

# FOOD PROTECTION TRENDS

SCIENCE AND NEWS

FROM THE  
INTERNATIONAL ASSOCIATION  
FOR FOOD PROTECTION

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## A NOTE FROM THE FPT SCIENTIFIC EDITOR...

# EDMUND A. ZOTTOLA

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I have completed my third year as the Scientific Editor of *Food Protection Trends*. It has been an interesting three years, each year being a little different than the others. As the past year has progressed, the number of manuscripts submitted has increased (there have been 33 submitted in 2006). By the end of 2006, possibly 40 manuscripts will be submitted.

A couple of concerns have come up that may be of interest to our readers. Several authors have expressed interest about where scientific articles in *Food Protection Trends* are indexed. Thanks to David Golden, Chairperson of the *FPT* Management Committee, it was determined that *FPT* scientific articles are indexed in *Agricola*, *Food Science and Technology*

Abstracts and *CAB* Abstracts. Each of these are credible indexing sources.

The second concern that has been discussed is the cover photographs. Do the covers reflect the contents of the journal? If you have any thoughts about the cover photographs let us know.

The rejection rate of manuscripts is above 10% this year. The number of manuscripts from countries outside of the United States has increased. *FPT* is truly becoming an international journal.

If you have any comments or suggestions regarding *FPT*, feel free to share them with me. *FPT* is designed to serve the members of IAFP. If we can serve you better, let us know.

Edmund A. Zottola, Scientific Editor

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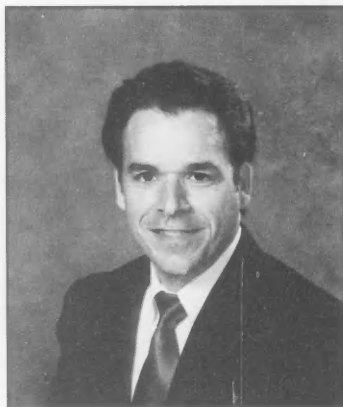
## “POINT OF VIEW” FROM YOUR PRESIDENT

As I write this month's column, I'm en route back to the US after attending IAFP's Second European Symposium, titled "Innovations in Food Safety Management." I'm pleased to report that by all accounts the meeting, which was held in Barcelona, Spain on November 30 and December 1, was a great success. In attendance were 140 professionals representing academia, industry, and regulatory. This represents a 100% increase in attendance when compared to our First European Symposium held in Prague, Czech Republic a little over a year ago. While most of the attendees came from various countries within the European Union, some came from as far away as New Zealand and Brazil.

Now, you might be asking yourself, why is it important for IAFP to maintain and develop stronger ties with Europe and our European members? Although there are several good reasons, let me briefly mention two.

First, our ties with Europe are part of our heritage. It is hard to believe, but IAFP was originally founded in 1911, almost a century ago. Of interest, our records indicate that we have had European members as part of our association dating back as early as 1918, so our ties with Europe have quite a long history. It's important that we maintain our long-standing relationship with our European members, build upon it, and hopefully, attract new ones too.

Second, a strong presence in Europe helps us to advance our



By **FRANK YIANNAS**  
PRESIDENT

***“Please join us  
at IAFP as we  
and our members  
work to share new  
food safety  
ideas, practices,  
and products”***

purpose to a broader audience. Our mission is simple. It is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply. We do this, among other ways, through the publication of our two technical journals, *Food Protection Trends* and the *Journal of Food Protection*, also known as *JFP*. As a special note, Spain (our host country for the meeting) was the country with the

second highest number of articles published in *JFP*. In 2005, 38 or 10% of the research articles published in *JFP* were from Spain. IAFP also accomplishes our mission through our Annual Meeting, held in North America, which attracts food safety professionals from all over the world.

But we at IAFP know that to fulfill our mission of Advancing Food Safety Worldwide, holding an Annual Meeting in North America is not good enough. So that's why we were in Europe for a second time and that leads me to the topic of the meeting – “Innovations in Food Safety Management.”

I don't think that there is any question that in many regions of the world, we have made progress in the battle against food-borne disease. Some might say that it has been incremental progress, but nevertheless, it is progress.

For those of us with a passion for advancing food safety and protecting public health worldwide, we would like to see even more progress made and at a more rapid pace. In order to do this, I am persuaded that we need innovation. We need innovations in food safety.

I came across a quote by Bill Gates that I think summarizes this point quite well. He said, “Never before in history has innovation offered promise of so much to so many in so short a time.” I think this point is certainly true in the field of food safety too.

A simple definition of an innovation is the act of introducing something new. From a

food safety perspective, an innovation can be a new or enhanced risk-reduction strategy or risk-reduction model. An innovation can be a new food safety practice or a new food-safety product. An innovation can be a new food-production process. The bottom line is that an innovation leads to a proactive change and a proactive change can lead to even greater reductions in the global burden of foodborne disease.

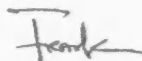
As you can imagine, putting together the European meeting required the hard work and contributions of many dedicated members and staff. Special thanks to all of the speakers who shared their expertise and the program committee members for their guidance in both selecting the topic and meeting location. I also

would like to thank the International Life Sciences Institute (ILSI) European Branch and the World Health Organization for their collaboration and Leon Gorris, Jeff Farber, David Tharp for their extra efforts in putting together the program. A very special thanks to our sponsors (listed in alphabetical order) – AES Chemunex, AOAC Research Institute, BD Diagnostics, bioMérieux, DuPont Qualicon, Food Diagnostics, FOSS, IAAP Foundation, ILSI Europe, Invitrogen Life Technologies, MATRIX MicroScience, and the Society for Applied Microbiology – for their contributions.

Several of the presentations given at the Innovations in Food Safety Management meeting are posted on our Web site. Please

take a moment to review and share them with others. Also, highlights of the meeting appear on page 30 of this edition of *Food Protection Trends*.

In closing, remember that without innovation and change, there can be no progress. Please join us at IAAP as we and our members work to share new food safety ideas, practices, and products. Working together, we can learn from each other and *Advance Food Safety Worldwide*.



As usual, if you have any questions, comments, or suggestions, please let me know. You can e-mail me at [frank.yiannas@disney.com](mailto:frank.yiannas@disney.com). Until next month, thanks for reading.

## *Announcing*

### *A New Dues Structure Effective January 2007*

Base membership plus the flexibility of choosing what **YOU** want as part of your membership package.

Watch for this on your next renewal  
or call the Association office for details.

## “COMMENTARY” FROM THE EXECUTIVE DIRECTOR

January begins a fresh start into a new year for everyone. We think about new opportunities as we (in the northern hemisphere) look forward to springtime. IAFP is no different—we look forward to springtime with a new outlook as we begin this new year. First, before entering too deep into this month's thoughts, I hope that you and your family enjoyed the holiday time together and we wish you the very best for the New Year.

As IAFP enters the year 2007, we have some fantastic opportunities facing us. We have new opportunities for Membership growth through a revised dues structure. You may have noticed that we restructured our Membership dues to now allow for a lower base, entry-level Membership fee. For the base fee, Members receive access to the Member directory, an online newsletter titled “IAFP Report,” and Member discounts for purchase of publications and registration fees to IAFP events (Annual Meetings, workshops, symposia, etc.).

In addition to the base level Membership dues, you may now choose which journal or journals you wish to receive. You may wish to receive only *Food Protection Trends* or *Journal of Food Protection* or *JFP Online* or any single one or combination of the three. You may also decide that you only want to be an IAFP Member receiving the “IAFP Report” and that satisfies your needs! Whatever you decide, it is YOUR decision and you now have a choice to make. For current IAFP Members, you will make the change when your renewal comes due during 2007. If you have any questions about the new system, feel free to call our office. We can



By **DAVID W. THARP, CAE**  
EXECUTIVE DIRECTOR

***“As IAFP enters  
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tell you when your renewal is due and explain all options available.

Some additional items to look forward to in 2007 are IAFP 2007 in Lake Buena Vista, Florida, IAFP involvement in a food safety conference in Beijing, China and a third European Symposium on Food Safety! Also, be assured if conditions exist that warrant a Rapid Response Symposium, IAFP will react quickly to plan a conference to address such issues.

As Frank Yiannas covered in his President's column this month, we just completed our Second European Symposium on Food Safety at the beginning of December

with great success. Now our sights and thoughts turn towards planning the Third European Symposium on Food Safety to be held in October or November of 2007. Due to the interest in our Second European Symposium and from reading survey comments received from attendees, it is imperative that IAFP continue holding an event in Europe for our European Members.

Please note that I did not call the European Symposium an “Annual Meeting” as that term is reserved for our annual event held in North America. We will refer to the European event as our “European Symposium on Food Safety” at least in the near term. As we grow internationally, we will branch out and hold other “symposia on food safety” events in other regions of the world. In the immediate future, we are looking at Asia and the Pacific Rim along with South America for future symposia.

This is truly an exciting time to be an IAFP Member as we look to new ways to address issues of food safety on a truly global basis. The new Membership structure allows for Members around the globe to receive the “IAFP Report” instantly, on a monthly basis to receive pertinent food safety news rapidly. With our IAFP European Symposium on Food Safety and other symposia on food safety to be presented around the globe, IAFP is providing new opportunities for Members around the world to join with colleagues in a learning environment.

I want to end this month with a reminder about IAFP 2007 in Lake Buena Vista, Florida. You can now make reservations for housing at



Disney's Contemporary Resort and our overflow property of Disney's Polynesian Resort (see the IAFPWeb site). A limited number of rooms are available for government attendees at the Port Orleans Resort at a reduced rate. Reservations must be made by telephone for these rooms

(at Port Orleans). Rooms at the Contemporary and Polynesian Resorts may be reserved online through a link available on the IAFPWeb site. We are looking to accommodate a record number of attendees this July for IAFP 2007, so make your hotel reservations early!

As you can see from our Annual Meeting and free-standing symposia, IAFP will have a very busy year in 2007 and we do look forward to springtime! We are glad that you are a Member who supports our mission and our efforts in "Advancing Food Safety Worldwide."<sup>®</sup>

### IS YOUR PROGRAM CRUMBINE MATERIAL? PUT IT TO THE TEST!

**The Samuel J. Crumbine Consumer Protection Award for Excellence in Food Protection at the Local Level is seeking submissions for its 2007 program.** The Crumbine Award is given for excellence and continual improvement in a comprehensive program of food protection at the local level. Achievement is measured by:

- ◆ Sustained improvements and excellence over the preceding four to six years;
- ◆ Innovative and effective use of program methods and problem solving to identify and reduce risk factors that are known to cause foodborne illness;
- ◆ Demonstrated improvements in planning, managing, and evaluating a comprehensive program; and
- ◆ Providing targeted outreach; forming partnerships; and fostering communication and information exchange among regulators, industry and consumer representatives.



All local environmental health jurisdictions in the U.S. and Canada are encouraged to apply, regardless of size, whether "small," "medium" or "large."

The Award is sponsored by the Conference for Food Protection, in cooperation with the American Academy of Sanitarians, American Public Health Association, Association of Food and Drug Officials, Foodservice & Packaging Institute, Inc., International Association for Food Protection, International Food Safety Council, National Association of County & City Health Officials, National Environmental Health Association, NSF International, and Underwriters Laboratories, Inc.

