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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

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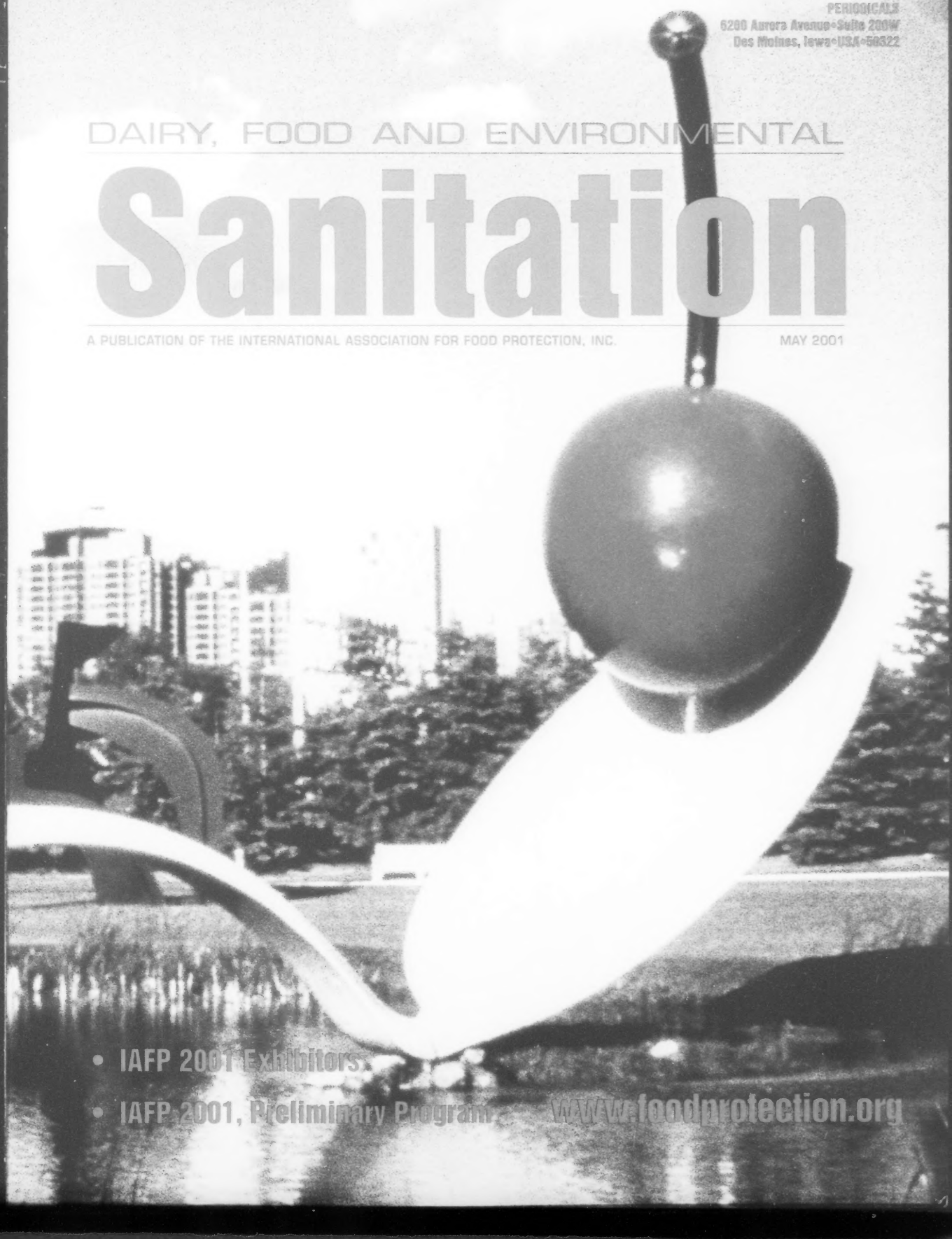

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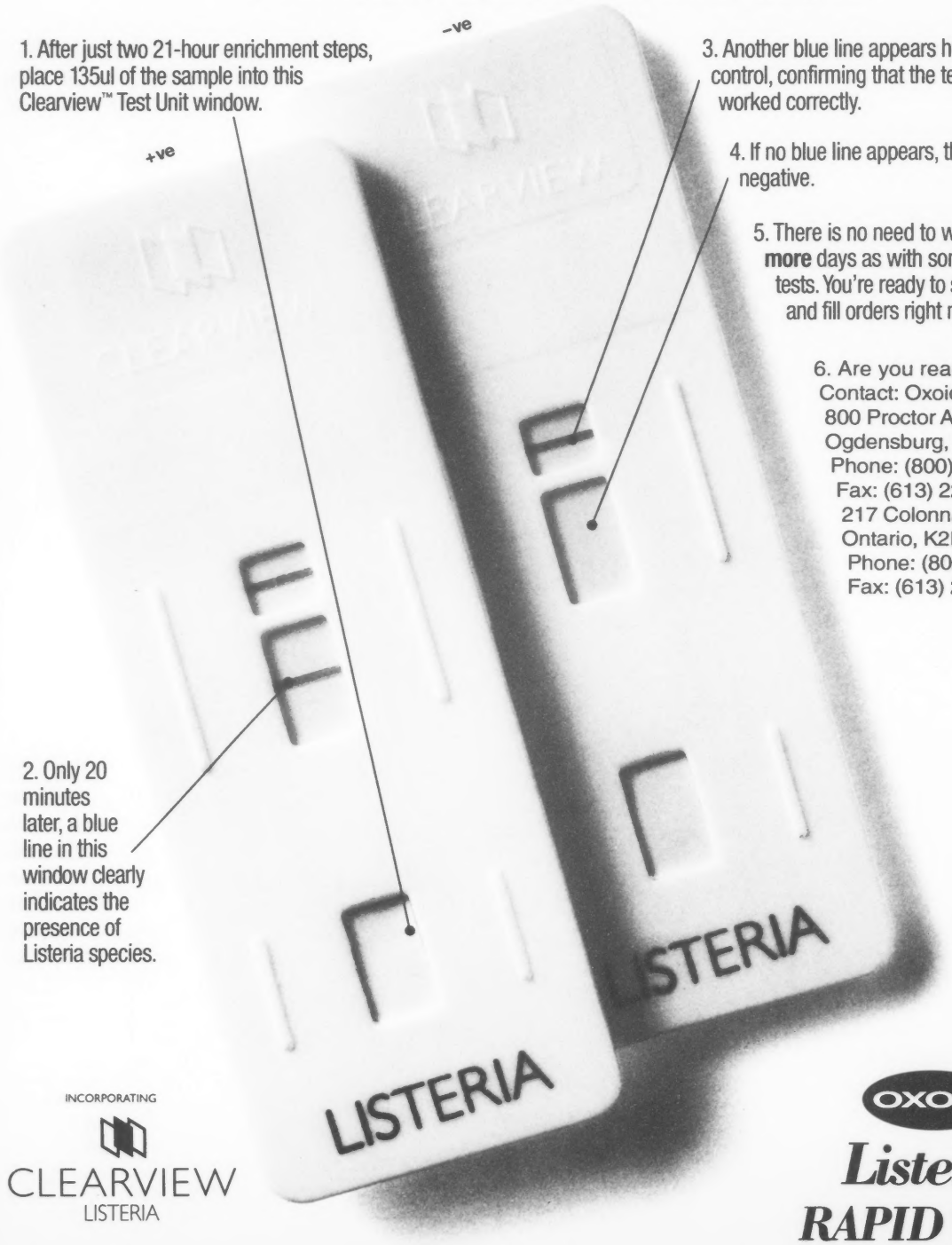

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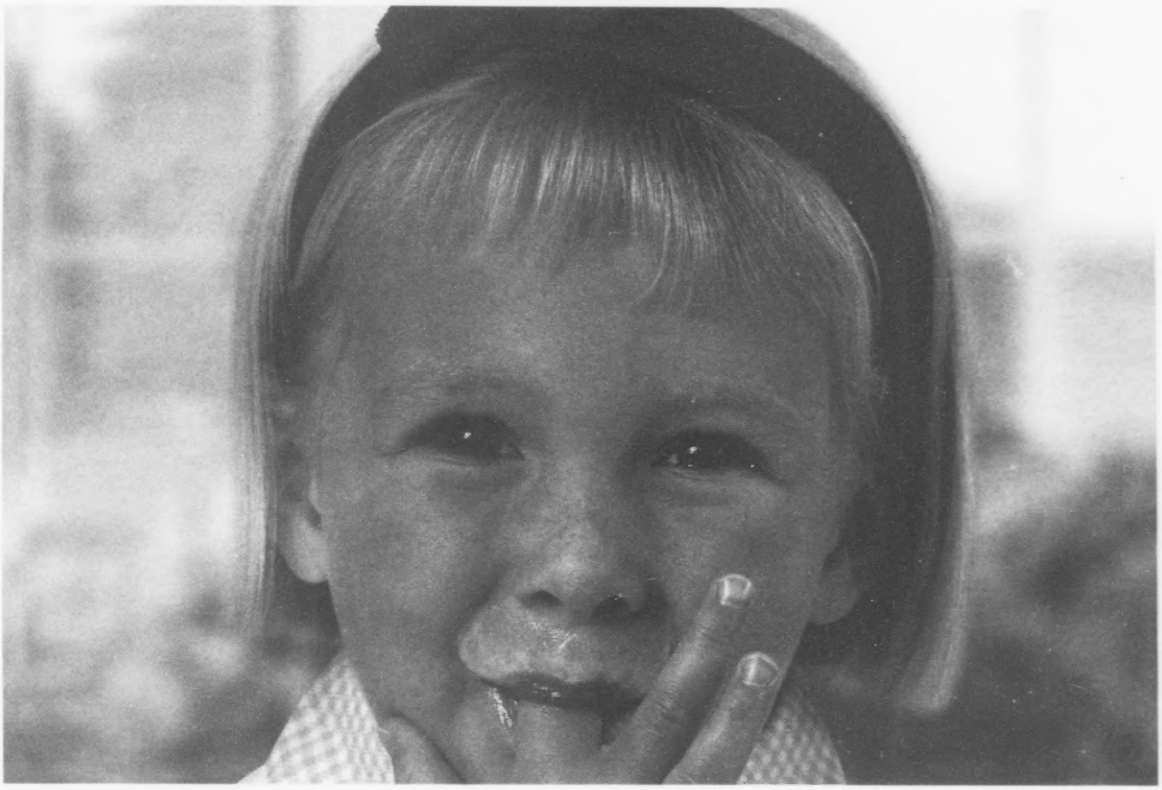

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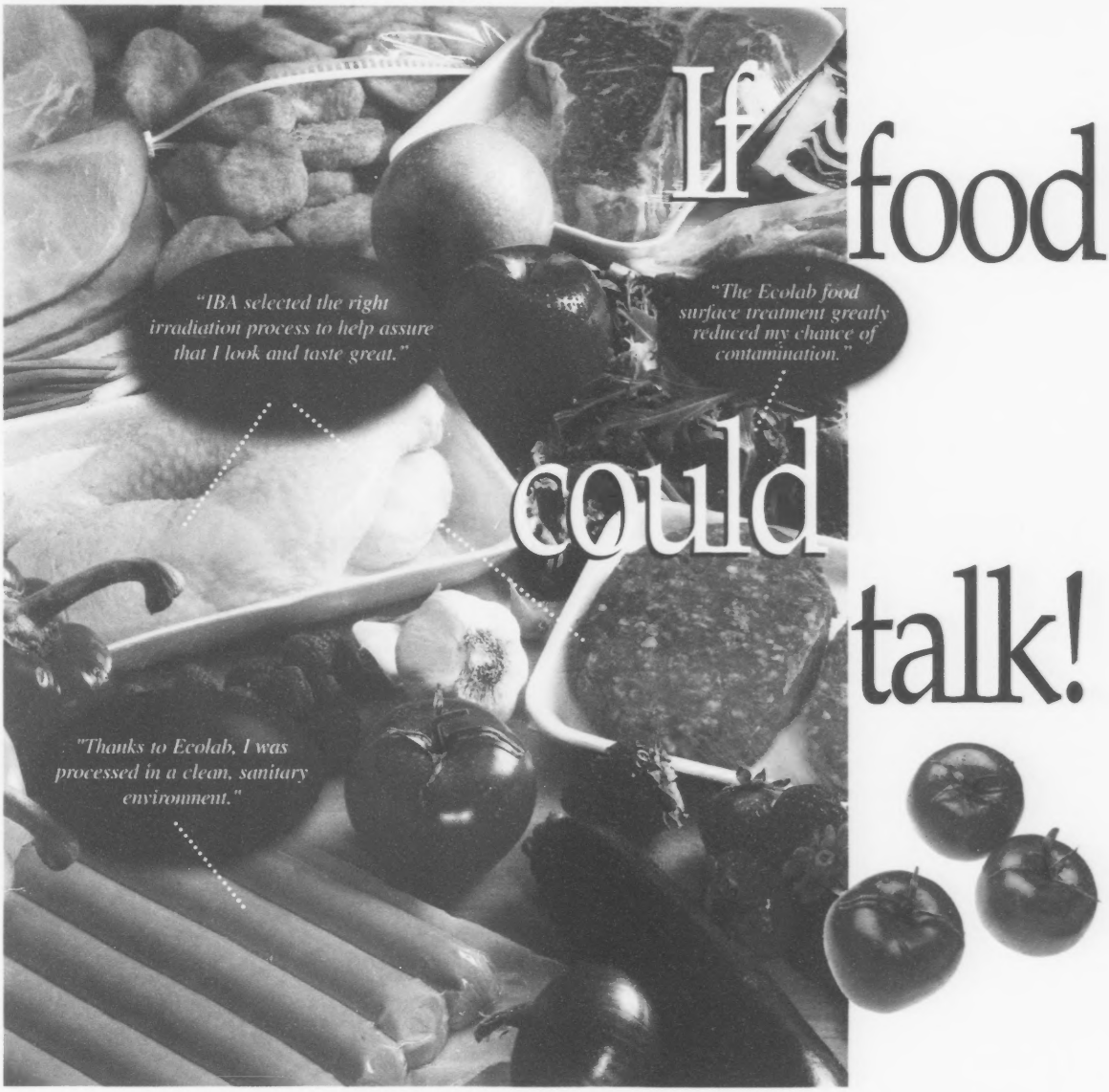

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My Perspective

By JENNY SCOTT
President

"IAFP tried something very new; we published a paper in a language other than English"

With this month's issue of *Dairy, Food and Environmental Sanitation*, IAFP tried something very new; we published a paper in a language other than English. On page 381 you will find a paper on "The Control of Post-Processing Contamination by *Listeria monocytogenes*." This paper was originally published in English in *DFES* in August 1999 (Tompkin, R.B. et al., 1999. Guidelines to prevent post-processing contamination from *Listeria monocytogenes*, Dairy, Food Env. Sanit. 19:551-562). It provides a practical approach (based on many years of experience) to control of *Listeria monocytogenes* in a food processing plant. The authors received a number of requests for a version of the article in Spanish. Because of this, the article was subsequently translated into Spanish by staff at the National Food Processors Association (NFPA) and IAFP was approached to determine if the Association would be interested in publishing the Spanish version of the article. NFPA felt this article could be used in the United States in food manufacturing facilities that employ workers who speak primarily Spanish and it could also be used by IAFP Members in other countries where Spanish is the native language. The IAFP Executive Board recognized that the publication of an article in a non-English language would raise a number of questions.

- Would IAFP Members see a benefit to this?
- If we publish an article in a non-English language, how would our English-speaking Members (the majority of IAFP Members) feel about this?
- Are our Members interested in seeing articles in other languages?
- If we publish an article in one language, should we publish it in other languages as well?
- Who would do the translation of articles?
- Who would review the galley proofs to determine if language errors had been made?
- Should we accept any article submitted with a translation (provided peer review deems the article appropriate for *DFES*) or should only specific types of articles be published in more than one language?
- If only specific types of articles should appear in both English and a non-English language, what criteria should we use as a basis for articles in non-English languages?

The Board considered these questions, discussed the issue with the *DFES* Management Committee and our current thinking is set out below. However, we have not made a final determination on this issue and we solicit your opinion on what the IAFP position should be. The Board believes that publishing an article *occasionally* in another language might

help demonstrate our commitment to being an international organization. However, because a majority of our Members primarily speak English, we feel it would be essential that any manuscript is published in a non-English language also be published in English. Therefore, in the future we might entertain the notion of publishing other articles in a non-English language; however we would publish both the English version and the non-English language version in the same issue of *DFES*. We also believe that not every article that is published in *DFES* is appropriate for publication in a non-English language. We feel that primarily articles on practical, applied topics would be of most benefit for publication in a non-English language. These could be used by United States food manufacturing or food service facilities that employ people who speak the chosen language. These articles could also be used in countries where that language is spoken. The author would be responsible for submitting the article in both English and the non-English language, and would be responsible for a careful review of the galley. The submitter may be asked to justify the choice of the alternate language.

The Executive Board would like to know how you, our Members, feel about this. We provided a response form on page 396 (English) and page 397 (Spanish) for you to fill out and send back via fax. Alternatively, you may go to the IAFP Web site at www. foodprotection.org and fill out the survey. We really do want to know your thoughts on this. We want to know if you like the idea; if you don't like it; if you have alternative approaches, such as publishing *DFES* papers in non-English languages only on the Web site; and we would like to know what languages you feel would be most popular for this type of information. The results of the survey will be discussed in a future issue of *DFES* and provided to the *DFES* Management Committee for their consideration. If the Membership wants to see more of this, we anticipate that the *DFES* Management Committee will develop guidelines to address the submission of articles in non-English languages.

You will also note that this issue of *DFES* is the "Pre-Annual Meeting" issue. I know that in some places this winter's snow may still be disappearing and the lake ice is still breaking up. But when you get this issue, it will be less than three months until our Annual Meeting! Take a look at the exciting line up of symposia, technical papers and posters. Then fill out the registration form – either the one in *DFES* on page 443, or go to the IAFP Web site at www. foodprotection.org and register online. I'm excited about going to Minneapolis, about this year's program, and about the social events our Minnesota Affiliate has planned for us, and I hope you are too. See you at IAFP 2001 this August!

COMMENTARY

FROM THE EXECUTIVE DIRECTOR

By DAVID W. THARP, CAE
Executive Director

"Make your plans now to be in Minneapolis this August"

Where can you go to see and hear the leading authorities in food science? Where can you go to discuss the latest findings and methods in food protection? Well of course, it is IAFP 2001 – the Association's 88th Annual Meeting! This year, like many years preceding, the International Association for Food Protection offers more than 350 presentations over the 3-day conference. Make your plans now to be in Minneapolis this August to partake and refresh your thirst for new knowledge.

We are expecting up to 1,400 attendees at this year's Annual Meeting. Our Meeting has become known as the place to be if your interests lie in food safety, science and protection. See page 423 for expanded information about IAFP 2001. The preliminary program gives a preview of what you can expect. There are 21 symposia, 60 technical presentations and 150 poster presentations this year in Minneapolis. Topics cover everything from dairy plant HACCP to irradiation, from zero tolerance to water quality, from food safety objectives to educating food service workers, and from indicator microorganisms to communications. Truly, something for everyone with interests in food safety.

You might ask, how does all of this come together to make up IAFP 2001? The answer is really quite simple – many dedicated individuals pool their time, efforts and talents to make the Meeting flow smoothly. Planning begins more than a year before the actual Meeting. Two groups put forth a great amount of time and energy. They are the Local Arrangements Committee and the Program Committee.

Jenny Scott covered the workings of the Program Committee in her March 2001 President's Column, "My Perspective," so I will not duplicate that information here. Just let me add my sincere thanks to all of the Program Committee Members for their work in developing this year's program. It takes a lot of hours to review the submitted abstracts, attend the Program Committee meeting and to place all elements of the Program in a logical order without duplicating topics or having speakers in two places at once! We rely upon the expertise of the Program Committee and Chairperson Stan Bailey to guide us in all Program related decisions.

The Local Arrangements Committee begins their work about 18 months before the Annual Meeting. This year's Committee is co-chaired by Paul Nierman and Mary Anderson from DQCI Services, Inc. and Dan Erickson from the State of Minnesota Department of Agriculture. These three Co-Chairpersons have been talking with Upper Midwest Dairy Industry Association (UMDIA) members for about three years to motivate those members to help out when the Meeting actually materializes. Now is the time that they (Paul, Mary and Dan) have to fill up their volunteer rosters and assign people to help at registration, in the session

rooms, with the Audiovisual Library and Silent Auction, and to serve as hospitality hosts.

We are grateful to UMDIA and all of the individual members who have agreed to help out during IAFP 2001. We recognize that it takes a great amount of dedication from everyone volunteering his or her time. By the end of our conference, UMDIA members will have logged hundreds of hours of volunteer time. Although it takes a lot of preparation and many hours, the experience forms lifetime friendships that might never have formed otherwise. Our thanks to all UMDIA members in advance for your commitment!

One other group of people who should be recognized is our speakers and presenters. The vast majority of our speakers pay their own expenses to come to IAFP 2001 to share their presentation with our attendees. This commitment is truly amazing when you look at the expense each speaker's employer incurs – all in the name of sharing information on protecting the food supply.

As you prepare for your journey to Minneapolis, please take a moment to think about the time and effort that so many people put forth in preparing for IAFP 2001 – the Association's 88th Annual Meeting. Remember that this Meeting doesn't just happen, it takes years of planning and many hours of many people's time.

In planning your travel schedule, you will want to consider this year's pre-meeting Workshops. We have three to choose from. Workshop I is titled, "Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*." Workshop II is "Applying Advanced Techniques to HACCP Systems," and is cosponsored by the US Poultry and Egg Association. Workshop I and II are 2-day workshops that begin on Friday. Workshop III is a one-day workshop on Saturday and is titled, "Crisis! Recall Management in the Food Industry." Workshop details appear on page 444 in this issue of *DFES*.

We hope to see you this August in Minneapolis for IAFP 2001. It is sure to be the best food safety conference ever!

Dairy, Food and Environmental Sanitation, Vol. 21, No. 5, Pages 370-379

Efficacy of Two Disinfecting Agents Against Mixed Culture Biofilms from Dairy Processing Lines

Manvi Sharma and S. K. Anand*

Dairy Microbiology Division, National Dairy Research Institute
Karnal-132001 (Haryana), India

SUMMARY

To devise an effective sanitation program for controlling biofilms prevailing in dairy processing lines, the efficiency of two commonly used disinfecting agents/sanitizers, (chlorine and iodophor), was evaluated under *in vitro* and *in situ* conditions. Sanitizer efficacy was determined at various exposure times (1, 3, 5, 10, 15, 20, 30 min). Sodium hypochlorite at a concentration of 100 ppm and for a contact time of 20 min brought about a 3 log unit reduction in the case of commercial plant (CP) mixed bacterial consortia; however, a 2.2 log unit reduction was achieved for experimental dairy plant (EDP) mixed bacterial consortia under *in vitro* conditions. On the other hand, iodophor, at a concentration of 10 ppm and with a minimum contact time of 20 min, was found to be most effective (resulting in units greater than 3 log reduction) under both *in vitro* and *in situ* conditions. The findings demonstrated that *in vitro* studies should invariably be repeated under *in situ* conditions to ensure control of the biofilms prevailing in dairy processing lines.

A peer-reviewed article.

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TABLE 1. ***In vitro*** **biofilm formation on SS chips (1 cm²) using bacterial consortia from different segments of processing lines**

Segment	Isolates of consortia
Cammercial plant:	
I. Raw milk line:	
1. Pre-chiller	*Escherichia coli* M-111 *Bacillus cereus* M-311 *Bacillus subtilis* M-314 *Enterobacter aerogenes* M-211
2. Post-chiller	*Streptacaccus* sp. M-224 *Bacillus cereus* M-321 *Bacillus subtilis* M-324 *Enterabacter aerogenes* M-325 *Shigella* sp. M-326
3. Sila	*Lactococcus* sp. M-131 *Bacillus cereus* M-132 *Escherichia coli* M-232 *Bacillus* sp. M-331 *Staphylacaccus aureus* M-333
II. Pre-pasteurization line:	
1. Pasteurizer inlet	*Streptococcus* sp. M-141 *Staphylococcus* sp. M-241 *Citrobacter* sp. M-242 *Lactabacillus* sp. M-341 *Enterobacter aerogenes* M-344 *Shigella* sp. M-346
III. Post-pasteurization line:	
1. Pasteurizer outlet	*Staphylococcus aureus* M-151 *Bacillus cereus* M-351 *Bacillus* sp. M-352 *Enterabacter aeragenes* M-355 *Shigella* sp. M-356
2. Pre-chiller (Packaging)	*Staphylococcus* sp. M-161 *Bacillus cereus* M-163 *Enterabacter aeragenes* M-263 *Shigella* sp. M-266 *Lactabacillus* sp. M-361 *Bacillus subtilis* M-362
3. Post-chiller (Packaging)	*Bacillus subtilis* M-171 *Bacillus cereus* M-272 *Escherichia cali* M-273 *Shigella* sp. M-275 *Staphylococcus* sp. M-371 *Flavobacterium* sp. M-373

INTRODUCTION

The attachment of bacteria to, and subsequent development of biofilms on, food contact surfaces constitute potential sources of post-processing contamination of finished products with spoilage and pathogenic microflora *(6, 25, 27)*. The limitation of some CIP systems, generally those that are not functioning adequately, may result in persistence of microorganisms on food contact surfaces and, given sufficient time between completion of cleaning/sanitizing and production startup, any surviving organisms could recolonize the equipment surfaces and result in product contamination *(2, 7, 8, 28)*. A biofilm, once formed is very difficult to remove, as microorganisms within biofilms are resistant to antimicrobial agents, including detergents and sanitizers, because of the presence of extensive exopolymeric matrix *(4)*. Mechanical or chemical breakage of the polysaccharide matrix has been found to be an important strategy for successful control of these biofilms. Various chemicals such as peracetic acid *(11)*, chlorine *(7)*, iodine *(5)*, and H_2O_2 *(13)* have been shown to have the ability to depolymerize the matrix. A number of reports are available on the control of monospecies biofilms under *in vitro* conditions *(15, 16, 19, 22)*. However, because laboratory conditions significantly differ from *in situ* conditions. The present study was conducted to develop the biofilms from consortia constituents, those prevailing in the dairy processing lines, under *in vitro* conditions. Response of these mixed species biofilms to sanitizers under *in vitro* and then *in situ* conditions was studied, to devise an effective sanitation program for controlling biofilms in the dairy industry.

MATERIALS AND METHODS

Constitutive microflora

The various bacterial cultures used in this study (table 1) were isolated from different segments of the raw and pasteurized lines of

TABLE 1. *Continued*

4. Buffer tank inlet (Pre-Pack)	*Bacillus subtilis* M-181 *Staphylococcus aureus* M-182 *Enterobacter aerogenes* M-282 *Proteus* sp. M-382
5. Buffer tank outlet (Pre-Pack)	*Citrobacter* sp. M-292 *Shigella* sp. M-294 *Lactobacillus* sp. M-392 *Bacillus cereus* M-393 *Staphylococcus aureus* M-394 *Escherichia coli* M-395 *Bacillus* sp. M-396 *Flavobacterium* sp M-399
Experimental dairy plant:	
1. Raw milk line	*Micrococcus* sp. E-111 *Lactococcus* sp. E-113 *Klebsiella* sp. E-211 *Bacillus subtilis* E-212 *Enterobacter aerogenes* E-215 *Staphylococcus aureus* E-314
2. Pre-pasteurization line	*Shigella* sp. E-221 *Bacillus cereus* E-222 *Bacillus* sp. E-223 *Enterobacter aerogenes* E-225 *Staphylococcus aureus* E-226 *Klebsiella* sp. E-322
3. Post-pasteurization line	*Bacillus* sp. E-131 *Staphylococcus* sp. E-132 *Escherichia coli* E-232

a commercial plant (CP) and an experimental dairy plant (EDP), using the swab method. These were biochemically characterized by standard procedures *(20)*.

Biofilm development using online consortia: attachment surface

The metal surface used in the *in vitro* study was stainless steel (SS) chips (1 cm^2) made of material similar to the material used for equipment and pipelines used in the dairy industry; the chips were obtained from JDR Stainless Steel Equipment, Noida. The chips were placed in 1 N HNO_3 for 30 min and then rinsed in distilled water 3 times, after which they were autoclaved at 121°C/15 min at 15 psi *(10)*.

For development of mixed species biofilms, the bacterial cultures (consortia constituents) were grown in nutrient broth. Twenty-four hour-old cultures were centrifuged at 5,000 g for 10 min. The pellets were suspended in 10 ml of 0.2 M phosphate buffer saline (pH 7.2). OD_{580} of each culture isolate was adjusted to 0.3≅ 10^8 CFU/ml according to the procedure recommeded by Leriche and Carpentier *(17)*. Bacterial suspensions were then mixed in a ratio of 1:1, and 1 ml of the mixed suspension was added to 20 ml of attachment menstruum, i.e., 10 percent reconstituted sterilized skim milk. The sterilized chips were placed in sterile petri dish. The SS chips were covered with skim milk containing the mixed culture suspension and incubated at 37°C for 24 h. Each SS chip with 24-hour-old biofilm was transferred aseptically to a sterilized 50-ml conical flask containing 10 ml 0.2 M phosphate buffer saline (PBS). The stainless steel chips were rinsed in PBS with shaking on a horizontal shaker (HS – 500 Janka & Kunkal Model) at 100 rpm for 1 min, to remove reversibly attached bacteria *(10)*.

To evaluate biofilm populations before sanitizer treatments, the SS chips with adherent cells were placed in sterile test tubes containing 10 ml of PBS (pH 7.2) along with 0.5 g sterile microscopic glass beads. The test tubes were mixed with a vortex mixer for 2 min to dislodge attached cells. The organisms were enumerated by plating serial dilutions onto nutrient agar and incubating the plates at 37°C for 24 h. Counts were expressed as log CFU/cm^2 *(15)*.

In vitro control of biofilm

To control the mixed species (consortia) biofilms, two sanitizers commonly used in the dairy industry were used: sodium hypochlorite (Polypharm, Free chlorine 2.5% w/v, pH 7.7) and iodophor (Polypharm Polysan; active ingredient alkyl phenoxy polyethoxy ethanoliodine complex, pH 3.5). These were diluted to produce concentrations of 100 and 200 ppm for sodium hypochlorite, and 10 and 25 ppm for iodophor.

A 24-hour-old mixed species biofilm, developed on SS chips and placed in sterilized test tubes, was

TABLE 2. Control of mixed species biofilm from a commercial plant using sodium hypochlorite as a sanitizer

Concentration of sanitizer (ppm)	Exposure time (min)	Log_{10}* (CFU/cm^2)	Log kill (Log N - Log n)
0	0	7.919[a]	-
100	1	7.152[b]	0.767
	3	6.725[b]	1.194
	5	5.653[b]	2.266
	10	5.544[b]	2.375
	15	5.322[b]	2.597
	20	4.556[b]	3.363
200	1	6.589[b]	1.330
	3	6.414[b]	1.505
	5	5.326[b]	2.593
	10	4.477[b]	3.442

[a]Log N = Initial cell count

[b]Log n = Cell count after sanitizer treatment

*Mean values (n=2)

exposed to 10 ml of sanitizer solution. Exposure time was 0, 1, 3, 5, 10, 15 and 20 min for sodium hypochlorite, and up to 30 min for iodophor. After exposure, SS chips were transferred immediately into neutralizing buffer (0.5 percent sodium thiosulphate in phosphate buffer, pH 7.2) and rinsed for about 10 s. Rinsing was repeated three times, for 10 s each, using 10 ml of fresh buffer each time. Numbers of survivors after sanitizer treatment were then determined by mixing with glass beads in a vortex mixer for 2 min to dislodge the attached cells and plating serial dilutions on nutrient agar. The plates were incubated at 37°C for 24 h. Counts were expressed as log CFU/cm^2. All experiments were conducted in duplicate. The log kill by each sanitizer was determined by using the following equation:

$$\text{Log kill} = \text{Log N} - \text{Log n}$$

Where N is the count for untreated (control) cells and n is the cell count after sanitizer treatment *(23)*.

In situ control of biofilm

The concentration with exposure time resulting in at least 3 log units reduction for *in vitro* experiments was recommended to the plants for *in situ* control of biofilms. To evaluate the effectiveness of *in situ* biofilm control, the initial swab samples were obtained after the existing CIP and sanitization procedure had been used.

In the second phase, the recommended sanitation plan was followed for about one week, after which samples (swabs) were drawn from each segment of the cleaned and sanitized raw and pasteurized lines. Numbers of organisms were enumerated by plating serial dilutions on nutrient agar and incubating the plates at 37°C for 24 h, as described previously.

