund: What It is & How It Works – (6) Research & Development/Closing Remarks
- ❒ E3240 Sink a Germ
- ❒ E3250 Waste Not: Reducing Hazardous Waste

FOOD

- ❒ F2010 Close Encounters of the Bird Kind
- ❒ F2020 Egg Handling & Safety
- ❒ F2040 Food Irradiation
- ❒ F2050 Food Safe - Food Smart - HACCP & Its Application to the Food Industry (Part 1&2)
- ❒ F2060 Food Safe - Series I (4 Videos)
- ❒ F2070 Food Safe - Series II (4 Videos)
- ❒ F2080 Food Safe - Series III (4 Videos)
- ❒ F2090 Food Safety: An Educational Video for Institutional Food-Service Workers
- ❒ F2110 Food Safety is No Mystery
- ❒ F2120 Food Safety: For Goodness Sake, Keep Food Safe
- ❒ F2130 Food Safety: You Make the Difference
- ❒ F2140 GMP: Basics – Employee Hygiene Practices
- ❒ F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
- ❒ F2160 GMP: Sources & Control of Contamination during Processing
- ❒ F2170 The Heart of HACCP
- ❒ F2180 HACCP: Safe Food Handling Techniques
- ❒ F2190 Is What You Order What You Get? Seafood Integrity
- ❒ F2210 Northern Delight - From Canada to the World
- ❒ F2220 Proper Handling of Peracidic Acid
- ❒ F2230E Purely Coincidental - English
- ❒ F2230S Purely Coincidental - Spanish
- ❒ F2240 On the Front Line
- ❒ F2250 On the Line
- ❒ F2260 100 Degrees of Doom...The Time & Temperature Caper
- ❒ F2270 Pest Control in Seafood Processing Plants
- ❒ F2280 Principles of Warehouse Sanitation
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- ❒ F2430 Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant
- ❒ F2440 Cleaning & Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!

OTHER

- ❒ M4010 Diet, Nutrition & Cancer
- ❒ M4020 Eating Defensively: Food Safety Advice for Persons with AIDS
- ❒ M4030 Ice: The Forgotten Food
- ❒ M4040 Legal Aspects of the Tampering Case
- ❒ M4050 Personal Hygiene & Sanitation for Food Processing Employees
- ❒ M4060 Psychiatric Aspects of Product Tampering
- ❒ M4070 Tampering: The Issue Examined

Preliminary Program
of the IAMFES 86th Annual Meeting

MONDAY MORNING — AUGUST 2, 1999

S1 Globalization of Foodborne Disease

- Types of Foodborne Outbreaks in Developing Countries – EWEN TODD, Health Canada, Ottawa, Ontario, Canada
- The Prevention of Spread of Foodborne Disease from a WHO Perspective – YASMINE MOTARJEMI, WHO, Geneva, Switzerland
- The Americas – ELLEN MORRISON, FDA, Washington, D.C., USA
- Trade with and within Europe – MICHIEL VAN SCHOTHORST, Nestec Ltd., Vevey, Switzerland
- Japan – HIROSHI TAKAHASHI, National Institute of Infectious Diseases, Tokyo, Japan
- Australia and New Zealand – TRISH DESMARCHELIER, CSIRO, Tingalpa, Queensland, Australia

S2 Fruits and Vegetables: Are They Safe Enough?

- Outbreaks Associated with Produce – MORRIS E. POTTER, CDC, Atlanta, GA, USA
- Risk Management Strategies at the Farm – NANCY NAGLE, Nagle Resources, Pleasanton, CA, USA
- Assuring the Safety of Unpasteurized Juices – ROBERT BUCHANAN, FDA, Washington, D.C., USA
- Interventions to Reduce the Risk of Pathogens Associated with Alfalfa Sprouts – LARRY BEUCHAT, University of Georgia, Griffin, GA, USA
- Quantitative Risk Assessment of *E. coli* O157 and *L. monocytogenes* in Fresh-cut Produce – EWEN TODD, Health Canada, Ottawa, Ontario, Canada
- Microbiological Issues Associated with Packaged Produce – E. JEFFREY RHODEHAMEL, Cryovac North America, Duncan, SC, USA

S3 Mini Workshop for Dairy Plant Employees and Regulators

- Plant Regulatory Inspection – CHARLES PRICE, SR., FDA, Chicago, IL, USA
- Employee G.M.P.'s – GAYLORD SMITH, Mohawk Assoc., Inc., Schenectady, NY, USA
- Standards Pertaining to Product Quality – RUTH FUQUA, Quality Creek Dairies, Inc., Mt. Juliet, TN, USA
- Sanitary Design & Installation of Equipment – DON GRAHAM, Graham Sanitary Design Consulting, Chesterfield, MO, USA

Microbiology of Meat and Poultry – Technical Session

T1 Reduction of *E. coli* O157:H7 Concentrations in Ruminal Contents In Vitro; Bacteriocidal Effect of Sodium Chlorate – ROBIN C. ANDERSON, David J. Nisbet, Sandra A. Buckely, Roger B. Harvey, and Larry H. Stanker, USDA, ARS, College Station, TX, USA

T2 Incidence of *E. coli* O157:H7 in Frozen Beef Patties Produced Over an Eight Hour Shift – W. PAYTON PRUETT, JR., Timothy Biela, Russell S. Flowers, Peter Mrozinski, Charles Lattauada, Bonnie Rose, Ann Marie McNamara, James O. Reagan, David Theno, and William Osborne, Silliker Laboratories Group, Inc., Homewood, IL, USA

T3 Commercial Evaluation of Multiple-Sequential Interventions for Decontamination of Beef Carcasses – R. TODD BACON, J. N. Sofos, K. E. Belk, J. O. Reagan, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

T4 Verification of the Effectiveness of a Second Generation Steam Pasteurization™ System for Decontaminating Pre-rigor Beef Carcass Sides in a Commercial Slaughter Facility – D. D. RETZLAFF, R. K. Phebus, S. B. Sporing, M. D. Schafer, and S. A. Rueger, Kansas State University, Manhattan, KS, USA

T5 Effectiveness of Potassium Lactate and Lactic Acid against *Campylobacter* on Chicken Breasts – DAVID D. RASMUSSEN, S. S. Sumner, C. R. Hackney, J. E. Eifert, M. L. Eckhoff, and B. T. deVegt, Virginia Tech, Food Science and Technology, Blacksburg, VA, USA

T6 Chlorination of Chill Tanks Reduces Salmonellae on Processed Broiler Carcasses – J. STAN BAILEY, N. A. Cox, and N. J. Stern, USDA, Athens, GA, USA

T7 Cross-contamination Model for *Salmonella* in Poultry Chilling Process – HONG YANG, Yanbin Li, and Michael G. Johnson, University of Arkansas, Fayetteville, AR, USA

T8 A Computer Software Application of Assessing the Risk and Severity of *Salmonella* and *Campylobacter* Infections from Poultry Products – THOMAS P. OSCAR, USDA, ARS, Princess Anne, MD, USA

T9 Changes in the Native Microflora, Weight, and pH of the Ceca of Turkeys Subjected to Feed Withdrawal – ARTHUR HINTON, JR., R. Jeff Buhr, and Kimberly D. Ingram, PPMQ, ARS, USDA, Athens, GA, USA

T10 Use of Whey-based Film Containing Antimicrobial Agents to Inhibit *L. monocytogenes* in Frankfurters – CRYSTAL R. MCDADE, S. M. Zutara, E. Ryser, C. W. Donnelly, and H. Chen, University of Vermont, Burlington, VT, USA

T11 Levels of Microbiological Contamination of Pork Carcasses during Slaughter – HENRY N. ZERBY, K. E. Belk, M. Hardin, J. N. Sofos, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

T12 Extent of Microbiological Contamination on Pork Variety Meats – HENRY N. ZERBY, K. E. Belk, M. Hardin, W. Lloyd, J. N. Sofos, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

Rapid Methods and Miscellaneous – Poster Session

P1 Modification of Some Selective Media for the Rapid Detection of *Salmonella* Using Impedance-splitting Method – PRAVATE TUITEMWONG, T. Hongdusit, and K. Tuitemwong, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

P2 Use of Membrane Fraction and Selective Motility for the Rapid Screening of *L. monocytogenes* – PRAVATE TUITEMWONG, J. Wongchavalit, and K. Tuitemwong, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

P3 Evaluation of the BAX for Screening/Genus *Listeria* Method for Testing Environmental Sponges – JOSEPH D. MEYER, Kara B. Mikkelson-Baldus, Adam C. Borger, W. Mark Barbour, and Paul A. Hall, Kraft Foods, Oscar Mayer Division, Madison, WI, USA

P4 Immunoassay-based Test for Detection of Peanuts in Food Products – MOHAMED M. ABOUZIED, Scott A. Askegard, Paul S. Satoh, Susan L. Hefle, Julie A. Nordlee, and Steve L. Taylor, Neogen Corporation, Lansing, MI, USA

P5 Detection of Egg Contamination in Food Products by Immunoassay-based Test – MOHAMED M. ABOUZIED, Carrie J. Fetzner, Paul S. Satoh, Susan L. Hefle, Elizabeth Jeanniton, and Steve Taylor, Neogen Corporation, Lansing, MI, USA

P6 Accuracy of *Salmonella* Detection in Food Using Commercially Available *Salmonella* ELISA tests – CATHERINE SMITH, K.W. Doherty, and C.-M. Chen, Idexx Laboratories, Westbrook, ME, USA

P7 Rapid Preparation of PCR Samples from Food Combined with Shortened PCR Cycles for the Detection of *E. coli* – WILLIAM K. SHAW, JR., and L. A. McLandsborough, University of Massachusetts, Amherst, MA, USA

P8 Enumeration of *Campylobacter jejuni* and *C. coli* within 36 h by Immunoblotting from Modified Blood Agar Medium – RAMA NANNAPANENI, R. Story, and M. G. Johnson, University of Arkansas, Dept. of Food Science, Fayetteville, AR, USA