For more information on the Crumbine Award program, and to download the 2007 criteria and previous winning entries, please go to [www.fpi.org](http://www.fpi.org) or call the Foodservice & Packaging Institute at (703) 538-2800. **Deadline for entries is March 15, 2007.**

# Effect of Cooling Rate on Pathogen Survival in Post-Process Contaminated Yogurt

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## SUMMARY

The effect of cooling rate on the survival of pathogens was compared in full-fat and nonfat yogurt with strawberry fruit preparation added (final pH 4.4). Products were inoculated with 4.5 log CFU/g of acid-adapted *Listeria monocytogenes*, *Salmonella* sp., or *Escherichia coli* O157:H7 and dispensed into yogurt cups. One set of packages was immediately chilled to 7.2°C, whereas a parallel set of packages was cooled from 27°C to 7.2°C within 96 hours, and then both sets were stored at 7.2°C for the duration of the two-week study. Triplicate samples of each treatment were enumerated by standard plating methods at 24, 48, 72, 96, 168, 240, and 336 hours storage. In yogurt cooled slowly, populations decreased 1.3 to 1.7 logs for *Listeria*, 2.2 to 3.0 logs for *Salmonella*, and 0.8-log for *E. coli* O157:H7 within 96 hours. In contrast, log reductions were 0.5 for *Listeria*, 1.7 to 1.9 for *Salmonella*, and 0.2 to 0.3 log for *E. coli* O157:H7 in yogurt chilled immediately and held at 7.2°C for 96 hours. The pH decreased in all yogurt treatments during the 2-week storage, but the decrease was more rapid in the yogurt cooled slowly (final pH 4.1) than in samples chilled to 7.2°C immediately after inoculation (final pH 4.2). These data support the safety implications of filling yogurt with active cultures at 27°C followed by cooling to < 7.2°C within 96 hours. To ensure a safe product to the consumer, manufacturers should also comply with good manufacturing practices and environmental controls.

## INTRODUCTION

The safety of dairy products in the United States is primarily dependent on the use of pasteurized milk to eliminate vegetative bacterial pathogens and spoilage microorganisms, and good manufacturing practices and sanitary operating procedures to reduce the potential for recontamination. In the case of commercial yogurt, high numbers of live and active *Streptococcus thermophilus* and *Lactobacillus bulgaricus* further assure safety by generating acid and other antimicrobial metabolites (acetaldehyde, hydrogen peroxide, acetic acid, formic acid, diacetyl, and bacteriocins) during fermentation, thereby preventing growth or causing death of pathogens should recontamination occur.

Chilling of the acid food to less than 7.2°C (45°F) within four hours after milk coagulation (pH ~4.6-4.8) reduces excessive acid production that may result in adverse flavor defects. However, the immediate cooling required by Section 7 of the 2003 Pasteurized Milk Ordinance (PMO; 15) does not appear to provide any safety advantage over current US industry practices of slow cooling to less than 7.2°C within 96 hours. In actuality, the higher levels of lactic acid produced by starter cultures during slow cooling may accelerate bacterial pathogen death. Multiple studies have reported the inactivation of bacterial pathogens in high-acid yogurt during extended storage, especially when storage is at temperatures greater than 4°C (1, 3, 5, 7, 9, 10, 11, 12, 14). Nevertheless, additional data is required to confirm equivalent safety between

A peer-reviewed article

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**TABLE 1. Proximate analysis for uninoculated full-fat and nonfat yogurt (average of triplicate samples for each product type)**

	<b>Full-fat Yogurt (w/ nutritive sweetener)</b>	<b>Nonfat Yogurt (w/ non-nutritive sweetener)</b>
<b>Moisture (finished product)</b>	83.93%	88.78%
<b>Moisture (fruit preparation)</b>	64.66%	80.37%
<b>pH (white mass)</b>	4.80	4.78
<b>pH (finished product)</b>	4.41	4.37
<b>pH (fruit preparation)</b>	3.90	3.87
<b>Titratable acidity (finished product)</b>	0.68%	0.64%
<b>Water activity (finished product)</b>	0.974	0.980
<b>Water activity (fruit preparation)</b>	0.915	0.965

yogurt that has been cooled slowly over several days (US industry practices) and that which is chilled immediately upon filling (PMO requirement) to validate changes in regulations.

The objective of this study was to compare the effect of two cooling rates, immediate cooling to 7.2°C vs. extended cooling from 27°C to 7.2°C in 96 hours, on the survival of three foodborne pathogens, *E. coli* O157:H7, *L. monocytogenes*, and *Salmonella*, in full-fat and nonfat strawberry yogurt.

## MATERIAL AND METHODS

### Test products

Yogurt was manufactured in a pilot dairy plant by the University of Wisconsin-Madison, using commercially available cultures and generic formulations for the white mass developed by the Wisconsin Center for Dairy Research, Madison, WI. Yogurt was transported to the Food Research Institute and inoculated after the pH of the white mass had reached 4.8, and 20% strawberry fruit preparation was blended into the white mass. Formulation was such that the pH of the white mass of the products would be 4.6 or less within 24 hours of fill.

Ingredients for the white mass for the nonfat yogurt included 96.9% skim milk, 1.78% skim milk powder, 0.52% whey protein concentrate-80, 0.42% yogurt culture, and 0.39% gelatin. Fruit preparation with non-nutritive sweetener used for the nonfat yogurt included strawberries, water, fructose, corn starch modified, natural

flavors, sodium citrate, aspartame, malic acid, potassium sorbate, and color. White mass for the full-fat yogurt was composed of 86.8% skim milk, 10.02% cream, 2.11% skim milk powder, 0.64% whey protein concentrate-80, and 0.42% yogurt culture; corresponding fruit preparation with nutritive sweetener included fructose, water, strawberries, high fructose corn syrup, modified corn starch, natural flavor, citric acid, pectin, sodium citrate, malic acid, potassium sorbate, tricalcium phosphate, and color.

### Yogurt preparation

Dry ingredients were blended into the liquid and warmed to 38°C. Blended ingredients were pasteurized at 85°C for 18 seconds and homogenized at 2500 psi. After pasteurization and homogenization, 0.42% preparation commercial yogurt culture (Chris Hansen YC-x19, Milwaukee, WI) was added to the mix with set temperature of 40.6°C, and the mixture was incubated without agitation until pH 4.8 was reached (4 hours for nonfat yogurt, pH 4.78; 5.25 hours for full-fat yogurt, pH 4.80). Mixes were then pumped through a homogenizing screen to produce a smooth texture, and 20% fruit preparations (with sweeteners) were added to the yogurt. Fruit preparation with non-nutritive sweetener was added to the nonfat yogurt, and fruit with nutritive sweetener was added to full-fat yogurt. Yogurts were packaged into sanitized 36.3 L stainless steel cans and transported to the Food Research Institute for inoculation within 15 minutes of filling.

### Proximate analysis

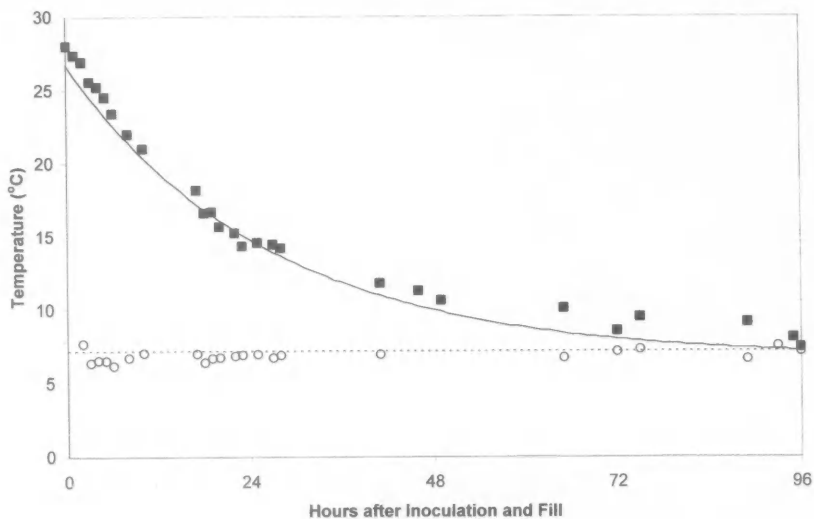
Analytical values for the two products and fruit preparations were assayed as described in Table 1. Triplicate samples for each product were analyzed for moisture (5 h, vacuum oven method, 100°C; (6)), pH (Direct pH; Accumet Basic pH meter, Fisherbrand Scientific Products, Hampton, NH; and Orion 8104 combination Electrode, Thermo Electron Corporation, Waltham, MA), titratable acidity (manual titration to pH 8.3 with 0.1N NaOH; expressed as % lactic acid meq. 0.09; (6)), and water activity (Decagon CX-2 Water activity meter, Aqualab, Pullman, WA).

### Inoculum

Strains from FRI stocks (previously frozen in 10% glycerol at -20°C) were passaged twice in Trypticase soy broth (TSB; BD Diagnostic Systems, Franklin Lake, NJ; cultures incubated at 37°C, 18–20 hours) to ensure vigorous growth. Strains included *L. monocytogenes* (Scott A, clinical isolate; LM101, hard salami isolate; LM310, goat cheese isolate associated with human illness), *Salmonella* (Enteritidis E40, chicken ovary isolate; Heidelberg S13, clinical isolate; Typhimurium S9, clinical isolate), and *E. coli* O157:H7 (C7927, clinical isolate associated with apple cider outbreak; F90, sausage isolate associated with dry-cured salami outbreak; F5854, cheese isolate associated with cheese-curd outbreak). Select colonies of each pathogen type were confirmed by use of the appropriate Micro-ID miniaturized biochemical identification system (Remel, Lenexa, KS).

**FIGURE 1.** Cooling Profile for yogurt filled at 27°C and cooled to 7.2°C within 96 h (Representative Industry Cooling) or within 0.5 h (PMO Cooling)

Target Industry Cooling Profile (—); Actual Industry Cooling Profile (■)  
Target PMO Cooling Profile (---); Actual PMO Cooling Profile (○)



Strains of each pathogen were grown individually to stationary phase in TSB supplemented with 1% glucose to induce acid-tolerance (incubated at 37°C for 18 hours), harvested by centrifugation at 2,500 × g for 20 minutes and washed with 0.1% buffered peptone water (BPW). Three strains of each pathogen were mixed in approximately equal concentrations and the inocula diluted in BPW to deliver approximately 4.5 log CFU/g of product. Populations of each three-strain mixture and of individual strains were verified by plating serial dilutions on appropriate selective media (Becton Dickinson Diagnostic Systems, Sparks, MD). *L. monocytogenes* was plated on Modified Oxford agar (MOX), *Salmonella* serotypes on xylose lysine desoxycholate agar (XLD), and *E. coli* O157:H7 on MacConkey agar with sorbitol (MSA); each strain was also verified for purity by streaking on nonselective Trypticase soy agar. All plates were incubated at 37°C for 24–48 hours, as appropriate.

#### Inoculation, packaging, cooling, and storage

For each product type-pathogen combination, 6000 g of yogurt (28–30°C) were measured into a sterilized polypropylene tray. Aliquots were then inoculated

with 6 ml of pathogen mixture by dripping inoculum over the surface and gently hand-stirring for approximately 5 minutes. Inoculated yogurt was dispensed into 170-g capacity yogurt cups (approximately 100 g/cup), and the internal temperature for each product type was monitored with a thermocouple (type K probe) inserted into one cup. Thermocouples were calibrated against a factory-calibrated mercury-filled thermometer prior to use (FisherBrand, factory-calibrated to meet the requirements of ISO/EC Guide 25, ANSI/NCSL 2540-1-1994, ISO 9000/QS 9000 Series of Quality Standards, and MIL STD 45662A).