RESULTS AND DISCUSSION

Biofilms were developed from the bacterial consortia recovered from various locations in a com-

TABLE 3. Control of mixed species biofilm from an experimental dairy plant using sodium hypochlorite as a sanitizer

Concentration of sanitizer (ppm)	Exposure time (min)	Log_{10}* (CFU/cm^2)	Log kill (Log N - Log n)
0	0	6.544[a]	-
100	1	6.361[b]	0.183
	3	6.079[b]	0.465
	5	5.908[b]	0.636
	10	5.303[b]	1.241
	15	4.770[b]	1.774
	20	4.361[b]	2.183
200	1	5.660[b]	0.884
	3	5.322[b]	1.222
	5	4.230[b]	2.314
	10	4.020[b]	2.534

[a] Log N = Initial cell count

[b] Log n = Cell count after sanitizer treatment

* Mean values (n=2)

mercial plant and an experimental dairy plant (table 1). The presence of a wide variety of microflora in biofilms associated with different segments of pasteurization lines is of great importance because of spoilage and health consequences. The data presented in tables 2 and 3 shows the control of mixed species biofilm (24 h old) of CP and EDP by means of sodium hypochlorite. A reduction of (table 2 and 3) more than 3 log units was achieved at a concentration of 100 ppm with a contact time of 20 min in the case of CP consortia (table 2). However, only a 2.2 log reduction was achieved with the same concentration and contact time in the case of EDP consortia (table 3).

The different effectiveness of sodium hypochlorite when CP and EDP consortia are compared may be due to differences in the constitutive microflora of these two plants. Richard *(22)* in a previous study indicated that sodium hypochlorite was ineffective even at a concentration of 100 ppm (log kill ranged from -1.41 to 1.03) against *Listeria monocytogenes* biofilms on stainless steel. Another reason could be the resistance of microflora in mixed-community biofilms evaluated in the present study, as compared to previous studies, which were mainly concerned with monospecies biofilms *(15, 16, 19, 22)*. Moreover, spatial heterogeneity of biofilms constitutes an important survival strategy, because at least some of the cells, which represent a wide range of different metabolic states, are almost certain to survive any metabolically directed attack *(14, 26)*. Competition for nutrients resulting in nutrient deficiency in mixed species biofilms also had a major role in the increased resistance of mixed-species biofilms to antimicrobial treatments *(12)*.

Tables 4 and 5 show control of mixed-species biofilms of CP and EDP, respectively, using iodophor as a sanitizer. The data revealed the effectiveness of iodophor at a concentration of 10 ppm, with a minimum contact time of 20 min, which brought about a reduction of more than 3 log units [3.32 log reduction in

TABLE 4. Control of mixed species biofilm from a commercial plant using iodophor as sanitizer

Concentration of sanitizer (ppm)	Exposure time (min)	Log_{10}* (CFU/cm^2)	Log kill (Log N - Log n)
0	0	9.411[a]	-
10	3	7.988[b]	1.423
	5	6.635[b]	2.776
	10	6.575[b]	2.836
	15	6.561[b]	2.850
	20	6.096[b]	3.315
	30	6.017[b]	3.394
25	3	7.460[b]	1.951
	5	7.090[b]	2.321
	10	6.866[b]	2.545
	15	6.003[b]	3.408
	20	5.380[b]	4.031
	30	5.045[b]	4.366

[a]Log N = Initiol cell count

[b]Log n = Cell count ofter sonitizer treotment

*Meon values (n=2)

the case of CP consortia (table 4) and 3.3 log reduction in the case of EDP consortia (table 5)], enough to meet the sanitizer efficacy standards for biofilm control as recommended by Mosteller and Bishop *(21)*.

As a guideline, to pass the AOAC Germicidal and Detergent Sanitizer Test, an effective sanitizer should reduce the initial planktonic cell count by 5 or more log units, i.e., 99.999 percent *(18, 21, 23)*. On the other hand, as far as attached cell counts are concerned, a decrease by 3 or more log units in 30 s, or 99.9 percent reduction, is assumed to be sufficient *(18, 21)*. Therefore, in this study, the goal for reduction of the number of surface-attached bacteria was 3 log units or 99.9 percent reduction.

In situ control of biofilms

In view of the results obtained, it was recommended that the commercial plant (CP) run the recommended sanitation program using 10 ppm iodophor for a contact time of 20 min for *in situ* control of biofilms.

Reduction of more than 3 log units was achieved in segments of the raw and pasteurized lines after application of iodophor for one week (table 6), indicating the effectiveness of sanitizer (iodophor). However, because of the initial higher counts in the pre- and post-chiller raw milk section, the final counts in these sections after reduction were more than 4 log units. Therefore, to achieve further reduction in these sections, it was thought necessary to try a combination of heat with the sanitizer (iodophor at 30°C). Samples were drawn after 1 week of such an application *in situ*. Results, presented in table 7, indicated that there was no further

TABLE 5. Control of mixed species biofilm from an experimental dairy plant using iodophor as sanitizer

Concentration of sanitizer (ppm)	Exposure time (min)	Log_{10}* (CFU/cm^2)	Log kill (Log N – Log n)
0	0	9.447[a]	-
10	3	7.579[b]	1.868
	5	6.732[b]	2.715
	10	6.510[b]	2.937
	15	6.462[b]	2.985
	20	6.146[b]	3.301
	30	5.579[b]	3.868
25	3	7.225[b]	2.222
	5	6.184[b]	3.263
	10	6.000[b]	3.447
	15	5.556[b]	3.891
	20	5.060[b]	4.387
	30	4.000[b]	5.447

[a]Log N = Initial cell count

[b]Log n = Cell count after sanitizer treatment

*Mean values (n=2)

reduction in number of microflora even after the modified treatment.

The reason for the greater survival of microflora in the raw milk segment may be the presence of older biofilms (> 24 h) due to the high contamination in incoming raw milk and possibly an inadequate cleaning program. Older biofilms have been reported to be more resistant than of young ones, due to microcolony formation, as many layers of cells prevent the penetration by chemical sanitizer *(1, 3, 9, 16)*.

To achieve complete elimination of biofilms especially in that raw milk pre- and post- chiller segment, higher concentrations of sanitizers were also tried *in vitro*. Data in Table 8 indicate that 50 ppm of iodophor and 200 ppm of sodium hypochlorite with a contact time of 20 min resulted in about 5 and 4 log unit reductions, respectively. However, because even these treatments could not result in complete removal of existing biofilms from raw milk segment, the higher concentrations were not tested *in situ*.

A number of previous reports have also shown that once a biofilm is firmly established, it is very difficult to eradicate it completely. Sanitizers were unable to penetrate the glycocalyx matrix and contact the bacterial cells in order to destroy them *(19, 21, 24)*.

Hence, due to high counts in raw milk, there is always a greater chance for formation of biofilms that tend to grow older in a continuous operation *(8)*.

Table 6. *In situ* control of biofilm in a commercial plant using iodophor

Segment	Counts* (Log_{10} CFU/cm^2)		Log kill (Log N - Log n)
	Before recommended sanitation (N)	After recommended sanitation (n)	
Pre-chiller raw milk	7.34	4.19	3.15
Post-chiller raw milk	7.97	4.74	3.23
Silo	6.45	1.31	5.14
Pasteurizer inlet	6.32	1.25	5.07
Pasteurizer outlet	6.45	1.43	5.02
Pre-chiller (packaging)	6.78	1.23	5.55
Post-chiller (packaging)	6.97	1.34	5.63
Buffer tank inlet (pre-pack)	6.29	2.23	4.06
Buffer tank outlet (pre-pack)	6.56	2.17	4.39

* Mean values (n=3)

Before recommended sanitation: Surfaces swabbed after existing CIP Plan with iodophor sanitation at 5 ppm for 15 min at 4-5°C

After recommended sanitation: Surfaces swabbed after recommended CIP Plan with iodophor sanitation at 10 ppm for 20 min at 10°C

CONCLUSIONS

It may be concluded that for effective control of biofilms, *in vitro* studies should invariably be repeated under *in situ* conditions. It was possible to identify a concentration of sanitizer that effectively reduced the biofilms in most segments of the processing lines, based on *in vitro* studies. Iodophor at a concentration of 10 ppm, with a contact time of 20 min, was found to be most effective under both *in vitro* and *in situ* conditions. Therefore, sanitizer efficacy as determined by a reduction of at least 3 log units was found to be a useful parameter in selecting the sanitizer for control of biofilms under *in situ* conditions.

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TABLE 7. *In situ* control of biofilm in a commercial plant using iodophor

Segment	Counts* (Log_{10} CFU/cm^2)		Log kill (Log N - Log n)
	Before recommended sanitation(N)	After recommended sanitation (n)	
Pre-chiller raw milk	4.21	3.95	0.16
Post-chiller raw milk	4.63	3.41	1.22
Silo	1.75	1.69	0.06
Pasteurizer inlet	1.45	1.39	0.06
Pasteurizer outlet	1.42	1.38	0.04
Pre-chiller (packaging)	1.38	1.30	0.08
Post-chiller (packaging)	1.35	1.20	0.15
Buffer tank inlet (pre-pack)	2.89	2.60	0.29
Buffer tank outlet (pre-pack)	2.48	2.34	0.14

*Mean values (n=3).

After recommended sanitation: Surfaces swabbed after CIP Plan with iodophor sanitation at 10 ppm for 20 min at 10°C.

After modified sanitation: Surfaces swabbed after modified CIP Plan with iodophor sanitation at 10 ppm for 20 min at 30°C.

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TABLE 8. Sanitizer efficacy at higher concentration against mixed species biofilms after 20 min-exposure time under *in vitro* conditions

Sanitizer	Concentration of sanitizer (ppm)	Log_{10}* (CFU/cm^2)	Log kill (Log N - Log n)
0	0	8.602[a]	-
Iodophor	10	5.507[b]	3.095
	25	5.195[b]	3.407
	50	3.623[b]	4.979
Sodium hypochlorite	100	5.103[b]	3.499
	200	4.610[b]	3.992

[a]Log N = Initial cell count

[b]Log n = Cell count after sanitizer treatment

*Mean values (n=2)

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In March 2001, the International Association for Food Protection exhibited at the United Fresh Fruit and Vegetable Association International Conference in Tampa, Florida. While exhibiting, we offered a drawing for a one-year Membership with our Association. We are pleased to announce the following winner of the drawing:

Anthony S. Italia
NC State University
Kinston, NC

Editor's Note

This manuscript was originally published in English in the August 1999 issue of *Dairy, Food and Environmental Sanitation* (*DFES*; Tompkin, R.B. et al., Vol. 19, p. 551-562). After receiving several requests for the article in Spanish, the National Food Processors Association had it translated on behalf of the authors. Because practical advice on control of *Listeria monocytogenes* in food plants benefits an industry that employs a large number of Spanish-speaking workers, we felt others might benefit from having the Spanish version of the article. The IAFP Executive Board concurred. While recognizing that the "official language" of IAFP is English, the Executive Board believes that, as an international association, it would be beneficial to periodically publish articles dealing with practical, applied topics in a widely used, non-English language, along with an English version.

For additional information about this "trial run," see "My Perspective," by Jenny Scott, IAFP President, on page 366. Let us know your thoughts on this issue by completing the short survey on page 396.

Este manuscrito fue originalmente publicado en inglés en el número de agosto de 1999 de *Dairy, Food and Environmental Sanitation* (*DFES*; Tompkin, R.B. et al., Vol. 19, p. 551-562). Después de recibir varios pedidos referentes a la publicación del artículo en español, la Asociación Nacional de Procesadores de Alimentos presenta esta traducción en nombre de los autores. Debido a que los consejos prácticos de como controlar *Listeria monocytogenes* en plantas de alimentos beneficia a una industria que emplea un gran número de trabajadores de habla hispana, creemos que muchos aprovecharán la versión española del artículo. La junta ejecutiva de la IAFP concertó con esta aseveración. Al tiempo que se reconoce que el lenguaje oficial de la IAFP es el inglés, la junta ejecutiva cree que como asociación internacional sería beneficioso publicar periódicamente artículos relevantes a temas prácticos en un lenguaje ampliamente usado que no sea el inglés, a la ves que se publica la versión inglesa.

Para obtener información adicional acerca de esta "prueba" refiérase a "Mi Perspectiva," por Jenny Scott, Presidente de la IAFP, en la página 366. Déjenos saber sus reflexiones al respecto mediante el llenado de la breve encuesta de la página 397.

Dairy, Food and Environmental Sanitation, Vol. 21, No. 5, Pages 381-395

Pautas Para Prevenir La Contaminación Con *Listeria monocytogenes* Después Del Procesamiento

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RESUMEN

Con esfuerzos extensivos se puede reducir la frecuencia y los niveles de contaminación de *Listeria monocytogenes,* pero no es posible, con las tecnologías disponibles en el presente, erradicarla del medio ambiente de las plantas de procesamiento ni eliminar totalmente el potencial de contaminación de los productos terminados. Debido a la seriedad de la listeriosis en individuos susceptibles, la industria debe tomar medidas rigurosas para controlar la presencia de *L. monocytogenes* en alimentos listos para el consumo en donde esta bacteria puede crecer. Este artículo ofrece recomendaciones prácticas para prevenir la recontaminación de alimentos con *L. monocytogenes*, incluyendo controles dirigidos a la prevención de la contaminación de las superficies de contacto con el alimento y la prevención del establecimiento y crecimiento del organismo en nichos en las plantas de procesamiento. Aunque este artículo se refiere a los alimentos refrigerados listos para el consumo que permiten el crecimiento de *L. monocytogenes*, las recomendaciones pueden ser aplicadas también a otros productos para minimizar la contaminación. Las recomendaciones–que abarcan consideraciones generales, operaciones de procesamiento, operaciones de empaquetado y almacenado, equipamiento, limpieza general de la planta e higiene del personal–también incluye algunas recomendaciones generales sobre los programas de monitoreo del ambiente que utilizan organismos indicadores, tales como "*Listeria* genérica," para verificar la efectividad de los programas de control de *L. monocytogenes*.

A peer-reviewed article.

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INTRODUCCIÓN

Este artículo se refiere principalmente a los alimentos refrigerados listos para el consumo que permiten el crecimiento de *Listeria monocytogenes*; sin embargo las recomendaciones aquí incluidas pueden ser aplicadas también a otros productos con la intención de minimizar la contaminación con *L. monocytogenes*. Estas recomendaciones no son aplicables en todas las situaciones: el control de *L. monocytogenes* es específico para el producto, el proceso y la planta de procesamiento. Por lo tanto, estas recomendaciones deben ser consideradas solo como una guía la cual se ajustará según los conocimientos que se adquieran para controlar a la *L. monocytogenes* en las plantas de procesamiento.

La listeriosis es una enfermedad grave causada principalmente por el consumo de alimentos contaminados con la bacteria *L. monocytogenes* (*4, 5*). A pesar de que la listeriosis puede ocurrir en personas sanas, ciertos sectores de la población, tales como las mujeres embarazadas, los recién nacidos, los ancianos y los individuos inmunocomprometidos, son más susceptibles a la listeriosis (*4, 5*). Los alimentos implicados en brotes y en casos esporádicos están limitados a pocos productos refrigerados que permiten el crecimiento del microorganismo a niveles elevados (*4*).

La *L. monocytogenes* está distribuida ampliamente en el ambiente; ésta se encuentra en suelos, agua, aguas residuales y vegetación en descomposición. Esta bacteria se aísla fácilmente de seres humanos, animales domésticos (incluyendo mascotas), productos agrícolas frescos, el medio ambiente de las plantas de procesamiento y hogares (*5*). El organismo se encuentra en amplia variedad de alimentos incluyendo carne de res, aves, vegetales, productos lácteos y productos pesqueros (*4, 5*). De hecho se encuentra en cualquier ambiente frío y húmedo. Esta es una de las razones por la cual los desagües en los pisos frecuentemente presentan una alta población de especies de *Listeria*. Debido a su alto poder de difusión, el organismo es constantemente reintroducido al medio ambiente de la planta de procesamiento. Los esfuerzos extensivos para controlar la *L. monocytogenes* pueden reducir el nivel de contaminación pero no se puede, con las tecnologías actuales, erradicar la *L. monocytogenes* de las plantas de procesamiento ni eliminar completamente el potencial de contaminación de los productos terminados (*1, 5, 8*). Sin embargo debido a la seriedad de la enfermedad–a veces fatal en casos de individuos susceptibles–es imperativo que la industria tome medidas estrictas para controlar el riesgo que existe de contaminar alimentos listos para el consumo. Debido a que las agencias reguladoras de los Estados Unidos consideran la presencia de *L. monocytogenes* en alimentos listos para el consumo un adulterante, estas agencias solicitarán a las compañías procesadoras que retiren del mercado el producto en el que se detecte *L. monocytogenes*.

El control efectivo de *L. monocytogenes* es un desafío que requiere el manejo intensivo de los recursos de las plantas procesadoras de alimentos; por lo tanto la gerencia debe estar altamente comprometida para invertir en los medios necesarios con el fin de resolver el problema, protegiendo la comercialización de los productos y salvaguardando la seguridad del consumidor (*1, 2*). Los empleados deben ser entrenados para que reconozcan el problema, las fuentes potenciales de contaminación y los controles específicos que la planta este implementando para controlar la incidencia de *L. monocytogenes* (*2*). El entrenamiento de los empleados va mucho más allá del entrenamiento normal en las buenas practicas de manufactura (Good Manufacturing Practices, GMPs). La gerencia debe esforzarse en inculcar un sentido de responsabilidad personal por la seguridad y calidad de los alimentos que se producen.

Debido a que la *L. monocytogenes* se encuentra presente en la materia prima, muchas plantas de procesamiento han adoptado algunos pasos adicionales con el fin de destruir o remover al organismo en la medida de lo posible durante el procesamiento. La planta debe verificar que el tratamiento térmico aplicado a los productos cocinados sea el adecuado para destruir a la *L. monocytogenes*. Este artículo no se enfoca en cómo establecer y validar este tipo de proceso, sino que se enfoca en cómo prevenir la recontaminación ulterior al procesado (rebanado, reempacado, etc.). El mayor riesgo de contaminación con *L. monocytogenes* proviene de la recontaminación después de la cocción. En general existe un riesgo muy bajo de sobrevida al tratamiento térmico por parte de la *L. monocytogenes*.

Las normas de este documento pueden ser aplicadas también a las operaciones en donde no se lleva a cabo un tratamiento térmico para destruir a la *L. monocytogenes*, pero en las cuales existe una necesidad de minimizar la contaminación del producto. Estas operaciones pueden incluir procesos adicionales para remover el organismo a través del pelado o el lavado de los alimento a procesar, etc. El control en estas operaciones debe enfocarse no solo en reducir el número de *L. monocytogenes* en el producto por medio de un método físico sino también en prevenir el establecimiento y el crecimiento de *L. monocytogenes* en el medio ambiente.

La *L. monocytogenes* es un microorganismo que continuamente es introducido al medio ambiente de las plantas de procesamiento. Por esta razón el con-

TABLA 1. Sitios comunes de contaminación con *L. monocytogenes*

Equipa de llenada a de empaquetada
Carreas transportadoras
Salucianes usadas para enfriar el alimenta
Máquinas de rebanar, máquinas para cartar en cubas, desfibradaras, mezcladares, etc., usadas después de la cacción a decantaminación y antes del empaquetada
Ordenadares usadas para armar y ardenar el producta durante el empaquetada
Estantes para transpartar el producta terminada
Herramientas de mana, guantes, delantales, etc., que entran en cantacta can el producta terminada no empacada
Congeladares en espiral, congeladares de carriente de aire
Cantenedares tales cama cubetas a cestas utilizadas para calacar alimenta mientras se espera para ser pracesada a para ser empaquetada más adelante

trol debe estar directamente dirigido a prevenir su establecimiento y crecimiento en el medio ambiente. La recontaminación con *L. monocytogenes* puede provenir de múltiples fuentes y el control a través de un análisis de pelligros y de puntos críticos de control (Hazard Analysis Critical Control Points, HACCP) no es práctico. Los programas pre-requisitos de HACCP *(7)* son el fundamento para el control de *L. monocytogenes*, con GMPs, desinfección y capacitación del personal dirigida específicamente al control de *L. monocytogenes*. A pesar de que no todos los sectores están de acuerdo con esta posición, el éxito radica en tener un programa de control de la recontaminación de la *L. monocytogenes* en vez de tratar de definir los controles específicamente.

Para verificar el control de *L. monocytogenes* las plantas procesadoras deben implementar un programa de monitoreo ambiental para un organismo indicador tal como la "*Listeria* genérica" (*Listeria* spp.; *8*). Este programa, específico para cada planta, debe nombrar en detalle las áreas a ser muestreadas para determinar la presencia de *Listeria* spp., la frecuencia del muestreo y la acción a tomar si *Listeria* spp. son detectadas en alguna de las muestras tomadas. Los detalles del programa de monitoreo ambiental serán cubiertos más adelante en este artículo.

PAUTAS DE CONTROL

Estas pautas están agrupadas en Consideraciones Generales, Operaciones de Procesamiento, Operaciones de Empaquetado y Almacenado, Equipamiento, Desinfección General de la Planta, e Higiene del Personal.

Consideraciones generales

Un programa de control para *L. monocytogenes* debe enfatizar las fuentes más comunes y directas de contaminación del producto. El riesgo más grande de contaminación ocurre cuando las superficies de contacto con el alimento están contaminadas. Este riesgo es aún más alto entre el punto de procesado (cocción, pasteurización, descontaminación, etc.), y el punto de empacado. Para conocer efectivamente el riesgo de contaminación es necesario saber en que lugares, a lo largo de la línea de producción, el alimento esta más expuesto a contaminarse. La contaminación ocurre generalmente en los lugares en donde hay contacto directo con el producto aún sin empacar. Ejemplos de algunos sitios comunes de contaminación pueden verse en la Tabla 1.

Otras áreas del medio ambiente pueden servir como fuente de contaminación indirecta de *L. monocytogenes*. Estas áreas pueden encubrir al microorganismo y bajo ciertas condiciones resultar en la contaminación de las superficies de contacto con el alimento, o en la contaminación del alimento mismo. El controlar la presencia de *L. monocytogenes* en el medio ambiente puede reducir el riesgo de contaminación del producto y de las superficies de contacto con el mismo. La importancia de estas áreas variará dependiendo de las instalaciones, el proceso, el tipo de alimento y la temperatura y humedad del lugar. Algunos ejemplos de lugares en donde podría encontrarse *L. monocytogenes* se citan en la Tabla 2.

TABLA 2. Ejemplos de fuentes de *L. monocytogenes* en la planta

El armazón del equipo y otros equipos en el área
Pisos
Drenajes
Paredes, especialmente en las grietas que retienen la humedad
Techos, estructuras por encima de la altura de la cabeza, pasadizos
Agua condensada
Aislantes en las paredes o alrededor de los tubos y unidades de refrigeración que se han mojado
Las carretillas, levantacargas, equipos con ruedas
Herramientas para la limpieza tales como esponjas, cepillos y limpiadores de piso
Herramientas para el mantenimiento

También se debe considerar la probabilidad que existe de introducir *L. monocytogenes* nuevamente a un medio ambiente ya libre de ésta. Esto podría ocurrir debido al tráfico del personal y de los equipos en las áreas de procesamiento y empaque (levanta cargas o carretillas provenientes de áreas contaminadas), o debido a las tareas de mantenimiento de los equipos fuera de los horarios regulares.

En una planta de procesamiento con un programa efectivo de control, la contaminación con *L. monocytogenes*, cuando ocurre, es específica a una línea o a un equipo. A pesar de que algún caso aislado de contaminación con *L. monocytogenes* es posible en un medio ambiente controlado, la contaminación más común ocurre posteriormente al establecimiento del organismo en un nicho, después de lo cual la limpieza y la desinfección se tornan inefectivas. A medida que los equipos son utilizados, la bacterias residentes en los nichos se depositan sobre las superficies exteriores de los equipos, lo cual resulta en la contaminación del producto y la consiguiente propagación de la contaminación a otras áreas a lo largo de la trayectoria del producto. Esta situación puede ser corregida mediante la identificación y la posterior eliminación de la fuente de contaminación o nicho en donde *L. monocytogenes* sobrevive y crece. Algunos de los sitios que pueden albergar *L. monocytogenes* se describen en la Tabla 3.

Además del establecimiento de un nicho existen otras condiciones que han resultado en la contaminación del producto y que por lo tanto merecen una atención especial. Ejemplos de algunas condiciones que han causado problemas y que deben ser vistas como "alertas rojos" incluyen las siguientes situaciones:

a. Una línea de empaquetado es movida o modificada en gran escala.
b. Un equipo usado es traído del almacén o de otra planta y es instalado en la línea de producción.
c. La falla de un equipo.
d. Una construcción o una modificación importante hecha en el área de procesamiento de un alimento listo para el consumo (reemplazar unidades de refrigeración, pisos, paredes del edificio, o modificación de las líneas de aguas residuales).
e. Un empleado nuevo que desconoce las operaciones de la planta y el control de la *L. monocytogenes* se ha incorporado para trabajar o para limpiar los equipos en el área donde se producen alimentos listos para el consumo.
f. El personal que maneja alimentos listos para el consumo que toca las superficies o los equipos propensos a estar contaminados (pisos, contenedores de basuras) y que no se cambia los guantes o sigue los procedimientos de limpieza establecidos antes de manipular el producto.
g. Períodos de alta producción que dificultan la limpieza de los pisos de los refrigeradores de acuerdo a lo programado.
h. Un drenaje de agua que revierte su flujo.
i. El producto que se queda atascado o colgando del equipo de procesamiento y se convierte en uno de los sitios de mayor importancia de crecimiento microbiano durante la producción. El equipo debe ser modificado para eliminar aquellas secciones en donde el producto se detiene o atasca a lo largo de la línea de producción.
j. Un producto crudo o no procesado completamente que es detectado en el área de los productos ya procesados. En estos casos, el procesamiento debe detenerse, se debe remover

TABLA 3. Sitios potenciales en donde *Listeria monocytogenes* puede encubrirse

Rodillas huecas de las correas transportadaras
Pratectares de las ruedas de equipos radantes
Máquinas de cartar en rebanadas o en cubos
Interruptares para prender y apagar luces y equipas
Sellos de gama alrededor de las puertas
Aislantes húmedas
Bandas transpartadaras con fibras a paros
Raspadores de las carreas transpartadaras, especialmente si están desgastadas y en malas condiciones
Estructuras sujetadaras que sirven de apaya para equipas tales como máquinas de cortar, separadores, etc.
Instrumentas huecos incluyenda las cartadores de cajas
Botes de basura y atros artículas auxiliares
Agua estancada en las áreas de producción
Herramientas de limpiezas incluyendo estropajos y espanjas
Filtras de aire mal mantenidas ubicados en las líneas de praducción a través de las cuales pasa el aire camprimida
Marcas majadas, oxidados o huecas
Cubiertas de matar
Paredes/grietas de las cangeladores en espiral
Maquinas de hacer hielo
Mangueras agrietadas

el producto inaceptable y lavar y desinfectar el equipo nuevamente.

k. La alta frecuencia con que se cambia de producto en una línea de empaquetado que resulta en la necesidad de cambiar empaques, moldes, troqueles, velocidad en la línea, etc.

l. Intercambio del personal que trabaja en el área de productos crudos con el personal del área de productos cocinados.

m. Hay un incremento en la producción que requiere de una limpieza profunda que involucra el lavado con agua de las líneas que no están funcionando en la misma área en donde aún quedan líneas en producción.

n. Los intercambiadores de calor presentan averías (como pequeños agujeros).

o. Las partes de los equipos (cubetas, mayas, etc.) se limpian en el piso.

p. Los contenedores de basura del área donde se encuentran los alimentos listos para el consumo no se limpian o desinfectan apropiadamente. El personal que maneja el producto puede tener contacto con estos contenedores o recipientes y luego contaminar el producto y/o las superficies de contacto con el producto.

q. El flujo del tráfico entre las áreas de los productos crudos y los alimentos listos para el consumo no se controla adecuadamente (las herramientas del personal de mantenimiento, contratistas, etc.).

Operaciones de Procesamiento

Como se mencionó anteriormente, la carne de res, las aves, los vegetales, los productos lácteos, los productos pesqueros y otros ingredientes crudos pueden estar contaminados con *L. monocytogenes*, aunque la presencia del organismo y sus niveles de contaminación varían ampliamente (*4, 5*). Estos ingredientes deben ser manejados como si estuvieran contaminados y se deben tomar algunas precauciones para prevenir la contaminación cruzada que surge cuando los ingredientes crudos contaminan los productos ya tratados para eliminar o reducir la contaminación.

La clave para prevenir la contaminación cruzada es separar los alimentos crudos de los alimentos a medio terminar o terminados.

1. Siempre que sea posible, debe existir un flujo linear desde los ingredientes crudos hasta el producto terminado.
   a. Las plantas de procesamiento y/o las prácticas de producción deben ser reordenadas, en caso de que sea necesario, para mejorar el flujo del producto, de las maquinarias y del personal de manera de asegurar la separación del material crudo con el producto cocinado o procesado.
   b. En algunas operaciones de procesamiento es necesario establecer una corriente positiva de aire en el lado "limpio" de la operación relativo al lado "sucio." Se deben mantener presiones de aire negativas en las áreas donde se trabaja con los ingredientes o el material crudo y mantener presiones de aire positivas en donde se trabaja con producto "limpio" o terminado).
2. Las operaciones deben realizarse de manera compartamentalizada con la finalidad de asegurar que el material crudo este separado del producto procesado.
   a. Las áreas dedicadas solamente al lavado y los sistemas "limpiar en su lugar/limpiar fuera de su lugar" (Clean In Place/Clean Out of Place, CIP/COP) deben ser provistas para los equipos de procesamiento de los productos crudos y los equipos de procesamiento de los productos ya terminados.
   b. Los contenedores de material para reuso y desecho en las áreas de productos cocinados o procesados deben ser debidamente etiquetados o codificados con colores, y no se deben utilizar en ningún otro lugar de la planta de producción. Estos contenedores deben ser limpiados y desinfectados diariamente, o con mayor frecuencia si los datos obtenidos del muestreo ambiental así lo indican.
   c. Cada día, antes de comenzar las operaciones de producción, las mangueras deben ser removidas del área de manufacturación donde los alimentos listos para el consumo están expuestos. De lo contrario, éstas deben ser apropiadamente colgadas y controladas durante la producción.
   d. Se deben separar los utensilios, las carretillas, los estantes, las cajas plásticas, los utensilios de limpieza, etc. (con colores distintos en lo posible), que se destinen para el área de los alimentos listos para el consumo.
   e. Se deben eliminar las líneas eléctricas aéreas por encima de los alimentos listos para consumo, especialmente cuando se encuentren en zonas donde se mantienen productos sin empaques. Estas instalaciones deben estar incluidas dentro de un programa de mantenimiento y limpieza.
   f. Las áreas de producción con agua excesiva deben estar aisladas de las otras áreas de producción. Como mínimo las aguas estancadas deben ser removidas tan pronto como sea posible.
3. Los esquemas de tráfico en una operación entre los sitios donde se encuentra la materia prima cruda y donde se encuentran los productos procesados deben ser controlados para prevenir la transferencia de *L. monocytogenes* desde el lado "sucio" o "crudo" hacia el lado "limpio" o "cocinado." Algunas medidas a considerar para controlar la transferencia de *L. monocytogenes* a las áreas limpias son:
   a. Los equipos, utensilios y personal que se encuentren en las áreas de los ingredientes crudos no deben ser intercambiados con los de las áreas de producto procesado durante la jornada de trabajo.
   b. Los desagües del lado "sucio" no deben estar conectados con los del lado "limpio."

c. Como una alternativa los gerentes de las plantas podrán instalar pediluvios o baños de pies; en este caso, los pediluvios deben mantenerse apropiadamente para prevenir que se conviertan en una fuente de contaminación. Es preferible mantener los pisos limpios y secos antes que usar los pediluvios, a menos que exista una necesidad específica que no pueda ser resuelta de otra manera. Las soluciones utilizadas en los pediluvios deben contener concentraciones de desinfectantes más altas que las concentraciones usadas normalmente en los equipos (200 partes por millón -ppm- de yodoformo o 400 a 800 ppm de los compuestos de amonio cuaternario). Se recomienda una profundidad mínima de 2 pulgadas de la solución. El cloro no es recomendado para este uso ya que éste se inactiva muy rápidamente. Si se utiliza cloro se debe monitorear frecuentemente para mantener su poder esterilizante. Los pediluvios son ineficientes y hasta contraproducentes si las botas de los empleados acarrean partículas de tierra o basura.
d. Otra opción sería la aplicación de una espuma desinfectante, la cual puede ser esparcida en el piso para desinfectar el calzado del personal o las ruedas de los equipos móviles (carretillas, levantacargas, etc.) que entran al área que deseamos proteger.

El agua utilizada en las operaciones de procesamiento en las cuales ésta tenga contacto con el producto debe contener un agente antimicrobiano efectivo contra *L. monocytogenes* y que este aprobado para dicha aplicación y para esos niveles de uso. Tal es el caso del agua utilizada para el enfriamiento de alimentos listos para el consumo y el agua utilizada para el escaldado de los vegetales destinados a ser utilizados en los alimentos listos para el consumo.