P9 A Single Medium for the Quantitative Screening of Three Foodborne Pathogens – R. VICTOR LACHICA, U.S. Army Natick Labs, Natick, MA, USA

P10 Comparison of Microbial Identification Methods – MARLENE CELIS, Joshua Deabel, Vidhya Gangar, and Mishael Curiale, Silliker Laboratories Research Corp. Center, South Holland, IL, USA

P11 A PCR-ELISA for Detecting Shiga Toxin-producing *E. coli* in Food – BEILEI GE, J. Meng, and S. Zhao, University of Maryland, College Park, MD, USA

P12 Evaluation of the TECRA® Unique™ Test for Rapid Detection of *Salmonella* in Food: A Collaborative Study – DENISE HUGHES, A. Dailianis, and L. Hill, TECRA Diagnostics, Roseville, Australia

P13 Rapid 24 H Multiplex Detection of Four Pathogens in Food from a Single Enrichment – ANNE DAVIES, R. Owen, D. Nelson, B. Wicks, L. Parsons, C. Hamill, R. Mackee, and B. Thomas, Celsis, Inc., Evanston, IL, USA

P14 Rappaport-Vassiliadis Enrichment Procedure for Use with DNA Hybridization Assays for Detection of *Salmonella* spp. in Foods – MARK A. MOZOLA and Gregory W. Durbin, GENE-TRAK Systems, Hopkinton, MA, USA

P15 Differentiation between Types and Strains of *Clostridium botulinum* by Riboprinting – GUY E. SKINNER, G. A. Fingerhut, S. M. Gendel, and H. M. Solomon, USFDA/NCFST, Summit-Argo, IL, USA

P16 Evaluation of Clearview™ and Bax™ for the Detection of *Listeria* sp. and *L. monocytogenes* – MARIA T. DESTRO and D. A. Rodrigues, FCF/USP, San Paulo, SP, Brazil

P17 Comparison of Different Dye Indicators for Early Detection of Microbial Growth – *E. coli* O157:H7 Using Biosys 32 – ADALGISA M. MORA, S. L. Archie, N. E. Allen, and A. P. Dessai, Tuskegee University, Tuskegee, AL, USA

P18 The Influence of Pre-enrichment Media on the Detection of *E. coli* O157:H7 with a Fluorogenic DNA-based Assay – ROBERT L. GREEN, Michiko Matsuura, Lisa A. Yagi, and Paul A. Foxall, PE Biosystems, Foster City, CA, USA

P19 Comparison of BAX® and Organon Teknika® *Salmonella*-Tek to Standard Selective Enrichment Method for the Detection of *Salmonella* in Food – THEODORA MORILLE-HINDS, Hugh Trenk, and Paul A. Hall, Kraft Foods, Tarrytown, NY, USA

P20 Isolation of Foodborne *Salmonella* Using Dynabeads® Anti-*Salmonella* and Oxiod S.P.R.I.N.T. *Salmonella* Medium – KOFITSYO S. CUDJOE, R. Krona, M. Ron, and A. Campbell, Dynal AS, Norwegian College of Vet. Medicine, Oslo, Norway

P21 Collaborative Testing of a Prototype Automated IMS System for Rapid Detection of *Salmonella* and *E. coli* O157 Using Dynabeads® – KOFITSYO S. CUDJOE, R. Krona, M. Ron, and A. Campbell, Dynal AS, Norwegian College of Vet Med., Oslo, Norway

P22 The Use of Rapid Methods to Assess the Incidence and Public Health Risk of *S. aureus* in Food and Food Production Environments – JILL GEBLER, Murray Goulburn Co-operative Co. Ltd., Victoria, Australia

P23 Evaluation of the Rapid SimPlate™ Yeast and Mold Test for Various Food Bar Products – Y. JENNIFER LEE, S. D. Allard, and D. J. Yonker, Amway Corporation, Ada, MI, USA

P24 Comparison of Two ELISA Tests against Standard Method for the Detection of *Listeria* Species in Food Samples – HAOYI GU, K. Osborne, and C. M. Chen, Idexx Laboratories, Inc., Westbrook, ME, USA

P25 *Salmonella* Detection in Food: Study of a Two-step Enrichment Protocol Combined with an ELISA – PATRICE ARBAULT and S. Poumerol, Diffchamb S.A., Lyon, France

P26 Cleaning Validation in Food Retail Environments by a New Protein Assay – BRIAN ECKENROTH and Elizabeth Ehrenfeld, IDEXX Laboratories, Westbrook, ME, USA

P27 A Comparative Media Analysis of Newspaper Coverage of Microbial Food Safety Issues in Canada, the US, the UK and Australia, 1994-1998 – AMANDA WHITFIELD, K. Vandenberg, J. Seib, S. Grant, and D. A. Powell, University of Guelph, Guelph, Ontario, Canada

P28 Statistical Process Monitoring and Fault Diagnosis in a Continuous Dairy Pasteurization Process – F. KOSEBALABAN, J. E. Schlesser, and Ali Cinar, Illinois Institute of Technology, Chicago, IL, USA

P29 Cleaning Validation of Food Processing Equipment: A Comparison between a New Ultrasonic Apparatus and Swab Method – NADIA OULAHAL-LAGSIR, A. Martial, E. Marquis-Boistier, and M. Bonneau, Raliment: Rhone Alpes Food Research Center, France

P30 A Comparative Evaluation of the Cleaning Performances of a Range of Seven Floors in Food Industry – NADIA OULAHAL-LAGSIR, Elisabeth Marquis-Boistier, and Jean-Paul Larpent, Raliment/Alimentec Recherche, Hygiene and Quality, France

P31 Indicative Microbes on Processed Shrimp before Implementation of US FDA's HACCP Regulations – CUSTY F. FERNANDES, C. D. Veal, D. L. Marshall, and K. R. Cadwallader, Mississippi State University, Pascagoula, MS, USA

P32 Evaluation of HACCP Program for Deli Food Service Managers – JULIE A. ALBRECHT, Dianne L. Peters, and Susan S. Sumner, University of Nebraska, Lincoln, NE, USA

MONDAY AFTERNOON — AUGUST 2, 1999

S4 Science-based Criteria for Harmonizing Food Safety Regulations

- Scientific Basis for Setting Performance Standards – MICHIEL VAN SCHOTHORST, Nestec Ltd., Vevey, Switzerland
- Harmonization of *Listeria* Tolerance Limits – European Experience – PAUL TEUFEL, Federal Institute for Health Protection of Consumers and Veterinary Medicine, Berlin, Germany
- Harmonization of Acceptance Criteria for Microbiological Methods – RUSSELL FLOWERS, Silliker Laboratories Group, Chicago, IL, USA
- Equivalence of Inspection Systems for International Trade – ROBERT BUCHANAN, FDA, Washington, D.C., USA
- Verotoxigenic Versus Other *E. coli* Standards – MICHAEL DOYLE, University of Georgia, Griffin, GA, USA

S5 Manure and Water: Produce Safety Implications

- Water and Manure Safety Issues for the Next Millennium – DEAN O. CLIVER, University of California-Davis, Davis, CA, USA
- Water Quality and Safety – JOAN ROSE, University of South Florida, St. Petersburg, FL, USA
- Developing Manure Management Controls for Conventional and Organic Farming – TREVOR SUSLOW, University of California-Davis, Davis, CA, USA
- Manure Quality and Safety – GARRY FORNEY, Bull Enterprises, El Centro, CA, USA
- Field Sanitation/Worker Hygiene Issues – FRANCES PABRUA, California Strawberry Commission, Watsonville, CA, USA

S6 Dairy Plant Quality and Safety Programs

- Preventive Maintenance in Dairy Plants – CHRIS NEWCOMER, New-Tech Consulting, Inc., Cincinnati, OH, USA
- Dairy Plant Quality Control – DEAN SUMMERS, Alto Cheese, Wampun, WI, USA
- Implementing a HACCP Program – JEFF MAIATICO, DFA, New Wilmington, PA, USA
- Designing a HACCP Plan – RANDY DOUGHERTY, National Sanitation Foundation, Ann Arbor, MI, USA
- Report from the NCIMS HACCP Committee – CLANDIA COLES, Washington State DPA, Olympia, WA, USA
- Dairy Plant Prerequisites – STEVE SIMS, M.S.B., Washington, D.C., USA

General Food Microbiology — Technical Session

T13 Modeling the Growth Boundary of *Staphylococcus aureus* for Risk Assessment Purposes — CYNTHIA M. STEWART, Martin B. Cole, J. David Legan, Donald Schaffner, Louise Slade, and Mark Vandeven, Nabisco Inc., E. Hanover, NJ, USA

T14 Response Surface Models for Effects of Previous Sodium Chloride and Temperature on Growth Kinetics of *Salmonella typhimurium* on Cooked Chicken Breast — THOMAS P. OSCAR, USDA, ARS, Princess Anne, MD, USA

T15 Bacteriophage Activity against *E. coli* O157:H7 and *Salmonella* spp. — ANANTA P. DESSAI, L. R. Chery, and S. L. Archie, Tuskegee University, Tuskegee, AL, USA

T16 Effect of Chlorine Treatment on Heat Inactivation of *E. coli* O157:H7 — JAMES P. FOLSOM and Joseph F. Frank, University of Georgia, Athens, GA, USA

T17 Application of Treatments to Reduce Contamination of Pork Variety Meats — HENRY N. ZERBY, K. E. Belk, M. Hardin, W. Lloyd, J. N. Sofos, and G. C. Smith, Colorada State University, Fort Collins, CO, USA

T18 Inactivation of *E. coli* O157:H7 and *L. monocytogenes* on Apples Using Ozone, Chlorine Dioxide, Sodium Hypochlorite and Peracetic Acid — STEPHANIE L. RODGERS, Jerry N. Cash, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

T19 Microbial Reduction of Laboratory Inoculated Produce Surfaces by Rinsing and Wiping with Paper Towels and Comparison to 200 PPM Chlorine Dip — BARRY MICHAELS, Vidhya Gangar, Eric Meyers, Heidi Johnson, and Michael S. Curiale, Georgia Pacific Corporation, Palatka, FL, USA