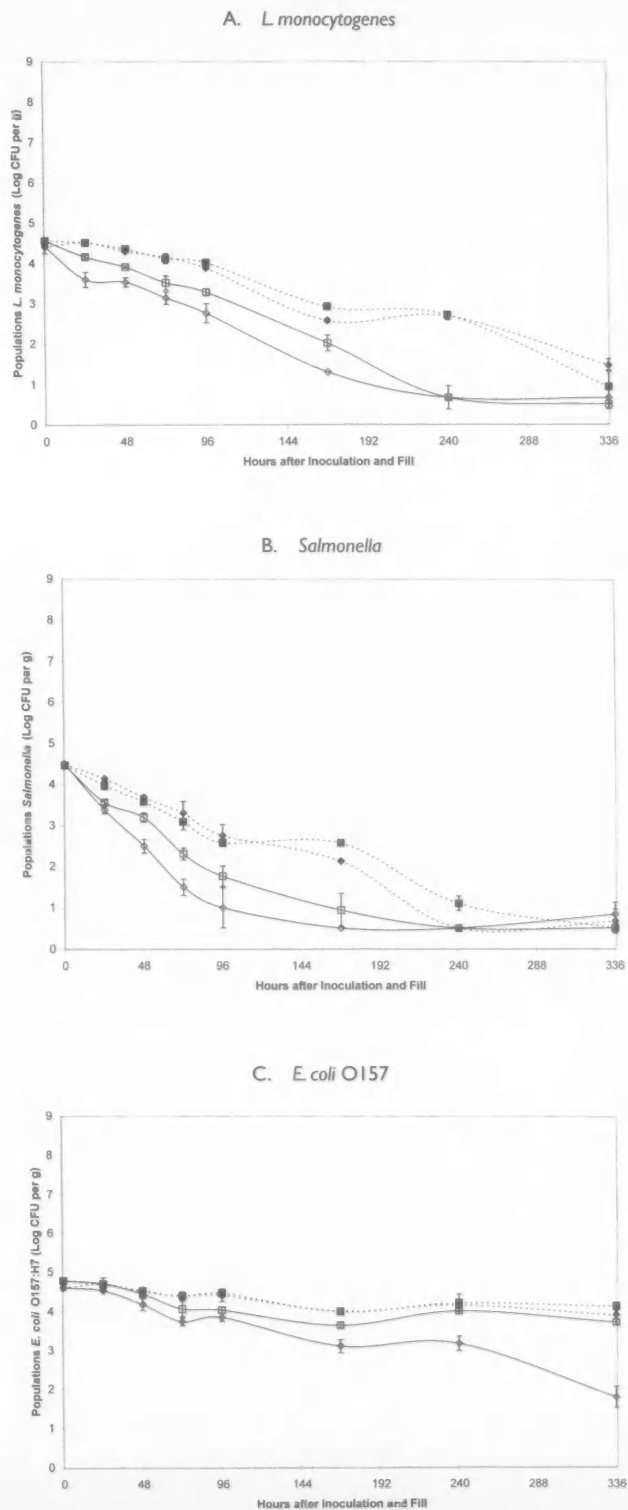
After inoculation and filling, packages were then divided for different storage temperatures to represent current PMO requirement (7.2°C) or industry cooling standards (Fig. 1). The target “typical” exponential industry cooling curves developed by Center for Food Safety and Applied Nutrition was derived from data supplied by the dairy industry for a representative variety of product sizes and cooling rates (CFSAN; Mark Walderhaug, personal communication). For PMO-cooling treatment, samples were chilled on ice to <7.2°C (approximately 15–20 minutes), then transferred to an incubator with air temperature set to 7.2°C. For the industry-cooling treatment, inoculated samples were

transferred to an incubator with air temperature set to 26.7°C and the air temperature was adjusted every hour for the first 6 hours (until 21.1°C), then in 0.6 to 1.0°C increments until the temperature of the yogurt reached 7.2°C, to mimic the designated industry-cooling regime. After 96 hours, all samples were then stored in the same 7.2°C incubator to reduce variability.

#### Sampling

For each product-pathogen combination, triplicate samples were assayed at day 0 for populations of inoculated pathogens (*L. monocytogenes*, *Salmonella*, or *E. coli* O157:H7), pH, and titratable acidity. Subsequently, triplicate samples for each product-pathogen-cooling combination were assayed for changes in populations of pathogens, pH, titratable acidity, and odor and appearance at 24, 48, 72, 96, 168, 240, and 336 hours. Temperature was monitored in representative yogurt samples throughout the sampling period. For microbial analysis, samples were assayed by aseptically removing a 25-g sample, diluting with an equal volume (w/v) 0.1% buffered peptone water (BPW) and thoroughly homogenizing, using a Lab Blender Stomacher Model 400 (Cooke Laboratory Products, Alexandria, VA). Serial dilutions were made

**FIGURE 2.** Changes in populations of *L. monocytogenes* (Panel A), *Salmonella* (Panel B), or *E. coli* O157:H7 (Panel C) during two-week storage of nonfat (NF) or full-fat (FF) yogurt cooled from 27°C to 7.2°C in 96 hours (followed by storage at 7.2°C; Industry) or cooled in 0.5 h to 7.2°C (PMO). n=3 for each data point; standard deviation for plate counts shown as error bars  
 NF, PMO (◆); FF, PMO (■); NF, Industry (◇); FF, Industry (□)



**TABLE 2. Changes in pH during two-week storage of nonfat (NF) or full-fat (FF) yogurt cooled from 27°C to 7.2°C in 96 h (followed by storage at 7.2°C; Industry) or cooled in 0.5 h to 7.2°C (PMO)<sup>1</sup>**

Time (hours)	Low-fat PMO	Low-fat Industry	Full-fat PMO	Full-fat Industry
0	4.36	4.36	4.41	4.41
24	4.37	4.20	4.41	4.24
48	4.34	4.19	4.37	4.22
72	4.30	4.17	4.35	4.20
96	4.36	4.24	4.41	4.26
168	4.31	4.19	4.31	4.21
240	4.26	4.16	4.28	4.15
336	4.21	4.09	4.22	4.11

<sup>1</sup>Average of nine samples for each product type-cooling scheme; standard deviation for all averages was less than 0.05.

in BPW and 0.1 ml aliquots surface-inoculated onto duplicate selective agar plates as previously described. The appearance of typical colonies on selective agar was considered confirmatory. Atypical colonies, if present, were selected for identification by Gram-stain, catalase activity, and biochemical profile.

#### Statistical analysis

Data were statistically analyzed using one-way and two-way ANOVA using Minitab v. 14.20 (Minitab Inc., State College, PA). Differences with  $P < 0.05$  were considered significant.

## RESULTS AND DISCUSSION

None of the pathogens tested grew in any treatment during the two-week storage period (Fig. 2). For *L. monocytogenes* and *Salmonella*, greater inactivation was observed in yogurt cooled slowly than in yogurt chilled immediately to less than 7.2°C. Populations of *L. monocytogenes* decreased  $\geq 1.3$  log at 96 hours for both yogurt types cooled slowly compared with a 0.5 log decrease in samples cooled rapidly and stored at 7.2°C. The *Salmonella* strains used in this study were more susceptible to the harsh, low-pH environment of the yogurt. Populations of *Salmonella* decreased 2.7 and 3.5 log at 96 hours for full-fat and nonfat products cooled slowly, respectively, whereas products chilled immediately to 7.2°C yielded only a 1.9

and 1.7 log decrease in 96 hours, respectively. As expected, *E. coli* O157:H7 was the most acid tolerant during cooling regardless of product type. Populations of *E. coli* O157:H7 decreased approximately 0.8 log at 96 h for yogurt cooled slowly; less than 0.3 log decrease was observed in formulations cooled rapidly.

Populations of all pathogens continued to decline during the remainder of the two week storage at 7.2°C. Less than 1.5 log CFU/g of *L. monocytogenes* or *Salmonella* were recovered from samples at the end of the sampling interval (more than 3 log reduction), regardless of product type or cooling regime. Final population differences of *L. monocytogenes* and *Salmonella* were not significant among the treatments. For the *E. coli* O157:H7-inoculated products, the nonfat yogurt that was cooled slowly inactivated  $>2.5$  log CFU/g, compared with only a 1-log decrease for full-fat yogurt cooled slowly. When either yogurt type was cooled rapidly, an average 0.7 log decrease was observed.

The pH of yogurt decreased in all treatments, but the decrease was more rapid in the yogurt cooled slowly than in samples chilled to 7.2°C immediately after inoculation (Table 2). At 96 hours, the pH values were 4.24 and 4.26 for nonfat and full-fat slow cooled yogurt, respectively, whereas the pH of the fast cooled samples were similar to 0 time, with an average of 4.36 and 4.41 for the nonfat and full-fat yogurt, respectively. Significant differences were similarly observed

at the end of the two-week sampling interval with pH  $4.10 \pm 0.01$  for either slow-cooled yogurt types and  $4.21 \pm 0.03$  for the fast-cooled yogurt.

Data revealed that although the pH values of the nonfat and full-fat varieties were the same for any given cooling regime, the nonfat variety contained greater concentrations of lactic acid than the full-fat variety. This difference might be attributed to variation in buffering capacity related to ingredients used for each product type and to the effect of available nutrients on the metabolic rate of the starter.

Titrateable acidities (expressed as % lactic acid) were approximately  $0.68 \pm 0.05$  and  $0.63 \pm 0.05\%$  for nonfat and full-yogurt, respectively, at 0 time (data not shown). At 24 hours, acid levels had increased to  $0.72 \pm 0.05$  and  $0.73 \pm 0.03\%$ , respectively, for nonfat and full-fat yogurt cooled quickly, whereas the lactic acid content for the slow cooled samples increased to  $0.82 \pm 0.04$  and  $0.85 \pm 0.07\%$  for the two yogurt types, respectively. At 336 h (two weeks), lactic acid levels for the fast-cooled samples were  $0.80 \pm 0.09$  and  $0.75 \pm 0.03\%$  for the nonfat and full-fat varieties, respectively. Increases in acid levels at the end of the two-week sampling interval were more significant for the slow-cooled samples; titrateable acidities were  $0.91 \pm 0.04$  and  $0.80 \pm 0.04\%$ , for the nonfat and full-fat varieties, respectively. All samples were normal in odor and appearance throughout the testing period, regardless of cooling rate.

The overall decrease in microbial populations correlated to the acid development in the yogurt during storage and was enhanced when product was held at higher temperatures. The greatest level of acid production and microbial inactivation was observed in nonfat yogurt cooled slowly, and the least was observed in the full-fat yogurt cooled rapidly. Similar inactivation trends have been observed for other acidic foods, such as apple cider and mayonnaise, held at non-refrigeration temperatures. Research has demonstrated that *L. monocytogenes*, *Salmonella*, and *E. coli* O157:H7 have lower tolerance to acid conditions when held at ambient temperatures than if refrigerated (2, 8, 13, 16). In addition to high acid content, which interferes with bacterial survival and growth capabilities, competition for nutrients and production of other antimicrobial substances by the metabolizing starter cultures may also contribute to the demise of bacterial pathogens in yogurt (4).

Results from this study confirm published studies that report inactivation of vegetative pathogens in commercial yogurt with pH  $\leq$  4.6. These experiments support the practice of filling yogurt at its typical fermentation temperature and cooling to  $< 7.2^{\circ}\text{C}$  within 96 hours, provided that the manufacturer uses pasteurized milk and ensures rapid and extended generation of acid by the yogurt starter cultures. In addition, environmental controls are necessary to prevent recontamination with acid-tolerant microorganisms that may have long survival times.

## ACKNOWLEDGMENTS

We thank Bill Klein, University of Wisconsin-Madison Dairy Plant, for assistance in production of yogurt used in this study, and Scott Wyman, Nicole Hardy and Garrett Kau for technical assistance. This work was funded by the Inter-

national Dairy Foods Association and by donations from the food industry.

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# Controlling *Listeria monocytogenes* in a Retail Setting

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## SUMMARY

*Listeria monocytogenes* (LM) is a deadly pathogen that sickens approximately 2,500 people in the United States each year and has a mortality rate of approximately 20%. The serious nature of the illnesses caused by this organism makes control of LM in any food handling environment important. Over the past decade, a vast amount of data has been published about LM, including the illness it causes, the nature of the organism, and its ecology. However, very little information has focused on LM in a retail environment. Recent research has demonstrated that LM is associated with a variety of ready-to-eat foods produced in retail settings. It is likely to be found in the retail environment, and there are many locations that could become harborage points for the pathogen. The most effective way to control LM in foods may be to keep the LM population to less than 100 cells per gram of food. That means that it is important to control the growth of this pathogen in food and in retail and other food handling environments. Fortunately, there are some steps that can be taken to help prevent LM from becoming established in a retail facility. These steps include proper training of employees and operators, keeping the retail environment as dry and clean as possible, maintaining temperature controls, and ensuring that employees follow good personal hygiene practices. Although *L. monocytogenes* is a dangerous organism, it is possible to control the organism and minimize the risks that it presents in a retail setting.