Operaciones de Empaquetado y Almacenado

Las plataformas de carga que se introducen a los cuartos de empaque deben estar limpias, secas y en buenas condiciones. Los productos expuestos deben ser almacenados y empacados en un medio ambiente limpio y seco. Esto último se debe a que:

a. Las bacterias no se pueden reproducir sin agua. Por lo tanto si el medio ambiente esta limpio y seco *L. monocytogenes* se mantendrá en estado de latencia y hasta quizás muera.
b. Existe una menor transferencia de bacterias desde las superficies si éstas se mantienen limpias y secas.
c. La propagación de la contaminación mediante el tráfico de vehículos o personas es minimizado si los pisos se mantienen limpios y secos.
d. Las unidades de enfriamiento en las salas de empaquetado y los refrigeradores para productos descubiertos deben tener la capacidad de controlar la humedad a niveles bajos. Para facilitar la remoción del aire húmedo y para secar los pisos después de la limpieza se debe remover el aire fuera de la planta. El calentar el aire que se encuentra dentro de una sala también puede ser efectivo para remover la humedad al final del proceso de limpieza y desinfección.

Equipamiento

El diseño y el mantenimiento apropiados del equipamiento es esencial.

a. Los equipos deben ser diseñados de manera tal de facilitar su limpieza y de minimizar la existencia de sitios donde la multiplicación microbiana pueda ocurrir. La aceptación de un diseño desde el punto de vista microbiológico y sanitario debe ser revisado antes de adquirir el equipo nuevo o antes de reemplazar una parte del equipo vigente.
b. Los equipos que se han utilizado previamente, aunque visualmente luzcan limpios, pueden estar enmascarando la presencia de patógenos. Dichos equipos deben ser limpiados y desinfectados minuciosamente, desarmándolos, de ser necesario, antes de ser colocados nuevamente en las líneas de producción.
c. Los equipos deben ser mantenidos apropiadamente con el fin de minimizar fallas y aumentar el riesgo de contaminación durante las reparaciones.
d. Los equipos dañados, agujerados, corroídos o agrietados deben ser reparados o reemplazados.
e. No se recomienda que los equipos ni las pasarelas posean cavidades hundidas ni profundas, ya que permiten la colección del agua que sirve de albergue para la *L. monocytogenes*.
f. Se deben usar lubricantes que contienen compuestos que son listericidas como el benzoato de sodio. Los lubricantes pueden contaminarse con residuos de producto y convertirse en un centro de crecimiento para *L. monocytogenes*.

g. Se debe evitar el uso de aquellas correas transportadoras que por su diseño y ubicación son difíciles de limpiar y desinfectar. Las correas que transportan productos antes de ser empacados no deben contener rodillos huecos. Las correas transportadoras o los equipos de procesamiento que mantengan al producto al descubierto no deben colocarse cerca del piso, ya que éste es una fuente de contaminación de *L. monocytogenes*. Las correas transportadoras por encima de la altura de la cabeza deben evitarse porque éstas son más difíciles de limpiar, desinfectar e inspeccionar. Se debe contar con una escalera segura para realizar la inspección de estas áreas o las correas transportadoras deben ser diseñadas de tal manera que puedan bajarse a una altura apropiada para su limpieza.

h. Los estantes utilizados para transportar productos al descubierto deben poseer ruedas resguardadas de manera que se prevenga el rociamiento de los estantes o el producto debido al movimiento de las ruedas.

i. Los estantes donde se coloca el producto antes de ser térmicamente tratado pueden ser una fuente significativa de contaminación si no se limpian y desinfectan apropiadamente antes del uso. El método más apropiado para esterilizar los estantes es el calor. El calor puede ser aplicado mediante (1) el enjuagando con agua caliente (180°F, 82.2°C) en un lavador de bandejas, en el cual las bandejas alcanzarán una temperatura de 160°F (71.1°C) o más; (2) la aplicación de vapor dentro de un gabinete después del lavado en un lavador de bandejas; o (3) colocando las bandejas en un horno y aplicando calor húmedo para que la temperatura de las bandejas llegue a 160°F (71.1°C) o más. Cuando se use calor es esencial que el equipo este profundamente limpio para que las altas temperaturas no endurezca los residuos presentes y los conviertan en futuros problemas de contaminación.

j. Se deben adoptar y seguir horarios de mantenimiento regulares para minimizar el potencial de albergue de bacteria y para reducir el potencial de contaminación del equipo debido a reparaciones inesperadas.

k. En cuanto al mantenimiento de los equipos en el área de los productos ya procesados o listos para el consumo, quizás sea necesario utilizar herramientas exclusivas para estas áreas o esterilizar las herramientas antes de ser utilizadas. El personal de mantenimiento debe utilizar ropa limpia que no se use en las área donde se encuentran el material crudo o la materia prima. Después de finalizar los trabajos de mantenimiento, los equipos deben ser nuevamente desinfectados en las superficies que contactan con el alimento y sus alrededores.

Limpieza general de la planta

a. Se deben usar los procedimientos de limpieza diseñados para el control de *L. monocytogenes*. La frecuencia de limpieza y desinfección de los equipos y del medio ambiente de una planta dependerá de la experiencia y los datos microbiológicos obtenidos. Las inspecciones visuales son muy importantes cuando se trata de verificar la limpieza de los equipos. Los exámenes microbiológicos de rutina (contaje total de aerobios) permiten recavar información básica para ser usada con fines comparativos, para observar las tendencias y para detectar un problema de desinfección en gestación. Los sistemas de monitoreo de ATP son también herramientas útiles para controlar la desinfección general de la planta. Sin embargo, estos procedimientos (inspección visual, contaje total de aerobios y monitoreo de ATP) no aseguran que *L. monocytogenes* no este presente, como lo hace la detección microbiológica de *Listeria* spp. en el medio ambiente de la planta (esto se señalará más adelante en este artículo).

b. El control adecuado de *L. monocytogenes* requiere de uniformidad y de la atención a los detalles siguiendo estos pasos: (1) limpieza seca, (2) pre-enjuagado del equipo, (3) inspección visual del equipo, (4) aplicación de espuma y frotado del equipo, (5) enjuague del equipo, (6) inspección visual del equipo, (7) limpieza del piso, (8) desinfección del equipo y del piso, (9) verificación post-desinfección, (10) secado del piso, (11) limpieza y almacenado de los utensilios de limpieza. Algunos equipos requieren el desarmado antes de la limpieza y desinfección y a veces una nueva de-

TABLA 4. Areas que deben limpiarse con compuestos de amonio cuatenario o con perácidos

Área	Frecuencia
Drenajes	Diariamente
Pisos	Diariamente
Contenedores de basura y de almacenaje	Diariamente
Paredes	Semanalmente/Mensualmente
Bandejas para el goteo del condensado	Semanalmente/Mensualmente
Sistema de ventilación y calentamiento y del aire acondicionado	Semanalmente/Mensualmente
Refrigeradores-enfriadores	Semanalmente/Mensualmente
Congeladores de espiral	Semi-anual

sinfección después del ensamblado.

c. Se conoce que los compuestos de amonio cuaternario son efectivos contra *L. monocytogenes* y que dejan un efecto residual germicida en las superficies. Asimismo, las soluciones esterilizantes que contienen ácido peracético y ácido peroctanóico han demostrado ser efectivas contra las películas biológicas (biofilms) que contienen *L. monocytogenes*. Las áreas a ser desinfectadas con estos compuestos y la frecuencia de desinfección están descritas en la Tabla 4.

d. El personal de limpieza debe recibir un entrenamiento especial en relación a los procedimientos de control de *L. monocytogenes*, a como llevar a cabo un monitoreo minucioso y a las correcciones para mejorar y mantener un nivel alto del funcionamiento.

e. Se debe dar prioridad a las salas y a los equipos utilizados para mantener y empaquetar alimentos listos para el consumo mientras el producto se encuentra expuesto al medio ambiente. Aquellas áreas en donde los productos son almacenados o procesados son de menor prioridad, ya que la limpieza inadecuada de los equipos en las áreas donde se procesa la materia prima no ha sido asociada con problemas de *L. monocytogenes* en el producto terminado. Se debe asignar al personal mejor capacitado y con más experiencia a las áreas donde se manejan y empacan los alimentos listos para el consumo.

f. Es muy conveniente, y hasta necesario en algunos casos, tener a una persona dentro del personal cuya principal responsabilidad sea la de monitorear los procesos de limpieza y desinfección para asegurar que éstos se lleven a cabo correctamente. Esta persona debe reconocer la importancia de tener la planta de procesamiento lista para el momento de comenzar la producción, pero este aspecto debe ser secundario cuando se compare con la necesidad de que la planta haya sido limpiada y desinfectada correctamente. De acuerdo a la experiencia, si los equipos se limpiaron y desinfectaron apropiadamente antes de comenzar la producción el riesgo de contaminación del alimento debido a los equipos durante la producción es mínima a lo largo de dos jornadas de trabajo.

g. Se debe evitar el realizar limpiezas en la mitad de la jornada de trabajo. Estas limpiezas incorporan aerosoles y agua al medio ambiente y pueden ser contraproducentes, incrementando el riesgo de contaminación con *L. monocytogenes* y haciéndola más difícil de controlar.

h. Algunas plantas han descubierto que el siguiente procedimiento de desinfección es de gran ayuda: Limpiar los equipos; aplicar el desinfectante a altas concentraciones (800 ppm para compuestos de amonio cuaternario); permitir que el desinfectante repose sobre los equipos por 20 minutos aproximadamente; enjuagar bien y finalmente aplicar el desinfectante a su nivel normal (200 ppm para compuestos de amonio cuaternario o cloro). Al final de la semana de producción el

desinfectante puede ser aplicado sobre los equipos y dejado allí hasta un poco antes de comenzar el próximo ciclo de producción. Antes de comenzar la producción el desinfectante es removido con agua limpia, aplicado nuevamente a una concentración normal y el área es preparada. Bajo ciertas circunstancias es beneficioso aplicar un aerosol de 200 ppm de compuestos de amonio cuaternario en el área de procesamiento al final de la limpieza y la desinfección. La aplicación de una neblina o aerosol semanalmente o mensualmente puede ser también de gran utilidad.

i. La rotación de otros desinfectantes (cloro, ácido aniónico, perácidos y yodoformos) dentro del programa de desinfección puede resultar en una mayor efectividad. También se puede considerar el uso de desinfectantes nuevos en base a perácidos y otros que hayan demostrado ser efectivos contra *L. monocytogenes.*

j. Los equipos deben ser modificados de manera que tengan un diseño fácil, sean de fácil limpieza y tengan menos problemas de mantenimiento: toda interrupción de la producción aumenta el riesgo de contaminación por parte de *L. monocytogenes.*

k. El desinfectar a altas temperaturas, en caso de que las instrucciones del fabricante lo permita, puede ser particularmente útil para combatir las películas biológicas.

l. La desinfección con agua caliente y/o vapor es una alternativa bastante efectiva a la desinfección química cuando los equipos son difíciles de limpiar. Cuando sea posible, el vapor debe ser aplicado como paso final en los equipos que son difíciles de limpiar. Existe un método que consiste en colocar una cubierta metálica sobre el equipo y luego inyectar el vapor. Se puede también aplicar vapor al equipo dentro de un horno. El objetivo es calentar el equipo de manera que éste alcance al menos una temperatura de 160°F (71.1°C) en todos sus componentes. Se debe mantener esta temperatura por un periodo de una hora o más. Para aquellos equipos que son sensibles al calor es necesario utilizar temperaturas mas bajas (145°F; 62.8°C) por un período más largo (refiérase a los cuidados de la limpieza antes de la aplicación de calor descrita anteriormente).

m. Las cubetas plásticas que son acumulables han sido un problema crónico cuando no se han limpiado y desinfectado diariamente. Estas cubetas no deben ser colocadas directamente sobre el piso, a menos que se coloquen sobre una esterilla plástica limpia.

n. La limpieza poco frecuente de los refrigeradores utilizados en las áreas de los alimentos ya procesados causa comúnmente un incremento en los problemas con *L. monocytogenes*, particularmente durante las temporadas de alta producción en verano. Estos refrigeradores deben ser vaciados y limpiadas al menos una vez por semana (o por mes) dependiendo del nivel de uso y de las condiciones de los refrigeradores. Los pisos deben mantenerse secos.

o. Los congeladores en forma de espiral utilizados para congelar producto que no ha sido empacado deben limpiarse dos veces al año. Los problemas con *L. monocytogenes* pueden generarse si el descongelamiento, la limpieza y la manutención se realizan infrecuentemente.

p. El agua condensada que se acumula en los colectores de los refrigeradores debe ser dirigida a un desagüe por medio de mangueras, cuidando que éstas no se obstruyan. Los desinfectantes en forma sólida (bloques o pastillas de compuestos de amonio cuaternario) pueden ser colocados en estos colectores para controlar el crecimiento microbiano. Además del uso rutinario de los desinfectantes los colectores de los refrigeradores deben limpiarse regularmente.

q. Al utilizar aire comprimido para remover los desechos de los equipos se puede aumentar el riesgo de contaminación. El aire comprimido puede ser una fuente de *L. monocytogenes* cuando los filtros de aire no se mantienen ni se cambian con regularidad. Cuando el aire comprimido se utiliza directamente sobre el producto o sobre las superficies de contacto con el producto, el aire debe filtrarse en el punto en que se utiliza y los filtros deben ser mantenidos adecuadamente. Esta práctica debe restringirse en lo posible a la limpieza de ciertos equipos (máquinas de empaquetado) al final de la producción, an-

tes de que comience la limpieza general.

r. Nunca se deben limpiar los refrigeradores u otras salas cuando los productos listos para el consumo estén expuestos al ambiente. El cubrir el producto con un plástico o papel no es una práctica confiable. Se debe quitar todo el producto expuesto y desempaquetado de la sala antes de comenzar la limpieza.

s. No se debe desmontar y lavar el equipo en el piso.

t. El mejor método para limpiar los pisos es utilizar un producto de limpieza cáustico pulverizado, aplicar el agua según sea necesario, utilizar un cepillo exclusivo y marcado con un color a modo de código para limpiar el piso, enjuagar el piso abundantemente usando una manguera del bajo volumen, y finalmente desinfectar el piso. Los limpiadores y desinfectantes más nuevos pueden ser más efectivos para controlar la presencia de *L. monocytogenes* en el piso. Los estropajos o limpiadores de piso pueden ayudar mucho, en particular para limpiar los espacios abiertos y grandes tales como los vestíbulos y los pasillos. El equipo usado para la limpieza debe mantenerse y limpiarse correctamente para que no se convierta en una fuente de contaminación. La aplicación de ácido cítrico pulverizado en ciertas áreas del piso puede ser eficaz para controlar *L. monocytogenes*, siempre y cuando el piso se haya limpiado y se haya secado antes de aplicar el ácido. Para una máxima eficacia la superficie del piso se debe mantener a un pH de 5,0 o menos utilizando papel de tornasol para medir y controlar los niveles de pH. A pesar de que esto puede ayudar a controlar la presencia de *L. monocytogenes*, la condición del piso debe ser controlada ya que el ácido puede causar el deterioro del mismo con un reemplazo prematuro.

u. Los drenajes del piso deben ser diseñados y mantenidos de manera de prevenir la reversión de flujos. Si ocurre una reversión en el flujo del drenaje la producción debe detenerse, el producto que haya estado expuesto debe ser removido de la habitación para luego decidir su disposición, el drenaje debe descongestionarse, y el área debe ser limpiada cuidadosamente con un cáustico, enjuagada y desinfectada. Se debe evitar salpicar el equipo durante el proceso. Se debe secar el piso. Nunca debe utilizarse una manguera de alta presión para destapar un drenaje ya que el aerosol creado esparcirá la contaminación al resto del cuarto.

v. En lo posible se deben eliminar los drenajes de tipo zanja.

w. Se recomiendan los anillos bactericidas para los drenajes.

x. Los drenajes del piso se deben limpiar y desinfectar de manera que se evite la contaminación de otras superficies en la sala. Los cepillos empleados para limpiar los drenajes del piso deben ser por lo menos 1/4 de pulgada más pequeño que el diámetro de apertura del drenaje, o un protector debe ser utilizado para evitar salpicaduras durante la limpieza. Los utensilios para la limpieza de los drenajes deben ser exclusivos para ese propósito para reducir al mínimo el potencial de contaminación. A veces es necesario limpiar y desinfectar los drenajes dos veces: al principio y al final del proceso de limpieza.

y. Las herramientas de limpieza deben ser desinfectadas con soluciones de 600 a 1000 ppm de compuestos de amonio cuaternario y deben ser guardadas secas o en soluciones de amonio cuaternario mantenidas a niveles de 1000 ppm.

Higiene del personal

Deben establecerse prácticas de higiene del personal teniendo como objetivo principal el control de *L. monocytogenes*. La información siguiente debe convertirse en parte del entrenamiento de los empleados para el control de *L. monocytogenes*.

a. Guantes, batas, y delantales limpios son esenciales para proteger al producto contra la contaminación. Idealmente debería utilizarse batas de un color para la zona en donde se trata la materia prima y otras de otro color para la zona en donde se trabaja con el producto procesado. Los guantes y delantales desechables deben ser utilizados en áreas donde se trabaja con productos cocinados. Las mangas de papel desechables o cubrebrazos pueden proporcionar otra barrera para el personal que manipulea el producto no empacado. Los artículos desechables deben descartarse al abandonar el área de trabajo y deben substituirse por nuevos al volver a trabajar. Se puede dejar cierta vestimenta

(delantales) en el departamento para su posterior reutilización, siempre y cuando estén todavía limpios. El hecho de utilizar guantes no excluye a los empleados de la necesidad de lavarse las manos regularmente.

b. El personal que trabaja en las áreas donde los alimentos listos para el consumo están expuestos deben entender claramente que el propósito de utilizar ropa limpia y guantes desechables es proteger al producto contra la contaminación, no el de proteger al empleado de la suciedad.
c. Cada vez que un empleado toca una superficie sucia deberá lavarse las manos y cambiarse los guantes.
d. El equipo y la ropa manchada no se deben guardar en armarios.
e. Se debe asignar una persona en el cuarto de empaque para recoger el material del piso, quitar la basura, y realizar otras tareas de limpieza. Esta persona no debe trabajar en la línea de empaque ni manipular producto que sea empaquetado o reemplazado en la línea.
f. Las botas de goma no porosas y que se limpian fácilmente son las mejores para el control de *L. monocytogenes* y es el calzado apropiado cuando se utilizan pediluvios.

PROGRAMA DE MONITOREO AMBIENTAL PARA VERIFICAR EL CONTROL DE *LISTERIA*

Un programa de monitoreo ambiental es de gran utilidad para evaluar la necesidad de otras medidas de control en productos que pueden recontaminarse con *L. monocytogenes (8)*. La experiencia de la industria ha demostrado que un programa continuo de monitoreo y de control que utilice *Listeria* spp. como indicador de la contaminación potencial de *L. monocytogenes* reduce no solamente la posibilidad de encontrar *L. monocytogenes* en el producto acabado sino también la posibilidad de encontrar otros patógenos *(2)*. También se ha demostrado que el reingreso de especies de *Listeria* en el ambiente de la producción no puede ser prevenido de una manera confiable. Consecuentemente, el monitoreo continuo para detectar a este organismo en el ambiente es necesario. Cada compañía debe establecer su propio programa de monitoreo de *L. monocytogenes* considerando las pautas que se exponen más adelante. Las acciones que se han de tomar cuando se obtengan resultados positivos en el monitoreo ambiental o en las superficies de contacto con el alimento varían con la política de cada compañía y con los planes de acción, los cuales pueden cambiar con el tiempo en base al conocimiento de las operaciones de producción y de sus controles, el riesgo de contaminar el producto, los requerimientos en las regulaciones y otros factores. Debe destacarse que existen muchas estrategias para controlar a *L. monocytogenes* y que lo que funciona para una compañía puede no ser apropiado para otra.

Principios generales para el monitoreo ambiental

El monitoreo ambiental (pruebas microbiológicas) debe centrarse en un indicador no patógeno, tal como *Listeria* spp. u organismos parecidos a la *Listeria* (por ejemplo los organismos que oscurecen el caldo de Fraser o que producen colonias negras en un agar selectivo y diferencial para *Listeria*), debido a que estos indicadores serán encontrados con más frecuencia que *L. monocytogenes* en el ambiente y porque los resultados de las pruebas estarán disponibles en un tiempo más corto. Los resultados del monitoreo deben alertar al personal de la planta acerca de las áreas con problemas potenciales que requieran de una investigación futura y del enfoque de recursos adicionales. Se debe establecer, entre las metas corporativas, el reducir la incidencia de resultados positivos para incentivar la continua mejoría *(8)*. Debe desarrollarse un conjunto detallado de planes de acción para controlar el riesgo de *L. monocytogenes* en caso de que las metas corporativas no se alcancen.

Cada planta, producto y proceso debe ser evaluado para determinar los puntos apropiados para el monitoreo. Cada línea de empaquetado se debe considerar como una unidad independiente para el control y el monitoreo de *L. monocytogenes*. Se recomienda que tanto las superficies de contacto como las de no-contacto con el alimento que posean el potencial de contaminar al producto sean analizadas. Una estrategia podría ser el separar los análisis en áreas ambientales, sitios de contacto con el producto y el producto en sí mismo (siempre recordando que el análisis del producto no será un indicador confiable de que no ha ocurrido contaminación con *L. monocytogenes* – la *L. monocytogenes* no se encuentra con frecuencia en el producto durante las operaciones de procesamiento que cumplen con estas recomendaciones de control, y las bacterias no se distribuyen uniformemente en los alimentos). Así, el énfasis del programa discutido aquí radica en examinar la incidencia de los organismos parecidos a *Listeria* en el ambiente como verificación de control. Hay muchas variaciones en cómo esto es llevado a cabo. Algunas guías que se presentan a continuación se ilustran en las Figuras 1 y 2.

Figura 1. Anólisis de los superficies de no-contocto con el producto poro indicodores de lo contominoción con *Listerio*

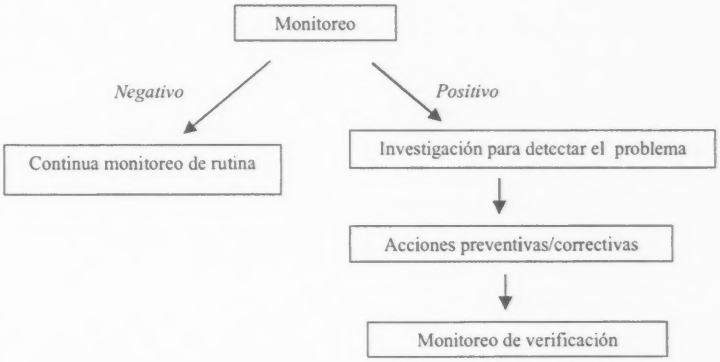
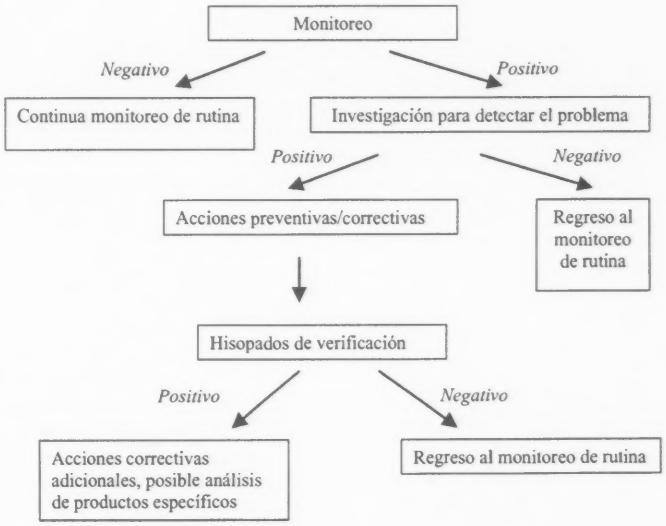


Figura 2. Anólisis de los superficies de contocto con el producto poro indicodores de lo contominoción con *Listerio*



Análisis ambiental

Cada planta debe determinar los puntos de muestreo y la frecuencia con que el muestreo debe realizarse basado en el conocimiento de sus operaciones específicas, el control que se ha estipulado, y en cualquier dato microbiológico disponible. Las áreas sugeridas de muestreo incluyen las estructuras de soporte, las áreas o las estructuras localizadas por encima de la cabeza, las paredes, los pisos, los drenajes y el aire del área. Inicialmente se recomienda un muestreo semanal para aquellas áreas de alto nivel de humedad donde *L. monocytogenes* puede crecer. El muestreo de áreas secas y limpias puede ser menos frecuente.

El número de los puntos de muestreo y la frecuencia de muestreo se deben ajustar en base a los resultados obtenidos con el tiempo. Por ejemplo, resultados negativos repetidos pueden sugerir la eliminación de un sitio de muestreo o la reducción del muestreo para un área determinada. Mediante el uso del control estadístico del proceso (SPC, Statistical Process Control) se puede hacer un seguimiento de los resultados e identificar si existe la necesidad de tomar alguna acción.

Cada planta debe determinar la acción a tomar en caso de que *Listeria* spp. sean detectadas con una frecuencia que exceda el límite de control más alto, o el límite que la planta haya fijado (se debe también prestar atención a la limpieza y a la desinfección de las áreas con resultados positivos). Las razones por las que se obtienen resultados positivos son específicas para esa planta en cuestión, por lo tanto las acciones correctivas a tomar variarán. Los siguientes puntos deben ser considerados en la determinación de las acciones correctivas para las pruebas ambientales que resulten positivas:

- La detección de *Listeria* genérica en una muestra de control del ambiente no indica necesariamente un problema de control microbiológico, indica que una investigación adicional debe ser emprendida. Así, una muestra de monitoreo ambiental que resulte positiva no sigifica que la línea de producción en la planta debe detenerse para tomar acciones correctivas inmediatas.
- Cuando los resultados del monitoreo ambiental indiquen una tendencia hacia el incremento en la incidencia de *Listeria* spp., las plantas deben investigar las razones de este aumento y deben tomar acciones para reducir los resultados a niveles aceptables. Un aumento en las muestras ambientales positivas pue-

de desencadenar un cambio hacia una modalidad de alerta para resolver el problema mediante planes de acción específicos de cada compañía.

- Si una muestra mixta resulta positiva se deberá analizar cada muestra individualmente para establecer claramente la localización específica del problema.
- Muestras adicionales deben tomarse del área ambiental donde fue detectada la muestra positiva. Estas muestras pueden indicar que acciones correctivas adicionales son necesarias para ésta área en particular. Una vez más, esto puede desencadenar que la planta entre en una modalidad de alerta para resolver el problema y aplicar un plan de acción específico de la compañía.
- Si después de que se hayan aplicado las acciones correctivas las muestras subsiguientes resultan positivas, el área debe ser limpiada intensivamente y se debe re-examinar.
- Se debe considerar la opción de tomar muestras adicionales de las superficies que tengan contacto con el alimento en las áreas donde se detecten muestras positivas.
- Si después de que se hayan ejecutado las acciones correctivas las muestras subsiguientes resultan negativas la planta podría regresar a su monitoreo de rutina.

Análisis de las superficies de contacto con el alimento

Las superficies de contacto con el alimento se pueden muestrear rutinariamente para detectar organismos parecidos a *Listeria* como procedimiento de verificación de que las medidas de control del medio ambiente están siendo eficaces para prevenir la contaminación de las superficies con *L. monocytogenes*. Alternativamente las superficies pueden ser muestreadas solamente cuando el monitoreo ambiental sugiere la posible presencia de un problema.

De la misma manera que para el monitoreo ambiental, las plantas deben determinar los puntos a muestrear, el momento del día para el muestreo, y la frecuencia del muestreo basada en el conocimiento de sus operaciones específicas y en los controles que se han estipulado -así como en cualquier dato microbiológico disponible.

Las plantas deben investigar para determinar las razones por las cuales se obtienen resultados positivos de *L. monocytogenes* en las superficies de contacto con el alimento. El muestreo investigativo (o modalidad de alerta para algunas plantas) debe ser capaz de identificar el equipo donde *L. monocytogenes* se han establecido. Hasta que estos sitios se localicen no será posible corregir el problema en curso.

Las acciones correctivas se deben tomar para todas las superficies de contacto con alimento que resulten positivas basadas en un plan de acción predeterminado. Las acciones correctivas deben ser documentadas. La contaminación de algunas superficies de contacto con el producto son de mayor preocupación que otras. Ejemplos de acciones correctivas son la modificación de los procedimientos de limpieza y desinfección, el reajuste del equipo, la mejora en las GMPs, el re-entrenamiento de los empleados, etc.

Las plantas deben decidir si se debe dar lugar al análisis del producto cuando se encuentren organismos parecidos a *Listeria* en las superficies de contacto con el alimento.

Análisis del alimento

Las plantas decidirán analizar o no el producto dependiendo de los resultados positivos en las superficies de contacto con el alimento. También se puede hacer un análisis del producto al azar como parte de un programa de verificación para evaluar si el programa de control y/o monitoreo es eficaz en la prevención de la contaminación del producto. Los programas eficaces para prevenir la contaminación no requieren necesariamente del análisis del producto. El análisis del producto terminado tiene limitada utilidad (por las razones ya indicadas) aún como herramienta de verificación. Siempre que se tome una muestra del producto los lotes deben ser retenidos hasta que se obtengan los resultados de laboratorio.

Las plantas deben determinar la acción que se tomará en caso de que *L. monocytogenes* se detecte en una muestra de producto.

Recomendaciones para el Muestreo Ambiental

Al tomar muestras con hisopos o con una esponja se debe utilizar un método científico aceptable. Las muestras pueden ser mixtas en casos científicamente apropiados. En lo posible se debe conservar la porción restante de cada muestra individual hasta que se obtengan los resultados de la muestra mixta, en caso de que el análisis de alguna muestra individual sea necesaria.

Las muestras de la línea de empaquetado (superficies de contacto con el producto) deben tomarse de áreas tan extensas como sea posible. Las muestras ambientales deben representar un área constante (por ejemplo 1,5 pies por 1,5 pies, 2 pies por 3 pies, etc.)

Los drenajes del piso representan áreas problemáticas constantes. El incluir o no a los dre-

najes en el programa de monitoreo ambiental es una decisión corporativa. En algunos casos se deberá implementar un objetivo aparte para los drenajes.

Todo análisis para *Listeria*, ya sea ambiental o en el producto terminado, debe ser realizado por un laboratorio certificado en el uso de GMPs (*3*). Se recomienda, en lo posible, que este laboratorio participe en un programa de certificación o de control de muestras de *Listeria*. Se debe tener en cuenta la incidencia de errores que ocurren con las pruebas de laboratorio. Por ende los programas de control deben utilizarse para ayudar a detectar errores del laboratorio y para asegurar que el laboratorio pueda identificar correctamente al organismo.

Como solucionar los problemas

Cuando se tiene un programa eficaz para el control de *L. monocytogenes*, la fuente primaria de contaminación es a menudo un lugar donde *L. monocytogenes* ha establecido un nicho y está multiplicándose. Cuando *L. monocytogenes* encuentra un nicho, la contaminación será específica de esa línea. En general la contaminación fluirá hacia adelante a lo largo de la línea de empaquetado. Para identificar los nichos se deben tomar muestras individuales—no mixtas—con la técnica de la esponja. Sitios adicionales también deben ser muestreados a lo largo de la línea, con un aumento en la frecuencia de muestreo durante el día. Aquellas partes del equipo que se consideren sospechosas deben ser desarmadas con la finalidad de tomar muestras de los lugares donde se puede haber establecido un nicho. El equipo debe ser limpiado y desinfectado durante el montaje. Si la limpieza y la desinfección no funcionan, se deben quitar los censores electrónicos, aceites y grasa y aplicar calor (160°F, 71.1°C). Las piezas pequeñas se pueden colocar en un horno. Los equipos más grande pueden ser cubierto para la aplicación de vapor por debajo del cobertor. La aplicación de temperaturas un poco más bajas por períodos más largos puede ser también eficaz. También se debe considerar la posibilidad de que los empleados estén implicado en la contaminación, en cuyo caso es ventajoso realizar un entrenamiento para refrescar los conocimientos acerca de los controles necesarios para prevenir la contaminación de *L. monocytogenes*.

AGRADECIMIENTOS

Los contribuyentes en la elaboración de este documento son Ruth Petran (Pillsbury); Dave Aggen (Alimentos Lakeside); Bill Sperber (Cargill); Fred Cook (Alimentos Congelados de ConAgra); Don Zink y Bruce Kohnz (Nestlé); Angie Siemens, Joe Meyer y Paul A. Hall (Alimentos Kraft); y Michael Jantschke y David Gombas (NFPA). Se agradece a Nina Parkinson por la lectura crítica del manuscrito y a Omar A. Oyarzábal por la corrección del mismo.

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Respond by July 10, 2001

1. Do you feel only articles written in English should be published in *DFES*?

   Yes No

2. Should we occasionally publish an article in both English and a non-English language?

   Yes No

3. Do you believe publishing articles in a non-English language benefits all International Association for Food Protection Members?

   Yes No

4. Do you see benefit in publishing an article in English in *DFES* and simultaneously providing the article in a non-English language on the Association Web site?