T20 Efficacy of Ultraviolet Light to Eliminate *E. coli* O157:H7 in Unpasteurized Apple Cider — JIM R. WRIGHT, S. S. Sumner, C. R. Hackney, and M. D. Pierson, Virginia Tech Food Science and Technology, Blacksburg, VA, USA

T21 Inhibition of Growth and Aflatoxin Production of *Aspergillus parasiticus* by Korean Soybean Paste (Doen-jang) and Identification of the Active Component — JONG-GYU KIM, Yong-Wook Lee, Pan-Gyi Kim, Woo-Sup Roh, and Hideharu Shintani, Keimyung University, Taegu, Korea

T22 Critical Role of *Pediococcus* sp. Cytoplasmic Membrane in Thermal Resistance — BASSAM A. ANNOUS, USDA, Wyndmoor, PA, USA

T23 Antibiotic Resistance of Gram-negative Enteric Pathogens Isolated from Retail Meats — ROBERT L. SUDLER JR., J. Meng, D. T. Ingram, and L. Liu, University of Maryland College Park, College Park, MD, USA

T24 Distribution and Role of Integrons in Multi-resistant *Salmonella* — LANCE F. BOLTON, Lynda C. Kelley, and Paula J. Fedorka-Cray, USDA-ARS-PMSRU, Athens, GA, USA

Microbiology of Meat, Poultry, and Produce — Poster Session

P33 Growth of Salmonellae in Previously Irradiated Ground Beef — JAMES S. DICKSON and D. G. Olson, Iowa State University, Ames, IA, USA

P34 Reduction of Bacterial Contamination on Hog Carcasses with Hot Water and Organic Acid Rinses — JAMES S. DICKSON, L. Eggenberger-Solorzano, S. E. Niebuhr, R. J. Huber, M. Hardin, and G. R. Acuff, Iowa State University, Ames, IA, USA

P35 Dissemination of *L. monocytogenes* in a Brazilian Frozen Chicken Nuggets Processing Line — MARIA T. DESTRO and D. A. Rodrigues, FCF/USP, San Paulo, SP, Brazil

P36 Production of Mortadella: Behavior of *L. monocytogenes* under Commercial Manufacturing and Storage Conditions — MARIA T. DESTRO and L. S. Bersot, FCF/USP, San Paulo, SP, Brazil

P37 Enumeration of *E. coli* in Poultry Carcass Rinse Using SimPlate and Petrifilm Methods — PURNENDU C. VASAVADA, D.E. Townsend, and G. Eaton, University of Wisconsin River Falls, River Falls, WI, USA

P38 Sensitivity of *Salmonella typhimurium* DT104 to Irradiation — STEVEN E. NIEBUHR, R. J. Huber, K. T. Rajkowski, D. W. Thayer, and J. S. Dickson, Iowa State University, Ames, IA, USA

P39 Fate of *Salmonella* Enteritidis in Hard-cooked Eggs — WALAIRUT CHANTARAPANONT and L. R. Beuchat, University of Georgia, Griffin, GA, USA

P40 Survival of Multidrug-resistant *Salmonella typhimurium* DT104 in Egg Powders as Affected by Water Activity and Temperature — YONGSOO JUNG and L. R. Beuchat, University of Georgia, Griffin, GA, USA

P41 Consumer Acceptability and Microbial Inactivation in Home-style Beef Jerky Produced by Various Methods — JUDY A. HARRISON, Mark A. Harrison, Ruth Ann Rose-Morrow, and Robert L. Shewfelt, The University of Georgia, Athens, GA, USA

P42 Evaluation of Environmental Microflora in a Korean Meat Plant for HACCP Application — DONG KWAN JEONG and J. S. Lee, Kosin University, Pusan, Korea

P43 Reduction of Normal Flora by Irradiation and Its Effect on Multiplication of *L. monocytogenes* on Ground Turkey at 7°C in a Modified Atmosphere — DONALD W. THAYER and Glenn Boyd, USDA, ARS, ERRC, Wyndmoor, PA, USA

P44 Microbiological Contamination Baselines of Beef Carcasses, Wholesale Cuts and Retail Cuts – MINDY L. KAIN, J. N. Sofos, K. E. Belk, J. O. Reagan, G. C. Smith, D. R. Buege, W. P. Henning, J. B. Morgan, T. P. Ringkob, and G. R. Bellinger, Colorado State University, Fort Collins, CO, USA

P45 Therapeutic Anti-idiotypic Antibodies to *E. coli* K88 as an Alternative to Antibiotic Use in Meat Industry – ZIAD WAHEED JARADAT and Ronald R. Marquardt, University of Manitoba, Winnipeg, Manitoba, Canada

P46 *E. coli* O157:H7 Risk Assessment for Production and Cooking of Blade Tenderized Beef Steaks – SARAH B. SPORING, R. K. Phebus, J. L. Marsden, D. D. Retzlaff, M. D. Schafer, C. B. Chandler, and A. L. Truax, Kansas State University, Manhattan, KS, USA

P47 Reduction of *Salmonella* Contamination on Pork Products Using Radiant Wall Oven Heating – MARK A. HARRISON, Shanna Lively, and Romeo Toledo, The University of Georgia, Athens, GA, USA

P48 The Occurrence of *Campylobacter* spp. in Swine Carcass Dressing Operations – SAMUEL A. PALUMBO, Jeffrey E. Call, Benne S. Marmer, and Linda S. Yu, USDA, ARS, Wyndmoor, PA, USA

P49 Automated Real Time CCP Monitoring of External Cooked Sausage Temperature Utilizing Infrared Sensors and Statistical Process Monitoring – JEFFREY DECICCO, A. Cinar, J. E. Schlesser, and B. Verdorn, Illinois Institute of Technology, Chicago, IL, USA

P50 Extending the Shelf-life of a Cooked Ham Product Using L-glucose and D-tagatose – D.A. BAUTISTA, P. J. Shand, and R. B. Pegg, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

P51 Microbial Population of Ready-to-Serve Salads in Tekirdog, Turkey – TUNCAY GUMUS, M. Arici, and O. Simjek, Trakya University, Tekirdog, Turkey

P52 A Quantitative Assessment of the Risk of *E. coli* O157:H7 in Apple Cider – SIOBAIN DUFFY, Cook College, Rutgers University, New Brunswick, NJ, USA

P53 Nature of *E. coli* O157:H7 Attachment to Lettuce Leaves and the Effect of Chlorine Disinfection – KAZUE TAKEUCHI and Joseph F. Frank, University of Georgia, Athens, GA, USA

P54 Sodium Chloride and Sodium Bicarbonate Washing Solution for Removal of Enterohemorragic *E. coli* O157:H7 from the Surfaces of Chopped Lettuce – MARLENE E. JANES, R. Nannapaneni, L. Howard, and M. G. Johnson, University of Arkansas, Fayetteville, AR, USA

P55 Survival of *E. coli* O157:H7 in Bovine Feces Applied to Lettuce and Effectiveness of Chlorine as a Disinfectant – L. R. BEUCHAT, University of Georgia, Griffin, GA, USA

P56 Survival of *E. coli* O157:H7 and *Salmonella* spp. on Fresh Strawberries – DAWN M. KNUDSEN and Linda J. Harris, University of California, Davis, CA, USA

P57 Recovery of Generic *E. coli* from Juice – DAVID E. TOWNSEND and Shawn Higgins, IDEXX Laboratories, Inc., Westbrook, ME, USA

P58 Inactivation of *E. coli* O157:H7 and *Salmonella* spp. in Unpasteurized Apple and Orange Juice by High Pressure Processing – GUODONG WANG, E. Raghubeer, and E. Ting, National Food Processors Association, Dublin, CA, USA

P59 Cold Shock Decreases the Thermal Tolerance of Bacterial Pathogens in Apple and Orange Juice – DARRELL O. BAYLES, USDA, ARS, NAA, ERRC, Wyndmoor, PA, USA

P60 Use of pGFP to Determine the Survival of *E. coli* O157:H7 and *Salmonella typhimurium* in Manure Applied to Soil – GENEVIEVE JOHNSON, J. J. Churey, and R. W. Worobo, Cornell University, Geneva, NY, USA

P61 Keeping Quality of Sprouts after Irradiation and D Radiation Values for *Salmonella* and *E. coli* O157:H7 – KATHLEEN T. RAJKOWSKI, USDA, ARS, ERRC, Wyndmoor, PA, USA

P62 Bacterial Decrease of Vegetable Juice by Ozone and Gamma Ray Irradiation – KOOK HEE KANG and S.C. Kwon, Sungkyunkwan University, Suwon, Korea

TUESDAY MORNING — AUGUST 3, 1999

Microbiological Methods and Miscellaneous — Technical Session

T35 An Epidemiological Study of *Pseudomonas aeruginosa* Strains Associated with Mastitis among Dairy Animals and Human Infections Based on Automated Ribotyping with the Restriction Enzyme *Pvu*II – JAMES L. BRUCE, Ariel L. Rivas, Mary Bodis, Renate Klein, and Kevin Anderson, Qualicon, Inc., Wilmington, DE, USA

T36 Fate of *L. monocytogenes* and *E. coli* O157:H7 in Dairy Foods – FATHY E. EL-GAZZAR and Seham Farrag, University of Assiut, Egypt

T37 Biochemical Comparison of *L. lactis* spp. *Lactis biovar*. diacetylactis WRP297 and WRP298, Phage Resistant Variants, with Original Sensitive Culture Used for Cheese Manufacture – R. PIRABHAKARAN and Rattan Chand, National Dairy Research Institute, Karnal, India

T38 A Comparative Study of a Colorimetric ATP Measurement Test, ATP Bioluminescence and Protein Detection for Hygiene Monitoring – MARK CARTER, Ramin Pirzad, James Baker, Drew Ferguson, Paul Meighan, and Peter Grant, Celsis, Inc., Evanston, IL, USA