## INTRODUCTION

*Listeria monocytogenes* (LM) is a pathogen that has been a major concern for the food industry for over 20 years. Of all foodborne pathogens known, it has one of the highest mortality rates. It is estimated that 2,500 cases of listeriosis occur each year in the United States, primarily affecting the very young, the elderly, and immunocompromised populations, including pregnant women, diabetics, transplant recipients, and cancer patients (2), and 500 of these 2,500 cases result in death. As a result, considerable research has been and continues to be conducted on this organism. In fact, over 500 articles that provide information about LM have been published in the *Journal of Food Protection* over the past ten years. When all the other scientific journals, trade or press publications, presentations, symposia, and workshops are considered, it becomes obvious that a tremendous amount of information has been generated about this organism. While it is generally true that more information is better, sometimes the volume of information can be overwhelming. Although we have learned a great deal about this organism, both on the farm and in food processing establishments, information about LM in the retail environment is scanty. Therefore, this article will focus on the retail setting and what can be done to control LM in that environment.

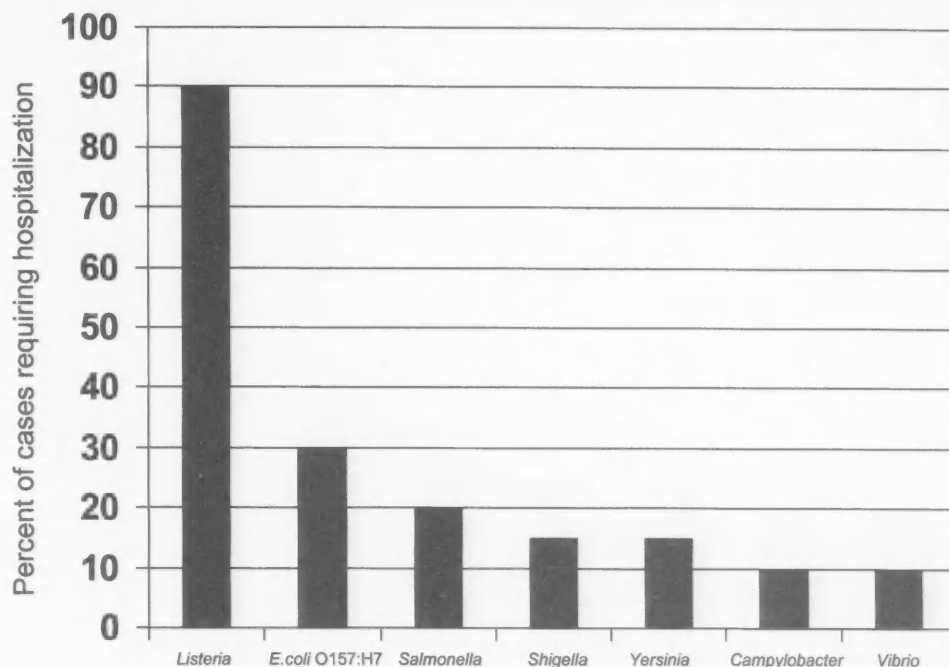
In the following document, we will address 4 main questions: What is LM? What does it do? Where is it found? How can it be controlled in a retail environment?

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FIGURE 1. Hospitalization rates associated with listeriosis as compared to other foodborne illnesses



### What is LM?

The genus *Listeria* consists of Gram-positive, non-spore forming rods and includes several species, including *ivanovii*, *welshimeri*, *innocua*, *grayi*, *seeligeri* and *monocytogenes*. Of these, *Listeria monocytogenes* (LM) is the most well known and is the organism that is of greatest concern for food safety, because of its ability to withstand harsh conditions, its ability to grow at refrigeration temperatures, and its pathogenicity.

LM possesses a combination of characteristics that make it a food safety concern. It is capable of forming and growing in biofilms, where it is more difficult to kill with sanitizers and disinfectants because of the protective film or slime layer associated with the biofilm. This characteristic can make LM difficult to control in the environment, particularly in areas that are frequently wet (floor drains, mats, cutting boards), because the organism thrives under these conditions. LM also is capable of growth at relatively high salt levels, up to 10% NaCl (9). In fact, LM has been found in several salty foods such as jerky as well as in brine solutions used in food

processing. Although LM is not normally resistant to extremes of pH, it is possible for the organism to become significantly more resistant under acidic conditions. For example, LM can survive for an extended time in acidic foods such as yogurt. The organism can adapt to its environment in response to stress, enabling LM to survive in an environment where it would normally be killed by the acidity (8). LM also is more heat resistant than most other non-spore forming bacteria, including pathogens such as *Salmonella* spp. and *Escherichia coli* O157:H7 (18).

One of the most important characteristics of LM that makes it a food safety concern is its capacity to grow at refrigeration temperatures (22). Although refrigeration is used to control the growth of most foodborne pathogens, LM is capable of growth at 5°C. Although it can grow slowly at refrigeration temperatures, it grows much faster at higher temperatures. Therefore, keeping food out of the 5–57°C (41–135°F) range is still an important means of controlling LM. The ability of LM to grow at refrigeration temperatures is one of the primary reasons that this organism is a food safety concern in ready-to-eat (RTE) foods.

### What does LM do?

Another reason for concern about LM is the seriousness of the disease it causes, known as listeriosis. In most individuals, listeriosis begins with flu-like symptoms, but it can progress to life-threatening sequelae such as septicemia, encephalitis, endocarditis, or miscarriage, especially in those individuals who are immunocompromised or have weakened immune systems. Despite today's modern medical resources, individuals with listeriosis have a high hospitalization rate (Fig. 1) (11) and a mortality rate of 25% (18). It is important to note that miscarriage and stillbirths account for a large percentage of the deaths associated with LM.

LM strikes immunocompromised people particularly hard (20). Unfortunately, the number of immunocompromised individuals in the United States population is higher than many people realize. An immunocompromised person is one whose immune system is not operating at peak effectiveness. Such individuals include children, the elderly, those with HIV, people with underlying chronic diseases (e.g., diabetes, alcoholism), che-

motherapy patients, transplant recipients, and pregnant women. Although a healthy individual may experience relatively mild flu-like symptoms such as fever, muscle aches, and possibly nausea or diarrhea, or even experience no symptoms at all after infection with LM, immunocompromised people are more susceptible to the very serious sequelae that are often associated with infection. The mortality rate for these individuals may be nearly twice what it is for people who are not immunocompromised (20).

Although listeriosis is a very serious disease, it also is relatively rare. According to the Centers for Disease Control (CDC), the annual reported incidence of listeriosis is approximately 3 cases per 1,000,000 Americans (1).

### Where is LM?

LM not only can grow at refrigeration temperatures and cause serious illness; it is also a ubiquitous bacterium, meaning it can be found nearly everywhere. The pathogen has been isolated from soil, sewage, silage, 37 species of mammals, and 17 species of birds (18). It can be shed in the feces of infected animals, contaminating a wide variety of surfaces, environments, water, or agricultural products. In fact, up to 10% of all people may be asymptomatic carriers of this organism (18). Given the ubiquitous nature of this organism, it can be very difficult to keep it out of a food handling setting.

The ubiquitous nature of LM also is reflected in the locations from which it has been isolated. LM has been isolated from fresh and further processed poultry (10, 12), beef (13) and seafood products, as well as the environment of the establishments where they are processed (16, 21). Within these processing establishments, as Tompkin et al. (17) have demonstrated, numerous harborage sites exist for the pathogen. Harborage sites are nooks and crannies on food contact and non-food contact surfaces that can be difficult to clean and are frequently missed during a cursory cleaning process. Food processing sites where the organism has been isolated include equipment, drains, walls, floors, air/cooling ventilation systems, knives, buckets, mops, brushes, boots, pallets, light fixtures, etc. (17). In addition to being found in processing establishments, the organism has been identified in a variety of fresh fruits and vegetables (14).

In addition to studies performed in food processing facilities, several studies have examined the retail food environment for LM. The National Food Process-

ors Association (NFPA) published a study in 2003 in which deli foods were examined for LM, although the authors did not look for the organism on food contact or non-food contact surfaces in the retail environment (6). Food samples included smoked seafood, seafood salad, deli salads, cheeses, and luncheon meats. Over 31,000 samples were taken over a one-year period from retail establishments in the states of Maryland and California (6). The most notable finding was the isolation and identification of LM in 577 of the 31,000 food samples. Four hundred of those samples had very low levels of LM, with only 0.3 organisms per gram of food; twenty deli samples had 100 organisms or more per gram of food, and several had very high levels (> 100,000) of the pathogen per gram of food. Other findings of the study indicated that the incidence of LM contamination was the same in winter or summer. Of the foods tested, both smoked and seafood salads were more likely to be contaminated, followed by deli salads and cheeses. Interestingly, deli meat, a product often thought to be associated with high risk, was the least likely to be contaminated with the pathogen of the products examined in this study (6).

Another finding of the NFPA study was that if the food was packaged in the retail store, it was more likely to be contaminated than if it had been packaged at a processing establishment. However, in those instances in which food packaged at an establishment was contaminated with LM, the level of contamination was higher than in food packaged at the retail level. This finding is not unexpected, as food that is packaged at a processing establishment is expected to be in transit from the processor to the retailer for several days. This allows time for LM to grow in the food, should the food be contaminated. The very stringent LM regulations for processors that are manufacturing ready-to-eat meat (19) is a reflection of the additional risk imparted by the delay between processing and consumption of the food.

The main findings of the National Food Processors Association Survey (6) are:

- Of the more than 31,000 samples of seafood, deli salads, and luncheon meats from retail establishments in Maryland and California that were examined for LM over a 1-year period, 577 samples were positive for LM.
- The majority (400) of the positive samples had very low levels (<1 CFU/ml) of LM.
- Twenty of the samples had 100 or more LM per gram of food.

- If the food had been packaged at the retail level, the likelihood of LM contamination was slightly higher than if it had been packaged at a processing establishment.
- When there was LM contamination of food packaged at a processing establishment, the level of contamination was higher than for food packaged at retail.

Another study, published in 2004, also examined the presence of LM in foods prepared in retail establishments, in samples from foods prepared in processing establishments, and in environmental samples, as well as in clinical isolates (15). In this study, conducted over 5 years, LM strains isolated were analyzed to determine the genetic fingerprint of the organisms. By determining the genetic fingerprints of each LM isolated, researchers could track an isolate through the environment, to the product(s), and ultimately to the patient. Different strains of LM, like different strains of all bacteria, can have minor differences in genetic structure, which can be detected by examining their genetic fingerprints. Bacteria undergo this sort of differentiation frequently, with the end result being that a LM cell isolated from one location may differ genetically from a LM cell isolated from another location. By examining the genetic fingerprint of LM, it is possible to differentiate between a new strain of LM contaminating a facility and another strain of LM that may have colonized in the facility previously. The genetic fingerprint analysis of the organisms isolated in this study also revealed that the same LM strain could be isolated weeks later, or even a year later, in the same facility. This observation strongly suggests that rather than isolated instances of LM existing in a plant, there was harborage of LM that had not been removed from the facility during the cleaning process. It was hypothesized that this harborage could serve as a source of contamination that could be spread to other locations in the facility (15).

The main findings of the study reported by Saunders et al. (15) are:

- LM was found in ready-to-eat food samples from 47 retail establishments.
- Twenty of the 47 establishments yielded more than one food sample that contained LM.
- Five of the 20 retail establishments that had multiple LM-positive food samples also had one or more environmental samples positive for LM.

- Of the 27 establishments that had only one food sample positive for LM, only 2 had environmental samples that contained LM.
- Of the 7 establishments in which LM was isolated from food as well as the environment, at least one of the isolates from food had the same genetic fingerprint of an environmental isolate from that establishment.
- For all 7 of the establishments in which LM was isolated from both food and the environment, organisms with the same genetic fingerprint were isolated from food and the environment on different dates, ranging from 2 to 4 weeks apart.