   Yes No

5. Would you prefer this approach to publishing an article in both English and a non-English language?

   Yes No

6. Can you suggest alternative approaches that might be better?

   Explain:

Comments:

Optional Information:

Name _____

Affiliation _____

Phone or E-mail _____

Fax your response to the IAFP office at 515.276.8655 by July 10, 2001. You may also respond to the above survey questions at the IAFP Web site (www.foodprotection.org) or contact an Executive Board Member or David Tharp at the IAFP office with your input. Contact information can be found in the front of the journal.

Responda antes del 10 de Julio de 2001

1. ¿Usted cree que solo artículos en inglés deberían publicarse en *DFES*?

   Si No

2. ¿Usted cree que ocasionalmente deberíamos publicar un artículo tanto en inglés como en otro lenguaje que no sea el inglés?

   Si No

3. ¿Usted considera que la publicación de artículos en otro lenguaje que no sea el inglés beneficia a los miembros de la Asociación Internacional de Protección de los Alimentos?

   Si No

4. ¿Usted ve algún beneficio en publicar un artículo en inglés en *DFES* y a la vez presentar el artículo en otro lenguaje que no sea el inglés en el sitio Web de la Asociación?

   Si No

5. ¿Preferiría la opción del Web en vez de publicar el artículo tanto en inglés como en otro idioma?

   Si No

6. ¿Puede usted sugerir otras alternativas que puedan ser mejores?

   Explique:

Comentarios:

Información Opcional:

Nombre _____

Compañía _____

Teléfono o Correo Electrónico _____

Envíe su respuesta por fax a la oficina de la IAFP, 515.276.8655, antes del 10 de Julio de 2001. Usted puede también responder a la encuesta en el sitio Web de la IAFP, (www.foodprotection.org), o puede contactar a un miembro de la Junta Ejecutiva o a David Tharp en la oficina de la IAFP. La dirección y número de teléfono se encuentra en la tapa de nuestra revista.

Kathleen A. Glass

Elected IAFP Secretary

The International Association for Food Protection welcomes Kathleen A. Glass to the Executive Board as Secretary. Ms. Glass will take office at the conclusion of the Awards Banquet at IAFP 2001, the Association's 88th Annual Meeting in Minneapolis, Minnesota. By accepting this position, she made a five-year commitment to the Association and will serve as President in 2005.

Ms. Glass is a Food Safety Microbiologist at the Food Research Institute at the University of Wisconsin-Madison. She designs and coordinates microbial challenge studies and assists the food industry in developing formulation-safe foods. Her research interests include the safety of low acid refrigerated foods, processed meat and process cheese products, focusing on the control of *Clostridium botulinum*, *Listeria monocytogenes*, and *Escherichia coli* O157:H7.

Ms. Glass has been an active Member of IAFP and its Wisconsin Affiliate (WAMFS) since 1990. Within IAFP, she has served as a member of the Program Committee, Meat and Poultry Safety and Quality Professional Development Group, Nominating Committee, Black Pearl Selection Committee, and as Chairperson of the Developing Scientist Awards Committee. She has organized and chaired numerous Annual Meeting symposia as well as presented technical papers. On the local level, she was elected to the WAMFS Executive Board in 1999 and will serve as President during the 2001-2002 term. Ms. Glass is the 2001 Conference Chairperson for an annual conference held jointly between WAMFS and Wisconsin Environmental Health Association and Wisconsin Association of Dairy Plant Field Representatives.

In addition to IAFP and WAMFS, Ms. Glass is a member of the Institute of Food Technologists, American Society of Microbiology, and Sigma Xi. She has published 17 scientific papers, has been an invited speaker at numerous workshops on food microbiology, dairy HACCP, process meat safety, and *Listeria* control methods, and is a guest lecturer for undergraduate and graduate UW-Madison courses in food bacteriology and food fermentation.

Ms. Glass received her undergraduate degree in Biology from the University of Wisconsin-Eau Claire. She taught high school biology for four years before earning her Master's of Science degree from Northern Illinois University in 1985. She joined the Food Research Institute in 1985, and is also currently completing a Doctorate in Food Microbiology and Safety at the University of Wisconsin-Madison.

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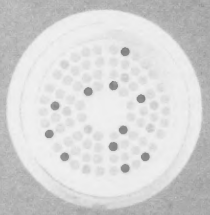

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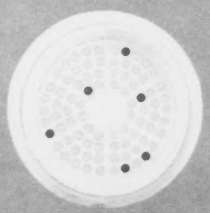

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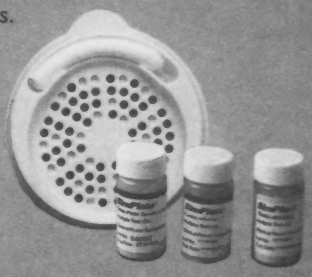

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Reader Service No. 115 **IAFP Exhibitor** **IAFP Sustaining Member**

CALL FOR SYMPOSIA

IAFP 2002

JUNE 30–JULY 3, 2002

SAN DIEGO, CALIFORNIA

The Program Committee invites International Association for Food Protection Members and other interested individuals to submit a symposium proposal for presentation during the 2002 Annual Meeting, June 30–July 3, 2002 in San Diego, California.

WHAT IS A SYMPOSIUM?

A symposium is an organized, half-day session emphasizing a central theme relating to food safety and usually consists of six 30-minute presentations by each presenter. It may be a discussion emphasizing a scientific aspect of a common food safety and quality topic, issues of general interest relating to food safety and quality, a report of recent developments, an update of state-of-the-art materials, or a discussion of results of basic research in a given area. The material covered should include current work and the newest findings. Symposia will be evaluated by the Program Committee for relevance to current science and to Association Members.

SUBMISSION GUIDELINES

To submit a symposium, complete the Symposium Proposal form. The title of symposium; names, telephone numbers, fax numbers, and complete mailing addresses of the person(s) organizing the symposium and convenors of the session; topics for presentation, suggested presenters, affiliations; description of audience to which this topic would be of greatest interest; and signature of organizer. When submitting a proposal, the presenters do not need to be confirmed, only identified. Confirmation of presenters takes place after acceptance of your symposium.

SYMPOSIUM FORMAT

Symposium sessions are 3 and 1/2 hours in length including a 30-minute break. A typical format is six 30-minute presentations. However, variations are permitted as long as the changes fit within the allotted time frame. If varying from the standard format, be sure to indicate this on the Symposium Proposal form.

SYMPOSIUM PROPOSAL DEADLINE

Proposals may be submitted by mail to International Association for Food Protection office for receipt no later than July 16, 2001 or by presenting the proposal to the Program Committee at its meeting on Sunday, August 5, 2001 in Minneapolis, Minnesota. Proposals may be prepared by individuals, committees, or professional development groups.

The Program Committee will review submitted symposia and organizers will be notified in October 2001 as to the disposition of their proposal.

PRESENTERS WHO ARE NOT MEMBERS

International Association for Food Protection does not reimburse invited presenters for travel, hotel, or other expenses incurred during the Annual Meeting. However, invited presenters who are not Association members will receive a complimentary registration. Presenters who are Association Members are expected to pay normal registration fees.

ASSOCIATION FOUNDATION SPONSORSHIP

The International Association for Food Protection Foundation has limited funds for travel sponsorship of presenters. Symposia organizers may make requests in writing to the Program Committee Chairperson. Requests are reviewed on an individual and first-come-first-served basis. The maximum funding grant will be $500 per symposium. Organizers are welcome to seek funding from other sources and the Association will provide recognition for these groups in our program materials. Organizers are asked to inform the Association if they obtain outside funding.

HAVE AN IDEA BUT YOU ARE UNABLE TO ORGANIZE IT?

Many Association Members have excellent suggestions for symposia topics, but are unable to organize the session. Such ideas are extremely valuable and are welcome. If you have an idea for a symposium topic, please inform the Program Committee Chairperson as soon as possible. Symposia topics are among the most valuable contribution an Association Member can make to assure the quality of our Annual Meeting.

WHO TO CONTACT:

Bev Corron
International Association for Food Protection
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2863, USA
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655
E-mail: bcorron@foodprotection.org

SYMPOSIUM PROPOSAL

IAFP 2002

JUNE 30–JULY 3, 2002

SAN DIEGO, CALIFORNIA

Title: _____

Organizer's Name: _____

Address: _____

Phone: _____ Fax: _____ E-mail: _____

Topic – Suggested Presenter, Affiliation

(Example: 1. HACCP Implementation – John Smith, University of Georgia)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Suggested Convenors:

_____

_____

Description of Audience: _____

Signature of Organizer: _____

Receipt by mail
by July 16, 2001 to:

International Association for Food Protection
Symposium Proposal
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2863, USA

Submit in person
on August 5, 2001 to:

Program Committee
Hilton Minneapolis
Minneapolis, MN

or Contact:

Bev Corron
International Association for Food Protection
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2863, USA
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Food Safety Net Services, Ltd.
San Antonio, TX

Robert J. Daley
RidgeView Products, LLC
Onalaska, WI

Updates

Daniel Osiedacz Appointed Process Engineer at Fristam Pumps

Fristam Pumps, Inc. is pleased to announce the appointment of Daniel Osiedacz to the position of process engineer. In his new assignment, Daniel is responsible for improving current manufacturing processes, training for new processes, charting and analyzing the flow of manufacturing material through Fristam and reviewing technical and maintenance literature.

Daniel has a B.S. degree from the University of Wisconsin-Madison in agricultural engineering/power & machinery and has been with Fristam for nearly four years. Previously he has held the positions of application engineer, project engineer and positive displacement pump product manager at Fristam.

Romer® Labs, Inc. Adds New Regulatory Director

Romer® Labs, Inc. is pleased to announce that Robin King has joined the company this January as regulatory director (a new position). In her role as regulatory director, Ms. King will be responsible for all regulations and quality standards governing the functions, products and services of Romer® Labs, Inc.

Ms. King is a certified quality manager (American Society for Quality) and joins Romer® Labs after a fifteen-year career with Monsanto Agricultural Company. She began her career with Monsanto as a research microbiologist in the animal sciences division where she participated in toxicology trials for FDA approval to assure safety of new agricultural food products. She later moved to the plant science division where she developed and managed increasingly complex regulatory and quality systems in compliance with a wide range of global standards and regulations. Most recently, Ms. King has worked as an independent consultant to design quality systems in compliance with FDA, cGMP and ISO standards for the medical device industry. In addition to her regulatory experience, her broad experience in total quality and information management will provide a valuable resource to Romer® Labs, Inc.

Ms. King is a graduate of Missouri Baptist College with a bachelor's degree in medical technology MT (ASCP).

Terry Davis Joins Bell Laboratories, Inc. as Western Technical Sales Representative

Terry Davis recently joined Bell Laboratories as the technical sales representative for the western United States. His territory consists of nine states: Washington, Oregon, California, Idaho, Nevada, Utah, Montana, Wyoming and Hawaii.

As technical sales representative, Davis attends trade shows and consults with distributors and pest management professionals. He also provides technical assistance by visiting rodent infestation sites with PMPs.

Based out of Antioch, CA, Davis has over a decade of sales, service and management experience in the pest management field. He started out as a field technician and moved into management positions. Davis worked as inside creative sales representative for Clark Pest Control, Inc. in Lodi, CA. Davis also worked as western regional sales manager for SpectracidePro, a Missouri manufacturer of pesticides and herbicides for professional markets.

Davis maintained California licenses in structural pest control and pesticide application. He recently completed an advanced level certification in urban and industrial integrated pest management from Purdue University.

Silliker Promotes Smoot and Veeramuthu

Silliker Laboratories promoted Dr. L. Michele Smoot to corporate director of microbiology and named Dr. Giri Veeramuthu director of its Columbus, OH, testing facility.

Dr. Smoot brings over 14 years of experience to her new post, including three years as director of Silliker's Columbus lab and research and management positions with ABC Research Corporation and Nestlé Ltd., Lausanne, Switzerland. She has developed molecular techniques for the detection of foodborne pathogens, and conducted numerous shelf-life studies, process evaluations, and antimicrobial efficacy studies. In her new role, she will administer a broad range of duties, including standard operating procedures, proficiency audits, testing methodologies, and ISO Gude 25 compliance activities. Dr. Smoot earned a doctorate in food science and technology from Virginia Tech in Blacksburg, VA.

Dr. Veeramuthu formerly served as technical services manager for J. Rettenmaier USA

LP, where he established HACCP, GMP, and other related laboratory procedures and processes. He will manage the Ohio lab's scientific operations, quality systems, and personnel to ensure accurate and timely services to the food industry. A Texas A&M University graduate with a doctorate in food science and technology, Veeramuthu has over 10 years of experience in the dietary fiber and beef industries. From 1996 to 1998, he served as laboratory manager of Murco, Inc., a leading beef slaughtering operation in the Midwest.

AWT Announces 2001 Executive Committee

The Association of Water Technologies (AWT) recently announced the installation of the following slate of officers who were elected to serve on the 2001 Executive Committee:

James A. Mulloy, president – Nashville Chemical, Nashville, TN; Anthony J. McNamara, CWT, president-elect – CH20, Olympia, WA; William E. Pearson, II, CWT, secretary–Southeastern Laboratories, Raleigh, NC; Cynthia Davidson, CWT, treasurer – Guardian-IPCO, Birmingham, AL; and Alfred J. Nickels, immediate past president – Watertech, Twin Falls, ID.

Elections were held during the summer Board of Directors' meeting in Park City UT, and the new officers were announced at the 13th Annual AWT Convention & Exposition in Honolulu, HI. The AWT Executive Committee is elected annually by the AWT Board of Directors who are, in turn, elected by the AWT membership.

Pollution Sleuths: MU Researchers Use DNA "Fingerprinting" Test to Trace Water Pollution Sources

Like police detectives trying to solve a crime, those who test for water pollution look for clues. However, finding the guilty party often is difficult because most tests can identify the presence of pollution, but not the source. To solve this problem, University of Missouri-Columbia researchers are using a "fingerprinting" test that can trace water pollution back to its source, using DNA from bacteria.

According to Andrew Carson, MU professor of veterinary pathobiology, the presence of fecal *E. coli* bacteria – microbes that live in the intestines of their host until they are excreted – commonly is used to determine if water pollution is caused by human or animal waste. "Typically, these organisms are non-pathogenic, which means they do not produce disease. However, their detection in water warns of the potential presence of disease-producing strains of *E. coli*, *Salmonella* or hepatitis virus that also can be found in human or animal waste," Carson said.

In order to track fecal *E. coli* water pollutants back to their host source, Carson's laboratory is applying a DNA pattern recognition technique. This novel approach is based on the premise that each host species harbors particular types of *E. coli* bacteria in its intestinal tract that have unique DNA patterns, or "fingerprints." By comparing the *E. coli* fingerprints found in water samples with *E. coli* DNA patterns from known-host species, possible sources of water pollution can be identified. "This technology, known as ribotyping, was first reported in 1988, but only recently has it been applied to water quality.

International Association for Food Protection®

Other scientists have used it to distinguish between human and non-human sources of water pollution, but we are now able to distinguish among a variety of animal and bird host species using DNA fingerprints," Carson said.

To date, Carson's laboratory has identified specific DNA fingerprints for fecal *E. coli* from eight common hosts: humans, cows, pigs, horses, dogs, chickens, turkeys and migratory geese. This technology has allowed Robert Broz, director of the MU Water Quality Program, to help communities in the Long Branch Watershed in north-central Missouri and the Shoal Creek Watershed in southeast Missouri's White River Basin identify and solve pollution problems that threaten their water supplies.

"Without a test such as this, time and energy are wasted when attempting to find where water pollution originates. With this new form of technical assistance, we can now make science-based decisions that relate to solving the problems," Broz said.

Carson said his laboratory continues to add to its database of known host bacterial DNA patterns, which will help to further improve the test's accuracy. Many states have sent water samples for analysis, and Carson expects that his laboratory and the fingerprinting technique will contribute significantly to the current nationwide water quality movement. Carson's most recent article on the application of DNA-fingerprinting is in-press with Applied and Environmental Microbiology. The US Geological Survey and MU funded the ongoing project.

FAO Warns of "Bushmeat Crisis" Caused by Excessive Hunting of Wild Animals for Food

Wild animal populations are dwindling in many parts of the world because of excessive hunting, leading to a "Bushmeat Crisis" that is threatening the food security of many forest communities, the UN Food and Agriculture Organization warned. FAO wildlife expert Douglas Williamson said that bushmeat traditionally made an important contribution to human nutrition in some 61 countries, where rural people obtained at least 20 percent of their animal protein from wild animals.

Mr. Williamson said that shrinking populations, particularly of large forest animals, could result in a long-term change in forest ecology, as many plants that depend on animals for pollination, seed dispersal, or seed germination eventually disappeared. There were also risks to human health that should not be overlooked, the FAO expert stressed. Among the main factors threatening long-term supplies of wild meat were increasing population needs and pressure, the use of new technologies such as automatic weapons, the temporary encroachment of large numbers of people displaced by conflicts, and the growth of a commercial trade in wild meat, Mr. Williamson said.

Meat from wild animals that was traditionally used by forest communities for their own consumption was now being collected for sale in urban areas, including cities with huge populations. Since there were natural limits to the level of harvesting that wildlife populations could sustain, such trade could result in the extinction of many populations, especially of vulnerable species such as elephants, larger antelopes, gorillas, and chimpanzees. Such unsustainable trade in wild meat is a particular problem in the Congo Basin because conflict and civil disturbances have disrupted normal economic activity and forced people to turn to wild meat as a source of income.

In response to the Bushmeat Crisis, a number of non-governmental organizations (NGOs) have formed an alliance to try to tackle the problem, which is being addressed by a working group of the Convention on International Trade in Endangered Species (CITES), of which FAO is a member. The Organization's Assistant Director General for Forestry, Hosny El Lakany, said current discussions between FAO and other organizations were concentrating on ways and means of enforcing existing laws and regulations, and effective protection and management of existing national parks and game reserves. He said potential longer term measures could include educating hunters and traders about species that can or cannot sustain intensive hunting; effective regulation of bushmeat markets and trade; identifying and promoting alternative protein sources; identifying and promoting alternative sources of income; expanding protected area systems; and including wildlife management among the conditions for the granting of logging concessions.

"FAO is currently working on two projects aimed at enhancing the sustainability of wild meat use as part of the Organization's commitment to improving food security and protecting biological diversity," Dr. El Lakany added.

USPEA Honors Tyson, Gold Kist for Outstanding Water Treatment

Tyson Foods Inc. and Gold Kist Inc. received the US Poultry & Egg Association's first-ever Clean Water Award in recognition of the companies' outstanding water treatment plant performance. The award consists of two separate divisions: pretreatment and full treatment. Springdale, AR-based Tyson Foods' Monett, MO, plant received the award for pretreatment facilities, while Gold Kist's Russellville, AL, plant won the award for full treatment facilities. Seaford, Delaware-based Allen Family Foods, in Cordova, MD, also received special mention for its commitment to environmental stewardship.

The companies were honored on March 7th at the Association's Annual Environmental Management Seminar in Birmingham, AL. "Tyson Foods merited this award for its long history of compliance and its excellent working relationship with the city of Monett," John Starkey, USPEAS's vice president, environmental programs, told The Meatingplace.com. "Tyson Foods' vision statement, 'Ensuring the Environment,' defines the company's mission of providing a clean and safe environment for the future by going beyond the compliance demanded at the present time." Starkey added that the Monett pretreatment facility employs policies that are beneficial to both the company and the environment. Such policies include extensive operator training and certification; installation of an ozone system; a blood storage tank to reduce odors; community involvement; and the implementation of a water conservation team to ensure reduced demands on both ground water withdrawals and the city's wastewater treatment facility.

Gold Kist's Russellville plant was recognized for its excellent compliance record, as well as for its ability to maintain an environment beneficial for native wildlife. "The plant's 14 employees are dedicated to high standards, making themselves known in the Russellville community for their participation in local activities," Starkey told The Meatingplace.com. "A recipient of the Alabama Water Environment Association's Excellence in Industrial Wastewater Award, this facility has operated more than 10 years without a lost time accident."

According to Starkey, the water treatment facility at Allen Family Foods' Cordova plant uses state-of-the-art wastewater treatment processes to achieve over 97 percent total nitrogen and phosphorous removal and over 99 percent removal of conventional pollutants prior to final wastewater disposal by spray irrigation during the growing season. Starkey added that the Clean Water Award Review Committee selected the three plants after an extensive review and site visits to competition applicants (all USPEA member companies were invited to enter). Members of the committee include Bill Satterfield, Delmarva Poultry Industry; Jim Walsh, Georgia Tech Economic Development Institute; Allan Youngblade, ConAgra Poultry Co.; Charles Horn, retired chief, Alabama Department of Environmental Management Water Section; and Randall Mathis, retired director, Arkansas Department of Environmental Quality.

AWWA: Water Infrastructure Requires New Approach to Make the Grade; Better Asset Management, Funding Influx Critical to Pipe Replacement Efforts

The American Water Works Association (AWWA) called on Congress and the nation's civil engineers to join it in developing an efficient, responsible plan to overcome the nation's multi-billion dollar shortfall in drinking water infrastructure investment. AWWA made its request in light of the latest evaluation of the nation's core infrastructure, conducted by the American Society of Civil Engineers (ASCE), which criticized the investment shortfall in issuing the nation's drinking water infrastructure a "D" grade. "America's water utilities, elected officials and civil engineers all agree: drinking water infrastructure needs our attention and needs it now. AWWA is eager to work with Congress and other interested groups to make the necessary improvements in the most practical, accountable manner possible," said AWWA executive director Jack Hoffbuhr.

In its Report Card for America's Infrastructure recently released, the ASCE estimated that the investment in drinking water infrastructure falls short $11 billion every year. Without the necessary rate of investment, many communities continue to rely on water pipe that has passed its prime and in some cases is well over 100 years old. As pipes age, they become more likely to burst, leak or corrode. According to the report, the investment shortfalls are a result of consistent underfunding of federal drinking water initiatives coupled with increased demands on water utilities' financial resources. The ASCE anticipates the problem being exacerbated by growing demand for drinking water nationwide over the next 20 years. To remedy the situation, ASCE recommended Congress fully fund existing federal drinking water programs and institute new federal programs targeted specifically to staving off future investment shortfalls to counter the current situation.

The findings of AWWA's ongoing research concur with the ASCE's findings on the scope of the problem and the budget pressures water utilities face, which led AWWA to call for a stronger commitment to water infrastructure investment from the federal government over a year ago. However, the Association's analysis also indicates that improved local management and more cooperative relationships between utilities and all levels of government must be implemented before access to any new funding resources can be optimized. "Attacking the nation's water infrastructure needs will require a more unified effort from all involved. AWWA intends to ensure those efforts result in plans that protect public health and promote economic sustainability for utilities and communities alike," concluded Hoffbuhr.

Reducing *Salmonella* and *E. coli* O157:H7 at the Farm

A practical approach to reducing two key on-farm pathogens in pigs and cows has been developed by Agricultural Research Service researchers in College Station, TX. The scientists report that sodium chlorate, fed in low doses to pigs and cows before slaughter, selectively kills the pathogens *Salmonella* Typhimurium and *E. coli* O157:H7.

The scientists in the ARS Food and Feed Safety Research Unit in College Station developed an animal model showing that sodium chlorate reduces these harmful bacteria in the animal intestinal tract. Gut and lymph tissue in meat animals and chickens are major reservoirs for *Salmonella* and *E. coli* O157:H7. The US Centers for Disease Control and Prevention estimate that about 1.4 million cases of salmonellosis and 73,000 cases of diarrheal illness caused by O157:H7 occur in the United States each year. *Salmonella* and *E. coli* O157:H7 have an enzyme–respiratory nitrate reductase–that beneficial intestinal bacteria lack. This enzyme converts the sodium chlorate to chlorite, which kills the harmful bacteria. Because the beneficial bacteria lack respiratory nitrate reductase, they are unharmed by the added chlorate.

In laboratory studies, 45 weaned pigs were fed as much as 0.04 grams of sodium chlorate per kilogram of body weight after being inoculated with *S.* Typhimurium. Within 16 hours, the treatment produced a 150-fold reduction in the number of pathogenic cells in the intestines.

The US Department of Agriculture applied for a patent on behalf of the inventors, ARS microbiologists Robin C. Anderson and David J. Nisbet in College Station and Larry H. Stanker in Albany, CA. The researchers are seeking a cooperative research partner to further develop the work for commercial meat processing.

Besides adding the chlorate to feed, the researchers suggest that a more realistic approach would be to add the chlorate to drinking water for the animals upon arrival at the processing facility. However, the Food and Drug Administration would need to approve any wide-scale use of the technique in food processing facilities.

Tracing the Costs and Benefits of Improvements in Food Safety: The Case of the Hazard Analysis Critical Control Point Program for Meat and Poultry

The level and distribution of the costs and benefits of the Hazard Analysis Critical Control Point (HACCP) regulatory program for meat and poultry changed dramatically once economy-wide effects were included in the analysis. We constructed a Social Accounting Matrix (SAM) model to extend the sector-specific cost-benefit analysis of the HACCP program to account for the economy-wide impact of the program on both producers and consumers. This type of analysis provides useful information for policymakers by indicating who ultimately benefits from improved health outcomes and who ultimately pays the costs of food safety regulation.

We used the SAM model to conduct two sets of simulations. One set examined the benefits of reducing foodborne illness and the other examined the cost of implementing HACCP. On the benefit side, the simulations examined the economy-wide benefits of reduced premature deaths and medical expenses. The SAM multiplier model indicated that every dollar of income saved by preventing premature deaths from foodborne illness resulted in an economy-wide income gain of $1.92. This result demonstrates that premature death imposes substantial costs on society as a whole. Fewer premature deaths led to an increase in household income nearly double the size of the initial increase.

For medical expenses, the SAM multiplier model showed that if households paid their medical expenses out of household income or savings, then every dollar saved through reduced foodborne illnesses resulted in an economy-wide income loss of $0.27. Likewise, if public or private insurance covered the cost of medical expenses, then every dollar saved because of fewer foodborne illnesses resulted in an economy-wide income loss of $0.32. These results indicate that the consumption of medical goods and services caused by foodborne illness triggers more economic activity than the consumption activities that households would have enjoyed if they had not needed to spend money on medical goods and services. One possible explanation for this result is that, in general, medical goods and services use a higher proportion of domestically produced inputs than do other goods and services. These results highlight the need for caution in interpreting income changes as changes in well-being and underline the need to refine methodology to account for changes in well-being that are not captured by income measures alone.

The final economy-wide distribution of the benefits of fewer illnesses and premature deaths differed from the initial distribution of benefits. Initially, the benefits of these reductions accrued to those who would have fallen sick or would have died prematurely. However, unlike the initial distribution of benefits, the final distribution did not mirror disease incidence, but depended instead on the relationship of households to the economy. As a result, higher income households, which have strong links to the economy, bore a larger share of the change in economic activity triggered by reduced premature deaths and medical expenses than lower income households, which have weak links to the economy.

Regarding costs, the simulations with the SAM multiplier model indicated that every dollar spent on HACCP implementation resulted in an economy-wide income loss of $0.35. This result occurred because, in this simulation, the increased costs of beef and poultry production due to HACCP implementation were passed on to consumers, so that households incurred a decrease in real income equivalent to the costs of HACCP implementation. When we held nominal income constant, economy-wide income actually rose by $0.65 for every dollar spent on HACCP. The spread between the real and nominal results serves as yet another reminder of the potential gap between a monetary accounting of economic activity and measures of well-being. The ultimate distribution of the reduction in real household income reflects the economic ties of the household groupings: both households below the poverty level and elderly households absorb relatively small percentages of the decrease in economy-wide income triggered by HACCP implementation.

The SAM analysis does not provide precise dollar estimates of the ultimate costs and benefits

of HACCP. Instead, it provides information on the market mechanisms through which costs and benefits of the HACCP program affect the economy, thereby indicating the direction and magnitude of the economic flows resulting from regulation and reductions in foodborne illness. The SAM analysis also sheds light on a number of issues central to cost-benefit analysis involving health. It focuses attention on the different ways that health benefits are measured and reveals fundamental differences in the way different types of health benefits impact the economy. The SAM analysis demonstrates the usefulness of the cost-of-illness approach in deciphering economic distortions caused by health shocks to the economy and the danger of equating changes in income with changes in well-being.

IBA Food Safety Division and AmeriCold Logistics to Build X-ray Food Irradiation Facility

IBA Food Safety Division, a developer of advanced food irradiation facilities in the United States announced an agreement with AmeriCold Logistics to construct an X-ray food irradiation facility at AmeriCold's site in Carthage, MO. Located at the crossroads of the nation's primary meat and poultry production regions, Carthage is the largest cold storage facility in the United States.

Completely dedicated to the irradiation of meat, poultry, fruits, vegetables and other perishable foods, the new IBA X-ray facility will allow AmeriCold Logistics, a provider of temperature-controlled storage and food distribution services, to provide customers with the most advanced X-ray food processing technology available.

Under the terms of the agreement, AmeriCold Logistics will provide product handling services for IBA customers and offer storage and distribution of frozen, refrigerated or dry foods and products for food processing companies choosing to benefit from X-ray irradiation technology. IBA will lease space from AmeriCold to construct the new X-ray processing center, scheduled to open in mid-2002. Both IBA and AmeriCold expect this facility to be the first of several AmeriCold locations to offer advanced IBA X-ray food irradiation processing.

"The food industry is asking for access to X-ray processing centers to introduce irradiated products," says IBA food safety division president, Pat Adams. "IBA is committed to building a network of the most advanced X-ray facilities across the US – and that means putting facilities where our customers need them – both onsite and at regional service centers." According to AmeriCold Logistics CEO, Dan McNamara, "Irradiation is a process that many of our customers are evaluating. As a cold storage provider in the US, we believe that AmeriCold Logistics is in good position to assist the food industry by providing them with access to improved food safety technology."

IBA has a strategic alliance with Ecolab Inc., a provider of critical environment sanitation systems and services, to provide food processors with one comprehensive resource for integrated, multiple intervention food safety programs. Ecolab's offerings include the latest in advanced detergents and sanitizers, automated systems to improve operational efficiencies, employee hygiene programs, and patented food surface treatment products. Combined with IBA's food irradiation technology and support services, this represents the most comprehensive food safety program available today.

In June 2000, the IBA Food Safety Division also announced the opening of a new X-ray test center in Edgewood, NY, that will allow food producers to develop X-ray irradiation plants for ready-to-eat meats (including hot dogs and deli meats), raw poultry, ground beef, and fresh and frozen vegetables. More recently, IBA announced the USDA go-ahead for gamma irradiation of meat and poultry at the IBA facility in Schaumburg, IL. Also under way is construction of the IBA X-ray processing facility located in Bridgeport, NJ, the first of its kind to offer large-capacity X-ray processing in the US. This facility is scheduled to open before the Carthage regional service center in the second quarter 2001.

Industry Products

Cox Technologies, Inc.

Cox Introduces TempList® Digital Clipboard

The Cox TempList® "digital clipboard" temperature monitor is a complete data collection, storage and documentation system that combines a temperature probe and an electronic data storage unit.

The TempList® is a virtual Hazard Analysis Critical Control Point (HACCP) documentation system in a single device. HACCP is the system for safety programs used in the food retail and food processing industries. Users only have to set up all of the critical control points in the TempList® Windows® 8-based software, note the correct or critical temperatures and download these values in the TempList® device. The unit is then ready to record temperatures and store them for later transfer to the software that is installed on a computer.

While taking current temperature readings using a temperature probe, users are warned of unsafe or extreme temperature limits instantaneously. The device displays the reading on a large LCD screen that is easy to read and has its own backlight for easy viewing in areas of limited lighting. The reading is then recorded with just a push of a button. The TempList® can record the critical temperature, product type, process or location, user identity, date and time.

Cox Technologies, Inc., Belmont, NC

Reader Service No. 263

BD Diagnostic Systems' New Bactrol™ Plus Quality Control Cultures in Vials will Replace Bactrol Disks

BD Diagnostic Systems announces the immediate availability of BD Bactrol™ Plus Quality Control Cultures in vials, for use in the quality control testing of microbiological media, reagents and identification systems. The Bactrol Plus vials of lyophilized microorganisms offer many advantages over the well-known Bactrol Disks, which they will be replacing. The Bactrol Plus vials present a wider range of quality control organisms than the Bactrol Disks, in a format that's user-friendly. And because the vials are easily reconstituted, there's less chance of contamination compared to the handling requirements of disks.

To use Bactrol Plus Quality Control Cultures, the vial must be reconstituted with 0.25 ml of Trypticase™ Soy Broth, saline or distilled, or deionized water for aerobic bacteria and fungi. Anaerobic and microaerophilic bacteria should be rehydrated with 0.25 ml of Thioglycollate Broth. The resulting suspension is ready for inoculation onto appropriate plating media.

Cultures contained in the Bactrol Plus vials are derived from nationally recognized culture collections, such as the American Type Culture Collection (ATCC™). Laboratories often use these cultures to evaluate their procedures and practices because the organisms have consistent biochemical profiles or known susceptibility patterns. Many accrediting organizations require the use of quality control organisms as part of a laboratory quality assurance/quality control program.