T39 An Isolation and Detection System for *L. monocytogenes* Using Fluorogenic and Chromogenic Substrates for Phosphatidylinositol-specific Phospholipase C – LAWRENCE RESTAINO, Elon W. Frampton, Robert M. Irbe, Gunter Schabert, and Hans Spitz, R & F Laboratories, West Chicago, IL, USA

T40 Detection and Tracking of *L. monocytogenes* in Smoked Fish Plants – MARTIN WIEDMANN, Dawn Norton, Meghan McCamey, Ken Gall, and Kathryn J. Boor, Cornell University, Ithaca, NY, USA

T41 Effects of Cryogenic Cooling and Traditional Cooling on *Salmonella* Enteritidis Population in Table Eggs – LAVONDA A. HUGHES, D. E. Conner, P. A. Curtis, and K. M. Keener, Auburn University, Auburn, AL, USA

T42 The Impact of Training on Grocery Store Seafood Employees' Food Safety and Sanitation Knowledge, Practices, and Department Profitability – TORI L. STIVERS and Keith W. Gates, University of Georgia Marine Extension Service, Peachtree City, GA, USA

T43 Microbiological Monitoring of "Bobby" Calf Slaughter and Dressing: The Need for a Stand-alone Program Design – ROGER COOK, Christine Esquerra, Monique Biss, and Steve Hathaway, Ministry of Agriculture & Forestry Regulatory Auth., Wellington, New Zealand

T44 Species and Strain Differentiation of *Pseudomonas* spp. by Ribotyping – KATHRYN J. BOOR, Martin Weidmann, John W. Czakja, Denise Weilmeier, Sean Dineen, and Robert Ralyea, Cornell University, Ithaca, NY, USA

T45 A Single-step Polymerase Chain Reaction for Combined Gene Detection and Epidemiological Typing (COGEDET) of *L. monocytogenes* Strains – JEFFREY M. FARBER, Elaine Daley, and Diane Medeiros, Health Canada, Ottawa, Ontario, Canada

T46 Development of Hybridoma Cell Line for the Production of a Monoclonal Antibody to Pesticide Bromacil – SUNG J. KANG, Jin S. Kang, and Duck H. Chung, Gyengsang National University, Chinju, Gyangnam, Korea

S7 Problems and Solutions to the Development of Pathogen Resistance to Traditional Processing

- Membranes as the Key to Resistance to Bacteriocins and Other Preservatives – THOMAS MONTVILLE, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA
- Potential for Emergence of Resistance to Antimicrobials Used in the Food Industry – P. MICHAEL DAVIDSON, University of Tennessee, Knoxville, TN, USA
- Problems and Solutions to Development of Pathogen Resistance to Thermal Processing – ALEJANDRO S. MAZZOTTA, National Food Processors Assn., Washington, D.C., USA
- F-ATPases, Adaptive Acid Tolerance and Coupled Oxidative Stress Resistance in Lactic-acid Bacteria – ROBERT MARQUIS, University of Rochester, Rochester, NY, USA
- Sanitizers/Disinfectants – WILLIAM RUTALA, University of North Carolina, Chapel Hill, NC, USA
- Microbial Resistance and Food Irradiation – ELSA MURANO, Texas A&M University, College Station, TX, USA

S8 Overview of Dairy Plant Regulations

- Overview of Agencies and Jurisdictions – CARY FRYE, IDFA, Washington, D.C., USA
- USDA Responsibilities as It Pertains to Plant Regulations – PHILIP WOLFF, USDA, Washington, D.C., USA
- OSHA and EPA's Role in Plant Regulations – JOHN WOLGEMUTH, J. W. Safety Management and Training, Hummelstown, PA, USA
- 1999 IMS Conference: From a State Perspective – PAUL HOGE, PDA, Harrisburg, PA, USA
- Bureau of Weights and Measures: Role in Plant Regulation – MICHAEL PINAGEL, Michigan Department of Agriculture, Williamston, MI, USA
- Viewpoint: Codex/Inter. Standards – ROB BYRNE, NMPF, Arlington, VA, USA

Produce and Sanitation – Technical Session

T25 Development, Implementation and Analysis of an On-farm Food Safety Program for the Ontario Greenhouse Vegetable Grower's Marketing Board – MAURICIO B. RUIZ and D. A. Powell, University of Guelph, Guelph, Ontario, Canada

T26 Microbial Colonization with Biofilm Formation on Packaging Film and Vegetable Tissue of Ready-to-Use Packaged Spinach – SUSAN ABRAHAM, Heidi Schraft, and Marvin A. Tung, University of Guelph, Guelph, Ontario, Canada

T27 Effect of Microwave Cooking on the Recovery of *Cryptosporidium oocysts* from Spinach – MILDRED M. CODY, T. Arcaro, V. O'Leary, S. Roman, J. Rau, and R. Cordell, Georgia State University, Atlanta, GA, USA

T28 Survey of Production Practices Used by Virginia Apple Cider Processors – JIM R. WRIGHT, S. S. Sumner, C. R. Hackney, and M. D. Pierson, Virginia Tech, Blacksburg, VA, USA

T29 Science, Society, and Cider: A Comparative Analysis of Integrative Food Safety Risk Management in Canada and the US – JEFF SMITH, S. E. Grant, and D. A. Powell, University of Guelph, Guelph, Ontario, Canada

T30 A Quantitative Risk Assessment for Determining the Efficacy of Various Hand Washing Practices – REBECCA MONTVILLE, Cook College, New Brunswick, NJ, USA

T31 The Dynamics of Surface Cleaning and Sanitization – BARRY MICHAELS, Vidhya Gangar, Ann Roering, and Michael S. Curiale, Georgia Pacific Corporation, Palatka, FL, USA

T32 Occurrence of *L. monocytogenes*, *Salmonella*, *E. coli* O157:H7 and Other Shiga-like Toxin-producing *E. coli* in Retail Fresh Vegetables and Ground Beef – W. MARK BARBOUR, M. Samadpour, P. Yang, F. Buck, S. Ammerman, G. Depavia, E. Mazengia, and D. Alfi, Qualicon, Inc., Wilmington, DE, USA

T33 Behavior of *E. coli* O157:H7 on Alfalfa Sprouts during the Sprouting Process as Influenced by Treatments with Various Chemicals – PETER J. TAORMINA and L. R. Beuchat, University of Georgia, Griffin, GA, USA

T34 Outbreaks of Viral Gastroenteritis Associated with Imported Raspberries – COLETTE GAULIN, Danielle Ramsay, Pierrette Cardinal, and Marie-Alix D'Halevyn, Public Health Center of Quebec City, Beauport, Canada

General Food Microbiology – Poster Session

P63 Development of a Standard Method for Assessing the Sanitizing Efficacy of a Prototype "GRAS" Produce Wash on Tomatoes – LINDA HARRIS, L. R. Beuchat, T. M. Kajs, C. H. Taylor, and T. E. Ward, University of California, Davis, CA, USA

P64 Assessment of the Microbial Efficacy of a Prototype GRAS Produce Wash on Alfalfa Seeds, Sprouts, and Selected Salad Vegetables – LARRY R. BEUCHAT and T. E. Ward, University of Georgia, Griffin, GA, USA

P65 Control of *E. coli* O157:H7 in Milk Using a Natural Antimicrobial Agent-Bacteriophage – STEPHANIE ARCHIE, A. M. Mora, N. E. Allen, and A. P. Dessai, Tuskegee University, Tuskegee, AL, USA

P66 Effect of Starter Culture and Fermentation Temperature on Survival of *E. coli* O157:H7 and *L. monocytogenes* during Fermentation and Storage of Soy Yogurt – MICHAEL M. KAYES, Boonsong Saeng-On, David A. Golden, and James L. Collins, The University of Tennessee, Knoxville, TN, USA

P67 Effect of Packaging Atmosphere and Storage Temperature on Survival of *L. monocytogenes* on Culture Media Containing Elevated NaCl and Lactic Acic – ROBERT C. WILLIAMS and David A. Golden, The University of Tennessee, Knoxville, TN, USA

P68 Occurrence of *L. monocytogenes* in Mexican Cheeses – JORGE A. SALTIJENAL O., Claudia E. Solano L., Valente B. Alvarez, Beatriz Garcia F., and Humberto Hernandez S., Ohio State University, Columbus, OH, USA

P69 Effect of Simulated Gastric Fluid and Bile on Survival of *Vibrio vulnificus* and *Vibrio vulnificus* Phage – JAHEON KOO, Angelo DePaola, and Douglas L. Marshall, Mississippi State University, Mississippi State, MS, USA

P70 In Vitro Evaluation of the Effects of Nitrite and NaCl on the Antimicrobial Activity of Lysozyme, Nisin and EDTA Combination Treatments – ALEXANDER O. GILL and R. A. Holley, University of Manitoba, Winnipeg, Manitoba, Canada

P71 Fate of pGFP-bearing *E. coli* O157:H7 in Ground Beef at 2° and 10°C, and Effects of Lactate, Diacetate, and Citrate – SRILATHA AJJARAPU and Leora A. Shelef, Wayne State University, Detroit, MI, USA

P72 Use of Extracts of *Nigella sativa* (NS) to Inhibit Spoilage and Pathogenic Microorganisms in Rainbow Trout – MONA ELGAYYAR and F. Ann Draughon, The University of Tennessee, Knoxville, TN, USA

P73 Inhibition of *E. coli* O157:H7 by Herbal and Spice Essential Oils – MONA ELGAYYAR, F. Ann Draughon, David A. Golden, and John R. Mount, The University of Tennessee, Knoxville, TN, USA

P74 Membrane Bio-catalysts as Growth Stimulator of *L. monocytogenes* in Enrichment Media – PRAVATE TUITEMWONG, J. Wongchavalit, K. Tuitemwong, and D. Y. C. Fung, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

P75 Combined Effect of Antibiotic and Competitive-Exclusion Treatment on *Salmonella* Enteritidis Fecal Shedding in Molted Laying Hens – KUN-HO SEO, P. S. Holt, C. L. Hofacre, and R. K. Gast, Southeast Poultry Research Laboratory, USDA, ARS, Athens, GA, USA

P76 Mechanisms of Antibacterial Activity of Allyl Isothiocyanate – CHIA-MIN LIN and C. -I. Wei, University of Florida, Gainesville, FL, USA

P77 Enhanced Inhibitory Effect of *E. coli* O157:H7 by Chitooligosaccharide and Monolaurin – DEOG-HWAN OH, M. K. Lee, and B. K. Park, Kangwon National University, Chunchon, Kangwon, Korea

P78 Effect of Balsam Apple Extract on Bacteria – CHUNG-YI HUANG, C. H. Lai, P. Y. Peng, F. C. Chao, H. L. Liang, and D. K. Kan, I-Lan Institute of Technology, I-Lan, Taiwan R.O.C.