Both studies already described above found LM in food samples taken in retail settings. Additionally, Saunders et al. (15) reported finding LM in environmental locations that included coolers, display cases, slicers, walls, shopping carts, floor drains, meat grinders, sinks, work tables, scales, and ice bins. This study is one of the few studies that have addressed and/or identified harborage sites for LM in retail environments.

However, there may be other places in the retail environment where LM is the potentially present (4). These harborage sites may include surfaces that can trap bits of food and water, thereby promoting microbial growth under favorable temperature conditions. Food contact surfaces that may harbor the organism include cutting boards, slicers, or utensils (including tongs and spoons), knives, gloves, hands, and aprons or smocks (these last 3 are not supposed to be food contact surfaces, but they frequently are). Non-food contact surfaces that may harbor LM include floors, drains, floor mats, switches, handles, door knobs, sinks, standing water, and cart wheels. Carts, particularly those used behind the counters, could spread LM around a retail environment. For example, a cart used to carry a carton of paper towels from dry good storage to the deli section may be rolled through a source of LM (e.g., a puddle of standing water in a raw meat area), thereby spreading the organism all along the path of the cart.

There are also various other non-food contact surfaces that are not often considered potential reservoirs for LM. These surfaces may include HVAC systems, cracked hoses, door tracks and seals, maintenance tools, improperly maintained and stored cleaning utensils, employees, suppliers, and customers. In short, just

about every surface in a retail environment could harbor LM can serve as a reservoir, causing it to spread to other locations within the environment, including food (4).

### How do we control LM?

Given that LM grows at refrigeration temperatures, is so common and wide spread in the environment, and causes such a serious illness, control of LM can be a daunting task. However, there are potential ways to control this organism in retail establishments.

In a modeling study conducted by the NPPA, the risk of listeriosis was determined on the basis of the concentration of LM in the food consumed (3). The study found that low levels of LM in food were associated with a much lower risk of listeriosis. For example, if LM in food could be limited to less than 10,000 organisms per gram, the incidence of listeriosis could be reduced by over 90%. If the level of LM could be limited to fewer than 100 organisms per gram of food, the risk of listeriosis could be reduced by more than 99%. In other words, 99% of the listeriosis cases could be eliminated by ensuring that food contained fewer than 100 organisms per gram (3). This finding suggests that the most effective way to control LM in foods may be to keep the LM population in food below 100 cells per gram.

Because of the pervasiveness of LM in the environment and the many ways that it may move throughout a retail setting, the goal of an effective LM control program should be to control the spread and prevent growth of the organism, rather than working to keep it out of a retail facility.

One of the most important things that can be done to control the growth of LM in a retail environment is to maintain a dry environment. All microorganisms need water to grow, and LM is no exception. Any place that is consistently wet, such as areas with standing water under sinks or coolers, as well as display cases in which condensation can collect and drip, is potentially an area where LM can multiply. Condensation also can collect in HVAC systems. Display cases and drip pans that collect runoff from produce misters could support the growth of LM. Sink sideboards that do not drain properly may allow water to pool, providing an environment that could support the growth of LM. Floor mats, which frequently get wet throughout the day or during cleaning and which can stay wet

for long periods of time, under the right conditions could become areas where LM can grow to high levels. Serving and cleaning utensils that are not cleaned or dried properly after use also could provide environments conducive to LM growth. Improperly sloped floors that allow water to puddle and stand after cleaning could be breeding grounds for microorganisms, including LM. Finally, older hoses that are cracked could support LM growth.

In addition to water, all microorganisms need nutrients to grow. In general, LM needs nutrients similar to those that people need to sustain life. Despite the prevalence of plentiful nutrients in retail establishments, there are many measures that can be implemented to reduce control the supply of food to LM. The main way is to have a good cleaning program in place. Four variables that can affect cleaning performance are **Time**, **Action**, **Chemical**, and **Temperature**, or **TACT**. Cleaning performance in retail establishments can be improved by increasing any of these individual factors.

For example, the contact **time** between the cleaning chemical and the surface being cleaned can be increased. Another variable that affects cleaning performance is **mechanical action**. Sometimes the most useful cleaning step is scrubbing to remove soils by mechanical action, which may require scrubbing of surfaces with pads or brushes. If cleaning utensils are used, care must be taken to clean the utensils thoroughly after use and store them so that they can dry completely. If this is not done, these same utensils can become breeding grounds for microorganisms and spread microbes around an environment, onto surfaces, and ultimately into foods.

The cleaning program also should include effective cleaning **chemicals** used at the proper concentration and in the proper manner. One way to increase cleaning effectiveness is to increase either the chemical concentration or the aggressiveness of the chemistry. Very tenacious soils may require aggressive chemicals such as caustics, chlorine, or solvents. For safety reasons, it is important that all cleaning chemicals be used at the manufacturer's recommended concentrations. Increasing chemical concentrations above what is recommended by the manufacturer can be hazardous to users, and damaging to equipment; in addition, it may not actually clean any better than the recommended-use levels.

The final cleaning variable that can be manipulated is **temperature**. Because higher temperatures often improve the

performance of cleaners, hot water is generally preferred over cold. However, it is important to follow manufacturers' instructions for cleaners and sanitizers. If water is too hot, it can be hazardous to use and "bake" some soils onto surfaces, making them harder to remove. An effective cleaning program will balance the four **TACT** variables to achieve the desired result. Remember, if one variable is decreased, then something else must increase in order to achieve the desired result. An effective cleaning program that optimizes the TACT variables to remove as much soil from environmental surfaces as possible is a critical element in controlling LM in a retail setting.

Another important measure in controlling LM is to ensure that time is taken to disassemble equipment. Some pieces of equipment in a food retail environment, notably slicers, are very complex and difficult to handle, and they may have many harborage points for LM, such as O-rings and grooves. Sometimes the only way to deal with this sort of equipment is to break it down into cleanable sections. Other pieces of equipment that may require disassembly to clean properly include mixers, display cases, shelving units, or coolers.

Although LM is capable of growing at refrigeration temperatures, it is still critical to maintain proper temperature controls. While it is possible for LM to grow at 4–5°C, it grows faster at higher temperatures and optimally at temperatures around 35°C. The faster growth rate of LM at elevated temperatures is one of the reasons that some surfaces, such as slicers, need to be cleaned every 4 hours. In 4 hours at room temperature, food particles left on the slicer can support enough microorganism growth to cause significant concern. In addition to dictating some cleaning schedules, the necessity to maintain proper temperature controls also requires that all food be kept out of the temperature "danger zone" of 5–57°C (41–135°F) as much as possible.

In spite of all the efforts to clean or dry the environments where LM can grow, it may not be possible to completely eliminate the organism from the retail environment. As a result of cleaning, floor drains are often wet for extended times. LM also may enter the store on raw or further processed foods. Therefore, it is important to minimize the risk of **cross contamination** from these products. Cross contamination, the transfer of microorganisms from one surface to another, can occur through a variety of intermediates. Serving utensils, gloves, and cutting

boards are all items that can transfer LM from one surface to another. For example, if raw food that is contaminated with LM is placed onto a cutting board, that cutting board may become contaminated with LM. If the board is not properly cleaned and sanitized before a Ready-To-Eat (RTE) food is placed on it, LM may be transferred from the board to the RTE food. Care must also be taken when cleaning non-food contact surfaces such as floor drains, which may be contaminated with LM. If cleaning utensils such as drain brushes are used improperly or if high pressure sprays are used to clean surfaces such as drains, it is possible to create aerosols that can spread organisms, including LM, from non-food contact surfaces to food contact surfaces.

Another element of an effective LM control program and an effective way to prevent cross contamination is through handwashing. Poor personal hygiene is a significant cause of foodborne illness (7). Yet, in an observational study reported by the CDC in 2006, handwashing occurred in less than a third of activities in which it should have (5). As indicated earlier, up to 10% of people may be asymptomatic carriers of LM (18). These factors suggest that good personal hygiene is critical to controlling the spread of LM or any other food pathogen in food establishments.

Drying the environment, effective cleaning programs, personal hygiene, and temperature controls are all important and effective ways to control LM in the retail environment. However, the most effective measure that can be employed to control this organism in retail establishments is to **train employees properly**. Nearly all food safety failures are preventable and are the result of improper human actions. Failures occur because an employee doesn't take the time to do the job correctly. Consider the following potential food safety failures: a slicer that is not disassembled so that it can be properly cleaned; a leaking pipe that is not reported or repaired, so that a puddle of standing water forms; employees who allow RTE foods to be temperature-abused; or other improper actions that allow LM to grow to levels that are likely to cause serious illness. In each case, employees can easily rectify the situation through diligence and attentiveness.

Microorganisms may be the mechanism by which foodborne illness occurs, but the main reason for outbreaks is people making mistakes. Attempts to prevent foodborne illness by focusing solely on the microorganisms in the environment can be compared to a doctor prescribing

a pain medication for appendicitis. It may alleviate the symptom, but it does not address the root cause of the problem. If foodborne illness is caused by human failures, then the best solution is to implement employee training. However, it is not sufficient just to have a training program in place. Rather, it is critical that the program trains people in what they need to know and why, that training is reinforced over time, and that management ensures that employees are practicing what they have been trained to do. Although many actions that are necessary to control food pathogens in a retail setting are not exciting, it is important to remember that very mundane actions are absolutely critical for food safety. Sometimes the importance of these activities gets lost in their routine nature. So, it is the responsibility of managers to make sure that operators who have these day-to-day tasks understand just how important they are. Employees doing these jobs need to know that they are critical activities ensuring the safety of their customers, for the future of the business, as well as for their own job security.

The final element of a LM control program is to seek assistance. A large number of experts and resources are available to help with food safety issues. Professional societies such as the International Association for Food Protection, Institute of Food Technologists, and American Society for Microbiology have a large amount of expertise in the specific area of LM control. Many of the leading experts in this field are members of one or more of these societies and are willing to provide suggestions and support to others dealing with this issue. Other sources of information and assistance are trade associations such as the Food Marketing Institute, The National Restaurant Association, National Food Processors Association, and National Sanitation Foundation. These organizations support their membership by producing informational materials and expertise that can be used to develop a LM control program.

Yet another valuable source of assistance is state universities that have extension programs; expert personnel associated with state extension programs have tremendous food safety expertise. Extension personnel can be invaluable aids in developing programs to control LM. Another, often overlooked, source of inexpensive information and assistance with LM control programs is through suppliers. Cleaning and sanitation chemical suppliers are often good sources of information for ways to control LM. Food or in-

ingredient suppliers also can be good sources of information. All manufacturers of RTE meats that are USDA-inspected are required to develop LM control programs for their own operations. Many of these suppliers may be willing to share their expertise on this issue with their customers.

## CONCLUSIONS

*Listeria monocytogenes*, a food pathogen that is very common in the environment, is so common that it can contaminate a retail environment, where it can persist over long periods of time. LM can also grow at refrigeration temperatures, so, although low temperatures will slow the growth of this organism, it will not prevent it. LM causes a very serious, although, fortunately relatively uncommon, illness, and studies have indicated that it takes a relatively high number of organisms (100 organisms/g of food or more) to create a high risk of causing illness. The key to controlling this disease, then, is to not let the organism grow to high levels in the retail environment or in food.

There are many elements of a program to keep LM from growing to high levels. Good cleaning practices that use a proper combination of the **TACT** variables and do not spread LM through the use of poorly maintained cleaning utensils are important in order to deny LM the nutrients that it needs to grow. Careful time/temperature controls will also help prevent growth of this organism, as will maintaining a dry environment. Practicing good personal hygiene can help prevent the spread of LM throughout a retail environment. In addition, possibly the most important element of a program to control LM is having training programs to ensure that the people most directly responsible for controlling LM understand the importance of their tasks and the proper way to carry them out.