BD Diagnostic Systems, Sparks, MD

Reader Service No. 264

Silliker Laboratories Group Inc.'s Microwave Thermal Evaluation Studies Protect Consumers and Food Processors

Hurried consumers rely on on-pack cooking instructions for proper and safe preparation of products in a microwave. If products are insufficiently heated, research has shown that bacterial pathogens can survive. This places responsibility on processors and retailers to validate the efficacy of their microwave cooking instructions

on products ranging from pizza to instant soup.

Silliker Laboratories Corporate Research Center is helping manufacturers and retailers ensure the safety of these products through new microwave evaluation studies. The center offers two types of thermal evaluation studies to food manufacturers: a pathogen kill study and a basic time-temperature validation study.

The pathogen kill study is a comprehensive challenge study in which potential pathogens are identified as posing a risk. The product is inoculated with these organisms under strict laboratory conditions, heated according to cooking instructions, and then analyzed to determine effectiveness. A successful trial assures the manufacturer that if their product is contaminated, pathogens will be destroyed under recommended cooking instructions.

In the time-temperature validation study, the product is heated according to instructions to verify the cooking time is properly recorded.

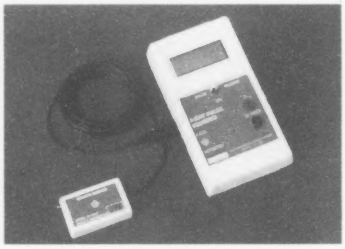
Using the new OSR microwave workstation from FISO Technologies, Silliker researchers can conduct an evaluation study, depending on its size and scope, in one to three weeks.

Silliker Laboratories Group Inc., Homewood, IL

Reader Service No. 265

Digital X-ray Pulse Counter/Timer from Nuclear Associates

Poor or inconsistent quality of x-ray images is often caused by inaccuracy or inconsistency of the generator's timer. This results in costly repeat examinations and is hazardous to the patient who might receive unnecessary radiation doses. Regular monitoring of x-ray systems and timers is an essential part of a good quality assurance program.



Nuclear Associates

The Digital X-Ray Pulse Counter/Timer (model 07-453) from Nuclear Associates is a non-invasive, solid-state instrument that can be used to measure the exposure time of either AC or DC x-rays. It can also measure the duration of radiation output produced by a wide variety of medical and dental x-ray systems. A sensitive x-ray detector in the instrument allows direct measurement of exposure from the x-ray head. Pulses produced by half-wave and full-wave x-rays are measured as 60 or 120 pulses per second. For DC, capacitor discharge and three-phase x-rays, the Digital X-Ray Pulse Counter/Timer measures the exposure time in milliseconds. When testing x-ray timers and controls, the time of relay contact closure can be measured using the AC input feature.

An output connector on the side of the Digital X-Ray Pulse Counter/Timer allows the user to view a radiation output waveform on an oscilloscope. Using this feature, technicians can diagnose and troubleshoot problems with x-ray generators. An optional Remote Sensor can be used when the user would like to have the unit in their hand, so readings can be seen without having to walk back-and-forth from the x-ray table to the control room after each exposure.

Nuclear Associates, Carle Place, NY

Reader Service No. 266

Safeline's New Bulk Unloading Metal Detector System Features a Reject Valve Solution that Works on Vacuum, Pneumatic Systems

Safeline's new bulk unloading metal detector system with its fast acting reject valve is available for use as a portable system or for fixed installations. Designed to provide dilute phase metal detection of such products as rice, grain, soybean, etc., as they are unloaded from bulk containers or railcars, the metal detector works with pneumatic and vacuum systems up to 6" diameter, vacuums up to 15" mercury, and speeds up to 5000 feet per minute.

This new Safeline system overcame the challenge of reject valve operation in large-scale bulk and powder metal detection. It operates with sensitivities of 1.2 mm ferrous in a 6" line, and even great sensitivities in smaller pipeline systems. The fast-acting reject valve can be located close to the metal detector, and rejected material is discharged for examination while still maintaining the vacuum in the line at all times, and without shutting the system down.

Safeline offers a complete system including a metal detector, reject valve, reject accumulator and manual or automatic testing capability. In use with vacuum systems to unload rail cars, the Safeline system can be mounted on a mezzanine above a railcar or at another location at least 5 feet from the railcar; this distance allows sufficient time for the product to accelerate to full speed for consistency.

When metal is detected by the Safeline metal detector, the detector sends a signal to the Safeline sealed flap "Y" valve, and product is diverted into the reject bin. Product enters the bin and falls to the bottom. The new

Safeline bulk unloading system metal detector has a fault and reject confirmation capability and fail-safe circuitry that takes appropriate action if the reject valve stays open for longer than a predetermined length of time.

Safeline Inc., Tampa, FL

Reader Service No. 267

New Food Safety Technology Approved by FDA; New Red Meat Carcass Treatment from Ecolab Effective against Pathogens

A new antimicrobial spray for the treatment of red meat carcasses has officially been introduced by Ecolab Inc., following its approval by the Food & Drug Administration (FDA). Developed by Ecolab Inc., the spray, Inspexx™ 200 is used to treat red meat carcasses during processing in plants to reduce microbial contamination.

Currently in the United States there are several hundred facilities that, collectively, process 500,000 head of beef and swine per day. Inspexx 200 is applied to each carcass at various processing points to reduce microbial, particularly pathogenic bacteria contamination. Inspexx 200 is unique in that it can be applied at concentration levels 100 times lower than other treatments currently available. This means contamination with pathogenic bacteria including *E. coli* O157: H7, *Salmonella* and *Listeria* is reduced at lower chemical concentrations, providing a cost effective alternative to other treatments.

Inspexx 200, along with effective in-plant sanitation and irradiation services offered by Ecolab's strategic partner, IBA, is another line of defense against pathogens that can ultimately impact the food consumed by the public. "Food safety is of the utmost importance to consumers, and recent news reports underscore processors' desire for improved practices combining sanitation and other intervention methods in meat and swine production. Inspexx 200 is a new weapon to combat pathogen contamination in red meat processing operations. The FDA's approval is a major milestone in our product development program. We have placed substantial research and development resources behind technologies that will enable food processors to operate more efficiently and produce safer, higher quality food products for the consumer," said Nick Alfano, vice president, Food & Critical Environment Business, Ecolab Food & Beverage Division.

Ecolab, St. Paul, MN

Reader Service No. 268

Petrifilm™ Rapid Coliform Count Plate Method from 3M Earns AOAC Official Method Status

After successfully completing rigorous testing, the 3M™ Petrifilm™ Rapid Coliform Count (RCC) plate method has received AOAC Official Method 2000.15 status.

With this certification, the dry rehydratable film method for the enumeration of coliform in foods becomes the fastest, approved and confirmed coliform test available. Petrifilm RCC plates detect high levels of coliform contamination (>1000/plate) as early as four to six hours during incubation. This allows users to discover, isolate and resolve potential problems much sooner than with traditional agar plates. Total confirmed coliforrn counts can be available in as early as 14 hours.

"Rapid reporting of microbiological data is a valuable tool in assessing food quality, whether it involves incoming raw materials or finished products," says Kevin Habas, market development manager, 3M Microbiology. "Early detection can make a critical difference in productivity, costs and product decisions. Rapid microbiological testing along the production line can also help pinpoint potential microbial contamination so that preventive steps can be initiated."

3M Microbiology, St. Paul, MN

Reader Service No. 269

Purifier® HEPA Filtered Enclosure Offer Personnel and Environmental Protection from Particulate Contaminants

Labconco Corporation presents the Purifier HEPA Filtered Enclosure, which is designed to protect personnel and the environment from particles and aerosols. Suitable applications include weighing chemical and mineral powders, media rehydration, handling pollen, asbestos testing, seedling inoculations and other procedures that generate fine dusts or aerosols.

The internal blower draws air in around the technician, through the work area and then into a 99.9% efficient HEPA filter. The HEPA-filtered exhaust air can be recirculated back into the room, or the cabinet can be connected to an exhaust system and ducted to the outside. All contaminated areas are under negative pressure so that if a leak should occur, contaminated air is forced through the HEPA filter, not into the room. The two-light filter condition indicator displays differential pressure across the HEPA filter. A green light indicates normal filter condition; an amber light indicated that service is required.

The front sash and side panels are made of scratch-resistant 1/4" thick laminated safety glass. The angled sash tilts up for easy cleaning and loading of the cabinet. A front air foil directs air into the work area providing maximum containment. Fluorescent lighting illuminates the work area.

Labconco Corporation, Kansas City, MO

Reader Service No. 270

NEW!

IAFP Job Fair

Attention Job Seekers and Employers

The first IAFP Job Fair will be held during IAFP 2001, the Association's 88th Annual Meeting, August 5-8, 2001 in Minneapolis, Minnesota. If you are seeking a career change or are a college senior or recent graduate, bring several copies of your curriculum vitae (C.V.)! Employers, take advantage of recruiting the top food scientists in the world.

Contact Scott Burnett for more information at 770. 228.7283 ext. 115 or E-mail: sburnett@cfsqe.griffin.peachnet.edu.

International Association for
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Des Moines, Iowa 50322-2863, USA

To All IAFP Members:

Today I'm writing to encourage your involvement through the International Association for Food Protection's Committees and Professional Development Groups (PDGs). You may volunteer to serve on multiple Committees or PDGs. Each of these groups serves a vital function in providing guidance and direction for the Association. Your experience and expertise is welcome and needed! If you have participated on our Committees or PDGs in the past, I commend you for your service and encourage you to continue.

Committees and PDGs meet during the Annual Meeting and may meet throughout the year via conference call or E-mail. Even if you are not able to attend the Annual Meeting, your involvement is still possible. Please review the Committees and PDG listing on the following pages to find a group that is of special interest to you. Call or E-mail the Chairperson listed to learn more about the function of the group. Then, if it sounds interesting to you, volunteer your time and efforts. Through active participation, you can establish a network of contacts and help better the profession while strengthening your leadership skills.

Your input and ideas are welcome at all times. So accept the challenge today; call one of the Chairpersons to let him or her know of your interest in sharing your knowledge and expertise with other IAFP Members.

I'm looking forward to seeing your name on our next Committee listing!

Sincerely,

Anna M. Lammerding
Vice President, IAFP

"Our mission is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."
Publisher of the *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation*

COMMITTEE CHAIRPERSONS

Professional Development Groups, Task Forces, and Support Groups

STANDING COMMITTEES

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SPECIAL COMMITTEES

3-A Committee on Sanitary Procedures

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Audiovisual Library Committee

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Committee on Communicable Diseases Affecting Man

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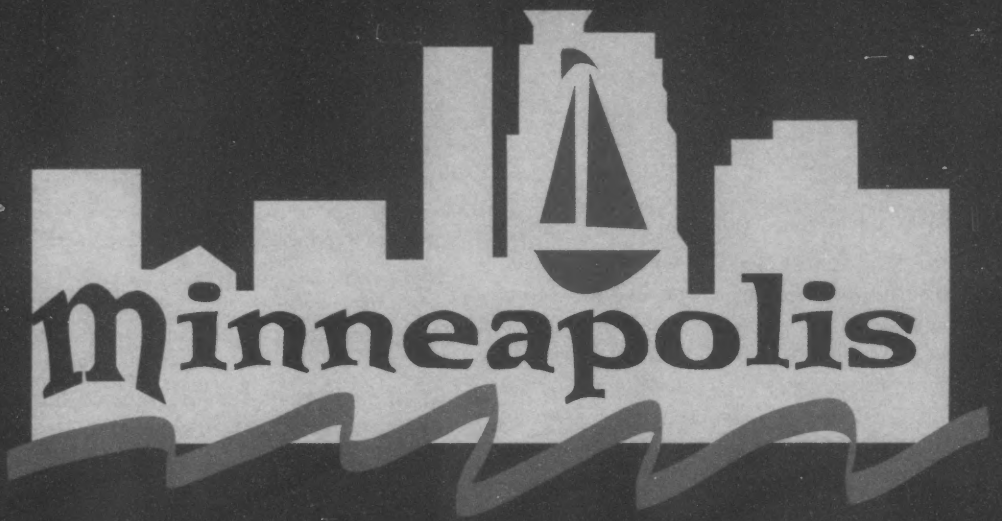

IAFP 2001

88th Annual Meeting

Experience the City of Lakes

August 5-8, 2001

International Association for Food Protection

Hilton Minneapolis

August 5-8, 2001

Hilton Minneapolis

Minneapolis, Minnesota

Preliminary Program

P – Posters; S – Symposia; T – Technicals

Program subject to change

SUNDAY EVENING — AUGUST 5, 2001
7:00 p.m. — 8:00 p.m.

Opening Session

- Presentation of the International Association for Food Protection Fellows Awards
- Ivan Parkin Lecture – Dr. Linda Detwiler, Senior Staff Veterinarian, USDA/Animal and Plant Health Inspection Service, Robinsville, New Jersey

  Cheese and Wine Reception will follow in the Exhibit Hall

MONDAY MORNING — AUGUST 6, 2001
8:30 a.m. — 12:00 p.m.

S01 Moving Beyond HACCP — Risk Management and Food Safety Objectives, Session I

(Sponsored by ILSI-NA)

- Introduction: International Commission on Microbiological Specifications for Foods (ICMSF) Framework for Managing the Safety of Foods – TERRY A. ROBERTS, ICMSF, Reading, UK
- Assessing Risks and Establishing Food Safety Objectives – ROBERT L. BUCHANAN, FDA-CFSAN, Washington, D.C., USA
- On-the-line: Process and Performance Criteria – MARTIN COLE, Food Science Australia, North Ryde, New South Wales, Australia
- Use and Misuses of Microcriteria for Foods – MICHIEL VAN SCHOTHORST, Nestlé, S.A., Vevey, Switzerland
- Applying ICMSF Processes for Foods – R. BRUCE TOMPKIN, ConAgra Refrigerated Prepared Food, Downers Grove, IL, USA
- Panel Discussion

S02 Impact of Water Quality on Food Safety

(Sponsored by IAFP Foundation Fund)

- Safety of Potable Water from Municipal Treatment Plants/Distribution Systems – MARK W. LECHEVALLIER, American Water Works Service Company, Inc., Voorhees, NJ, USA
- The Walkerton Water Disaster: Our Changing Environment Water Advisory: The Walkerton Experience – MURRAY S. MCQUIGGE, Bruce-Grey-Owen Sound Health Unit, Owen Sound, Ontario, Canada
- Food Production and Processing Risks Using Recycled Water – DEAN O. CLIVER, University of California-Davis, Davis, CA, USA
- Public Health Risks in the Food Industry Associated with Viral Contamination of Potable Water – LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA
- Public Health Risks in the Food Industry Associated with Parasitic Contamination of Potable Water: Outbreaks and Detection – HUW V. SMITH, Scottish Parasite Diagnostic Laboratory, Glasgow, UK

S03 Improving Laboratory Quality Assurance in the Real World

- Laboratory QA: Basic Challenges and Issues – RUSSELL FLOWERS, Silliker Laboratories, Homewood, IL, USA
- Industry Perspectives on Lab Quality Assurance – LORALYN LEDENBACH, Kraft Foods Inc., Glenview, IL, USA

- The Role of Proficiency Testing in Laboratory Quality Assurance – ARLENE FOX, AOAC International, Gaithersburg, MD, USA
- International Perspectives on Laboratory Quality Assurance – MICHAEL BRODSKY, Brodsky Consultants, Thornhill, Ontario, Canada
- Good Laboratory Practices: The Foundation of an Effective Quality Assurance Program – SUZANNE TORTORELLI, Campbell Soup Company, Camden, NJ, USA

S04 Food Allergens — Current Issues and Concerns

(Sponsored by IAFP Foundation Fund)

- Consumer Issues – ANN MUNOZ-FURLONG, Food Allergy Network, Fairfax, VA, USA
- Analytical Information – Methods and Findings – STEVE TAYLOR, University of Nebraska-Lincoln, Lincoln, NE, USA
- Supplier Issues – KEVIN FARNUM, General Mills, Inc., Minneapolis, MN, USA
- In-plant Practices – KEVIN FARNUM, General Mills, Inc., Minneapolis, MN, USA
- Regulatory Perspective – KEN FALCI, FDA, Washington, D.C., USA
- Legal Issues and Perspective – MARTIN HAHN, Hozan and Hartson, Washington, D.C., USA

T01 Meat Microbiology

T1 Evaluation of Methods for Sampling Rectal/Colonal Feces, Hides, and Carcasses to Test for Presence of *Escherichia coli* O157:H7 and *Salmonella* spp. – J. R. RANSOM, R. T. Bacon, K. E. Belk, J. N. Sofos, J. A. Scanga, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

T2 Rapid Detection of *Escherichia coli* O157:H7 in Raw Ground Beef via PCR Using a 375 g Sample Composite and Short Enrichment – C. E. Miller, E. R. Richter, and W. M. BARBOUR, Qualicon, Inc., Wilmington, DE, USA

T3 Towards a Rapid Quantitative Risk Assessment Model of Human Illness: The Example of *Escherichia coli* O157:H7 in Non-intact Beef – JANELL KAUSE, Eric Ebel, Wayne Schlosser, and Kathy Orloski, USDA-FSIS, Washington, D.C., USA

T4 Combined Treatments of 2% Lactic Acid (80°C) and Microwaves for the Reduction of Natural Microflora and *Escherichia coli* O157:H7 on Vacuum-packaged Beef Subprimals – BETH A. CROZIER-DODSON, Daniel Y. C. Fung, Jin-Man Kim, and Leslie K. Thompson, Kansas State University, Manhattan, KS, USA

T5 Inhibition of *Listeria monocytogenes* on Hot Dogs Using Antimicrobial Whey Protein-based Edible Casings – A. CAGRI, Z. Ustunol, W. N. Osburn, and E. T. Ryser, Michigan State University, East Lansing, MI, USA

T6 Effects of Dried Prune Purees on Suppression of Growth of Foodborne Pathogens in Ground Beef – LESLIE K. THOMPSON and Daniel Y. C. Fung, Kansas State University, Manhattan, KS, USA

T7 Application of Potassium Sorbate and Other Antimicrobial Ingredients to Control *Listeria monocytogenes* in Ready-to-eat Meat and Poultry Products – W. PAYTON PRUETT, JR., Robin Kalinowski, and Jennifer Schmelder, ConAgra Refrigerated Prepared Foods, Downers Grove, IL, USA

T8 Serotype Tracking of *Salmonella* through Integrated Broiler Chicken Operations – J. S. BAILEY, N. A. Cox, N. J. Stern, and S. E. Craven, USDA-ARS, Athens, GA, USA

T9 Microbiological Risk Assessment on Raw Pork Carcasses in Ontario Abattoirs – PAT JOHNSON, Joseph Odumeru, Abdullahi Mahdi, Tom Baker, Christine Power, and Frank Pollari, Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, Ontario, Canada

T10 Evaluations of Acidified Sodium Chlorite for Use on Red Meats – T. Rourke, M. Guerra, G. K. Kemp, B. C. TINSLEY, C. C. Warf, T. G. Richardson, P. L. Baxter, and K. R. Schneider, Alcide Corporation, Redmond, WA, USA

T11 Comparative Studies of the Microbial-Vac™, a Non-destructive Wet-vacuum Microbial Collection System on Beef Carcasses – BRUCE J. BRADLEY, Filomena S. Saddler, and Danielle J. Prescott, Rocky Mountain Resource Labs, Inc., Jerome, ID, USA

T12 Real Time Detection of Pathogenic *Vibrio parahaemolyticus* in Oysters – ANGELO DEPAOLA, George Blackstone, Jessica Jones, Michael Bowen, and Richard Meyer, FDA, Dauphin Island, AL, USA

P01 Produce Microbiology

10:00 a.m. – 1:00 p.m.
(Authors present 10:30 a.m. – 12:30 p.m.)

P1 Comparative Study of *Toxoplasma gondii* Oocysts on Raspberries and Blueberries – K. K. PHELPS, S. S. Sumner, D. S. Lindsay, J. P. Dubey, and M. D. Pierson, Virginia Tech., Blacksburg, VA, USA

P2 Development of a Standard Method to Detect *Giardia* on Fresh Fruit and Vegetables – NOREEN WILKINSON, K. L. Barker, C. A. Paton, R. A. B. Nichols, H. V. Smith, and N. Cook, Central Science Laboratory, York, N. Yorks, UK

P3 Isolation of Potential Microbial Competitors of Foodborne Pathogens for Use on Fresh and Minimally-processed Produce – KAREN M. CRAMP and Mark A. Harrison, University of Georgia, Athens, GA, USA

P4 Consumer Handling of Fresh Produce – AMY E. LI and Christine M. Bruhn, University of California-Davis, Davis, CA, USA

P5 Withdrawn

P6 Evaluation of Postharvest Survival and Growth of *Salmonella*, *Escherichia coli*, and *Listeria* on Peaches – R. Cifuentes, S. Goerge, A. Hernandez, T. Parnell, L. J. Harris, and T. SUSLOW, University of California-Davis, Davis, CA, USA

P7 *Salmonella* Inactivation from the Surface of Whole and Cut Produce by Gaseous Ozone – JOSEPH EIFERT, Parameswarakumar Mallikarjunan, and Fletcher Arritt, Virginia Tech., Blacksburg, VA, USA

P8 Is *Salmonella enterica* a Good Colonizer of Plant Surfaces? – MARIA BRANDL and Robert Mandrell, USDA-ARS-WRRC, Albany, CA, USA

P9 Reducing *Salmonella* on the Surface of Apples Using Wash Practices Commonly Used by Consumers – TRACY L. PARNELL and Linda J. Harris, University of California-Davis, Davis, CA, USA

P10 Isolation and Characterization of a *Lactobacillus plantarum* Bacteriophage from Cucumber Fermentation – ZHONGJING LU, Fred Breidt, Jr., and Henry P. Fleming, USDA-ARS, Raleigh, NC, USA

P11 Effect of Glycine Betaine on Survival of *Lactococcus lactis* in Fresh, Refrigerated, Spicy Cucumbers – LAURA D. REINA, Fred Breidt, Jr., and Henry P. Fleming, USDA-ARS, Raleigh, NC, USA

P12 Reduction of *Listeria monocytogenes* on Green Peppers (*Capsicum annuum*) by Gaseous and Aqueous Chlorine Dioxide and Water Washing, and Its Growth at Refrigerated Temperature – Y. HAN, R. H. Linton, P. E. Nelson, and S. S. Nielsen, Purdue University, West Lafayette, IN, USA

P13 Mold and Yeast Flora in Fresh Fruits – VALERIE TOURNAS, FDA, Washington, D.C., USA

P14 Improved Quality and Fumonisin Levels in Mexican Corn – H. Calderón, R. Márquez, A. Arias, S. D. PENA-BETANCOURT, and J. Saltijeral, Universidad Autonoma Metropolitana, Mexico City, Distrito Federal, Mexico

P15 Spread of *Listeria monocytogenes* during Preparation of Freshly Squeezed Orange Juice – N. E. MARTINEZ-GONZALES, A. Hernandez-Herrera, L. Martinez-Chavez, L. Mota de la Garza, and A. Castillo, University of Guadalajara, Guadalajara, Jalisco, Mexico

P16 Effects of pH and Temperature on Inactivation of *Escherichia coli* O157:H7 in a Model Apple Cider System – DIANNE R. RIPBERGER, Richard H. Linton, and John D. Floros, Purdue University, West Lafayette, IN, USA

P17 A Survey of Production Practices and Microbial Contamination in Iowa Apple Cider – ALECIA CUMMINS and Bonita Glatz, Iowa State University, Ames, IA, USA

P18 Elimination of *Escherichia coli* O157:H7 in Apple Cider by Electron Beam Irradiation – HUI WANG, Cheryll Reitmeier, and Bonita Glatz, Iowa State University, Ames, IA, USA

P19 Influence of Temperature on Inactivation of *Escherichia coli* O157:H7 and *Salmonella* in Apple Cider and Orange Juice Treated with Ozone – R. C. WILLIAMS, C. A. Lakins, D. A. Golden, and S. S. Sumner, University of Tennessee, Knoxville, TN, USA

P20 Chemical Inactivation of *Escherichia coli* O157:H7 and *Salmonella* spp. in Apple Cider and Orange Juice – C. A. LAKINS, D. A. Golden, and S. S. Sumner, University of Tennessee, Knoxville, TN, USA

P21 Survival of *Salmonella* in Calcium-fortified Orange Juice at Refrigeration Temperature – M. SHARMA, L. R. Beuchat, M. P. Doyle, and J. Chen, University of Georgia, Griffin, GA, USA

P22 Survival Differences of Enterohemorrhagic *Escherichia coli* O157:H7 Strains in Three Apple Varieties at 25° and 4°C – MARLENE E. JANES, Tajhma Cobbs, and Mike G. Johnson, University of Arkansas, Fayetteville, AR, USA

P23 Effect of Low-temperature, High-pressure Treatment on the Survival of *Escherichia coli* O157:H7 and *Salmonella* in Unpasteurized Fruit Juices – Alex Yeow-Lim Teo, SADHANA RAVISHANKAR, and Charles E. Sizer, The National Center for Food Safety and Technology, Summit-Argo, IL, USA

P24 Validation of Thermal Pasteurization Treatments for Commercial Apple Ciders Using *Escherichia coli* O157:H7 – P. MAK, S. C. Ingham, and B. H. Ingham, University of Wisconsin-Madison, Madison, WI, USA

P25 Inactivation of *Listeria monocytogenes* in Cinnamon-added Apple Juice – Josep Yuste and DANIEL Y. C. FUNG, Kansas State University, Manhattan, KS, USA

P26 Transmission and Internalization of *Escherichia coli* O157:H7 from Contaminated Cow Manure into Lettuce Tissue as Monitored By Laser Scanning Confocal Microscopy – ETHAN B. SOLOMON, Sima Yaron, and Karl R. Matthews, Rutgers University, Cook College, New Brunswick, NJ, USA

P27 Evaluation of Various Household Sanitizers for Eliminating *Escherichia coli* on Lettuce – CHITRA VIJAYAKUMAR and Charlene Wolf-Hall, North Dakota State University, Fargo, ND, USA

P28 Effectiveness of Water Rinse as a Means for Pathogen Recovery in Lettuce – TONG-JEN FU and Olif Vanpelt, FDA, Summit-Argo, IL, USA

P29 Simulation of an *Escherichia coli* O157:H7 Lettuce Outbreak in a Restaurant Setting: Survival of *E. coli* O157:H7 on and Contamination of Shredded Lettuce – MARIAN R. WACHTEL and Amy O. Charkowski, USDA-ARS-BARC-W-PQSL, Beltsville, MD, USA

P30 Changes in Appearance and Natural Microflora on Iceberg Lettuce Treated in Warm Chlorinated Water and Then Stored at Refrigeration Temperature – Y. LI, R. E. Brackett, R. L. Shewfelt, and L. R. Beuchat, University of Georgia, Griffin, GA, USA

P31 Comparison of Commercial Cleaners for Effectiveness in Removing *Salmonella* and *Escherichia coli* O157:H7 from the Surface of Apples – STEPHEN J. KENNEY and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P32 Destruction of *Escherichia coli* O157:H7 on Apples of Different Varieties Treated with Citric Acid before Drying – S. LAKKAKULA, P. A. Kendall, J. Samelis, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P33 Destruction of *Escherichia coli* O157:H7 during Drying of Apple Slices Pre-treated with Acidic Solutions after Inoculation – E. L. DERRICKSON, P. A. Kendall, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P34 The Localization and Persistence of Bacterial and Viral Contaminants on the Surface of Inoculated Cantaloupe and Their Response to Disinfection Treatments – MICHAEL L. BRADLEY, Jerzy Lukasik, Mark L. Tamplin, and Samuel R. Farrah, University of Florida, Gainesville, FL, USA

P35 Minimum Bacteriostatic and Bactericidal Concentrations of Various Household Sanitizers for *Escherichia coli* – CHITRA VIJAYAKUMAR and Charlene Wolf-Hall, North Dakota State University, Fargo, ND, USA

P36 The Bactericidal Effect of Chlorine Dioxide Treatment against *Salmonella* spp., *Escherichia coli* O157:H7, and *Listeria monocytogenes* Inoculated on Tomatoes and Carrots – I-HSUAN CHEN, J. Kim, T. S. Huang, D. E. Conner, S. J. Weese, F. M. Woods, and C. I. Wei, Auburn University, Auburn, AL, USA

P37 Enhancement of the Microbiological Quality of Selected Ready-to-eat Vegetables Disinfected by Chloramine, Chlorine, Ethanol, and Ozone – T. T. TRAN, J. I. Uwaleke, R. L. Thunberg, C. R. Warner, and S. J. Chirtel, FDA, Washington, D.C., USA

P38 Assessment of the Antibacterial Efficacy of Fruit and Vegetable Washes Using In-vitro and In-situ Methods – CHARLES A. PETTIGREW, Andrea B. Burnett, Larry R. Beuchat, E. Fernandez Escartín, Theresa M. Kajs, Russ D. Poehner, and Charles H. Taylor, The Procter & Gamble Company, Cincinnati, OH, USA

P39 Inactivation of Pathogenic Bacteria on Lettuce by Hydrogen Peroxide and Mild Heat – CHIA-MIN LIN, Sarah S. Moon, Kay H. McWatters, and Michael P. Doyle, University of Georgia, Griffin, GA, USA

P40 Comparison of Peptone Water and Dey-Engley Neutralizing Broth in Recovering Bacteria from the Surface of Fresh Produce Treated with Lactic Acid and Hydrogen Peroxide – CHIA-MIN LIN, Hannalore Bailey, Sarah S. Moon, and Michael P. Doyle, University of Georgia, Griffin, GA, USA

P41 Evaluation of Volatile Chemical Treatments for Lethality to *Salmonella* on Seeds and Sprouts – W. R. Weissinger, K. H. McWatters, and L. R. BEUCHAT, University of Georgia, Griffin, GA, USA

MONDAY AFTERNOON — AUGUST 6, 2001
1:30 p.m. — 5:00 p.m.

S05 Moving Beyond HACCP — Risk Management and Food Safety Objectives, Session II

(Sponsored by ILSI-N.A.)

- What are Food Safety Objectives and How do They Relate to Public Health Objectives? – R. BRUCE TOMPKIN, ConAgra Refrigerated Prepared Food, Downers Grove, IL, USA
- What Role Should Food Safety Objectives Play in the United States Food Industry and How Will They Affect the Way Industry Does HACCP? – DON L. ZINK, Future Beef Operations, LLC, Thousand Oaks, CA, USA
- What Role Should Food Safety Objectives Play in the Regulatory Process? – ROBERT L. BUCHANAN, FDA-CFSAN, Washington, D.C., USA
- An International Perspective on Food Safety Objectives – STEVE C. HATHAWAY, MAF Food Assurance Authority, Gisborne, New Zealand
- How Can We Educate the Public about Tolerable Level of Risk/Acceptable Level of Protection? – SUSAN SANTOS, Focus Group, Medford, MA, USA
- Panel Discussion

S06 USDA Competitive Grants in Food Safety and the Awards Process

- Enhancing Food Safety and Epidemiological Approaches to Food Safety (NRI) – ETTA SALTOS, USDA-CSREES, Washington, D.C., USA
- National Integrated Food Safety Initiative Grants (406) – JAN SINGLETON, USDA-CSREES, Washington, D.C., USA
- Initiative for Future Agriculture and Food Systems (401), RFP Formulation and Stakeholder's Input – DAMANNA RAMKISHAN RAO, USDA-CSREES, Washington, D.C., USA
- Awards Process: A Panel Manager's Perspective – SUSAN S. SUMNER, Virginia Tech., Blacksburg, VA, USA
- Winning Integrated Proposals: A Winner's Perspective – PATRICIA A. KENDALL, Colorado State University, Fort Collins, CO, USA
- Panel Discussion

S07 Food Safety in the Digital Age

- From Data to Knowledge Management – KAREN MULLERY, 3M Microbiology, St. Paul, MN, USA
- New and Emerging Information Technologies – JOHN GRIGGS, GSC Mobile Solutions, East Lansing, MI, USA
- From EpiInfo to FoodNet: Improving Surveillance and Outbreak Response – ARTHUR P. LIANG, CDC, Atlanta, GA, USA
- Meeting Regulatory Requirements for Electronic Record Keeping and Electronic Signatures (21 CFR 11) – JOHN LARKIN, FDA, Summit-Argo, IL, USA
- Emerging Technologies to Map and Mitigate Biocontaminatants – RICK BRENNER, USDA-ARS-CMAVE, Gainesville, FL, USA
- Using Information Technology to Make Better Business Decisions – MARK CARTER, McKee Foods, Collegedale, TN, USA
- Kraft Takes a Byte Out of Food Safety – LORI LEDENBACH, Kraft Foods, Glenview, IL, USA

S08 Dairy Plant HACCP — Where are We and Where are We Going?