P79 Water Activity pH and Potassium Sorbate Concentration Effects on the Growth/No Growth Interface of *Saccharomyces cerevisiae* – AURELIO LOPEZ-MALO, S. Guerrero, and S. M. Alzamora, Universidad de las Americas-Puebla, Puebla, Mexico

P80 Synergistic Effect of Vanillin and Potassium Sorbate Combinations to Inhibit Mold Growth – AURELIO LOPEZ-MALO, B. Matamoros-Leon, and A. Argaiz, Universidad de las Americas-Puebla, Puebla, Mexico

P81 Modeling and Simulating Growth of *Clostridium botulinum* at Varying Inoculum Size, Temperature, pH, and Salt Concentration – LIHUI ZHAO, Rutgers University, New Brunswick, NJ, USA

P82 Modeling the Bacterial Spoilage of Ready-to-Drink Beverages – ALYCE STILES-BATTEY and Donald Schaffner, Kraft Foods, Inc., Tarrytown, NY, USA

P83 Use of *Bacillus megaterium* Spore Germination and Cell Parameter Distributions to Predict Spoilage Times at Low Inoculum Size and Differing Environmental Conditions – MARISA L. CAIPO and D. W. Schaffner, Rutgers University, New Brunswick, NJ, USA

P84 Survival of *E. coli* O157:H7 in Dried Beef as Affected by Water Activity, Sodium Chloride, and Temperature – J.-H. RYU, Y. Deng, and L. R. Beuchat, University of Georgia, Griffin, GA, USA

P85 Critical Temperatures to Inhibit *Zygosaccharomyces bailii* Growth in Mango Puree Preserved by Combined Factors – ENRIQUE PALOU, X. Castanon, J. Welti-Chanes, and A. Lopez-Malo, Universidad de las Americas-Puebla, Puebla, Mexico

P86 Growth and Recovery of Selected Gram Negative Bacteria in Reconditioned Wastewater – KATHLEEN T. RAJKOWSKI and Eugene Rice, USDA, ARS, NAA, ERRC, Wyndmoor, PA, USA

P87 Contamination Ways of Cold-smoked Fish with *L. monocytogenes* – MARIELLE GAY, ASEPT, Laval Cedex 9, France

P88 The Effect of Temperature on the Survival of *Shigella flexneri* at Low pH – LAURA L. ZAIKA and Joseph S. Fanelli, USDA, ARS, NAA, ERRC, Microbial Food Safety RU, Wyndmoor, PA, USA

P89 Models for Growth of *Zygosaccharomyces bailii* in High-acid Foods – PHYLLIS JENKINS, Peter G. Poulos, Martin B. Cole, Mark Vandeven, and J. David Legan, Nabisco, Inc., E. Hanover, NJ, USA

P90 Survival of *E. coli* O157:H7 in Margarine, Reduced Fat Spreads and Liquid Water-in-Oil Toppings – MICHAEL C. CIRIGLIANO, A. M. Keller, R. B. Zemser, and P. J. Rothenberg, Lipton, Cresskill, NJ, USA

P91 Growth Response of *L. monocytogenes*, *Salmonella* Enteritidis and *Salmonella typhimurium* DT104 in Pasteurized and Raw Liquid Whole Egg Held at Chill Abuse – MICHAEL C. CIRIGLIANO and R. T. McKenna, Lipton, Cresskill, NJ, USA

P92 Modulation Effects of Antioxidant Vitamins on Ochratoxin A-induced Oxidantic Toxicity in Mice – JUNG HYEON PARK, Sung J. Kang, and Duck H. Chung, Gyengsand National University, Chinju, Gyangnam, Korea

TUESDAY AFTERNOON — AUGUST 3, 1999

General Session – Update on Latest *Listeria* Outbreak

IAMFES Business Meeting

WEDNESDAY MORNING — AUGUST 3, 1999

S10 USDA Risk Assessment of *E. coli* O157:H7 in Ground Beef

- An Overview and Scope of the USDA Risk Assessment of *E. coli* O157:H7 in Ground Beef – MARK POWELL, USDA/FSIS/OPHS/ERAD, Washington, D.C., USA
- Production Module – ERIC EBEL, USDA/FSIS, Ft. Collins, CO, USA
- Slaughter Concentration Variables – TANYA ROBERTS, USDA/ERS, Washington, D.C., USA
- Slaughter Product Fraction Variables – PETER COWEN, USDA/FSIS/OPHS/ERAD, Washington, D.C., USA
- Slaughter Simulation Model – CLARE NARROD, USDA/FSIS/OPHS/ERAD, Washington, D.C., USA
- Preparation Module – WAYNE SCHLOSSER, USDA/FSIS, Fort Collins, CO, USA
- Public Health Module – PEG COLEMAN, USDA/FSIS/OPHS/ERAD, Washington, D.C., USA
- Risk Communication – PETER COWEN, USDA/FSIS/OPHS/ERAD, Washington, D.C., USA

PANEL DISCUSSION

S11 Animal Waste Management and Its Relationship to Food Safety

- Manure and Microbes: A Public and Animal Health Problem? – ALICE PELL, Cornell University, Ithaca, NY, USA
- Types of Manure Handling Practices – ROBERT BURNS, University of Tennessee, Knoxville, TN, USA
- Persistence of Pathogenic Bacteria in Animal Waste – CAROLYN BOHACH-HOVDE, University of Idaho, Moscow, ID, USA
- Persistence of Viruses in Animal Waste – DEAN CLIVER, University of California-Davis, Davis, CA, USA
- Presence of Microbial Pathogens in Processed Animal Waste Used as Animal Feed – JAMES S. CULLOR, University of California-Davis, Davis, CA, USA
- Animal Production's Environmental Impact on Water Quality – L. E. LANYON, The Pennsylvania State University, University Park, PA, USA

S12 New Emerging Pathogens — *Mycobacterium* spp.

- Overview of *Mycobacterium* spp. and Their Role as Foodborne Pathogens – LUCIC MUTHARIA, University of Guelph, Guelph, Ontario, Canada
- Survival of *M. paratuberculosis* in HTST Milk – MIKE COLLINS, University of Wisconsin, Madison, WI, USA

- Mycobacterium spp. as Environmental Pathogens – YVONNE TAYLOR, University of Ottawa, Ottawa, Ontario, Canada
- Crohn's Disease and the Link to Foodborne Pathogens: Fact or Fallacy – To be announced
- Methods to Detect and Identify Mycobacterium spp. in Environmental Samples – BOB ARBEIT, VA Hospital, Boston, MA, USA

S13 – HACCP in Retail Operations

- The Maryland Voluntary Retail HACCP Program – LISL WILKINSON, Maryland Hospitality Education Foundation, Baltimore, MD, USA
- Retail HACCP in Florida – CLIFF WARWICK, REHS, Orlando, FL, USA
- HACCP in Hotel Food Service – DONALD B. GRIM, Marriott International, Inc., Washington, D.C., USA
- HACCP in Food Markets – FREDRICK REIMERS, H-E-B Grocery Company, San Antonio, TX, USA
- HACCP in Restaurants – DEE CLINGMAN, Darden Restaurants, Inc., Orlando, FL, USA
- Integrating FDA Fisheries, USDA, FDA Industrial, and FDA Retail HACCP into One Set of National Industry Self-control Requirements – O. PETER SNYDER, JR., Hospitality Institute of Technology and Management, St. Paul, MN, USA

WEDNESDAY AFTERNOON — AUGUST 3, 1999

S14 USDA HACCP Implementation – Where Have We Been; Where Are We Going?

- Overview and Reflections of HACCP for Meat and Poultry Plants – DANE T. BERNARD, National Food Processors Association, Washington, D.C., USA
- HACCP Implementation Experiences in a Large Plant – PETER BODNARUK, ConAgra Refrigerated Prepared Foods, Downers Grove, IL, USA
- HACCP Implementation Experiences in a Small Plant – HERB TETENS, Marathon Enterprises, Jersey City, NJ, USA
- USDA FSIS Overview of HACCP – Past, Present and Future Challenges – BARBARA MASTERS, USDA/FSIS Technical Service Center, Omaha, NE, USA
- HACCP Model Demonstration Project Experiences – The Future? – ALAN OSER, Hatfield Quality Meats, Inc., Hatfield, PA, USA
- Regulatory Challenges and Perspectives for the Future – MICHAEL ROBACH, International Continental Grain Company, Gainesville, GA, USA

S15 *Campylobacter* and Food Safety: The State of the Science

- Prevalence of *Campylobacter* in Human Disease – FRED ANGULO, CDC, Atlanta, GA, USA
- Guillain-Barre Syndrome and Other Chronic Sequellae of Campylobacteriosis – BAN MISHU, Vanderbilt University, Nashville, TN, USA
- Modern Cultural Methodology for the Isolation of *Campylobacter* spp. – J. ERIC LINE, USDA, ARS, Athens, GA, USA
- Subtyping of *Campylobacter* spp. – SCOTT FRITSCHEL, Qualicon®, Inc., Wilmington, DE, USA
- Risk Assessment and Regulatory Significance of *Campylobacter* spp. – ANNA LAMMERDING, Health Canada, Guelph, Ontario, Canada
- Poultry Industry Response to the Challenges of *Campylobacter* – LENORE BENNETT, Perdue Farms, Horsham, PA, USA