Finally, it is important to take advantage of the many sources of help that are available; from government agencies, to university extension programs, professional and trade associations, and suppliers, there is a tremendous amount of expertise available that can help retailers develop effective and practical programs to control *Listeria monocytogenes*.

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#### References:

<sup>1</sup> Rose, Bonnie E. 2001. Isolation and identification of *Salmonella* from meat, poultry and egg products. In Microbiology laboratory guidebook, 3rd ed., Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, D.C.

<sup>2</sup> U.S. Food and Drug Administration. 2003. Bacteriological analytical manual (online), AOAC International, Gaithersburg, MD.

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<sup>4</sup> Data on file, Diagnostic Systems, Sparks, MD 21152, USA.

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# Barcelona Highlights





# *IAFP's Second European Symposium on Food Safety*

## *Innovations in Food Safety Management*

**I**AFP's Second European Symposium on Food Safety, titled *Innovations in Food Safety Management*, was held on 30 November and 1 December 2006 in Barcelona, Spain. There were 140 food safety professionals in attendance for the Symposium. Fourteen presentations were delivered over the day and a half of sessions.

A welcome reception was sponsored by the AOAC Research Institute on Wednesday evening. Participants were able to meet new friends and reestablish communications with long-time colleagues. The Research Institute also held an Advisory Council meeting on Thursday morning which helped to bring people to Barcelona to attend the Symposium. Also on Thursday morning, a private tour of the Silliker Laboratory in Barcelona took place.

The Symposium began Thursday afternoon followed by an IAFP-sponsored reception in the exhibit room. Twenty companies or organizations provided current food safety products and information through their stands in the exhibit room. On Thursday evening, bioMérieux and IAFP teamed up to provide a short bus tour of the main areas of historic significance in Barcelona, ending with a Spanish tapas dinner of delicious Catalan foods.

Friday's symposium speakers delivered important information on "Innovations in Food Safety Management" and the Symposium

wrapped up by 4:00 p.m. Presentations given at the Symposium are available on the IAFP Web site. Many attendees stayed on in Barcelona to enjoy the mild, fall weather over the weekend in this beautiful Mediterranean city.

We appreciate the work of the organizing committee who helped to form the Symposium program. We also thank ILSI Europe and the World Health Organization for collaborating with IAFP on this program.

IAFP thanks everyone who attended the Second IAFP European Symposium and especially wants to thank the many sponsors and exhibitors. The attendance and sponsor support this year shows that IAFP is serving a need in Europe. We look forward to working on a Third European Symposium on Food Safety and announcing the topic soon!

### **Exhibitors:**

AES Chemunex, Agencia Catalana De Seguretat Alimentaria—The Catalan Agency of Food Safety, AOAC Research Institute, B2P Ltd., BD Diagnostics, BioControl Systems, bioMérieux, British Food Journal, DuPont Qualicon, Food Diagnostics, Foss, ILSI Europe, International Food Hygiene, Invitrogen Ltd., Lab Ferrer, Matrix MicroScience, Society for Applied Microbiology, Strategic Diagnostics and World Health Organization.



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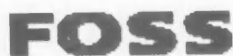
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#### **Paper in journal**

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West, D. I., and L. B. Bullerman. 1992. Physical and chemical separation of mycotoxins from agricultural products, p. 52-57. *In* J. E. Smith (ed.), *Mycotoxins and animal feeding stuffs*, vol. 4. CRC Press, Boca Raton, FL.

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Pitt, J. I., and A. D. Hocking. 1997. *Fungi and food spoilage*. Blackie Academic and Professional, London.

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## **MONDAY, AUGUST 14**

### **(S06) Symposium on Foodborne Viruses and Foodborne Viral Infections: Disease Burden, Epidemiology, Detection, and Transmission**

*Co-sponsored by the IAFP Viral and Parasitic Foodborne Disease Professional Development Group*

Co-convenors: Lee-Ann Jaykus, Les Smoot, and Martin Wiedmann

Enteric viral pathogens have been estimated to cause about 9.3 million foodborne disease cases, including 129 deaths annually in the United States alone. While foodborne disease surveillance and prevention efforts traditionally have focused on bacterial and parasitic pathogens, the importance of viral pathogens is increasingly recognized. This symposium provides an overview of the nature, epidemiology and transmission of foodborne viral infections, including updates on surveillance systems used for viral foodborne diseases. Since enteric viruses can be transmitted by a variety of pathways, including foods, attribution of viral infections to specific transmission routes and in the case of foodborne disease, specific foods, will also be discussed. Examples of current research efforts to characterize survival, persistence, transmission, and risk of enteric viruses and their diseases also will be presented. This session provides an understanding of foodborne viral infections and their human health impact as well as the challenges associated with the detection and characterization of viral foodborne pathogens.

### **Foodborne Viruses: Introduction, Disease Burden, Epidemiology, and Attribution**

Marc-Alain Widdowson, STEPHAN S. MONROE,\*  
Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A-30, Atlanta, Georgia 30333, USA;  
\*Speaker

In the United States, foodborne viruses are estimated to be responsible for 9.3 million infections per year. Noroviruses are increasingly recognized as the most frequent cause of sporadic cases and outbreaks of acute gastroenteritis. As the use of molecular diagnostic methods has become more common in recent years, the importance of noroviruses as a cause of outbreaks of foodborne illness has been well documented.

Noroviruses were associated with 305 (27%) of 1,146 foodborne outbreaks with a laboratory-confirmed etiology reported to the Centers for Disease Control and Prevention (CDC) from 1998 to 2000. Molecular characterization indicates that a diversity of norovirus strains is responsible for outbreaks, with a group of closely related strains responsible for the majority of outbreaks from 2002 to 2004. Contamination of food items with viruses can occur at any point throughout the farm-to-table continuum, however, most reported outbreaks are related to contamination by an infected foodhandler. As more outbreaks are reported, a wide array of contaminated food products has been implicated. Several examples will be presented demonstrating the variety of virus genetic types and food vehicles involved.

Foodborne viruses are an increasingly important public health problem, the control of which will require education and interventions at many points along the food distribution chain.

## Using a Tiered Approach to Employee Health Guidelines to Address the Control of Norovirus in the FDA 2005 Food Code

JOHN J. GUZEWICH,\* Wendy Fanaselle, David Acheson, Center for Food Safety and Applied Nutrition, US Food and Drug Administration, 5100 Paint Branch Parkway, Room 3B074, Mail Stop HFS-600, College Park, Maryland 20740, USA; \*Speaker

When the US Food and Drug Administration (FDA) Food Code was first developed in 1993, there was little appreciation of the importance of norovirus (NV) as a foodborne pathogen. However, NV, known previously as "Norwalk-like virus," is now recognized as the single most common cause of gastroenteritis in all age groups, and one of the most important foodborne pathogens in the western world. A number of studies have now demonstrated that consuming food contaminated by infected food workers is a leading risk of NV foodborne illness. This combined with the low infectious dose and its easy transmissibility as an aerosol emphasizes that more must be done to control the spread of this pathogen in a food environment. These new data on the transmissibility and extreme infectivity of NV has allowed us to develop improved guidance in the Food Code to reduce further the risk of transmitting NV at the retail level. Control of foodborne viruses and bacteria that are transmitted via food from food workers requires a trilateral approach. The trilateral approach, including exclusion of ill food workers exhibiting specific symptoms, washing hands and avoiding bare hand contact with ready-to-eat food items, provides a solid barrier to the transmission of foodborne viruses when utilized consecutively. The revised employee health guidelines in the Food Code improve the strength of this approach through a tiered approach to exclusion of infected or ill food workers and by providing the greatest protection to at-risk populations. This presentation will review both the data that led to the changes in the 2005 Food Code as well as the changes themselves.

### Surveillance of Foodborne Viruses: A European Perspective

MARION P. G. KOOPMANS, National Institute of Public Health and the Environment (RIVM), P.O. Box 1, 3720 BA Bilthoven, The Netherlands

The foodborne viruses in Europe network is a collaboration among virologists and epidemiologists from 24 institutes in 13 countries in Europe funded by the European Commission since 1999. The central research goals are to better understand the mechanisms of emergence of variant norovirus (NV) strains, to develop robust methods and criteria for linking cases in different outbreaks through combined molecular and

epidemiological data collection, and to provide better estimates for the incidence of foodborne NV infections. In order to address these questions we built a European surveillance structure for outbreaks of viral gastroenteritis, including foodborne or waterborne outbreaks.

The first phase was designed to review existing surveillance systems for viral gastroenteritis, design and agree upon a minimum dataset for collection, review and evaluate currently used methods for detection and genotyping of NV with the aim to harmonize methods, and build a database of combined epidemiological and virological data for use by all participants. Since its start, we have collected data on over 5,000 norovirus outbreaks. Over this time period, the completeness of reporting of the minimum dataset has gradually increased, as did the proportion of outbreaks for which strain sequences were available. The proportion of outbreaks attributed to foodborne infection varies greatly from year to year and between countries. At least 15 international alerts were issued over the years about possible international foodborne outbreaks but complete outbreak investigations are often hampered by political barriers. Genogroup II.4 strains predominate, but are relatively more frequently associated with person-to-person outbreaks than with foodborne outbreaks. A specific problem is the observation that often contaminated food contains mixtures of viruses, increasing the risk of a generation of new recombinant strains. Such sudden, but also more gradual, changes in the circulating viruses have a clear impact on their epidemiology.

### Harmonization of Sampling, Detection, and Subtyping Methods for Foodborne Viruses

DAVID N. LEES, CEFAS, Weymouth Laboratory, Barrack Road, The Nothe, Weymouth, Dorset, DT4 8UB, United Kingdom

Epidemiological evidence shows that the viruses primarily associated with foodborne illness are norovirus, causing gastroenteritis, and hepatitis A virus. Recent years have seen a proliferation of publications on methods for detection of these viruses in foodstuffs using PCR (polymerase chain reaction). However, thus far no standard harmonized procedures have been elaborated and formalized quality assurance procedures are generally lacking. This laboratory runs a worldwide external proficiency testing program for detection of viruses in molluscan shellfish. The results illustrate the current diversity of methods in use, their variable performance, and the urgent need for standardization and formal quality assurance. This is particularly necessary before virus methods can be considered for adoption within a regulatory framework. This presentation focuses on European progress towards standardization and quality assurance of methods for detection of viruses in foodstuffs.

## Survival and Persistence of Enteric Foodborne Viruses on Fresh Fruits and Vegetables

GAIL E. GREENING, Institute of Environmental Science & Research Ltd., Kenepuru Science Centre, P.O. Box 50-348, Porirua 6006, New Zealand

Foodborne viral disease is an increasing problem. Limited information is available on the survival and persistence of enteric viruses on fresh produce. Quantitative culture and real-time quantitative polymerase chain reaction (qPCR) methods were used to investigate the survival and persistence of hepatitis A virus (HAV), adenovirus (ADV) and norovirus (NV) on fresh produce. Strawberries and lettuce were seeded with the three viruses and stored at 4°C for 15 days, with viral analysis at 3 day intervals. ADV and HAV survival and persistence were determined by quantitative culture and real-time qPCR methods. NV persistence was determined by real-time qRT-PCR because human noroviruses are not culturable.

After 15 days of storage at 4°C, NV, HAV and ADV were still detected on both lettuce and strawberries. No significant decline was observed for NV over the 15 days on either lettuce or strawberries. A decline in infectious ADV titre was observed on strawberries and a decline in infectious HAV was observed on lettuce. Washing strawberries and lettuce in water at ambient (~18°C) and warm temperatures (~42°C) produced 2-4 log reductions for NV, ADV and HAV by both culture and molecular methods.

A novel culture real-time PCR approach was evaluated to determine if it was valid for quantitation of infectious ADV and HAV. Although the method did not accurately quantify virus, it could detect infectious viruses on fresh produce.

This research is providing additional information on the longevity of foodborne enteric viruses on fresh produce under normal storage conditions and will contribute to food safety outcomes.

This research was funded by the Technical Committee on Food Microbiology of the International Life Sciences Institute, North America Branch.