(Sponsored by Foss North America)

- Outline of HACCP Pilot Program – WILLIAM SVEUM, Kraft Foods, Madison, WI, USA
- Evaluation of Pilot at Present and Long-term Goals – SUSAN CRAWFORD, Michigan Dept. of Agriculture, East Lansing, MI, USA
- Overview of HACCP Pilot Results – JOHN RUSHING, North Carolina State University, Raleigh, NC, USA
- First Hand HACCP Pilot Experience – REBECCA PISTON, Gerelick Farms, Bangor, ME, USA
- What Happens to PMO with HACCP (SSOP's and HACCP Pilot) – STEVE SIMS, FDA, Milk Safety Branch, Washington, D.C., USA
- FDA Juice HACCP Regulations Versus NCIMS Dairy Pilot Program – KATHY GOMBAS, FDA, Division of HACCP, Washington, D.C., USA
- Panel Discussion

T02 General Food Microbiology

T13 A Microbial Survey of Toilet Paper and Associated Performance Variables Related to Its Role in Reducing Communicable Disease Transmission – BARRY MICHAELS, Marlene Celis, Troy Ayers, and Vidhya Gangar, Georgia-Pacific Corporation, Palatka, FL, USA

T14 Evaluation of the Combined Effects of Selective Handwashing Water Temperatures and Antimicrobial Soaps on Microbial Reduction Efficacy and Skin Irritation – BARRY MICHAELS, James Budd, Troy Ayers, Christopher Beausoliel, and Daryl Paulson, Georgia-Pacific Corporation, Palatka, FL, USA

T15 Application of Real Time Temperature Monitoring for Food Safety and Quality Manangement in Food Retail – ALAN CAMERICK HELLER, Bruce Cords, and Meto Raha, FreshLoc Technologies, Inc., Plano, TX, USA

T16 A Microbial Survey of Household Can Openers, Food and Beverage Can Tops, and Cleaning Methodology Effectiveness – Barry Michaels, Vidhya Gangar, Ann Schultz, Michael S. Curiale, and TROY AYERS, Ayers Hygiene Consulting, Gainesville, FL, USA

T17 Inhibitory Activity of Honey against Foodborne Pathogens as Influenced by the Presence of Hydrogen Peroxide and Level of Antioxidant Power – PETER J. TAORMINA, Brendan A. Niemira, and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

T18 Sensitization of Gram-negative Bacteria for Antimicrobial Peptides under High Hydrostatic Pressure: Role of Cell Surface Characteristics – BARBARA MASSCHALCK and Christiaan W. Michiels, Catholic University of Leuven, Leuven, Belgium

T19 Protective Effect of Colanic Acid of *Escherichia coli* O157:H7 to Environmental Stress – Y. Mao, S. M. Lee, J. G. Adams, M. P. Doyle, and J. CHEN, University of Georgia, Griffin, GA, USA

T20 Bactericidal Activity of Oleate Towards Vegetative Cells and Endospores of *Clostridium perfringens* – ARTHUR HINTON, JR. and Kimberly D. Ingram, USDA-RRC, Athens, GA, USA

T21 Validating Sanitation Regimes in Drink-vending and Post-mix Systems – J. BARON, L. F. Fielding, and A. Peters, University of Wales Institute, Cardiff, Cardiff, UK

T22 Providing Safe Food for the Homeless and Destitute: An Educational Program for Soup Kitchen Workers – DONNA L. SCOTT and Robert B. Gravani, Cornell University, Ithaca, NY, USA

T23 Microbiological Survey of Hot-air Hand Dryers from Various Locations – BARRY MICHAELS, Armondo D'Onorio, Maria Arenas, Marlene Cellis, and Vidhya Gangar, Georgia-Pacific Corporation, Palatka, FL, USA

T24 Pathogenic and Indicator Bacteria Associated with Handwashing and Drying Contact Surfaces – BARRY MICHAELS, Brian Smith, and Merle Pierson, Georgia-Pacific Corporation, Palatka, FL, USA

P02 Meat Microbiology

3:00 p.m. – 6:00 p.m.
(Authors present 3:30 p.m. – 5:30 p.m.)

P42 Inhibition of *Listeria monocytogenes* on Turkey Frankfurters by Carbon Dioxide and Chemical Additives – J. A. GOODE, M. D. Pierson, S. S. Sumner, and J. E. Marcy, Virginia Tech., Blacksburg, VA, USA

P43 Inhibition of *Listeria monocytogenes* by Sodium Diacetate and Sodium Lactate on Wieners and Cooked Bratwurst – KATHLEEN A. GLASS, Dawn A. Granberg, Angelique L. Smith, and Eric A. Johnson, University of Wisconsin-Madison, Madison, WI, USA

P44 Radiation Resistance of *Listeria monocytogenes* Isolated from Frankfurters – CHRISTOPHER H. SOMMERS, USDA-ARS-NAA-ERRC-FS, Wyndmoor, PA, USA

P45 Control of *Listeria monocytogenes* on Turkey Frankfurters by GRAS Preservatives – MAHBUB ISLAM, Michael P. Doyle, Jinru Chen, and Manjeet Chinnan, University of Georgia, Griffin, GA, USA

P46 Effect of Antimicrobials in the Formulation and Post-packaging Thermal Pasteurization on *Listeria monocytogenes* Inoculated on Frankfurters after Peeling – G. BEDIE, J. Samelis, J. N. Sofos, K. E. Belk, J. A. Scanga, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P47 Treatments to Control Post-processing Contamination by *Listeria monocytogenes* on Sliced Pork Bologna Stored at 4°C in Vacuum Packages – M. L. Kain, J. Samelis, J. N. SOFOS, K. E. Belk, J. A. Scanga, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P48 Combinations of Nisin with Organic Acids or Salts to Control Post-processing Contamination of *Listeria monocytogenes* on Sliced, Vacuum Packaged Pork Bologna at 4°C – J. SAMELIS, M. L. Kain, J. N. Sofos, J. A. Scanga, K. E. Belk, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P49 Fate of Acid-adapted and Non-adapted *Listeria monocytogenes* on Fresh Beef Following Acid and Non-acid Decontamination Treatments – J. S. IKEDA, J. Samelis, P. A. Kendall, G. C. Smith, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P50 Lactic Acid Sensitization of *Salmonella* Typhimurium DT 104 and *Listeria monocytogenes* in Non-acid (Water) Meat Decontamination Fluids at 10°C – J. SAMELIS, J. N. Sofos, P. A. Kendall, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P51 Biofilm Formation by Acid-adapted and Non-adapted *Listeria monocytogenes* in Fresh Meat Decontamination Washings and Its Destruction by Sanitizers – J. D. STROPFORTH, J. Samelis, J. N. Sofos, P. A. Kendall, G. C. Smith, Colorado State University, Fort Collins, CO, USA

P52 Inactivation of *Listeria monocytogenes* in Packaged Hot Dogs and Luncheon Meats by High Pressure Processing (HPP) – P. J. Slade, C. Martino, S. Ravishankar, N. MAKS, C. Rodriguez, O. Martin, and V. M. (Bala) Balasubramaniam, Illinois Institute of Technology, Summit-Argo, IL, USA

P53 Survival of *Salmonella* spp. and *Listeria monocytogenes* during Manufacture of Italian Salami – K. D. KERR, H. Thippareddi, R. K. Phebus, J. L. Marsden, and C. L. Kastner, Kansas State University, Manhattan, KS, USA

P54 *Salmonella* spp. Risk Assessment for Production and Cooking of Non-intact Pork Products – D.L. LAMBERT, R. K. Phebus, H. Thippareddi, J. L. Marsden, and C. L. Kastner, Kansas State University, Manhattan, KS, USA

P55 Biofilm Development by *Listeria monocytogenes* under Ready-to-eat Meat Processing Conditions and a Control Strategy Using Cold Plasma Technology – EILEEN B. SOMERS and Amy C. L. Wong, University of Wisconsin-Madison, Madison, WI, USA

P56 Enhanced Inhibition of *Listeria monocytogenes* and *Salmonella enterica* Serovar Enteritidis in Beef Bologna by Combinations of Lactate and Diacetate – EVELYNE MBANDI and Leora A. Shelef, Wayne State University, Detroit, MI, USA

P57 Survival and Recovery of *Listeria monocytogenes* on Ready-to-eat Meats Inoculated Using Desiccated and Nutritionally Depleted Vectors – M. A. DE ROIN, S. C. C. Foong, and J. S. Dickson, Iowa State University, Ames, IA, USA

P58 Post-process Pasteurization of Packaged Ham, Roast Beef, and Turkey Breast Surfaces to Reduce *Listeria monocytogenes* – VINEET S. GILL, H. Thippareddi, R. K. Phebus, J. L. Marsden, and C. L. Kastner, Kansas State University, Manhattan, KS, USA

P59 Post-process Pasteurization of Kielbasa (Full and Half) and Salami to Reduce Surface *Listeria monocytogenes* – VINEET S. GILL, H. Thippareddi, R. K. Phebus, J. L. Marsden, and C. L. Kastner, Kansas State University, Manhattan, KS, USA

P60 Inhibition of *Listeria monocytogenes* by Sodium Diacetate and Potassium Lactate in Cured, Ready-to-eat Processed Meat Products at Refrigerated Temperatures – D. L. Seman, A. C. BORGER, J. D. Meyer, A. L. Milkowski, and P. A. Hall, Kraft Foods/Oscar Mayer Div., Madison, WI, USA

P61 Application of the Bacteriocinogenic *Lactobacillus sake* 2a to Prevent Growth of *Listeria monocytogenes* in Brazilian Sausage (Lingüiça Frescal) Packed with Different Atmospheres – Alcina M. Liserre and BERNADETTE D. G. FRANCO, Universidade de Sao Paulo, Sao Paulo, Sao Paulo, Brazil

P62 The Presence of *Campylobacter* and *Salmonella* in Retail Poultry and Packaging – WENDY HARRISON, Chris Griffith, David Tennant, and Adrian Peters, University of Wales Institute, Cardiff, Cardiff, Wales, UK

P63 PCR-based Fluorescent Method for Rapid Detection of *Campylobacter jejuni* and *Salmonella* Typhimurium in Poultry Samples – HONG WANG, Yanbin Li, Michael Slavik, and Jianming Ye, University of Arkansas, Fayetteville, AR, USA

P64 Determination of Critical Control Points (CCPs) at Poultry Slaughterhouses in Korea – WONKI BAE, Ji Yeon Kim, Keun Seok Seo, Hye Cheong Koo, Soo Jin Yang, So Hyun Kim, Nam Hoon Kwon, Ji Yeun Lim, and Yong Ho Park, Seoul National University, Suwon, Republic of Korea

P65 Antimicrobial Effect of Electrolyzed Water for Inactivating *Campylobacter jejuni* during Poultry Washing – HOON PARK, Yen-Con Hung, and Robert E. Brackett, University of Georgia, Griffin, GA, USA

P66 Mucosal Humoral Immunity to Experimental *Salmonella* Enteritidis Infection in Chickens – K. H. SEO, P. S. Holt, H. D. Stone, C. Green, and R. K. Gast, USDA-ARS, Southeast Poultry Research Laboratory, Athens, GA, USA

P67 Bacterial Survival, Moisture Content, and Soluble Proteins in Chicken Patties Processed by an Air Impingement Oven – R. Y. MURPHY, L. K. Duncan, E. R. Johnson, and M. D. Davis, University of Arkansas, Fayetteville, AR, USA

P68 Kinetic Parameters for Thermal Inactivation of *Salmonella* spp. in Commercially Formulated Chicken Patties and Franks – R. Y. MURPHY, E. R. Johnson, and M. D. Davis, University of Arkansas, Fayetteville, AR, USA

P69 Incidence of *Clostridium perfringens* in an Integrated Broiler Chicken Operation from Breeder Farm to the Fully-processed Product – S. E. CRAVEN, N. A. Cox, N. J. Stern, and J. S. Bailey, USDA-ARS-RRC, Athens, GA, USA

P70 *Clostridium perfringens* Levels in Cooked and Uncooked Meat and Poultry Products – ROBIN M. KALINOWSKI, Peter Bodnaruk, and R. Bruce Tompkin, ConAgra Refrigerated Prepared Foods, Downers Grove, IL, USA

P71 Evaluation of the MicroFoss System for Enumeration of Total Viable Organisms, *Escherichia coli*, and Coliforms in Ground Beef – JOSEPH ODUMERU and Jennifer Belvedere, University of Guelph, Guelph, Ontario, Canada

P72 Gel Peroxygens as Barrier and Treatment Systems for Beef Carcasses – Charles J. Giambrone and CRYSTAL J. NESBITT, FMC Corp., Princeton, NJ, USA

P73 Comparison of Methods for the Isolation of *Escherichia coli* O157:H7 from Ground Beef – WENDY LEEPER, Ann Schultz, Katie Vandre, Carol Gravens, Ronald Johnson, and Pat Rule, Silliker Laboratories Research, South Holland, IL, USA

P74 *Escherichia coli* O157:H7 Risk Assessment for the Production and Cooking of Restructured Beef Steaks – M.T. ORTEGA-VALENZUELA, R. K. Phebus, H. Thippareddi, J. L. Marsden, and C.L. Kastner, Kansas State University, Manhattan, KS, USA

P75 *Escherichia coli* O157:H7 Maintains Acid Tolerance in Acid-containing but not in Nonacid-containing Fresh Meat Decontamination Waste Fluids – J. SAMELIS, J. N. Sofos, P. A. Kendall, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P76 Food Safety: Consumer Views of Public Versus Private Interventions Related to Meat Processing – Christiane Schroeter, KAREN P. PENNER, and Sean Fox, Kansas State University, Manhattan, KS, USA

P77 The Incidence of *Salmonella* spp. and Biotype 1 *Escherichia coli* on Swine Carcasses Processed under the HACCP-based Inspection Models Project – MARK L. TAMPLIN, Ingrid Feder, Samuel A. Palumbo, Alan Oser, Lisa Yoder, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P78 Vero Cell Assay for Detection of Cytoplasmic Vacuolation by *Arcobacter* spp. Isolated from Meat – A. Villarruel-Lopez, L. Garay-Martinez, R. Torres-Vitela, E. CABRERA-DIAZ, E. Murano, and L. Mota de la Garza, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico

P79 Validation and Use of Alkaline Phosphatase Reduction as an Indicator for Meat Cooking Efficiency – E. C. REDMOND, C. J. Griffith, and A. C. Peters, University of Wales Institute, Cardiff, Cardiff, South Wales, UK

P80 Isolation of Shiga Toxin-producing *Escherichia coli* in Cattle Manure after a Passive Treatment – E. CABRERA-DIAZ, M. Marquez-Gonzalez, F. Sandoval-Garcia, H. M. Zepeda-Lopez, and M. R. Torres-Vitela, University of Guadalajara, Guadalajara, Jalisco, Mexico

P81 Survival of *Escherichia coli* O157:H7 in Cow Manure-amended Soil – X. P. JIANG, J. M. Morgan, and M. P. Doyle, University of Georgia, Griffin, GA, USA

P82 Seasonal Occurrence of *Campylobacter* in Dairy Cattle and Their Environment – WILLIE TAYLOR, Ann Draughon, David Golden, Stephen Oliver, and Michelle Saul, University of Tennessee, Knoxville, TN, USA

P83 Sampling of the Dairy Farm Environment for *Listeria monocytogenes* – VALERIE W. LING, Matthew R. Evans, F. Ann Draughon, and Stephen P. Oliver, University of Tennessee, Knoxville, TN, USA

P84 Comparison of Multiplex, ELISA and 5' Nuclease PCR Assays for Detection of Plasmid-bearing Virulent *Yersinia enterocolitica* in Pig Feces – SAUMYA BHADURI and Bryan Cottrell, USDA-ARS-ERRC, Wyndmoor, PA, USA

TUESDAY MORNING — AUGUST 7, 2001
8:30 a.m. — 12:00 p.m.

S09 Joint FAO/WHO Initiative on Microbial Risk Assessment

(Sponsored by IAFP Foundation Fund)

- Overview of the FAO/WHO Process – JURGEN SCHLUNDT, WHO, Food Safety Program, Geneva, Switzerland
- Exposure Assessment of *Salmonella* spp. in Broilers – LOUISE KELLY, Veterinary Laboratories Agency, Weybridge, Surry, UK
- Exposure Assessment of *Salmonella* Enteritidis in Eggs – FUMIKO KASUGO, National Institute of Infectious Diseases, Shinjuku-Ku, Tokyo, Japan

- Hazard and Risk Characterization of *Salmonella* – AAMIR FAZIL, Health Canada, Guelph, Ontario, Canada
- Exposure Assessment of *Listeria monocytogenes* in Ready-to-eat Meat and Fish – TOM ROSS, University of Tasmania, Hobart, Tasmania, Australia
- Exposure Assessment of *Listeria monocytogenes* in Dairy Products – EWEN TODD, Michigan State University, East Lansing, MI, USA
- Hazard and Risk Characterization of *Listeria monocytogenes* – ROBERT L. BUCHANAN, FDA-CFSAN, Washington, D.C., USA

S10 Organic Foods: Unique Characteristics and Growth Potential

(Sponsored by IAFP Foundation Fund)

- The Unique Characteristics of Organic Production – JIM RIDDLE, Organic Inspection Association, Winona, MN, USA
- What Organic Means in the Produce Industry – CRAIG WEAKLEY, Small Planet Foods, Sedro Woolley, WA, USA
- Organic Dairy Products, Production and Quality Characteristics – PAM RIESGRAF, Organic Valley, LaFarge, WI, USA
- Chemical Safety Issues in Organic Production – CARL WINTER, University of California-Davis, Davis, CA, USA
- Microbiological Safety Issues in Organic Production – MICHAEL P. DOYLE, University of Georgia, Griffin, GA, USA
- International Organic Market: Standards and Potential – DIANE BOWEN, Crop Improvement Association, International, Milwaukee, WI, USA

S11 Indicator Microorganisms — What do They Indicate, and is It of Any Use?

- Practical Applications of Indicator Organisms in Poultry Processing – MIKE ROBACH, Wayne Farms LLC, Gainesville, GA, USA
- Use of Indicator Organism Testing in the Food Industry: Rationale and Examples – ANN MARIE MCNAMARA, Sara Lee Foods, Cordova, TN, USA
- FDA and Indicator Organisms: Which, Where, and Why? – ROBERT E. BRACKETT, FDA, Washington, D.C., USA
- The New Zealand National Microbiological Database HACCP Verification Program – ROGER COOK, Ministry of Agriculture and Forestry, Wellington, New Zealand
- Is There a Relationship between Microbial and Non-microbial Indicators of Fecal Contamination and Fecal Bacteria – GREG SIRAGUSA, USDA-ARS-RRC, Athens, GA, USA
- How Much is That Sample in the Window? Application of Value-of-information Techniques to Evaluate and Compare Sampling Strategies – GREG PAOLI, Decisionalysis Risk Consultants, Inc., Ottawa, Ontario, Canada

S12 Ensuring the Quality and Safety of Extended Shelf-Life Milk Products

- The Essentials of Extended Shelf-Life (ESL) Processing – CHUCK SIZER, National Center for Food Safety and Technology, Summit-Argo, IL, USA
- Validation of Safety Control and Packaging Systems in ESL Processing – JEAN DELISI, Tetra Rex, Inc., Minneapolis, MN, USA
- Quality Assurance of ESL Products – From Plant to Consumer – ROGER HOOI, Dean Foods, Rockford, IL, USA
- Regulatory Perspective of ESL Processing and Products – JOSEPH SMUCKER, FDA, Washington, D.C., USA
- Overview of NCFST's ESL Dairy Products Task Force – PETER J. SLADE, National Center for Food Safety and Technology, Summit-Argo, IL, USA
- International Perspective of ESL Processing and Products – CHUCK SIZER, National Center for Food Safety and Technology, Summit-Argo, IL, USA

T03 Microbiological Methods

T25 An Improved Transport Medium for the Preservation and Recovery of *Listeria monocytogenes* in Plant Environmental Samples – MICHAEL C. CIRIGLIANO and Raymond T. McKenna, Lipton, Cresskill, NJ, USA

T26 Comparison of a New ELISA-based Method and a Molecular Method for the Detection of *Listeria monocytogenes* in Food – PATRICE ARBAULT, Marie-Laure Sorin, Pascal Faraut, and Arnaud Carlotti, Diffchamb S.A., Lyon, France

T27 Evaluation of a Next-day PCR Method for Detection of *Listeria monocytogenes* in Foods – George Tice, W. MARK BARBOUR, Willie Hudson, Bridgette Andaloro, and Angeline Stoltzfus, Qualicon, Inc., Wilmington, DE, USA

T28 *Campylobacter* Detection in Food Using an ELISA-based Method – Marie-Laure Sorin, Sandrine Rougier, Cécile Wicker, Magali Giordano, and PATRICE ARBAULT, Diffchamb S.A., Lyon, France

T29 A Comparison of the Survival Rates of *Campylobacter jejuni* under Varying Organic Loads and Food Contact Surfaces – Alessandra De Cesare and BRIAN W. SHELDON, North Carolina State University, Raleigh, NC, USA

T30 Comparison of Polymerase Chain Reaction Primer Sets Designed to Detect *Salmonella* Enterica – AMY O. CHARKOWSKI, Eric S. Jackson, Jeri Barak, Robert E. Mandrell, and Michael Delwiche, USDA-ARS, Albany, CA, USA

T31 Factors That Influence the Recovery of *Escherichia coli* O157:H7 after an Acid Shock – Yildiz Karaibrahimoglu and FRANCISCO DIEZ-GONZALEZ, University of Minnesota, St. Paul, MN, USA

T32 Development of a Digital Database of Lactic Acid Bacteria in Europe – Maija-Liisa Suihko, Erko Stackebrandt, Bruno Pot, Martine Alliot, Timothy R. Dambaugh, JAMES L. BRUCE, and Annick Mercenier, Qualicon, Inc., Wilmington, DE, USA

T33 The Risks of Using Data Loggers to Monitor Average Temperature Exposures – JOHN A. SPEVACEK, Ph.D, 3M Microbiology Products, St. Paul, MN, USA

T34 An Evaluation of Surface Hygiene Monitoring Techniques for Use in the Food Industry – GINNY MOORE, Chris Griffith, and Louise Fielding, University of Wales Institute, Cardiff, Cardiff, UK

T35 Detection of Hepatitis A Virus in a Complex Food: Strawberry Frosting Mix – THERESA L. CROMEANS, Mark D. Sobsey, and Harold S. Margolis, CDC, Atlanta, GA, USA

T36 Development of PCR Primers for Detection of Prolific Histamine Former, *Morganella morganii* – SHIN-HEE KIM, Haejung An, Cheng-I Wei, and Thomas P. Pitta, Auburn University, Auburn, AL, USA

P03 General Food Microbiology and Methods

10:00 a.m. – 1:00 p.m.
(Authors present 10:30 a.m. – 12:30 p.m.)

P85 Antimicrobial Spectrum of Thymol, Eugenol, Potassium Sorbate and Sodium Benzoate at Selected pHs – R. Astorga-Solari, A. Santiesteban-López, E. Palou, and A. LOPEZ-MALO, Universidad de las Americas-Puebla, Cholula, Puebla, Mexico

P86 Rope Spoilage in Bread and Its Control by Natural Antimicrobials – Tracey-Lee Botes and ALEX VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P87 Antimycotic Activity of Vanillin in Combination with Selected Antimicrobial Agents – A. LOPEZ-MALO, S. M. Alzamora, and E. Palou, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

P88 Reduction of Aflatoxins by Korean Soybean Paste and Its Effect on Cytotoxicity and Reproductive Toxicity: Antigenotoxic Effect of the Methanol Extract of Korean Soybean Paste on Aflatoxin B1-induced Bacterial Reverse Mutation and Chromosome Aberration – KIM JONG-GYU, Lee Yong-Wook, and Shintani Hideharu, Keimyung University, Dalseo-gu, Taegu, Korea

P89 Performance of Mycological Media for Supporting Colony Formation by Desiccated Food Spoilage Yeasts: An Inter-laboratory Study – L. R. BEUCHAT, E. Frandberg, T. Deak, S. M. Alzamora, J. Chen, S. Guerrero, A. Lopez-Malo, I. Ohlsson, M. Olsen, J. M. Pienado, J. Schnurer, M. I. de Siloniz, and J. Tornai-Lehoczhi, University of Georgia, Griffin, GA, USA

P90 SimPlate for Yeast and Mold – Color Indicator: A New Method for Rapid Enumeration of Fungi in Food – DAVID E. TOWNSEND, Linda Mui, Drew Lienau, Stephanie Leung, Donna Gallagher, and Phil Feldsine, BioControl Systems, Inc., Bellevue, WA, USA

P91 Detection of Antifungal Activity of *Lactobacillus rhamnosus* and *Bacillus pumilus* Using a Milk Agar Plate Assay – JITKA STILES, Shilpa Penkar, Milada Plockova, Jana Chumchalova, and Lloyd B. Bullerman, University of Nebraska-Lincoln, Lincoln, NE, USA

P92 Reduction of Aflatoxins by Korean Soybean Paste and Its Effect on Cytotoxicity and Reproductive Toxicity: Inhibitory Effect of Korean Soybean Paste on the Aflatoxin Toxicity in Laying Hens – JONG-GYU KIM, Yong-Wook Lee, Pan-Gyi Kim, Woo-Sup Roh and Hideharu Shintani, Keimyung University, Dalseo-gu, Taegu, Korea

P93 *Aspergillus flavus* Radial Growth Rate and Lag Time as Affected by Natural and Synthetic Antimicrobial Agent Concentrations – A. López-Malo, E. Palou, and S. M. ALZAMORA, Universidad de Buenos Aires, Capital Federal, Buenos Aires, Argentina

P94 Hurdle Technology and *Aspergillus flavus* Time-to-growth – A. López-Malo, E. PALOU, S. M. Alzamora, and P. M. Davidson, Universidad de las Americas-Puebla, Cholula, Puebla, Mexico

P95 Survival and Growth of *Salmonella* in Reconstituted Infant Cereal Hydrated with Water, Milk, or Apple Juice – A. A. ABUSHELAIBI, J. Samelis, P. A. Kendall, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P96 Evaluation of Liquid Egg White Pasteurization Guidelines for *Salmonella* – DIANNE L. PETERS, Glenn W. Froning, and Mindy M. Brashears, University of Nebraska-Lincoln, Lincoln, NE, USA

P97 New Easy-to-read, Quantitative Method for *Escherichia coli* Testing in Foods – KAREN HESSELROTH, Francoise Horriere, Barbara Horter, and Katheryn Lindberg, 3M Microbiology Products Department, St. Paul, MN, USA

P98 Inhibitory Activity of *Bifidobacterium longum* HY8001 against Verocytotoxin of *Escherichia coli* O157:H7 – S. H. KIM, S. J. Yang, H. C. Koo, W. K. Bae, J. Y. Kim, J. H. Park, Y. J. Back, and Y. H. Park, Seoul National University, Suwon, Republic of Korea

P99 Effect of Glucose Supplementation on Growth and Acid Tolerance of *Escherichia coli* O157:H7 in Pure and Mixed Cultures with a *Pseudomonas* spp. at 10°C – J. SAMELIS, J. N. Sofos, J. S. Ikeda, P. A. Kendall, and G. C. Smith, Colorado State University, Fort Collins, CO, USA

P100 Influence of Process Parameters on the Lethality of *Escherichia coli* O157:H7 during Pulsed Electric Fields Processing – K. THANT, V. M. Balasubramaniam, and S. Ravishankar, Illinois Institute of Technology, Summit-Argo, IL, USA

P101 Detex for Detection of *Escherichia coli* O157 in Raw Ground Beef and Raw Ground Poultry – Wendy F. Lauer, Nandini Natrajan, and YVETTE M. HENRY, Molecular Circuitry, Inc, King of Prussia, PA, USA

P102 Resuscitation and Growth of Heat- and Freeze-injured *Escherichia coli* O157:H7 in Selective Enrichment Broths – LAWRENCE RESTAINO, Elon W. Frampton, and Hans Spitz, R & F Laboratories, West Chicago, IL, USA

P103 Changes in Thermal Sensitivity Resulting from pH and Nutritional Shifts of Acid-adapted and Non-acid-adapted *Listeria monocytogenes* Scott A, a Serotype 4b Strain – DARRELL O. BAYLES and Stacy R. Raleigh, USDA-ARS-ERRC, Wyndmoor, PA, USA

P104 Comparison of Predictive Models for a 4-log Thermal Reduction of *Listeria monocytogenes* when Growth Conditions Differed – A. T. Chhabra, R. H. Linton, W. H. Carter, and M. A. COUSIN, Purdue University, West Lafayette, IN, USA

P105 Thermal Inactivation Studies of *Listeria monocytogenes* Strains Belonging to Three Distinct Genotypic Lineages – A. J. DE JESUS and R. C. Whiting, FDA-CFSAN, Washington, D.C., USA

P106 Cycloheximide Replacement in Campy-line Agar for *Campylobacter* Enumeration – J. ERIC LINE, USDA-ARS-RRC, Athens, GA, USA

P107 Detex for the Detection of *Campylobacter* in Raw and Cooked Poultry – YVETTE M. HENRY, Wendy F. Lauer, and Sharon L. Brunelle, Molecular Circuitry Inc., King of Prussia, PA, USA

P108 Survival and Thermotolerance of *Campylobacter jejuni* in Liquid Foods: Effects of Temperature and Presence of *Escherichia coli* and *Pseudomonas fluorescens* – ORLA M. CLOAK and Pina M. Fratamico, USDA-ARS-ERRC, Wyndmoor, PA, USA

P109 Effectiveness of Selected Chemical Sanitizers against *Campylobacter jejuni* containing Biofilms – NATHANON TRACHOO and Joseph F. Frank, University of Georgia, Athens, GA, USA

P110 Heat Shock Enhances Acid Tolerance of *Shigella flexneri* – GLORIA L. TETTEH and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P111 Effect of Organic Acids and Temperature on Survival of *Shigella flexneri* in Broth – LAURA L. ZAIKA, USDA-ARS-ERRC, Wyndmoor, PA, USA

P112 Response of Food Spoilage *Bacillus* spp. to Three Acid-based Sanitizers – M. Esther Peta, Denise Lindsay, Volker S. Brozel, and ALEX VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P113 Presence of Toxigenic *Bacillus* in Cup Drinks from Automatic Vending Machines on the Street – JONG-HYUN PARK, J. Y. Shin, S. J. Lee, Y. A. Kwon, and C. Mok, Kyungwon University, Songnam-shi, Kyonggi-Do, Republic of Korea

P114 Monte Carlo Simulation of the Influence of Spore Inoculum Size on *Clostridium botulinum* Germination and Growth – LIHUI ZHAO, Thomas J. Montville, and Donald W. Schaffner, Rutgers University, New Brunswick, NJ, USA

P115 Estimation of Bacterial Cell Counts in Foods Using an Oxygen Electrode Sensor – YOSHIHISA AMANO, Jun-ichiro Arai, Shunsuke Yamanaka, Kenji Isshiki, Daikin Environmental Laboratory, Ltd., Tsukuba-shi, Ibaraki, Japan

P116 Rapid Detection of *Listeria monocytogenes* without DNA Extraction from Foods Using Polymerase Chain Reaction – D. H. OH, S. Y. Cho, Y. C. Choi, and B. K. Park, Kangwon National University, Chunchon, Kangwon, Korea

P117 PCR Detection of *Listeria monocytogenes* on Hot Dog Using Oligonucleotide Primers Targeting the Genes Encoding Internalin AB – Y. S. JUNG, J. F. Frank, R. E. Brackett, and J. Chen, University of Georgia, Griffin, GA, USA

P118 Inactivation of Hepatitis A Virus by a Dynamic High Pressure Treatment – JULIE JEAN, Jean-François Vachon, André Darveau, and Ismaïl Fliss, Laval University, Quebec, Quebec, Canada

P119 Handwashing Practices in United Kingdom Nursing Homes – DEBORAH CLAYTON, Christopher Griffith, Adrian Peters, and Patricia Price, University of Wales Institute, Cardiff, Cardiff, South Wales, UK

P120 Assessment and Variability of Cleaning Practices of United Kingdom Consumers, Using Observation, ATP, and Microbiological Assessment – E. C. REDMOND, C. J. Griffith, and A. C. Peters, University of Wales Institute, Cardiff, Cardiff, South Wales, UK

P121 Kansas Food*A*Syst: Self-assessment Tools for Determining Risks to Food Safety during Production and Home Preparation – JUDY M. WILLINGHAM and Karen P. Penner, Kansas State University, Manhattan, KS, USA

P122 Effect of Ozonated Water on the Assimilable Organic Carbon and Coliform Growth Response Values and on Pathogenic Bacteria Survival – KATHLEEN T. RAJKOWSKI and Eugene Rice, USDA-ARS-ERRC, Wyndmoor, PA, USA

P123 Adaptative Acid Tolerance Response in *Vibrio parahaemolyticus* and *V. vulnificus* – JAHEON KOO and Michael Jahncke, Virginia Seafood Agricultural Research and Extension Center, Hampton, VA, USA

P124 Thermotolerance of Coagulase-negative *Staphylococci* and Their Potential Use as Indicators of Cheese Plant Sanitation – KOLE A. EWOLDT and Steven C. Ingham, University of Wisconsin-Madison, Madison, WI, USA

P125 Protecting the United States Food Supply in a Global Economy: An Expert Gap Analysis – PAUL A. HALL, La Salle University, Mundelein, IL, USA

TUESDAY AFTERNOON — AUGUST 7, 2001
1:30 p.m. — 5:00 p.m.