S16 Methods for the Detection of Infectious Viruses in Foods

- An Overview of Conventional Methods for Detecting Enteric Viruses in Foods – DEAN O. CLIVER, University of California-Davis, Davis, CA, USA
- Limitations in Cell Culture and Molecular Biological Methods for Detecting Infectious Viruses in Foods – GARY P. RICHARDS, USDA, ARS, Dover, DE, USA
- Integrated Cell Culture-PCR Techniques – CHARLES P. GERBA, University of Arizona, Tucson, AZ, USA
- Detection and Control of Viruses in Produce – MARK D. SOBSEY, University of North Carolina, Chapel Hill, NC, USA
- Role of Molecular Epidemiology in Virus Outbreak Investigations – LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

S17 The Seafood Safety Initiative

- Overview of Seafood Safety Initiative – ROBERT BUCHANAN, FDA, Washington, D.C., USA
- Considerations for Testing of *Listeria* in Seafood – CATHERINE DONNELLY, University of Vermont, Burlington, VT, USA
- Control of Viral and Bacterial Human Pathogens in Seafood – WILLIAM BURKHARDT, US FDA, Dauphin Island, AL, USA
- Food Service Chain Experience – KEITH JACKSON, Darden Restaurants, Orlando, FL, USA
- Levels of *V. vulnificus* and *V. parahaemolyticus* in Retail Seafood – ANGELO DEPAOLA, US FDA, Dauphin Island, AL, USA
- West Coast Working Group on *V. parahaemolyticus* Outbreaks – TIM SAMPLE, US FDA, Seattle, WA, USA

IAMFES ANNUAL MEETING

86th Dearborn • Michigan

EVENT INFORMATION

EVENING EVENTS

Cheese and Wine Reception
Sunday, August 1, 1999, *(8:00 p.m. – 10:00 p.m.)*

An IAMFES tradition continues for attendees and guests. The reception begins immediately following the Ivan Parkin Lecture on Sunday evening in the exhibit hall.

Exhibit Hall Reception
Monday, August 2, 1999, *(5:00 p.m. – 6:30 p.m.)*

Relax with colleagues and friends in the exhibit hall at the end of the day. Exhibitors showcase the latest developments in the industry at an informal reception.

Historical Adventures
Monday, August 2, 1999, *(6:00 p.m. – 9:30 p.m.)*

Ride a carriage back into history at the Greenfield Village Living Museum. Discover what inspired inventors Henry Ford, Thomas Edison, and Orville and Wilbur Wright. Gather around the antique carousel. Enjoy dinner and spend the evening with friends.

An Evening in Wine Country
Tuesday, August 3, 1999, *(5:30 p.m. – 10:30 p.m.)*

A quiet country evening begins in surroundings reminiscent of an "Old World" wine cellar at Pelee Island Winery, located near Kingsville, Ontario. Then tempt your taste buds in the tropical gardens of Colasanti while exotic birds call to you from the wild.

(When traveling to Canada, proof of citizenship such as voter's registration, passport, or birth certificate is required.)

Take Me Out to the Ballgame
Tuesday, August 3, 1999, *(6:00 p.m. – 10:30 p.m.)*

Cheer yourself silly as the Detroit Tigers take on the Chicago White Sox in one of the oldest baseball stadiums in the US. When the game is over, you can claim to be one of the last fans to visit the original Tiger Stadium before it closes. Tickets and round trip bus transportation included.

IAMFES Awards Banquet
Wednesday, August 4, 1999, *(7:00 p.m. – 9:30 p.m.)*

A special occasion to formally recognize the accomplishments of deserving food safety professionals. An elegant reception and dinner are followed by the awards ceremony. Business attire requested.

TOURS

Great Lakes and "Motor City" Culture
Sunday, August 1, 1999, *(9:30 a.m. – 3:00 p.m.)*

Belle Isle, a 1000 acre island park, beckons you to visit the Dossin Great Lakes Museum and other cultural attractions. Tour the Coast Guard Station on the Detroit River. Then it's smooth sailing to lunch on the waterfront at Sinbad's restaurant. Start your engines at the interactive "Motor City Exhibition" in the Detroit Historical Museum. Race to explore your favorite destinations including the Detroit Institute of Art, the Museum of African American History and the Detroit Science Center.

At Home with the Auto Barons
Monday, August 2, 1999, *(9:30 a.m. – 3:30 p.m.)*

Just for a day, imagine you are a guest in Fair Lane, the 15th and final home of Henry Ford. Stroll through the same rooms as some of the world's most influential people.

Don't forget your invitation for lunch at the Eleanor and Edsel Ford Estate, located on the shores of Lake St. Claire. Architect Albert Kahn created a sense of the English countryside in the home at Grosse Point. Inside, original masterpieces line the walls. Your tour includes the home, the scenic gardens, the pool-house, the garage with Mrs. Ford's custom-built 1952 Lincoln Town Car, and the children's playhouse.

All Things Canadian
Tuesday, August 3, 1999, *(9:30 a.m. – 3:30 p.m.)*

Watch as world famous Canadian Club Whiskey is produced at the Hiram Walker & Sons Distillery. Then stroll through the classical Jackson Park gardens featuring over 12,000 rose bushes in bloom. Soak up the local flavor during lunch at a restaurant in downtown Windsor, Canada. Step inside the log cabin used as terminal of the Underground Railway built by fugitive slave John Freeman Walls.

(When traveling to Canada, proof of citizenship such as voter's registration, passport, or birth certificate is required.)

GOLF TOURNAMENT

FORE! Best-Ball Golf Tournament
Sunday, August 1, 1999, *(6:00 a.m. – 2:00 p.m.)*

A swinging good time at the newest golf course in the area — the Inkster Golf Course. You don't even need to know how to play to win a prize. Golf, transportation, breakfast, lunch and prizes all included in your registration fee.

GENERAL INFORMATION

IAMFES 86th ANNUAL MEETING
AUGUST 1-4, 1999
DEARBORN, MICHIGAN

IMPORTANT! Please read this information before completing your registration form.

■ Meeting Information

Register to attend the world's leading food safety conference.

Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception
- Awards Banquet
- Program and Abstract Book

■ Registration Information

Please mail the registration form with payment today. Registrations post-marked after July 1, 1999 must pay the late registration fee. Checks should be made payable to: IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2863, USA. For faster service, use your credit card and call 800.369.6337, or fax the completed registration form with credit card information to 515.276.8655.

■ Refund/Cancellation Policy

Registration fees, minus a $50 processing charge and any applicable bank charges, will be refunded for written cancellations received by July 15, 1999. **No refunds will be made after July 15;** however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 6, 1999.

■ Hotel Information

For reservations, contact the hotel directly and identify yourself as an IAMFES Annual Meeting attendee to receive a special rate of $102 per night, single or double. Make your reservations as soon as possible, this special rate is available only until July 2, 1999.

Hyatt Regency Dearborn
Fairlane Town Center
Dearborn, Michigan 48126
Phone: 313.593.1234; Fax: 313.593.3366

■ EVENTS

(See the preceeding page for detailed descriptions)

■ Evening Events

Sunday, August 1, 1999
Cheese and Wine Reception *(8:00 p.m. – 10:00 p.m.)*

Monday, August 2, 1999
Exhibit Hall Reception *(5:00 p.m. – 6:30 p.m.)*
Historical Adventures *(6:00 p.m. – 9:30 p.m.)*

Tuesday, August 3, 1999
An Evening in Wine Country *(5:30 p.m. – 10:30 p.m.)*
Take Me Out to the Ballgame *(6:00 p.m. – 10:30 p.m.)*

Wednesday, August 4, 1999
IAMFES Awards Banquet *(7:00 p.m. – 9:30 p.m.)*

■ Tours

Sunday, August 1, 1999
Great Lakes and "Motor City" Culture
(9:30 a.m. – 3:00 p.m.) (Lunch included)

Monday, August 2, 1999
At Home with the Auto Barons
(9:30 a.m. – 3:30 p.m.) (Lunch included)

Tuesday, August 3, 1999
All Things Canadian
(9:30 a.m. – 3:30 p.m.) (Lunch included)

■ Golf Tournament

Sunday, August 1, 1999
FORE! Best-Ball Golf Tournament *(6:00 a.m. – 2:00 p.m.)*

MEMBERSHIP RATES

	UNITED STATES	CANADA/ MEXICO	INTERNATIONAL
Membership with *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation* (Student Membership)*	**$140.00** ($70.00)	**165.00** ($95.00)	**$210.00** ($140.00)
Membership with *Dairy, Food and Environmental Sanitation* (Student Membership)*	**$85.00** ($42.50)	**$95.00** ($52.50)	**$110.00** ($67.50)
(Student Membership* with *Journal of Food Protection*)	($42.50)	($57.50)	($87.50)

**Full-time student verification required*

All prices include Shipping & Handling

Prices effective through August 31, 1999

FOR OFFICE USE
First initial Last name DFES
Registration #

REGISTRATION FORM

IAMFES 86th Annual Meeting August 1-4, 1999 Dearborn, Michigan

Name (Print or type your name as you wish it to appear on name badge)

Title Employer

Mailing Address (Please specify: ❒ Home ❒ Work)

City State/Province Country Postal/Zip Code

Telephone Fax E-mail

IAMFES Member since: 19_____

Regarding the *Americans with Disabilities Act*, please indicate special requirements you may have. _____

REGISTER BY JULY 1, 1999 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:	MEMBERS	NONMEMBERS	AMOUNT
Registration (Awards Banquet included)	$ 245 ($295 late)	$365 ($415 late)	
IAMFES Student Member*	$ 40 ($ 50 late)	Not Available	
Retired IAMFES Member*	$ 40 ($ 50 late)	Not Available	
One Day Registration: ❒ Mon. ❒ Tues. ❒ Wed.	$ 125 ($150 late)	$180 ($205 late)	
Spouse/Companion (Name): _____	$ 35 ($ 35 late)	$ 35 ($ 35 late)	
Children 15 & Over (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	
Children 14 & Under (Names): _____	FREE	FREE	