## The Impact of Virus Survival, Persistence, and Transfer on the Transmission and Risk of Foodborne Disease

LEE-ANN JAYKUS,\* Jong H. Park, Efstathia Papafragkou, Pengbo Liu, Amir H. Mokhtari, Doris H. D'Souza, and Christine L. Moe, Departments of Food Science and Microbiology, North Carolina State University, 400 Dan Allen Drive, Raleigh, North Carolina 27695, USA, \*Speaker

The human enteric viruses are increasingly recognized as important causes of foodborne disease, and recent epidemiological evidence suggests that many

viral foodborne disease outbreaks are attributable to poor personal hygiene practices of infected food-handlers. Unfortunately, few systematic studies to investigate the transmission of these viruses in food preparation environments have been undertaken. In this presentation, we describe recent laboratory-based data documenting enteric virus persistence and transfer, and in turn, use these data to inform a risk model.

Working with five enteric viruses [two human norovirus (NV) strains, two NV surrogates (feline calicivirus and mouse norovirus) and hepatitis A virus (HAV)], we collected data on their persistence and/or removal from relevant food-processing surfaces and human hands. Based on two different molecular amplification approaches, we found HAV to be highly persistent (over 42 days) on stainless steel, Formica, and ceramic surfaces. The genogroup II NVs were somewhat less persistent than HAV (over 21 days), but more stable than Norwalk virus, a prototype genogroup I NV. Virus persistence on hands was volunteer-specific but viral RNA could be detected on the fingers of volunteers at one hour post-inoculation; viruses were not completely inactivated or eliminated by handwashing. A probabilistic mathematical model was developed to describe the risk of foodborne viral gastroenteritis associated with poor personal hygiene practices of infected foodhandlers.

When what-if scenario analysis was applied to evaluate potential mitigation strategies, results showed that the probability of wearing gloves, the number of bathroom visits, and the degree of contamination in the restroom area substantially impacted contamination level and, hence, the risk of NV infection. Using laboratory-based methods and mathematical modeling, this work provides an integrated approach to characterizing the transmission of enteric viruses in the food preparation environment.

This research was funded by the Technical Committee on Food Microbiology of the International Life Sciences Institute, North America Branch.

## TUESDAY, AUGUST 15

### (SI I) Symposium on *Enterobacter sakazakii*

Co-conveners: Marguerite A. Neill, Karl E. Olson, and Don L. Zink

*Enterobacter sakazakii* is an emerging pathogen notable for its severe morbidity and mortality in human infections. It has caused meningitis in infants and bacteremias in adults, and these infections have been notable for very high fatality rates despite treatment.

In a few outbreaks in infants, powdered infant formula has been identified as a vehicle of transmission for this pathogen both in the United States and internationally. Overall however, relatively little is known about the clinical epidemiology of human infection with



*E. sakazakii*, its environmental niche, and its presence and survival in infant formula and foods. This symposium provides the most current information on the epidemiology and clinical significance of *E. sakazakii* as a human pathogen. The design of the current US Food and Drug Administration study to investigate clinical cases of *E. sakazakii* infection will be discussed along with its strengths, limitations and preliminary data. The survival and persistence of this pathogen in powdered infant formulas and cereals will be described. Studies of the pathogenicity of *E. sakazakii* in murine and other non-primate animal models will be presented. A perspective on industry methods to ensure the safety and integrity of powdered infant formula is presented. These talks aim to advance our understanding of the pathogenicity of *E. sakazakii* and the ways to decrease transmission of this emerging pathogen.

### Clinical and Epidemiological Significance of *E. sakazakii*

CHRISTOPHER R. BRADEN, Division of Bacterial Foodborne and Mycotic Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A38, Atlanta, Georgia 30329, USA

*Enterobacter sakazakii* is a rare and poorly understood cause of neonatal disease that has been epidemiologically and microbiologically linked to powdered infant formula, though other sources of infection likely exist. The infection has a predilection to cause severe meningoencephalitis with a mortality rate of 35–80%. The incidence of infections in the United States has been estimated at 1 per 100,000 infants; among low-birth-weight infants, the rate was 8.7 per 100,000.

In a recent case-series analysis, at least 16% of 37 infants developed brain abscess, 22% had seizures, and 35% died. Of the 22 known surviving infants, 36% showed developmental delays, 18% had motor impairment, and 23% required ventricular shunting for hydrocephalus. Infants with only bacteremia were significantly more premature at birth, lower birth weight, but older age at the time of illness onset compared with infants who suffered meningitis.

*E. sakazakii* outbreak investigations are reviewed, including the evidence supporting powdered infant formula as a major source of infections from epidemiologic and microbiologic studies.

*E. sakazakii* has a predilection to infect premature and low-birthweight neonates, and often causes meningitis and death. A strong link to powdered infant formula is suggested in some cases. Further research is needed to clarify host risk factors, the role of infant formula as a source of infections, and other potential sources of *E. sakazakii* infection.

### Survival and Growth of *Enterobacter sakazakii* in Dry and Reconstituted Infant Formula and Cereal

LARRY R. BEUCHAT,\* Joshua B. Gurtler, and Li-Chun Lin, Center for Food Safety and Department of Food Science and Technology, University of Georgia, 1109 Experiment Street, Griffin, Georgia 30223, USA; \*Speaker

*Enterobacter sakazakii* is not uncommonly found in the environment. On rare occasions, it is the cause of invasive infection in preterm neonates, infants, children under the age of four, and immunocompromised adults. Surveys of powdered infant formulas have shown the presence of *E. sakazakii* at very low populations in some products. Although the bacterium will not grow in powdered infant formula or dry cereal, its ability to survive for an extended time as affected by  $a_w$ , temperature, and formula composition is not known.

If *E. sakazakii* is present in powdered infant formula or dry cereal at the time they are reconstituted for feeding to infants, it may grow, thereby presenting a higher risk of infection. We conducted studies with two major objectives: (1) to determine the survival characteristics of *E. sakazakii* in powdered infant formulas and dry infant cereals as affected by  $a_w$  and temperature; and (2) to determine survival and growth characteristics of *E. sakazakii* in reconstituted infant formulas and cereals as affected by the composition of the liquid used for reconstitution, storage temperature, and storage time.

A ten-strain mixture of *E. sakazakii* was inoculated at populations of 0.31 – 7.07 log CFU/g into six commercially manufactured powdered infant formulas and four dry cereals at  $a_w$  values of 0.24 – 0.87 and stored at 4, 21, and 30°C for up to 9 months. Increased rates of death were correlated with increased  $a_w$  and storage temperature. At initial populations as low as 0.86 log CFU/g of formula and 0.31 CFU/g of cereal, the bacterium survived for 9 months at all storage temperatures, demonstrating exceptional tolerance to desiccation. An initial population of 0.03 CFU/ml of formula reconstituted with water increased to ca. 10 CFU/ml within 8 h and > 8 log CFU/ml within 24 h at 30°C. Lag times of  $\geq 8$  and > 24 h were required at 21 and 12°C, respectively, for populations to reach ca. 2 CFU/ml of formula. When inoculated at a population of 0.52 CFU/ml of cereal reconstituted with water or milk, *E. sakazakii* grew within 4, 8, and 24 h at 30, 21, and 12°C, respectively, but did not grow within 72 h at 4°C. The bacterium grew at 21 and 30°C in cereal reconstituted with apple juice, but only after lag times of 48 and 24 h, respectively. Results provide information needed to predict survival and growth characteristics of *E. sakazakii* in dry and reconstituted infant formulas and cereals, thus giving valuable insights to the development of interventions aimed at eliminating or greatly reducing the risk of *E. sakazakii* infections in infants.

## Mouse Models to Assess *Enterobacter sakazakii* Virulence and Pathogenicity

MARY A. SMITH\* and Arena N. Richardson, College of Public Health and College of Agricultural and Environmental Health Sciences, University of Georgia, 206 Environmental Health Science Department, Athens, Georgia 30602, USA; \*Speaker

Most deaths and permanent disability resulting from *Enterobacter sakazakii* infection are in premature infants. To determine how *E. sakazakii* causes infections, to develop therapies to treat infection, to test vaccines that might protect against *E. sakazakii* infection, and to develop animal models that mimic human disease are needed. Newborn mice have an immature central nervous system and may be similar to that of premature humans.

Our objective was to compare different mouse strains for their susceptibility to *E. sakazakii* infection and their ability to mimic the infection in humans. Two strains of pregnant mice, CD-1 and C57BL/6, were obtained and allowed to give birth naturally. Neonates were exposed to *E. sakazakii* strain MNW2 by gavage at 3–4 days of age. CD-1 neonatal mortality was 17.8% and 34.8% at doses of 9 log and 11 log colony forming units (CFU), respectively, compared to only 4.2% at a dose of 12 log CFU in C57BL/6 neonates. In CD-1 neonates, *E. sakazakii* was isolated from an increasing number of brain, liver and cecum tissues as the dose increased. This was not true for the C57BL/6 neonates. In CD-1 mice, 1 in 3 litters receiving 9 log CFU had *E. sakazakii*-related mortality and 4 in 4 litters receiving 11 log CFU had at least 3 *E. sakazakii*-related deaths. In C57BL/6 mice, only 1 in 4 litters at 12 log CFU had one neonatal death. In conclusion, CD-1 neonatal mice are more susceptible to *E. sakazakii*-related deaths than C57BL/6 and these deaths occur in a dose-related manner.

## Non-primate Animal Models to Assess *Enterobacter sakazakii* Virulence and Pathogenicity

Franco Pagotto, Raquel Lenati, Min Lin, and JEFFREY M. FARBER,\* Bureau of Microbial Hazards, Health Products and Food Branch, P/L 2204A2, Health Canada, Ottawa, Ontario, K1A 0L2; \*Speaker

*Enterobacter sakazakii* is an emerging opportunistic pathogen that causes neonatal meningitis and necrotizing enterocolitis in infants, often resulting from the consumption of reconstituted powdered infant formula (PIF). The mechanism(s) it uses to cause disease in humans and how many cells are required to cause illness remain unknown at present. As such, it is very difficult for regulatory agencies to set policies. Our laboratory was the first to provide evidence that *E. sakazakii* can produce enterotoxin-like compounds.

In our study, 5 young (chicks, gerbils, guinea pigs, piglets, rabbits) and two neonatal animal species (gerbils, rats) were used to find a model that could mimic human pathogenesis and clinical manifestations of *E. sakazakii* infection in infants. Animals were orally challenged with PIF containing  $10^9$  *E. sakazakii* from a core set of three strains, namely SK81 (clinical), 2001–10–01 (clinical), and MNW2 (food). Young (days 7 and 14) and neonatal (days 2 and 7) non-primate models were assessed post-inoculation, and organs (brain, heart, liver, spleen, mesentery, kidneys, intestines), blood, and fecal specimens were examined for the presence of *E. sakazakii*.

None of the animals presented symptoms as observed in human infections. *E. sakazakii* was isolated from fecal samples of all animals challenged. The intestines, gizzard, liver, proventriculus and brain of chicks were positive upon selective enrichment only for strain 2001–10–01 on day 7. Interestingly, when using either oral dosing or intraperitoneal inoculation of young guinea pigs, *E. sakazakii* was only recovered from fecal samples. Gerbils (young and neonatal), while asymptomatic, were the only species where *E. sakazakii* was recovered from all organs, including the brain. In addition, death was observed in some neonatal gerbils. Ongoing work will focus on our remaining *E. sakazakii* diversity strains using the gerbil neonatal model.