General Session — (1:30 p.m. — 3:30 p.m.)

S13 Irradiation Pasteurization: Realizing the Food Safety Potential
(Sponsored by IAFP Foundation Fund)

- Potential Impact of Irradiation on Reducing Foodborne Illness in the United States – ROB TAUXE, CDC, Atlanta, GA, USA
- Safety, Nutritional Adequacy and the Status of Irradiated Foods: International Perspective – FRITZ KAFERSTEIN, FDA-USDA, Washington, D.C., USA
- Food Irradiation – The Clear and Simple Facts – PAT ADAMS, IBA Advanced Applications, Memphis, TN, USA
- Expanding Consumers Food Safety Choices – The Minnesota Experience – ROD CHURCH, Minnesota Dept. of Health, Minneapolis, MN, USA
- Putting Irradiated Food on Supermarket Shelves – Experiences of a Leader in the Retail Industry – MICHAEL WRIGHT, Supervalu and Cub Food Stores, Minneapolis, MN, USA
- Legal Issues with Foods in General and Irradiated Food Specifically – WILLIAM MARLER, Marler Clark Attorneys at Law, Seattle, WA, USA

Business Meeting (4:00 p.m. — 5:00 p.m.)

WEDNESDAY MORNING — AUGUST 8, 2001
8:30 a.m. — 12:00 p.m.

S14 *Mycobacterium paratuberculosis* — Villain or Bystander?
(Sponsored by ILSI-N.A.)

- The Evidence for and against the Association of *Mycobacterium paratuberculosis* with Human Crohn's Disease – R. BALFOUR SARTOR, University of North Carolina, Chapel Hill, NC, USA
- The Etiology of Bovine Paratuberculosis and On-farm Management Strategies – SCOTT J. WELLS, University of Minnesota, St. Paul, MN, USA
- Ecological and Physical Characteristics of *Mycobacterium paratuberculosis* – MICHAEL COLLINS, University of Wisconsin-Madison, Madison, WI, USA
- Methodology for Detecting *Mycobacterium paratuberculosis* in Food Products – JUDITH R. STABEL, USDA-ARS, Ames, IA, USA

- Detection of *Mycobacterium paratuberculosis* in Retail Milk in the United Kingdom: Analysis and Perspectives – NORMAN A. SIMMONS, Guy's and St. Thomas' Hospital Trust, London, UK
- Panel Discussion

S15 Zero Tolerance: Boon or Bust?

- An Overview of Zero Tolerance as a Regulatory Policy – LYNN MCMULLEN, University of Alberta, Edmonton, Alberta, Canada
- An Industry View of Zero Tolerance – DANE BERNARD, National Food Processors Association, Washington, D.C., USA
- Applications and Problems Associated with Zero Tolerance for *Escherichia coli* O157:H7 in Beef Products – DEAN DANILSON, IBP World Headquarters, Dakota Dunes, SD, USA
- Public Health and Regulatory Perspectives on Zero Tolerance – I. KAYE WACHSMUTH, USDA-FSIS, Washington, D.C., USA
- A Canadian Perspective on Zero Tolerance – JEFF FARBER, Health Canada, Ottawa, Ontario, Canada
- An International Perspective on Zero Tolerance – PAUL TEUFEL, Institute for Hygiene and Food Safety, Kiel, Germany
- A Consumer Perspective on Benefits and Application – CAROLINE SMITH-DEWAAL, Center for Science in the Public Interest, Washington, D.C., USA

S16 Communicating Science Effectively

(Sponsored by IAFP Foundation Fund)

- Listening, the First Step in Effective Communication to the Public – CHRISTINE M. BRUHN, University of California-Davis, Davis, CA, USA
- How to Communicate Food Science to Produce Grant Dollars – SUSAN S. SUMNER, Virginia Tech., Blacksburg, VA, USA
- The Role of the Trade Association in Effectively Communicating"Understandable" Science to Consumers – RHONA S. APPLEBAUM, National Food Processors Association, Washington, D.C., USA
- Communicating with the Public: Making a Hard Sell a Success – NANCY PETERSON, Kansas State University, Manhattan, KS, USA
- Communicating Hot Topics: Consumer and Producer Response to Genetically Engineered and Conventional Sweetcorn and Potatoes – DOUG POWELL, University of Guelph, Guelph, Ontario, Canada
- Panel Discussion

S17 Educating Food Service Workers

- Social Marketing: A Strategy for Effective Food Service Education – CLARA LAWHEAD, Pasco Co. Health Dept., New Port Richey, FL, USA
- FDA Retail Food Program Database of Foodborne Illness Risk Factors (August 2000) – Suggested Interventions for Dealing with the Three Risk Factors in Need of Great Attention – RICHARD BARNES, FDA, Rockville, MD, USA
- The Power of Partnering – ANGELA FRASER, North Carolina State University, Raleigh, NC, USA
- Training in the Quick Service Environment – LISA WRIGHT, Foodmaker, Inc., San Diego, CA, USA
- Keeping It Upbeat! A University of South Florida Food Safety Workshop Based on Fight BAC™! – ROY COSTA, Sanitary Environmental Monitoring Labs, (Semco Labs) Deerfield Beach, FL, USA
- The Teachable Moment – Training Temporary Event Paid and Volunteer Foodservice Workers – MARTHA SMITH PATNOAD, University of Rhode Island, Kingston, RI, USA

T04 Produce Microbiology

T37 Food Safety Begins on the Farm: A National Education and Extension Program for Growers and Packers – Elizabeth A. Bihn and ROBERT B. GRAVANI, Cornell University, Ithaca, NY, USA

T38 Efficacy of Disinfection Methods against Caliciviruses on Fresh Fruits, Vegetables, and Food-contact Surfaces – B. R. GULATI, P. B. Allwood, C. W. Hedberg, and S. M. Goyal, University of Minnesota, St. Paul, MN, USA

T39 Concentration and Detection of Viruses from Fresh Produce and Food-contact Surfaces – A. K. TAKU, B. R. Gulati, P. B. Allwood, C. W. Hedberg, and S. M. Goyal, University of Minnesota, St. Paul, MN, USA

T40 Inactivation of *Cryptosporidium parvum* in Apple Cider Using Ultraviolet Light – N. BASARAN, J. Churey, and R. W. Worobo, Cornell University, Geneva, NY, USA

T41 Effects of Hydrogen Peroxide on the Survival of *Cryptosporidium parvum* Oocysts in Unpasteurized Fruit Juices – K. K. PHELPS, D. S. Lindsay, R. Fayer, D. A. Golden, and S. S. Sumner, Virginia Tech., Blacksburg, VA, USA

T42 Inactivation of *Escherichia coli* O157:H7 and *Salmonella* in Apple Cider and Orange Juice by Combination Treatments of Ozone and Chemical Preservatives – R. C. WILLIAMS, D. A. Golden, and S. S. Sumner, University of Tennessee, Knoxville, TN, USA

T43 Hydrogen Peroxide and Organic Acids as Antimicrobials in Fruit Juices – J. SCHURMAN, S. S. Sumner, D. A. Golden, M. D. Pierson, J. D. Eifert, and J. E. Marcy, Virginia Tech., Blacksburg, VA, USA

T44 Growth of *Listeria monocytogenes* and *Escherichia coli* O157:H7 is Enhanced in Ready-to-eat Lettuce Washed in Warm Water – P. J. DELAQUIS, P. M. Toivonen, and S. Stewart, AAFC, Pacific Agri-Food Research Centre, Summerland, British Columbia, Canada

T45 Application of Vapor Heat to the Exocarp of Cantaloupe for the Reduction of *Salmonella* and *Escherichia coli* Prior to Minimal Processing – TREVOR SUSLOW and Marcella Zúñiga, University of California-Davis, Davis, CA, USA

T46 Effect of Hot Water and Heated Hydrogen Peroxide Treatments in Reducing Transfer of *Salmonella* and *Escherichia coli* from Cantaloupe Surfaces to Fresh-cut Tissues – D. O. UKUKU, V. Pilizota, G. M. Sapers, and P. H. Cooke, USDA-ARS-ERRC, Wyndmoor, PA, USA

T47 Lethality of 5 MeV e-Beam to *Staphylococcus*, *Salmonella* and *Listeria* in Sliced Cantaloupe and Tomato – ANN DRAUGHON, Amelia Evans, Greg Hulbert, and John Mount, University of Tennessee, Knoxville, TN, USA

T48 Isolation, Identification, and Selection of Lactic Acid Bacteria from Alfalfa Sprouts for Competitive Inhibition of Foodborne Pathogens – M. R. HARRIS, M. M. Brashears, and D. Smith, University of Nebraska-Lincoln, Lincoln, NE, USA

P04 Meat, Dairy, and General Food Microbiology

10:00 a.m. – 1:00 p.m.
(Authors present 10:30 a.m. – 12:30 p.m.)

P126 Dairy-associated *Bacillus cereus* Growing as a Biofilm Has a Distinct Proteome – Marinda Oosthuizen, Bridgitta Steyn, Volker Brözel, Denise Lindsay, and ALEX VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P127 Growth of *Bacillus cereus* and *Pseudomonas fluorescens* Binary Biofilms and Response to a Chlorine Dioxide-containing Sanitizer in a Model Flow System – Denise Lindsay, Volker Brözel, and ALEX VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P128 Heat Inactivation of *Listeria* Biofilm – R. CHMIELEWSKI and J. Frank, University of Georgia, Athens, GA, USA

P129 Microbial Growth in Transgenic Pork – P. C. NEDOLUHA, M. B. Solomon, V. G. Pursel, and A. D. Mitchell, USDA-ARS, Beltsville, MD, USA

P130 Recovery of Injured *Yersinia enterocolitica* from Swine Production Sites – MINA SHEHEE and Mark Sobsey, University of North Carolina, Chapel Hill, NC, USA

P131 Microbiological and Sensory Quality of New York State Fluid Milk Products: 1990-1999 – NANCY R. CAREY, Kathryn W. Chapman, Shirley M. Kozlowski, Steven C. Murphy, David K. Bandler, and Kathryn J. Boor, Cornell University, Ithaca, NY, USA

P132 Survival of *Listeria monocytogenes* in Refrigerated, Nisin-treated, Skim, 2%, and Whole Milk during Storage at 5°C – APAMA VEERAMACHANENI and Leora A. Shelef, Wayne State University, Detroit, MI, USA

P133 Effect of Residual Sanitizers on Cultured Dairy Products – TIMOTHY HARRIED, Chr. Hansen, Inc., Milwaukee, WI, USA

P134 The Effect of Osmotic Stress Adaptation on Heat Resistance of *Listeria monocytogenes* Scott A in Pork Slurry – MAKUBA A. LIHONO, Aubrey F. Mendonca, and Edward E. Fetzer, Iowa State University, Ames, IA, USA

P135 Inhibition of Pathogens on Process Cheese Slices at Abuse Temperature – KATHLEEN A. GLASS, Dawn A. Granberg, Ann E. Larson, and Eric A. Johnson, University of Wisconsin-Madison, Madison, WI, USA

P136 Recovery of *Salmonella* from Dairy Cattle and Their Environment – PHILIPUS PANGLOLI, Ann Draughon, Stephen Oliver, David Golden, and Yobouet Dje, University of Tennessee, Knoxville, TN, USA

P137 *Escherichia coli* O157:H7 in Dairy Cows and Their Environment – PHILIPUS PANGLOLI, Ann Draughon, Stephen Oliver, David Golden, and Yobouet Dje, University of Tennessee, Knoxville, TN, USA

P138 GIS and Epidemiology of *Salmonella* on Dairy Farms – KIMBERLY D. LAMAR, F. Ann Draughon, Philipus Pangloli, Stephen P. Oliver, and David Golden, University of Tennessee, Knoxville, TN, USA

P139 Assessment of *Salmonella*, *Listeria* and *Escherichia coli* O157 in Biosolids and Streams Associated with a Dairy Farm – TERESA ERVIN, Ron Yoder, Ann Draughon, Robert Burns, and Raj. Raman, University of Tennessee, Knoxville, TN, USA

P140 Microbial Safety of Pasture Versus Free-range Chickens Using Organic and Traditional Feed – TRISH WELCH, Jeannette Endres, and Bill Banz, Southern Illinois University, Carbondale, IL, USA

P141 Survival of Fecal Indicator Bacteria in Bovine Manure Incorporated into Soil – MARIA M. LAU and Steven C. Ingham, University of Wisconsin-Madison, Madison, WI, USA

P142 A Rapid Method for the Detection of *Listeria* in the Dairy Factory Environment – JILL GEBLER and Sharon Savory, Murray Goulburn Co-op Co. Ltd., Yarram, Victoria, Australia

P143 Rapid Detection of Microorganisms in Dairy Products Using an Automated Optical System – RUTH FIRSTENBERG-EDEN, Debra L. Foti, and Susan T. McDougal, BioSys Inc., Ann Arbor, MI, USA

P144 Dead *Listeria monocytogenes* Cells are Detected in Cooked Meat and Smoked Fish with a Commercial PCR-based Kit – ARNAUD CARLOTTI, Pascal Faraut, Marie-Laure Sorin, and Patrice Arbault, IDmyk S.A., Limonest, France

P145 Assessment of Protein Fingerprinting Method for Species Verification of Meats – J. A. ODUMERU, J. Siwik, K. Lee, M. Marcone, and R. Robinson, University of Guelph, Guelph, Ontario, Canada

P146 Validation of CCPs in HACCP Systems in Small Meat and Poultry Processing Plants in Nebraska – JASON E. MANN, Mindy M. Brashears, Dennis E. Burson, and Erin S. Dormedy, University of Nebraska-Lincoln, Lincoln, NE, USA

P147 Determining Exposure Assessment and Modelling Risks Associated with the Preparation of Poultry Products in the Home in the United Kingdom – WENDY HARRISON, Chris Griffith, David Tennant, and Adrian Peters, University of Wales Institute, Cardiff, Cardiff, Wales, UK

P148 Validation of the Use of Antibiotic-resistant Strains of *Escherichia coli* O157:H7 and *Salmonella* spp. for Recovery of Injured Cells Subjected to Stress Conditions Encountered during Competitive Inhibition – M. M. BRASHEARS, J. S. Stratton, and A. Amezquita, University of Nebraska-Lincoln, Lincoln, NE, USA

P149 Ochratoxin A Production by Black *Aspergillus* Species and Significance to the Food Industry – AILSA D. HOCKING, Su-lin Leong, and John I. Pitt, Food Science Australia, CSIRO, North Ryde, NSW, Australia

P150 Evaluation of Electrochemiluminescent Assays for the Rapid Detection of Foodborne Pathogens on Environmental Surfaces – RICHARD OBISCO, Chuck Yound, and Jill White, IGEN International, Inc., Gaithersburg, MD, USA

P151 Development and Evaluation of a Multiplex PCR Assay for Specific Detection of *Campylobacter jejuni*, *Escherichia coli* O157:H7, *Listeria monocytogenes*, and *Salmonella* in Contaminated Food – M. F. SLAVIK, Debby Winters, and Awilda O'Leary, University of Arkansas, Fayetteville, AR, USA

POSTER SYMPOSIUM

10:00 a.m. – 1:00 p.m.
(Authors present 10:30 a.m. – 12:30 p.m.)

S18 Detection and Control of Human Pathogens in Fresh Fruit and Vegetables

- Sampling and Detection of Bacterial Pathogens in Fresh Produce – PINA M. FRATAMICO, USDA-ARS-ERRC, Wyndmoor, PA, USA
- Potential Sources of *Escherichia coli* O157:H7 Contamination of Apples during Growth, Harvesting, Distribution, and Processing – BASSAM A. ANNOUS, USDA-ARS-ERRC, Wyndmoor, PA, USA
- Microbial Safety of Sprouts – WILLIAM F. FETT, USDA-ARS-ERRC, Wyndmoor, PA, USA
- Surface Characteristics and Adhesion of *Salmonella stanley*, *Listeria monocytogenes*, and *Escherichia coli* on Cantaloupe Surfaces Treated with Chlorine or Hydrogen Peroxide – DIKE O. UKUKU, USDA-ARS-ERRC, Wyndmoor, PA, USA
- Human Pathogens on Produce: Attachment, Biofilms and Ecology – ROBERT E. MANDRELL, USDA-ARS-WRRC, Albany, CA, USA
- Methods in Decontaminating Fruits and Vegetables – LARRY R. BEUCHAT, University of Georgia, Griffin, GA, USA

WEDNESDAY AFTERNOON — AUGUST 8, 2001
1:30 p.m. — 5:00 p.m.

S19 HACCP: How to Evaluate Success

- USDA HACCP: How to Evaluate Success – THOMAS BILLY, USDA-FSIS, Washington, D.C., USA

- FDA Seafood and Juice HACCP: Microbial Testing and Other Tools to Measure Success – ROBERT L. BUCHANAN, FDA-CFSAN, Washington, D.C., USA
- CDC: Using Epidemiology to Evaluate HACCP – ROBERT V. TAUXE, CDC, Atlanta, GA, USA
- Industry Perspective: Is HACCP Working for the Food Industries? – R. BRUCE TOMPKIN, ConAgra Refrigerated Prepared Food, Downer's Grove, IL, USA
- Consumer Perspective: Is HACCP Improving Food Safety? – CAROLINE SMITH DEWAAL, Center for Science in the Public Interest, Washington, D.C., USA

S20 ILSI North America-sponsored Research Updates

- Engineering Vegetative Buffer Strips for Removal of *Cryptosporidium parvum* from Runoff from Dairies and Grazed Agricultural Land – EDWARD R. ATWILL, University of California-Davis, Tulare, CA, USA
- Optimization of Conditions to Kill *Escherichia coli* O157:H7 in Manure – MICHAEL P. DOYLE, University of Georgia, Griffin, GA, USA
- Effect of Organic Acid Content of Silages on the Growth of *Escherichia coli* O157:H7 and *Salmonella* Typhimurium DT104 on Total Mixed Rations – DALE D. HANCOCK, Washington State University, Pullman, WA, USA
- Molecular Tools for Identification of *Listeria monocytogenes* Serotype 4b Strains – SOPHIA KATHARIOU, North Carolina State University, Raleigh, NC, USA
- Effects of Environment and Management on Persistence of Antibiotic Resistance in Bacteria from Swine – ALAN G. MATHEW, University of Tennessee, Knoxville, TN, USA
- Factors Affecting Transfer of Genes Encoding Multiple Antibiotic Resistance to *Salmonella* Typhimurium DT104 – CORNELIUS POPPE, Health Canada, Guelph, Ontario, Canada

S21 The Benefits of Better Government and Industry Relations in Assuring Food Safety

- Current State of Federal Government/ Industry Food Safety Relations: FSIS Perspective – RON HICKS, USDA-FSIS, Washington, D.C., USA
- Current State of Federal Government/ Industry Food Safety Relations: FDA/CFSAN Perspective – JOHN KVENBERG, FDA-CFSAN, Washington, D.C., USA
- Current State of Federal Government/ Industry Food Safety Relations: Industry Perspective – MARK DOPP, American Meat Institute, Arlington, VA, USA
- Current State of Federal Government/ Industry Food Safety Relations: State Perspective – MARTHA ROBERTS, Florida Dept. of Agriculture and Consumer Affairs, Tallahassee, FL, USA
- Current State of Federal Government/ Industry Food Safety Relations: Food Service Perspective – STEVEN GROVER, National Restaurant Association, Washington, D.C., USA
- Panel Discussion

T05 General Food Microbiology

T49 Death Kinetics of *Listeria monocytogenes* in Margarine, Yellow Fat Spreads, and Toppings – MICHAEL C. CIRIGLIANO and Andreas M. Keller, Lipton, Cresskill, NJ, USA

T50 Survey of Pasteurized Milk at Retail in the United States for *Listeria monocytogenes* – CARY P. FRYE, Milk Industry Foundation/ International Foods Association, Washington, D.C., USA

T51 The Thermal Resistance of *Listeria monocytogenes* as Affected by the pH and Water Activity of the Heating Menstrum – S. G. EDELSON-MAMMEL, R. L. Buchanan, and R. C. Whiting, FDA-CFSAN, Washington, D.C., USA

T52 Foodworkers as a Source for Salmonellosis – C. MEDUS, J. B. Bender, K. E. Smith, F. T. Leano, J. Besser, and C. H. Hedberg, Minnesota Dept. of Health, Minneapolis, MN, USA

T53 Yeast Inactivation Kinetics during Thermoultrasonication Treatments – A. LOPEZ-MALO, E. Palou, and A. Franco-Corzo, Universidad de las Americas-Puebla, Cholula, Puebla, Mexico

T54 The Biocidal Efficacy of High Retention Gel Oxidant Sanitizers on Vertical and Irregular Surfaces – CHARLES J. GIAMBRONE and Crystal Nesbitt, FMC Corp., Princeton, NJ, USA

T55 Assessing and Reducing the Risk of Cross Contamination in Food Service – CHRIS GRIFFITH, Carys Davies, Jane Breverton, and Adrian Peters, University of Wales Institute Cardiff, Cardiff, UK

T56 Exposure Assessment for Human Pathogens Transmitted by Poor Handling Practices of Ready-to-eat (RTE) Foods – HEEJEONG LATIMER, Lee-Ann Jaykus, Roberta Morales, and Peter Cowen, North Carolina State University, Raleigh, NC, USA

T57 Physicians' Attitudes toward Food Safety Education – Anthony Flood, DAVID SCHMIDT, Gillian Steele, and Christie White, International Food Information Council, Washington, D.C., USA

T58 Effect of Peroxy Acid Sanitizers against Bacteriophage Associated with Cultured Dairy Products – JEROME KELLER, Ecolab Inc., Mendota Heights, MN, USA

T59 Molecular Epidemiology of Norwalk-like Virus Outbreaks in Minnesota – E. SWANSON, J. Bartkus, L. Carroll, K. Smith, J. Hunt, J. Besser, and C. Hedberg, Minnesota Dept. of Health, Minneapolis, MN, USA

T60 Technology Requirements and Technology Transfer in the Welsh Food Industry – DAVID LLOYD, Emma Norman, and Chris Griffith, University of Wales Institute Cardiff, Cardiff, UK

August 5-8, 2001

Hilton Minneapolis

Minneapolis, Minnesota

EVENT INFORMATION

Evening Events

Cheese and Wine Reception
Sunday, August 5, 2001 (8:00 p.m. - 10:00 p.m.)

Attendees and guests will experience Midwestern hospitality at this traditional Sunday evening reception in the exhibit hall.

Exhibit Hall Reception
Monday, August 6, 2001 (5:00 p.m. - 6:30 p.m.)

Network with fellow food safety professionals during this informal reception while seeing the latest developments in the industry.

Monday Night Social — Mississippi River Dinner Cruise
Monday, August 6, 2001 (6:00 p.m. - 10:00 p.m.)

The mighty Mississippi River is the reason Minneapolis and St. Paul exist today. Feel the history of the Mississippi River on this spectacular dinner cruise. You will quickly escape into an island of nature in the midst of this major metropolitan area with old St. Anthony, where Minneapolis began, on one side and the spectacular downtown skyline on the other. At your leisure you may dine, socialize with friends and colleagues, or walk around the riverboat and experience the view from the upper deck. The riverboat travels through the Upper St. Anthony Falls Lock, the northern most lock of 29 on the Mississippi River and the deepest – it descends 50 feet! You pass under both the historic James J. Hill Stone Arch Bridge and the new Hennepin Avenue suspension bridge. This will be a river experience you will long remember.

Chanhassen Dinner Theater
Tuesday, August 7, 2001 (5:30 p.m. - 11:00 p.m.)

Food and entertainment – what a perfect combination! The people at Chanhassen Dinner Theater know this and have been working hard since 1968 to perfect this concept. Quoted as "the Cadillac of Dinner Theaters," it is the nation's largest professional dinner theater complex. Your ticket includes roundtrip transportation, dinner, and theater ticket. At this time, the show cannot be confirmed (word is it might be "My Fair Lady"). Limited tickets are available.

Minnesota Twins Baseball Game
Tuesday, August 7, 2001 (6:00 p.m. - 10:00 p.m.)

Go Twins! Cheer on the Minnesota Twins as they take on the Cleveland Indians in the Hubert H. Humphrey Metrodome. The Metrodome was the third domed facility in baseball and remains the only air-supported structure of the 30 ballparks. Join your friends and colleagues for a night at the ballpark. Price includes transportation to and from the Metrodome and a reserved seat for the game.

Awards Banquet
Wednesday, August 8, 2001 (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.

Daytime Tours

Expanded descriptions available at www.foodprotection.org

Twin Cities Highlights Tour
Sunday, August 5, 2001 (9:30 a.m. - 2:30 p.m.)

The fantastic diversity of the Greater Twin Cities Metro Area often catches first-time visitors by surprise. This tour includes both downtowns of St. Paul and Minneapolis. While in Minneapolis

you will experience the famous Nicollet Mall, the skyway network of downtown Minneapolis and the Minneapolis Sculpture Garden. The journey will continue through the Kenwood residential area to see the television home of Mary Tyler Moore, around sparkling lakes and lagoons, and make a short stop at the legendary Minnehaha Falls. Then it is on past Fort Snelling and into St. Paul. A guide will provide commentary on many sites including the trip along stately Summit Avenue, showcasing the best-preserved Victorian mansions in the country. The final stop is at the Minnesota History Center. The Center showcases and preserves the state's historical resources. Lunch will be provided at the History Center. The tour concludes with a drive past the University of Minnesota and an excursion into the St. Anthony Falls area – the birthplace of Minneapolis.

Historic Stillwater

Monday, August 6, 2001 (9:30 a.m. - 3:30 p.m.)

A trip to Stillwater is a trip to Minnesota's yesteryear. Located on the sparkling blue St. Croix River, Stillwater lays claim to being Minnesota's oldest town and the birthplace of the Minnesota Territory in 1849. The tour guide will provide a riding tour of this enchanting old river-town and takes you behind the scenes of history. Anecdotes and incidents from bygone years will illuminate the lives of immigrants and entrepreneurs as you view mansions built by wealthy lumber barons and beautiful old churches on the "Street of Spires." You will stop at the Warden's Home Museum, an 1853 home for 11 wardens who managed the first territorial prison in that part of the country. Next, enjoy a delicious lunch at the famed Lowell Inn. Since 1927 this famous "Mount Vernon of the Midwest" has been a hotel known to serve the very finest food. You will have time after lunch to explore the many boutiques, galleries and shops that line Stillwater's historic streets.

Mansions & Museums Tour

Tuesday, August 7, 2001 (9:30 a.m. - 3:30 p.m.)

The first stop of the day will be the James J. Hill House on Summit Avenue in St. Paul. James J. Hill, the "Empire Builder," purchased a bankrupt railroad in St. Paul in the late 1800s and masterminded its success by building the Great Northern Railway. Completed in 1891, the house has 36,000 square feet, including 32 rooms, 13 bathrooms, and 22 fireplaces. With its carved woodwork, stained glass, and skylit art gallery, it is one of the most impressive residences ever constructed in the Midwest. Next, you will stop at the Cathedral of St. Paul. Modeled after St. Peter's in Rome, it is one of the largest church buildings in North America. Among its many points of interest are the six chapels called the Shrine of Nations in which stand statues of the patron saints carved out of marble. Following the stop at the Cathedral, you will have lunch at Forepaugh's Restaurant, an elegant Victorian mansion complete with a French chef and staff in period costumes. After lunch, your final stop is at the Minneapolis Institute of Arts. The permanent collection includes American, European, Asian, African, Oceanic ancient and Oriental objects. Masterpieces from every age and culture await your discovery.

New Member Reception and Orientation

New Member Reception and Orientation

Saturday, August 4, 2001 (4:30 p.m. - 5:30 p.m.)

If you recently joined the Association or if this is your first time attending an IAFP Annual Meeting, welcome! Attend this informal reception to learn how to get the most out of attending the Meeting. Meet some of today's leaders and gain knowledge on how you too can become a leader in your Association.

Affiliate Reception

Affiliate Reception

Saturday, August 4, 2001 (5:30 p.m. - 7:00 p.m.)

Affiliate officers and delegates plan to arrive in time to participate in this educational reception. Watch your mail for additional details.

Committee Meetings

Committee Meetings

Sunday, August 5, 2001 (7:00 a.m. - 5:00 p.m.)

Committees and Professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on any number of committees or PDGs.

Student Luncheon

Student Luncheon

Sunday, August 5, 2001 (12:00 p.m. - 1:30 p.m.)

Attention students, are you a Member of the Student Professional Development Group (PDG)? Join by signing up for the student luncheon to help you start building your professional network.The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP.

International Association for Food Protection®

88th Annual Meeting

6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2863, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

August 5-8, 2001
Minneapolis, Minnesota

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
- Program and Abstract Book

4 Easy Ways to Register

To register, complete the Attendee Registration Form and submit it to the International Association for Food Protection by:

Phone: 800.369.6337; 515.276.3344

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863

Web site: www.foodprotection.org

The early registration deadline is July 6, 2001. After July 6, 2001 late registration fees are in effect. Pick up registration materials on site at the Hilton Minneapolis.

Refund/Cancellation Policy

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by July 13, 2001. No refunds will be made after July 13, 2001; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 13, 2001. Additional tickets purchased are nonrefundable.

Exhibit Hours

Sunday, August 5, 2001	—	8:00 p.m. – 10:00 p.m.
Monday, August 6, 2001	—	9:30 a.m. – 1:30 p.m. 3:00 p.m. – 6:30 p.m.
Tuesday, August 7, 2001	—	9:30 a.m. – 1:30 p.m.

Hotel Information

For reservations, contact the hotel directly and identify yourself as an International Association for Food Protection Annual Meeting attendee to receive a special rate of $129 per night, single or double. Make your reservations as soon as possible; this special rate is available only until July 6, 2001.

Hilton Minneapolis
1001 Marquette Avenue
Minneapolis, Minnesota 55403
612.376.1000
1.800.HILTONS

Evening Events

Sunday, August 5, 2001

Opening Session (7:00 p.m. – 8:00 p.m.)

Cheese and Wine Reception (8:00 p.m. – 10:00 p.m.)

Monday, August 6, 2001

Exhibit Hall Reception (5:00 p.m. – 6:30 p.m.)

Monday Night Social, **Mississippi Dinner Cruise** (6:00 p.m. – 10:00 p.m.)

Tuesday, August 7, 2001

Chanhassen Dinner Theatre (5:30 p.m. – 11:00 p.m.)

Minnesota Twins Baseball Game (6:00 p.m. – 10:00 p.m.)

Wednesday, August 8, 2001

Awards Banquet (7:00 p.m. – 9:30 p.m.)

Daytime Tours

(Lunch included in all daytime tours)

Sunday, August 5, 2001

Twin Cities Highlights (9:30 a.m. – 2:30 p.m.)

Monday, August 6, 2001

Historic Stillwater (9:30 a.m. – 3:30 p.m.)

Tuesday, August 7, 2001

Mansions & Museums (9:30 a.m. – 3:30 p.m.)

International Association for
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E-mail: info@foodprotection.org
Web site: www.foodprotection.org

Attendee Registration Form

August 5-8, 2001
Minneapolis, Minnesota

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

Title _____ Employer _____

Mailing Address (Please specify: ❒ Home ❒ Work) _____

City _____ State/Province _____ Country _____ Postal/Zip Code _____

Telephone _____ Fax _____ E-mail _____

❒ First time attending meeting Member since: _____

❒ Regarding the ADA, please attach a brief description of special requirements you may have.

❒ IAFP occasionally provides Attendees' addresses (excluding phone and E-mail) to vendors and exhibitors supplying products and services for the food safety industry. If you prefer NOT to be included in these lists, please check the box.

PAYMENT MUST BE RECEIVED BY JULY 6, 2001 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:	MEMBERS	NONMEMBERS	TOTAL
Registration (Awards Banquet included)	$ 275 ($325 late)	$415 ($465 late)	_____
Association Student Member*	$ 45 ($ 55 late)	Not Available	_____
Retired Association Member*	$ 45 ($ 55 late)	Not Available	_____
One Day Registration: ❒ Mon. ❒ Tues. ❒ Wed.	$ 155 ($180 late)	$210 ($235 late)	_____
Spouse/Companion* (Name): _____	$ 45 ($ 45 late)	$ 45 ($ 45 late)	_____
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	_____
Children 14 & Under* (Names): _____	FREE	FREE	_____
*Awards Banquet not included			

EVENTS:		# OF TICKETS	
Student Luncheon (Sunday, 8/5)	$ 5 ($ 10 late)	_____	_____
Monday Night Social, Mississippi Dinner Cruise (Monday, 8/6)	$ 39 ($ 44 late)	_____	_____
Children 14 and under	$ 34 ($ 39 late)	_____	_____
Chanhassen Dinner Theatre (Tuesday, 8/7)	$ 75 ($ 80 late)	_____	_____
Minnesota Twins Baseball Game (Tuesday, 8/7)	$ 21 ($ 26 late)	_____	_____
Awards Banquet (Wednesday, 8/8)	$ 45 ($ 50 late)	_____	_____

DAYTIME TOURS: (Lunch included in all daytime tours)			
Twin Cities Highlights (Sunday, 8/5)	$ 40 ($ 45 late)	_____	_____
Historic Stillwater (Monday, 8/6)	$ 47 ($ 52 late)	_____	_____
Mansions & Museums (Tuesday, 8/7)	$ 49 ($ 54 late)	_____	_____

Payment Options:

❒ Check Enclosed ❒ VISA ❒ MasterCard ❒ Discover

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(See page 464 of this issue for a membership application)

EXHIBITORS DO NOT USE THIS FORM

Hilton Minneapolis
Minneapolis, Minnesota

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WORKSHOPS

Workshop I
Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*

This workshop offers information on the potential pitfalls or errors associated with the detection of *Listeria monocytogenes* in foods. The methods examined will include cultural (FDA/USDA), Immunological, Nucleic Acid, Subtyping, and Pulse Field Electrophoresis. Participants will be introduced to the limitations of each method, and possible modifications to insure the accuracy and effectiveness of your analysis. The workshop includes a laboratory section at the University of Minnesota allowing participants to view many of the common mistakes associated with *Listeria* analysis. Participants will also join in a round table discussion to share problems and ideas.