*Awards Banquet not included

EVENTS:		# OF TICKETS	
FORE! Best-Ball Golf Tournament (Sunday, 8/1)	$ 80 ($ 95 late)		
Historical Adventures (Monday, 8/2)	$ 39 ($ 44 late)		
Children 14 and under	$ 29 ($ 34 late)		
An Evening in Wine Country (Tuesday, 8/3)	$ 49 ($ 54 late)		
Take Me Out to the Ballgame (Tuesday, 8/3)	$ 22 ($ 27 late)		
IAMFES Awards Banquet (Wednesday, 8/4)	$ 40 ($ 45 late)		

TOURS:			
Great Lakes and "Motor City" Culture (Sunday, 8/1)	$ 45 ($ 51 late)		
At Home with the Auto Barons (Monday, 8/2)	$ 42 ($ 47 late)		
All Things Canadian (Tuesday, 8/3)	$ 43 ($ 48 late)		

JOIN IAMFES TODAY AND SAVE!!! (Attach a completed Membership application) _____

TOTAL AMOUNT ENCLOSED _____

(CHECK PAYABLE TO IAMFES — US FUNDS ON US BANK)

International Association of Milk, Food and Environmental Sanitarians
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655; E-mail: iamfes@iamfes.org

Credit Card Payments:

❒ VISA ❒ MasterCard ❒

Card # | | | | | | | | | | | | | | | | |

Exp. Date _____

Name on Card _____

Signature _____

EXHIBITORS DO NOT USE THIS FORM

Technical Control

The role of "technology" as a concept to be used in controlling allergens applies to the hazard analysis conducted to determine the "what, where, when, and how" control steps that need to be taken; the validation of the allergen control plan; and the daily verification the plan is working effectively. If a water flush is to be used to eliminate an allergen residue from a process, it is important to determine the quantity and temperature of water needed to effectively reduce residue levels to acceptable levels. Tests should be conducted, under controlled conditions, to validate the effectiveness of the flushing process chosen.

In summary, allergens have been shown to be the cause of serious injury to many consumers, especially the very young. The health risk associated with allergen poisoning has been adequately demonstrated in scientific literature and by anecdotal examples reported by the community at large.

One of the strategies that may be effectively used to reduce risk of contaminating a food product with an allergen during manufacturing includes:

1. Physical and procedural ways to *separate* allergens from non-allergen containing foods,
2. Using *sanitary design* criteria for the construction of the facility and plant equipment,
3. Employee training and work procedures that follow *hygienic practices* to reduce the likelihood of cross-contamination, and
4. Using new technologies to validate and verify control plan effectiveness.

For example, if risk analysis indicates a water flush is the preferred control strategy to be used to *separate* an allergen from a non-allergenic food, the equipment *design* must permit unrestricted access to all product contact surfaces when the prescribed flushing *practice* is followed. The *technology* used to validate and verify the control plan must be sensitive enough to indicate if the flush is an effective procedure to reduce the allergen to an acceptable level.

ComingEvents

APRIL

·7-8, Introduction to Microbiological Criteria and Sampling Plans, Omni Netherland Plaza, Cincinnati, OH. Sponsored by Silliker Laboratories Group, Inc. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800.829.7879; 708.957.7878; Fax: 708.957.8405.

·7-9, Missouri Milk, Food and Environmental Health Association Annual Educational Conference, Ramada Inn, Columbia, MO. For further information, contact Steve St. Clair, Phone: 573.221.1166 or 1167; Fax: 273.221.1214.

·8-10, Introduction to Statistical Methods for Sensory Evaluation of Foods, University of California-Davis, Davis, CA. This course introduces statistical analysis to the beginning sensory scientist as well as being an excellent update on applying statistical procedures for the experienced professional. For additional information, contact Michael O'Mahoney at 530.752.6389; E-mail: maomhony@ucdavis.edu.

·8-12, Canadian Institute of Public Health Inspectors Educational Conference, Vancouver, B.C. For additional information, contact Richard Taki, Promotions Chair at 604.736.2866; Fax: 604.736.8651; E-mail: bcciphi@cnx.net.

·11-14, Scanning 99 – The 11th Annual International Conference on Scanning Microscopies, sponsored by FAMS, Inc., Chicago, IL. For more information contact Mary K. Sullivan, Foundation for Advances in Medicine and Science, Inc., P.O. Box 832, Mahwah, NJ 07430-0832; Phone: 201.818.1010; Fax: 201.818.0086; E-mail: scanning@fams.org.

·12-13, "An Insider's Look at Microbial Risk Assessment," DoubleTree Hotel, National Airport, Arlington, VA. The workshop, **presented by IAMFES,** will compare and contrast two risk assessments conducted to address the risk of *Salmonella* Enteritidis in shell eggs to illustrate how different data and assumptions can impact the resulting risk estimates. For further information, contact IAMFES at 515.276.3344; Fax: 515.276.8655; E-mail: iamfes@iamfes.org.

·12-14, Learning the 7 HACCP Principles and Developing a HACCP Plan, Rutgers University, New Brunswick, NJ. For additional information, contact Keith Wilson, Phone: 732.932.9271; Fax: 732.932.1187; E-mail: ocpe@aesop.rutgers.edu; Web site: www.cook.rutgers.edu/~ocpe.

·12-14, Sensory Evaluation: Overview and Update, University of California-Davis, Davis, CA. Designed for both the beginner and experienced professional, this course will give an overview on why tests can be set up in some ways and not in others, enabling the professional to modify and custom-design techniques specific to the product being tested. For additional information, contact Michael O'Mahony at 530.752.6389; E-mail: maomhony@ucdavis.edu.

·13-14, Microbiological Concerns in Food Plant Sanitation & Hygiene, San Antonio, TX. Sponsored by Silliker Laboratories Group, Inc. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800.829.7879; 708.957.7878; Fax: 708.957.8405.

·15-16, Carolinas Association of Milk, Food and Environmental Sanitarians Affiliate Meeting. For further information, contact Joe Neely at 803.935.7890.

·15-17, IFPA Hosts 12th Annual Conference, Tampa, FL. The International Fresh-cut Produce Association's (IFPA) will host its 1999 Conference and Exhibition, "Tampa '99: Bridge to the New Millennium," at the Tampa Convention Center. This is the only produce industry event specifically geared toward the fresh-cut sector and this year's conference will feature an impressive lineup of speakers, seminars, exhibits and networking opportunities focused on the rapidly growing fresh-cut industry. For more information, contact Justina Brewer at 703.299.6282.

·19, International Dairy Federation Symposium, Convention Centre, Ottawa, Canada. The symposium will deal with the subject of Laboratory Accreditation and Proficiency Testing. For additional information contact, International Dairy Federation, Secretariat, 41 Sqaure Vergote, B-1030 Bruxelles, Belgium or Fax: 32 2 733 04 13; E-mail: Info@fil-idf.org; Web site: www.fil-idf.org.

·21, Metropolitan Association of Dairy, Food and Environmental Specialists Affiliate Meeting, Woodbridge, NJ. For further information, contact Fred Weber at 609.584.7677.

·22, Nebraska Association of Milk and Food Sanitarians Affiliate Meeting. For further information, contact Roger Biltoft, Phone: 402.225.2254.

·22, Indiana Environmental Health Association, Inc. Spring Conference, Valle Vista Country Club, Greenwood, IN. For further information, contact Helene Uhlmann at 219.853.6358.

·27-29, High Temperature Short Time (HTST) Pasteurization

Hands-On Workshop, L.A. Fairplex, outside Los Angeles, CA. Sponsored by the International Association of Food Industry Suppliers (IAFIS). This program will be organized under the direction of John C. Bruhn, Director, Dairy Research and Information Center and Dairy Foods Processing Specialist at the University of California-Davis. For more information, contact Dorothy Brady at 703. 761.2600; E-mail: dbrady@iafis.org.

MAY

·**1-7, The 27th National Conference on Interstate Milk Shipments,** will meet at the Spirit of Atlanta Hotel (formerly Radisson), in Atlanta, GA. For additional information, contact Leon Townsend, Executive Secretary, 110 Tecumseh Trail, Frankfort, KY 40601; Phone/Fax: 502.695.0253; E-mail: lcontown@dcr.net.

·**4-5, Wyoming Environmental Health Association Annual Educational Conference,** Casper, WY. For further information, contact Laurie Leis at 307.266.1203.

·**4-6, Principles of Food Microbiology,** Marriott Fisherman's Wharf, San Francisco, CA. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Rd., Homewood, IL 60430; Phone: 800.829.7879; 708. 957.7878; Fax: 708.957.8405.

·**5-7, Public Health in the 20th Century: 100 Years of Success,** Cavanaugh's Inn at the Park, Spokane, WA. For additional information, call the Washington State Environmental Health Association at 425.334.5399.

·**6-12, 15th International Trade Fair for Packaging Machinery, Packaging and Confectionery Machinery,** in Düsseldorf, Germany. For further information, contact Düsseldorf Trade Shows, Inc., 150 N. Michigan Ave., Suite 2920, Chicago, IL 60601 or Phone: 312.781.5180; Fax: 312.781.5188; Web site: www.dtsusa.com/dts/.

·**12-13, Traceback of Fresh Produce and Other Commodities Satellite Course.** (11:00 a.m. to 3:30 p.m. ET.) For additional information, contact U.S. Food and Drug Administration, OR A/ORM/DHRD, HFC-60, 5600 Fishers Lane, Rockville, MD 20857. For questions prior to broadcast fax questions to: Attention Satellite Courses(s): 301.594.1966; Voice Mail: 301.594.2263.

·**12-14, Food Irradiation 99 Conference—The Solution to the Food Safety Crisis,** Sheraton National Hotel, Arlington, VA. This international conference will present an examination of the business and technical outlook for food irradiation as a solution to the growing global problem of food safety. For further information, contact Deborah Crommett, Conference Coordinator, Intertech Conferences, 411 US Route One, Portland, ME 04105 or Phone: 207.781. 9800; Fax: 207.781.2150; E-mail: info@intertechusa.com or www.intertechusa.com.

·**17-21, Laboratory Methods in Food Microbiology,** Silliker Laboratories' Corporate Research Center, South Holland, IL. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Rd., Homewood, IL 60430; Phone: 800.829.7879;708. 957.7878; Fax: 708.957.8405.

·**18-19, The Pennsylvania Association of Milk, Food, and Environmental Sanitarians 60th Annual Meeting,** to be held at the Nittany Lion Inn, University Park, PA. Golf tournament begins at 1:00 p.m. on Monday, May 17. The conference begins with registration at 8:00 a.m., Tuesday, May 18 and concludes at 3:00 p.m. Wednesday, May 19. For further information, call PAMFES at 814.865.8301.

·**18-19, Aseptic Processing and Packaging Introductory Workshop,** University of California-Davis, Davis, CA. This course focuses on the engineering, microbiological and chemical principles related to aseptic processing. Hands-on laboratories allow participants to learn methods of aseptic product quality evaluation, packaging and equipment particulars. For further information, contact Diane Barrett at 530.752. 4800; E-mail: dmbarrett@ ucdavis.edu.

·**20, Advanced Aseptic Processing and Packaging,** University of California-Davis, Davis, CA. As a continuation of the 2-day introductory workshop, this course will focus on heat penetration and distribution, process deviation and recommendations, and a computerized program for calculating thermal processes is demonstrated. For further information, contact Diane Barrett at 530.752. 4800; E-mail: dmbarrett@ucdavis.edu.

·**24-26, 3rd International Symposium on Recombined Milk and Milk Products,** Penang, Malaysia. The symposium will seek to discuss and review issues facing the milk recombination industry, the need for the industry to keep pace with the challenges of the future, and product development opportunities presented by the introduction of new technologies and emerging markets. For further information, contact Alison Johnson, The Secretariat, 3rd International Symposium on Recombined Milk and Milk Products, Private Bag 16, Werribee, Victoria Australia, 3030 or Phone: 61 3 97 42 0117; Fax: 61 3 9742 0201; E-mail: alison.johnson@foodscience.afisc.csiro.au.

JUNE

·**3-4, International Prospects for Dairying in the Next WTO Negotiating Round,** Hotel Claridge, Buenos Aires, Argentina. Sponsored jointly by Food & Agriculture Organization of the UN, Pan American Dairy Federation, and International Dairy Federation. For additional information, contact Mr. Ricardo A. James, President Comité Nacional Argentino de la FIL, Medrano 281, 1178 Buenos Aires, Argentine; Phone: 54 1 983 6149; 54 1 983 0587, 54 1 983 1865; Fax: 54 1 958 4056; E-mail: cil@cil.org.ar.

·**7-10, New Applications of Membrane Technology in the Dairy Industry,** Palais du Grand Large, Saint-Malo, France. The semi-

nar will attempt to assemble the most recent information on new applications of the membrane processes that would benefit the dairy processing industry worldwide. For further information, contact Prof. J. L. Maubois, Dairy Research Laboratory INRA, 65 Rue de Saint Brieuc, FR-35042 Rennes Cedex, France.

· **14-16, The Food Safety Summit and Expo,** Washington, D.C. The conference serves food processors and manufacturers, as well as the food service and grocery fields, and others who produce, sell, or serve food. For more information, Phone: 800.746.9646.

· **14-16, Food Engineering,** Rutgers University, New Brunswick, NJ. For additional information, contact Keith Wilson, Phone: 732.932.9271; Fax: 732.932.1187; E-mail: ocpe@aesop. rutgers.edu; Web site: www.cook.rutgers.edu/ocpe.

JULY

· **9-16, Rapid Methods and Automation in Microbiology International Workshop XIX,** Manhattan, KS. For scientific content, contact Daniel Y. C. Fung, Director of the Workshop at 785.532.5654; Fax: 785.532.5681; E-mail: dfung@oz.oznet.ksu.edu. For registration information, please see www.dec.ksu.edu/dce/conf/microbiology.

· **30-31, IAMFES 86th Annual Meeting Workshop,** Dearborn, MI. "An Insider's Look at Microbial Risk Assessment." Additional information will be available next month in *DFES* or contact IAMFES at 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@iamfes.org.

AUGUST

· **1-4, IAMFES 86th Annual Meeting,** Dearborn, MI at the Hyatt Regency Dearborn. Registration information available in this issue of *DFES* on pages 225-226 or contact Julie Cattanach at Phone: 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@iamfes.org.

SEPTEMBER

· **13-17, Food Micro 99, co-sponsored by IAMFES.** Food Micro 99 is primarily for individuals working in food microbiological research and those who are studying food microbiology as well as for professionals responsible for the production of (safe) food and authorities involved in safe food regulation. For additional information, contact Dr. Leon Gorris, Unilever Research Laboratorium Vlaardingen, Postbus 114, 3130 AC Vlaardingen, The Netherlands, Phone: 31 10 4605709; Fax: 31 10 4605188; E-mail: leon.gorris@unilever.com.

IAMFES THANKS THE FOLLOWING INDIVIDUALS FOR THEIR SUPPORT OF THE IAMFES FOUNDATION FUND

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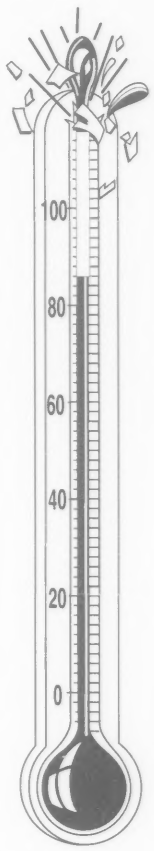

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The above list represents individual contributors to the IAMFES Foundation Fund through February 10, 1999. In addition, a portion of the Sustaining Member dues are allocated to support this Fund. Your contribution is welcome. Call the IAMFES office at 800.369.6337 or 515.276.3344 for more information on how you can support the Foundation.

International Association of Milk, Food and Environmental Sanitarians, Inc.
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA
Phone: 800.369.6337 • 515.276.3344; Fax: 515.276.8655
E-mail: iamfes@iamfes.org; Web site: www.iamfes.org

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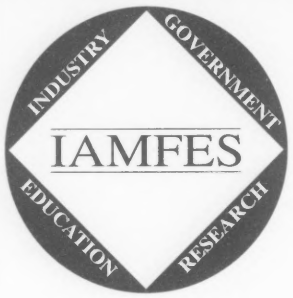

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THOUGHTS on Today's Food Safety...

Controlling Allergens in the Food Manufacturing Environment

Chris Newcomer, President,
New-Tech Consulting, Inc.
Cincinnati, Ohio

In a research note published in Volume 61 of the *Journal of Food Protection*, J. W. Yunginger and his co-workers discuss the effects that milk residues from a manufacturing process had on a 3-year-old boy after eating sorbet that had been processed following ice cream. They concluded, "trace quantities of whey proteins (<200 µg) can elicit systemic reactions in exquisitely milk-allergenic individuals." They also observed "Such individuals should avoid eating frozen desserts prepared using equipment also used for producing or packaging ice cream, unless manufacturers can demonstrate unequivocally that their cleaning practices are sufficient to prevent milk contamination."

Manufacturing is only one of many company processes that need to be concerned about allergens. For example, other functions such as marketing, product development, purchasing, label development, corporate quality assurance, consumer relations, etc. all play key roles in protecting consumers from allergen-containing foods. Within a processing facility there are many factors to consider when developing and implementing an allergen control program. Certainly, an effective plant strategy starts with a management resolve to control allergens. An allergen control program conceptually may include the following components or principals:

Separation of Operations

The concept of "separation" can be expressed in several ways, including the provisions that are made during the design phase of new or remodeled facilities to minimize the potential for cross-contamination in processing, in warehousing, and in traffic patterns. For example, traffic patterns for moving ingredients into processing or finished foods into packaging areas and the removal of empty ingredient containers or other waste. Whenever possible, production planners should schedule long runs of allergenic products or schedule allergen containing foods to be processed just prior to cleanup. When product design permits, allergenic ingredients should be added as late in the process as possible. When feasible, workers handling non-allergenic foods should not handle allergenic foods.

Sanitary Design

Relative to the plant equipment and to the facility, the concept of "design" may address the following critical elements of controlling allergens: employee safety and ease of use, maintainability, the ease of cleaning and sanitizing, and the accessibility of product contact surfaces for examination. In order to avoid sites for allergen residues, the selection of construction materials, the fabrication and installation should all meet high standards of hygienic design. Processes that generate aerosols need to be designed to limit their spread.

Hygienic Practices

The concept of "practices" applies to the training of all plant workers in food safety and the importance of controlling allergens (including food handlers, maintenance employees, sanitarians, inspection personnel, supervisors, etc.), having well written and effective SOP's for both food production and sanitation, and following safe food handling work practices. When worker duties require handling allergen and non-allergenic foods they need to take precautions concerning cross-contamination from soiled hands and clothing. The policies and procedures for handling rework need to have an allergen control component, such as reworking like-into-like product. The plant needs to have effective tagging, coding or other identification procedures for allergen sensitive ingredients or finished foods. The quality control procedures and tools used for sampling may be sources of cross-contamination unless proper sanitation practices are followed. Procedures need to be in-place to document the allergen control plan, e.g., if a water flush is required, records must be maintained to indicate if the required procedure was completed as specified.

Continued on page 227

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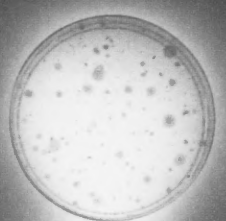

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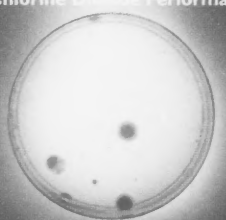

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