Workshop Topics

- Development and Validation of Methodologies for the Detection of *L. monocytogenes*
- Critical Steps in the Detection of *L. monocytogenes* Using Immunological Methods
- Critical Steps in the Detection of *L. monocytogenes* Using Nucleic Acid Methods
- Critical Steps in the Detection of *L. monocytogenes* Using RAPD and PFE
- Critical Steps in the Detection of *L. monocytogenes* Using Cultural Methods
- The Regulatory Perspective on *L. monocytogenes* Testing

Instructors

James R. Agin, Ohio Department of Agriculture, Reynoldsburg, OH

Jeffrey M. Farber, Ph.D., Health Canada, Ottawa, Ontario, Canada

Judy Fraser-Heaps, Pillsbury Company, Apple Valley, MN

Anthony D. Hitchins, Ph.D., FDA, Washington, D.C.

Timothy C. Jackson, Ph.D., Nestlé USA, Dublin, OH

Melissa C. Newman, Ph.D., University of Kentucky, Lexington, KY

W. Payton Pruett, Ph.D., ConAgra Refrigerated Prepared Foods, Downers Grove, IL

Who Should Attend?

Individuals working in food microbiology laboratories currently performing or planning to perform *Listeria* analysis.

Hours for Workshop

Friday August 3, 2001	Saturday August 4, 2001
Registration — 7:30 a.m. Continental Breakfast	7:30 a.m. Continental Breakfast
Workshop — 8:00 a.m. - 5:00 p.m. (Lunch Provided)	**Workshop —** 8:00 a.m. - 4:00 p.m. (Lunch Provided)

Workshop II
Applying Advanced Techniques to HACCP Systems

(Co-sponsored by the US Poultry and Egg Association)

The purpose of this workshop is to provide an overview of business tools that can be applied to HACCP systems for process evaluation and improvement. This is not an introductory HACCP course. Rather, attendees will be expected to have a basic understanding of HACCP, and should have experience in working with an implemented HACCP system. A further processed poultry model serves as a focal point upon which other workshop topics are presented and discussed.

Workshop Topics

- The Process Model – Further Processed Poultry
- Data Collection, Interpretation, and Response
- Auditing
- Recall Management

Instructors

S. F. Bilgili, Ph.D., Auburn University, Auburn, AL

Don Conner, Ph.D., Auburn University, Auburn, AL

Steve Knight, US Poultry & Egg Association, Tucker, GA

Who Should Attend?

HACCP, quality, production, and management personnel of food processing plants using HACCP in their facilities. In particular, meat and poultry processors operating under mandatory HACCP, however, the principles and applications presented in this workshop are applicable to all segments of the food industry.

Hours for Workshop

Friday August 3, 2001	Saturday August 4, 2001
Registration – 7:30 a.m. Continental Breakfast	7:30 a.m. Continental Breakfast
Workshop – 8:00 a.m. - 5:00 p.m. (Lunch Provided)	**Workshop –** 8:00 a.m. - 4:00 p.m. (Lunch Provided)

Workshop III
Crisis! Recall Management in the Food Industry

The legal aspects of dealing with crisis will be discussed as well as how to assess your risk and exposure before a crisis occurs. The nuts and bolts of dealing with crisis will be reviewed as well as a comprehensive discussion of how to deal with all aspects of the media.

Workshop Topics

- Legal Ramifications of a Food Recall
- How to Prevent a Crisis
- The Anatomy and Physiology of a Crisis
- Media/Interview in Times of Crisis
- Establishment of a Crisis Team and Plan

Instructors

William Marler, Marler Clark Attorneys at Law, Seattle, WA

Gale Prince, The Kroger Co., Cincinnati, OH

Larry L. Smith, Institute of Crisis Management, Louisville, KY

Jim Spata, Ph.D., New-Tech Consulting, Cincinnati, OH

Robert Strong, Ph.D., DiverseyLever Consulting, Liberty Town, OH

Who Should Attend?

Management personnel responsible for writing or implementing a crisis management plan.

Hours for Workshop

Saturday August 4, 2001
Registration – 7:30 a.m. Continental Breakfast
Workshop – 8:00 a.m. - 5:00 p.m. (Lunch Provided)

Annual Meeting Workshops

• Registration Form •

Hilton Minneapolis

Minneapolis, Minnesota

Friday-Saturday, August 3-4, 2001

❑ **Workshop I:** Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*

❑ **Workshop II:** Applying Advanced Techniques to HACCP Systems

Saturday, August 4, 2001

❑ **Workshop III:** Crisis! Recall Management in the Food Industry

First Name (will appear on badge)

Last Name

Company | Job Title

Address | City

State/Province | Country | Postal Code/Zip + 4

Area Code & Telephone | Fax

E-mail | Member #

❑ Check Enclosed ❑ VISA ❑ ❑

Total Amount Enclosed (US Funds on US Bank) $ _____

Signature _____ **Expiration date** _____

Register by July 13, 2001 to avoid late registration fees

• Registration •

WORKSHOP I: Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*

	Early Rate	Late Rate
IAFP Member	$475	$550
NonMember	$575	$650

WORKSHOP II: Applying Advanced Techniques to HACCP Systems

	Early Rate	Late Rate
IAFP Member	$450	$525
NonMember	$550	$625

WORKSHOP III: Crisis! Recall Management in the Food Industry

	Early Rate	Late Rate
IAFP Member	$285	$360
NonMember	$385	$460

GROUP DISCOUNT:
Register 3 or more people from your company and receive a 15% discount. Registrations must be received as a group.

Refund/Cancellation Policy

Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by July 20, 2001. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 13, 2001. The workshop may be cancelled if sufficient enrollment is not received by July 13, 2001.

For further information, please contact the Association office at 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@foodprotection.org.

• 4 Easy Ways to Register •

To register, complete the Workshop Registration Form and submit it to the International Association for Food Protection by:

Phone: 800.369.6337; 515.276.3344

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863

Web site: www.foodprotection.org

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Warren Analytical Laboratory

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Zep Manufacturing Company

Exhibitors of IAFP 2001

(Companies scheduled to exhibit as of March 31, 2001)

3-A Sanitary Standards Symbol Administrative Council
Phone: 319.286.9221 Fax: 319.286.9290

3M Microbiology Products
Phone: 651.733.0942 Fax: 651.733.5602

ABC Research Corporation
Phone: 352.372.0436 Fax: 352.378.6483

Advanced Analytical Technologies, Inc. (AATI)
Phone: 515.296.6600 Fax: 515.296.6789

Aquionics, Inc.
Phone: 859.341.0710 Fax: 859.341.0350

BD Diagnostic Systems
Phone: 410.316.4000 Fax: 410.316.4906

BioControl Systems, Inc.
Phone: 425.603.1123 Fax: 425.603.0080

bioMérieux, Inc.
Phone: 314.506.8052 Fax: 314.731.8678

BioSys, Inc.
Phone: 613.271.1144 Fax: 613.271.1148

BIOTECON Diagnostics, Inc.
Phone: 609.588.8828 Fax: 609.588.6660

Biotest Diagnostics Corporation
Phone: 973.625.1300 Fax: 973.625.5882

Brain Wave Technologies, Inc.
Phone: 608.204.7440 Fax: 608.204.7445

Capitol Vial, Inc.
Phone: 800.772.8871 Fax: 518.853.3409

Celsis, Inc.
Phone: 847.509.7633 Fax: 847.509.7601

Cogent Technologies, Ltd.
Phone: 513.469.6800 Fax: 513.469.6811

Copan Diagnostics, Inc.
Phone: 909.549.8793 Fax: 909.549.8850

Daikin Environmental Laboratory, Ltd.
Phone: 81.298.58.5010 Fax: 81.298.58.5082

Decagon Devices, Inc.
Phone: 509.332.2756 Fax: 509.332.5158

DQCI Services, Inc.
Phone: 763.785.0484 Fax: 763.785.0584

DSM Food Specialties
Phone: 262.255.7955 Fax: 262.255.7732

DuPont Qualicon
Phone: 302.695.5300 Fax: 302.695.5301

Ecolab, Inc.
Phone: 651.293.2233 Fax: 651.293.2260

Elsevier Science
Phone: 212.633.3756 Fax: 212.633.3112

Food Processors Institute
Phone: 202.393.0890 Fax: 202.639.5941

Food Quality Magazine
Phone: 215.860.7800 Fax: 215.860.7900

Food Safety Net Services, Ltd.
Phone: 210.384.3424 Fax: 210.308.8730

FoodHandler, Inc.
Phone: 516.338.4433 Fax: 516.338.5486

Foss North America, Inc.
Phone: 952.974.9892 Fax: 952.974.9823

GENE-TRAK Systems
Phone: 508.435.7402 Fax: 508.435.0025

IBA Food Safety Division
Phone: 901.681.9006 Fax: 901.681.9007

International Association for Food Protection
Phone: 515.276.3344 Fax: 515.276.8655

International Association for Food Protection — Student PDG
Phone: 515.276.3344 Fax: 515.276.8655

International BioProducts
Phone: 425.398.7993 Fax: 425.398.7973

International Food Hygiene
Phone: 44.13.7724.1724 Fax: 44.13.7725.3640

International Food Information Council Foundation
Phone: 202.296.6540 Fax: 202.296.6547

LABPLAS, Inc.
Phone: 450.649.7343 Fax: 450.649.3113

Medallion Laboratories
Phone: 800.245.5615 Fax: 763.764.4010

Medical Packaging Corporation
Phone: 805.388.2383 Fax: 805.388.5531

MicroBioLogics, Inc.
Phone: 320.253.1640 Fax: 320.253.6250

Microbiology International
Phone: 301.662.6835 Fax: 301.662.8096

NASCO
Phone: 920.563.2446 Fax: 920.563.8296

The National Food Laboratory, Inc.
Phone: 925.551.4290 Fax: 925.833.9239

Nelson-Jameson, Inc.
Phone: 715.387.1151 Fax: 715.387.8746

Neogen Corporation
Phone: 517.372.9200 Fax: 517.372.2006

NSF International
Phone: 734.769.8010 Fax: 734.769.0109

Organon Teknika
Phone: 919.620.2298 Fax: 919.620.2615

Orkin Pest Control
Phone: 404.888.2000 Fax: 404.888.2012

Q Laboratories, Inc.
Phone: 513.471.1300 Fax: 513.471.5600

QA Life Sciences, Inc.
Phone: 858.622.0560 Fax: 858.622.0564

QMI
Phone: 651.501.2337 Fax: 651.501.5797

REMEL, Inc.
Phone: 800.255.6730 Fax: 800.447.5750

RidgeView Products, LLC
Phone: 608.781.5946 Fax: 608.781.4408

rtech™ laboratories
Phone: 651.481.2270 Fax: 651.481.2002

S & S Biopath
Phone: 561.655.2302 Fax: 561.655.3361

USDA, Food Safety and Inspection Service
Phone: 202.205.0428 Fax: 202.720.1843

Warren Analytical Laboratory
Phone: 800.945.6669 Fax: 970.351.6648

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Phone: 609.584.7677 Fax: 609.584.8388

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Phone: 404.352.1680 Fax: 404.350.2742

Indicates IAFP Sustaining Member

CONTRIBUTE to the Fourth Annual Foundation Fund Silent Auction Today!

The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2001, the Association's 88th Annual Meeting in Minneapolis, Minnesota August 5-8, 2001. The Foundation Fund supports the following:

- Ivan Parkin Lecture
- Travel support for exceptional speakers at the Annual Meeting
- Audiovisual Library
- Developing Scientist Competition
- Shipment of volumes of surplus *JFP* and *DFES* journals to developing countries through FAO in Rome

Support the Foundation by donating an item today. A sample of items donated last year included:

- Food Safety Videos
- California Salted Pistachios
- Pearl Necklace
- Missouri Country Sugar Cured Ham
- New Jersey Devils Hockey Jersey
- Waterford Crystal Vase
- IAFP Polo Shirts
- Wine

Complete the form and send it in today. Notification of donated items must be received by June 15, 2001 to be listed in the Program and Abstract Book.

Description of auction items _____

Estimated Value _____

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E-mail: dgronstal@foodprotection.org

SPONSORSHIPS

We invite you to participate as a sponsor for IAFP 2001. Sponsorship participation provides an excellent opportunity to position your company or organization as a supporter of the Association.

Several exciting opportunities are available this year. Please review the event listing to select the one that will best position your organization. Reservations will be considered in order received for any open sponsorship events.

Sponsorship Event List

Full Support	Partial Support	Event
$16,000	$5,000 - $9,000	Monday Evening Social
$13,000	$5,000 - $7,000	Opening Reception Wine (Sunday)
$13,000	$5,000 - $6,000	Exhibit Hall Reception (Monday)
$7,500	$3,500 - $4,000	Leather Badge Holders w/Lanyards
$3,000	$1,000 - $2,000	Exhibit Hall Pastries and Coffee (Monday Morning)
$2,500	$1,250 - $1,500	Exhibit Hall Coffee Break (Monday Afternoon)
$3,000	$1,000 - $2,000	Exhibit Hall Pastries and Coffee (Tuesday Morning)
$2,500	$1,250 - $1,500	Coffee Break (Tuesday Afternoon)
$3,000	$1,000 - $1,500	Coffee Break (Wednesday)
$3,000	$1,000 - $1,500	IAFP New Member Orientation (Saturday)
$3,500	$1,500 - $2,500	Spouse/Companion Hospitality Room
$2,000	$750 - $1,000	Exhibitor Move-in Refreshments (Sunday)
$2,000	$750 - $1,000	Student PDG Luncheon (Sunday)
$1,750	$500 - $800	Awards Banquet Flowers (Wednesday)
$1,500	$500 - $800	Committee Day Refreshments (Sunday)
$1,000	$400 - $750	Speaker Travel Support

SPONSORSHIP PARTICIPANT

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Desired Event to Sponsor _____

Contact:

David Larson
Phone: 515.440.2810
Fax: 515.440.2809
E-mail: larson6@earthlink.net

Ivan Parkin Lecture

Sunday Evening — August 5, 2001
7:00 p.m.

Dr. Linda Detwiler
Senior Staff Veterinarian
USDA/Animal and Plant Health Inspection Service

Chanhassen Dinner Theater

Tuesday, August 7, 2001
5:30 p.m. – 11:00 p.m.

Food and entertainment — what a perfect combination! The people at Chanhassen Dinner Theater know this and have been working hard since 1968 to perfect this concept. Quoted as "the Cadillac of Dinner Theaters," it is the nation's largest professional dinner theater complex.

Tickets are limited, so order yours today (see page 443).

IAFP 2001
Monday Night Social —
Mississippi River Dinner Cruise

JOIN US

ABOARD THE STERNWHEELER

ANSON NORTHRUP

AND

BETSEY NORTHRUP

Monday, August 6, 2001

6:00 p.m. – 10:00 p.m.

See page 440 in this issue of *DFES* for additional information.

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Nothing satisfies your appetite for bigger profits like Worldwide Food Expo.

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WORLDWIDE FOOD EXPO

OCTOBER 18-21, 2001
McCORMICK PLACE
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FEATURING:

IAFIS/ IDFA Food & Dairy Exposition

AMI International Meat, Poultry & Seafood Exposition

First in Food Technology

ADVERTISING INDEX

Coming Events

JUNE

·5, Water Activity Seminar, Lisle, IL. For more information, contact Marlene Woodbury at 800.755.2751.

·5-6, Associated Illinois Milk, Food and Environmental Sanitarians Dairy Plant Workshop, Holiday Inn, Rockford, IL. For further information, contact Pat Callahan at 217.854.2547.

·5-6, Texas Association for Food Protection Annual Meeting, Holiday Inn South, Austin, TX. For further information, contact Ron Richter at 979.845.4409.

·7-8, HACCP Workshop, Minneapolis, MN. For additional information, contact AIB International, at 785.537.4750; fax: 785.537.1493.

·7-8, Dairy 2001, Hyatt Regency, Paris. For additional information, call 44.1892.511807; 44.1892.527758; E-mail: conferences @agra-net.com.

·10-14, Values in Decisions on Risk Symposium, held in Stockholm. The symposium will address the role of experts, media and regulators in complex decisions. For further information, contact Kjell Andersson, phone: 46.8.510.14755; fax: 46.8.510.14756; E-mail: kjell.andersson@karinta-konsult.se.

·13-15, Expo Dairy Show, Lacteo's 2001, Expo Guadalajara, Guadalajara, Mexico. For further information, phone 564.70.40/564.70.68; fax: 52.5.564.03.29; E-mail: gefemani@iwm.com.mx.

·13-15, NIZO Dairy Conference on Food Microbes 2001, Ede, The Netherlands. For more information, contact Jane Macmillan at 44.1865.245685.

·20-22, ASI Food Safety Consultants Inc., Lead Auditor Training, St. Louis, MO. For further information, phone 800.477.0778; fax: 314.727.2563.

·20-22, South Dakota Environmental Health Association Annual Meeting, Ramkota River Centre, Pierre, SD. For further information, contact Gary Van Voorst at 605.367.8787.

·23-27, Institute of Food Technologists Annual Meeting, Ernest N. Morial Convention Center, New Orleans, LA. For more information, contact James N. Klapthor at 312.782.8424 ext. 231; E-mail: jnklapthor@ift.org.

·29-July 3, National Environmental Health Association Annual Educational Conference, Hyatt Regency Atlanta, Atlanta, GA. For more information, call 303.756.9090.

JULY

·6-13, International Workshop and Mini-Symposium on Rapid Methods and Automation in Microbiology XXI, Kansas State University, Manhattan, KS. For further information, contact Daniel Y. C. Fung at 785.532.5654; Fax: 785.532.5681; E-mail: dfung@oznet.ksu.net.

·15-18, 38th Annual Florida Pesticide Residue Workshop, St. Pete Beach, FL. For additional information, contact Dr. Joanne Brown, at 850.488.0670; fax: 850.488.4226; E-mail: flprw@doacs.state.fl.us.

·18-20, 4th Annual Foodborne Pathogen Analysis Conference, St. Pete Beach, FL. For additional information, contact Dr. Joanne Brown, at 850.488.0670; fax: 850.488.4226; E-mail: flprw@doacs.state.fl.us.

AUGUST

·3-4, IAFP Workshops, Minneapolis, MN.

- Workshop I "Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*."
- Workshop II "Applying Advanced Techniques to HACCP Systems."
- Workshop III "Crisis! Recall Management in the Food Industry."

Additional workshop information available in this issue of *DFES* on page 444.

·5-8, IAFP 2001, the Association's 88th Annual Meeting, Minneapolis, MN. Registration materials available in this issue of *DFES* on page 443 or contact Julie Cattanach at 800.369.6337; 515.276.3344; fax: 515.276.8655; E-mail: jcattanach@foodprotection.org. Visit our Web site at **www.foodprotection.org** for the most current Annual Meeting information.

·22-26, The National Society for Healthcare Foodservice Management (HFM) Annual Conference, The Saddlebrook Resort in Tampa, FL. For additional information, contact Sheila Crowley at 202.546.7236; E-mail: smc@hfm.org.

SEPTEMBER

·5, Managing Dairy Food Safety Workshop, Madison, WI. For additional information, contact W. L. Wendorff at 608.263.2015; E-mail: wlwendor@facstaff.wisc.edu.

·13-15, 2nd International Mastitis & Milk Quality Symposium, Vancouver, British Columbia, Canada. For additional information, contact National Mastitis Council, 608.224.0622; fax: 608.224.0644; E-mail: nmc@nmconline.org.

·18-20, New York State Association of Milk and Food Sanitarians Annual Meeting, Holiday Inn, Syracuse/Liverpool. For additional information, contact Janene Lucia at 607.255.2892.

• **24-26, Indiana Environmental Health Association, Inc., Fall Conference,** Holidome, Columbus, IN. For further information, contact Helene Uhlman at 219.853.6358.

• **25-26, Wisconsin Milk and Food Sanitarians Association 2001 Joint Conference,** Chula Vista Resort and Conference Center, Wisconsin Dells, WI. For further information, contact Kathy Glass at 608.263.6935.

• **26-28, Washington Association for Food Protection Annual Conference,** Campbell's Lake Chelan Resort and Conference Center, Chelan, WA. For further information, contact Bill Brewer at 206.363.5411.

OCTOBER

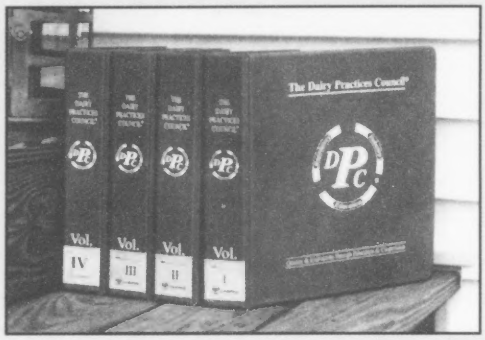
• **10-11, Iowa Association for Food Protection Annual Meeting,** Starlite Village, Ames, IA. For further information, contact Monica Streicher at 712.324.0163.

• **15-18, North Dakota Environmental Health Association Fall Meeting,** Best Western Doublewood Inn, Bismarck, ND. For further information, contact Deb Larson at 701.328.1292.

• **16-18, 1st International Symposium on Spray Drying of Milk Products,** ENSP, Rennes, France. For additional information, E-mail: sympo2001@rennes.inra.fr.

• **18-21, Worldwide Food Expo,** McCormick Place, Chicago, IL. For additional information, call 202.371.9243.

• **24-25, Associated Illinois Milk, Food and Environmental Sanitarians Annual Meeting,** Stoney Creek Inn, East Peoria, IL. For further information, contact Pat Callahan at 217.854.2547.



IAFP
Offers
"Guidelines for the Dairy Industry"
from
The Dairy Practices Council®

This newly expanded Four-volume set consists of 66 guidelines.

1 Planning Dairy Freestall Barns
2 Effective Installation, Cleaning, and Sanitizing of Milking Systems
3 Selected Personnel in Milk Sanitation
4 Installation, Cleaning, & Sanitizing of Large Parlor Milking Systems
5 Directory of Dairy Farm Building & Milking System Resource People
6 Natural Ventilation for Dairy Tie Stall Barns
7 Sampling Fluid Milk
8 Good Manufacturing Practices for Dairy Processing Plants
9 Fundamentals of Cleaning & Sanitizing Farm Milk Handling Equipment
10 Maintaining & Testing Fluid Milk Shelf-Life
11 Sediment Testing & Producing Clean Milk
12 Tunnel Ventilation for Dairy Tie Stall Barns
13 Environmental Air Control and Quality for Dairy Food Plants
14 Clean Room Technology
15 Milking Center Wastewater
16 Handling Dairy Products from Processing to Consumption
17 Causes of Added Water in Milk
18 Fieldperson's Guide to Troubleshooting High Somatic Cell Counts
21 Raw Milk Quality Tests
22 Control of Antibacterial Drugs & Growth Inhibitors in Milk and Milk Products
23 Preventing Rancid Flavors in Milk
24 Troubleshooting High Bacteria Counts of Raw Milk
25 Cleaning & Sanitation Responsibilities for Bulk Pickup & Transport Tankers
27 Dairy Manure Management From Barn to Storage
28 Troubleshooting Residual Films on Dairy Farm Milk Handling Equipment
29 Cleaning & Sanitizing in Fluid Milk Processing Plants
30 Potable Water on Dairy Farms
31 Composition & Nutritive Value of Dairy Products
32 Fat Test Variations in Raw Milk
33 Brucellosis & Some Other Milkborne Diseases
34 Butterfat Determinations of Various Dairy Products
35 Dairy Plant Waste Management
36 Dairy Farm Inspection
37 Planning Dairy Stall Barns
38 Preventing Off-Flavors in Milk
39 Grade A Fluid Milk Plant Inspection
40 Controlling Fluid Milk Volume and Fat Losses
41 Milkrooms and Bulk Tank Installations
42 Stray Voltage on Dairy Farms
43 Farm Tank Calibrating and Checking
45 Gravity Flow Gutters for Manure Removal in Milking Barns
46 Dairy Odor Control
48 Cooling Milk on the Farm
49 Postmilking Teat Dips
50 Farm Bulk Milk Collection Procedures
51 Controlling the Accuracy of Electronic Testing Instruments for Milk Components
52 Emergency Action Plan for Outbreak of Milk-borne Illness in the Northeast
53 Vitamin Fortification of Fluid Milk Products
54 Selection of Elevated Milking Parlors
55 Hazard Analysis Critical Control Point System - HACCP For The Dairy Industry
56 Dairy Product Safety (Pathogenic Bacteria) for Fluid Milk and Frozen Dessert Plants
57 Dairy Plant Sanitation
58 Sizing Dairy Farm Water Heater Systems
59 Production and Regulation of Quality Dairy Goat Milk
60 Trouble Shooting Microbial Defects: Product Line Sampling & Hygiene Monitoring
61 Frozen Dessert Processing
62 Resources For Dairy Equipment Construction Evaluation
63 Controlling The Quality And Use Of Dairy Product Rework
64 Control Points for Good Management Practices on Dairy Farms
65 Installing & Operating Milk Precoolers Properly on Dairy Farms
66 Planning A Dairy Complex - "100+ Questions To Ask"
69 Abnormal Milk - Risk Reduction and HACCP
71 Farmers Guide To Somatic Cell Counts In Sheep
72 Farmers Guide To Somatic Cell Counts In Goats
73 Layout of Dairy Milk Houses for Small Ruminant Operations
80 Food Allergen Awareness In Dairy Plant Operations

IAFP has agreed with The Dairy Practices Council to distribute their guidelines. DPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout the United States. In addition, its membership roster lists individuals and organizations throughout the world.

For the past 30 year, DPC's primary mission has been the development and distribution of educational guidelines directed to proper and improved sanitation practices in the production, processing, and distribution of high quality milk and milk products.

The DPC Guidelines are written by professionals who comprise six permanent task forces. Prior to distribution, every guideline is submitted for approval to the state regulatory agencies in each member state. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

The guidelines are renown for their common sense and useful approach to proper and improved sanitation practices. We think they will be a valuable addition to your professional reference library.

If purchased individually, the entire set would coat $289. We are offering the set, packaged in four looseleaf binders for $205.00.

Information on how to receive new and updated guidelines will be included with your order.

To purchase this important source of information, complete the order form below and mail or fax (515-276-8655) to IAFP.

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Research Notes

* Asterisk indicates author for correspondence.

How the Audiovisual Library Serves IAFP Members

Purpose ...

The Audiovisual Library offers International Association for Food Protection Members an educational service through a wide variety of quality training videos dealing with various food safety issues. This benefit allows Members free use of these videos.

How It Works ...

(1) Members simply fill out an order form (see page 461) and fax or mail it to the IAFP office. Members may also find a Library listing and an order form online at the IAFP Web site at www.foodprotection.org.

(2) Material from the Audiovisual Library is checked out for a maximum of two weeks (three weeks outside of North America) so that all Members can benefit from its use.

(3) Requests are limited to five videos at a time.

How to Contribute to the Audiovisual Library ...

(1) As the IAFP Membership continues to grow, so does the need for additional committee members and materials for the Library. The Audiovisual Committee meets at the IAFP Annual Meeting to discuss the status of the Audiovisual Library and ways to improve the service. New Members are sought to add fresh insight and ideas.

(2) Donations of audiovisual materials are always needed and appreciated. Tapes in foreign languages (including, but not limited to Spanish, French, Chinese [Manderin/Cantonese]), are especially desired for International Members who wish to view tapes in their native language.

(3) Members may also make a financial contribution to the Foundation Fund. The Foundation Fund sponsors worthy causes that enrich the Association. Revenue from the Foundation Fund supports the IAFP Audiovisual Library. Call Lisa Hovey, Assistant Director or Lucia Collison, Association Services at 800.369.6337 or 515.276.3344 if you wish to make a donation.

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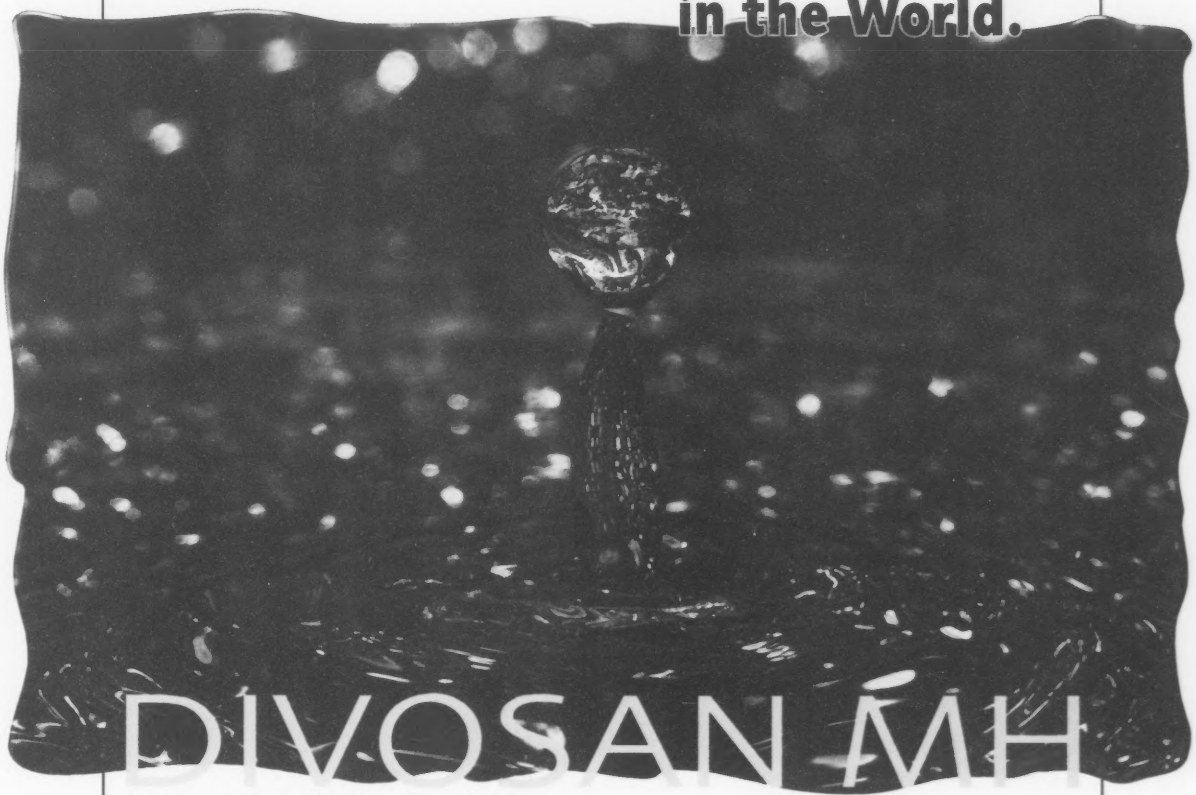

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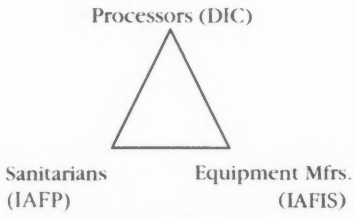
The 3-A Symbol Story

The 3-A Sanitary Standards Symbol Administrative Council, known throughout the industry as the "**3-A Symbol Council**," was organized in 1956. Its purpose is to grant authorization to use the **3-A Symbol** on equipment that meets 3-A Sanitary Standards for design and fabrication.



A Modern Concept

The modern concept of the 3-A program was established in 1944 when the Dairy Industry Committee (DIC) was formed. DIC is one of the three industry segments involved in the preparation of 3-A Sanitary Standards. These industry segments are:

- **Processors,** represented by DIC
- **Equipment Manufacturers**, represented by IAFIS
- **Sanitarians**, represented by IAFP

Use of the Symbol

Voluntary use of the **3-A Symbol** on dairy equipment:

- assures processors that equipment meets sanitary standards
- provides accepted criteria to equipment manufacturers for sanitary design & fabrication
- establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A Sanitary Standards Symbol Administrative Council

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