## Current Approaches to Investigating Cases of *Enterobacter sakazakii*

Elisa L. Elliot, JOHN J. GUZEWICH,\* and Marianne Ross, US Food and Drug Administration, Center for Food Safety and Applied Nutrition, 5100 Paint Branch Parkway, College Park, Maryland 20740, USA; \*Speaker

Rare and severe *Enterobacter sakazakii* infections have been reported worldwide to include cases of meningitis, septicemia and necrotizing enterocolitis. Most cases occur in infants and some cases have been linked to feeding of powdered infant formulas. A case in 2001 in Tennessee was linked to powdered infant formula by matching pulsed-field gel electrophoresis patterns of clinical and product isolates. Between 2001 and 2005, the US Food and Drug Administration (FDA), the Centers for Disease Control and Prevention (CDC), and state/local public health agencies jointly investigated at least 15 other isolated cases of *E. sakazakii* infections in infants. In some cases the organism was detected in the preparation area, on utensils used to mix formula, and/or in opened containers, but not in unopened containers of powdered infant formula. In 2005, FDA re-examined its response to *E. sakazakii* infections in infants due to the intense investigation and laboratory response that is required, and the inability to detect the organism in unopened containers. FDA's proposed actions include: (1) use or development of additional

analytical methods; and (2) development of a standard reporting tool to guide a coordinated approach to clinical and environmental investigation, laboratory testing and data sharing. FDA and CDC developed a questionnaire to manage the second action item. The questionnaire addresses epidemiology, such as illness, medical and medication history; infant formula details, such as feeding history, preparation and feeding methods; environmental investigation, focusing on storage and delivery of powdered formula and cross contact issues; and laboratory methods, such as analysis and results for clinical, formula, and environmental samples.

### **Safety and Integrity of Powdered Infant Formula: An Industry Perspective**

KARL E. OLSON, Ross Products Division/Abbott Laboratories, 625 Cleveland Ave., Columbus, Ohio 43215, USA

Powdered infant formula has been identified as a vehicle for *Enterobacter sakazakii* and has been linked to some rare, but potentially severe, bacterial infections in infants. In order to ensure that powder of only the highest quality and integrity is released to the market, the industry employs stringent measures to ensure the microbiological integrity of raw materials, production, packaging, and storage. This presentation will provide insight into the measures that are implemented by a manufacturer to ensure that product in the final container meets the highest standards for quality and safety.

## **WEDNESDAY, AUGUST 16**

### **(S22) Symposium on Salmonella: The Saga Continues**

Co-conveners: J. Stanley Bailey and Paul A. Hall

*Salmonella* has reemerged as the leading cause of foodborne bacterial enteric disease in humans and is the only major enteric bacterial pathogen that has not seen reductions in human illnesses in recent years. Despite the implementation of new regulations by the US Department of Agriculture's Food Safety and Inspection Service, and large expenditures by the poultry industry, the level of *Salmonella* in processed poultry has not been reduced significantly. In addition, better attribution models have shown that tomatoes and other fruits are responsible for a large number of outbreaks of human salmonellosis. The use of antibiotics has been reduced, but there are continuing concerns about the development of antimicrobial resistance in bacteria associated with animal production systems. In Europe, *Salmonella* Enteritidis continues to be the predominate serotype of concern, but many new issues are emerging. A distinguished panel of experts discuss these and other issues surrounding an old pathogen, *Salmonella*: The Saga Continues.

### **Trends in Foods Associated with Outbreaks of Salmonellosis**

MICHAEL F. LYNCH, Foodborne and Diarrheal Diseases Branch, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A38, Atlanta, Georgia 30329, USA

Salmonellosis is one of the most common foodborne illnesses in the United States with an estimated 1.4 million cases each year. The relatively small proportion of cases identified as part of outbreaks can tell us much about the foods associated with these infections and, in turn, how these infections may be prevented. Review of salmonellosis outbreaks reported to the US Centers for Disease Control and Prevention indicates several food items of concern. Several multi-state outbreaks of *Salmonella* infections, due to several serotypes of *Salmonella*, have been associated with consumption of tomatoes. Though one outbreak strain has been found in the tomato-growing environment, the mechanism of contamination remains obscure. The number of outbreaks of a serotype *Salmonella* Enteritidis due to eggs has decreased recently; however, outbreaks of *S. Enteritidis* associated with poultry meat may be on the rise. Two recent outbreaks of infections with strains of *S. Typhimurium* and *S. Newport* resistant to multiple antimicrobial agents have been associated with ground beef. These outbreaks highlight the need for prudent use of antimicrobials for food animal care as well as consumer education on handling raw meat. The incidence of infection with the monophasic serotype *S. I 4, 5, 12:i:-* has increased dramatically in the US over the past 10 years. The factors responsible for this increase are not entirely clear; several recent outbreak investigations suggest chicken as a source. More work is needed to better understand how foods implicated in salmonellosis outbreaks become contaminated and to develop effective prevention strategies.

### **The FSIS Enhanced Salmonella Policy**

Daniel Engeljohn and HEEJEONG K. LATIMER,\*  
Food Safety and Inspection Service, US Dept. of  
Agriculture, 1400 Independence Ave. SW, 333  
Aerospace Center, Washington, D.C. 20250, USA;  
\*Speaker

The Food Safety and Inspection Service (FSIS) has initiated a new risk-based approach for conducting verification activities particularly associated with *Salmonella* control in broilers. FSIS is concerned that there is a persistent upward trend of percent positive *Salmonella* sample sets seen in the broiler class. In order to protect public health better and reduce the public's exposure to *Salmonella*, FSIS is committed to redirecting its *Salmonella* Verification Sampling Program by allocating inspection and sampling resources at a greater frequency in establishments that exhibit highly variable

or variable control. This approach is intended to cause a significant reduction in exposure of the public to serotypes of *Salmonella* found on raw poultry that also are associated with common human illness. Priority will be given to getting information on sampling results back to establishments in a more timely manner as well as allocating resources towards assisting those establishments showing poor performance regarding pathogen control. In addition, FSIS has begun testing turkey carcasses for *Salmonella* in order to evaluate process control in turkey slaughter establishments. As a critical public health strategy, it is the Agency's intent to move 90% of establishments in all product classes into consistent control regarding *Salmonella*. These initiatives are explained in greater detail in the Federal Register Notice, *Salmonella* Verification Sample Result Reporting: Agency Policy and Use in Public Health Protection.

### **Research and Industry Efforts to Control *Salmonella* in Chickens**

J. STANLEY BAILEY, Agricultural Research Service, US Department of Agriculture, 950 College Station Road, Athens, Georgia 30605, USA

The ecology and epidemiology of *Salmonella* in poultry and their environments is complex. Elimination or significant reduction of *Salmonella* from chickens and their production and processing environments will require comprehensive, multi-faceted intervention procedures from the breeder level through grow-out and processing. The majority of research and industry efforts to control *Salmonella* in raw chicken meat have focused on identifying a "terminal pasteurization" step for the processing plant. There is also recognition that in order to eliminate or reduce the load of *Salmonella* entering the processing plant, that intervention procedures will have to be implemented on the farm.

In recent years, processing equipment has been modified to facilitate food safety applications, and numerous cleaning and disinfection steps have been added to commercial processing plants. In addition, numerous antimicrobial chemicals have been tested and shown to have varying degrees of effectiveness for controlling *Salmonella*. The effectiveness of these procedures and chemicals will be reviewed. Evidence of the role that on-farm interventions can play in effectively helping to control *Salmonella* can be seen in Sweden and Denmark where on-farm programs have significantly controlled *Salmonella* in broiler chicken production. The size and competitive nature of the industry make implementation of new pathogen

intervention technologies, that would increase costs of production significantly, a challenge unless there is a concomitant decision by the entire industry to implement the technology. Research and anecdotal evidence suggests that the use of live and killed cell vaccines in breeders, competitive exclusion treatments in breeders and broilers, and extensive biosecurity in breeder and broiler operations should yield similar results without the extensive costs of eradication programs used in the Scandinavian countries.

### **Ecology, Physiological and Genetic Factors Associated with the Survival and Growth of *Salmonella* on or within Tomatoes**

Xiaoqing Shi, Magdalena Kostrzynska, and KEITH WARRINER,\* Dept. of Food Science, University of Guelph, Guelph, Ontario N1G 2W1, Canada; \*Speaker

In North America there have been over 2000 reported cases of salmonellosis linked to contaminated tomatoes since 1990. *Salmonella* associated with tomatoes belong to relatively uncommon serotypes suggesting that certain strains of the pathogen have adapted to persist on or with the fruit. By gaining a better understanding on the interactions of *Salmonella* with tomatoes, more effective intervention strategies can be devised.

In the following presentation we will report on the persistence of a range of *Salmonella* serovars on/within pre- and post-harvest tomatoes. In addition, a comparative study on the genetic and physiological attributes associated with the different *Salmonella* serovars will be described. Finally, the role of the microecology of tomatoes on the persistence of *Salmonella* will be discussed.

The persistence of *Salmonella* on pre- and post-harvest ripened tomatoes was serovar dependent. Those previously implicated in foodborne illness cases linked to tomatoes (e.g., Montevideo) persisted to a greater extent compared to those isolated from animals or clinical samples (e.g., Typhimurium). All the *Salmonella* types studied exhibited cellulose production and similar biofilm forming abilities. However, serovars were found to differ with respect to *RpoS* mediated gene expression and attachment strength but neither attribute could be correlated to persistence on tomatoes. Microbial ecology studies illustrated that *Salmonella* has a significant impact on the diversity and microbial types associated with tomatoes. This ecological modifying effect, in combination other factors, can explain the enhanced persistence of certain serovars on or within tomatoes.

## Antimicrobial Resistance Trends in *Salmonella*

PAULA J. FEDORKA-CRAY,\* J. Stanley Bailey, Jonathan G. Frye, Jovita Haro, Jodie R. Plumblee, and Douglas E. Cosby, Agricultural Research Service, US Dept. of Agriculture, 950 College Station Road, Athens, Georgia 30605, USA; \*Speaker

Since the early 1990s there has been increasing awareness and concern regarding the development of antimicrobial resistance among bacteria of public health significance. Reports targeting zoonotic bacteria, and in particular *Salmonella* species, suggest that resistance is trending upward. However, analysis of the data demonstrates variability that may not be readily apparent in these reports.

There are over 2500 reported serotypes of *Salmonella* and each serotype is unique not only in its antigenic presentation, but also in its virulence, potential for host specificity, and apparent ability to develop resistance or acquire resistance genes. Additionally, while the top five serotypes for humans remain fairly constant, serotypes vary dramatically between and within animal species. Seasonal and regional differences in weather and animal production may also play a role in the development and maintenance of resistance and clinical status of recovered isolates (diagnostic versus farm/slaughter/retail) must be taken into account. Therefore, an overview of resistance in *Salmonella*, which does not differentiate between serotype, animal species, or other characteristics, may not provide an accurate assessment of resistance trends.

Multiple resistance (MR) must also be well defined. Although multiple typically means >1, investigators may only report MR exceeding 5 antimicrobials. Additionally, while MR may occur to  $\geq 2$  antimicrobials, resistance to later generations of antimicrobials within the same antimicrobial class suggests that this may not be true MR. Antimicrobial resistance among *Salmonella* is complex and most accurately described by a detailed analysis of the data using all available descriptors.

Antimicrobial resistance among *Salmonella* is complex and most accurately described by a detailed analysis of the data using all available descriptors.

## *Salmonella*: The European Situation and Risk Assessment Perspective

MARTA HUGAS, Panel on Biological Hazards, European Food Safety Authority (EFSA), Largo N. Palli 5/A, Parma 43100, Italy

*Salmonella* spp. is one of the major causes of foodborne illnesses in humans. According to the Community Summary Report on Trends and Sources of Zoonoses, a total of 192,703 cases of human salmonellosis were reported by 25 Member States in 2004. Eggs, poultry meat, and pork are the major sources of human foodborne salmonellosis in the European Union (EU).

Regulation (EC) No 2160/2003 on the control of *Salmonella* provides for the setting of Community targets, for reducing the prevalence of *Salmonella* serovars with public health significance in different animal populations: breeding flocks of *Gallus gallus*, laying hens, broilers, turkeys, and slaughter and breeding pigs. According to the Regulation, it may be decided to establish rules concerning the use of specific control methods in the context of the control programs. The Regulation states that before proposing such rules on specific control methods, the Commission shall consult the European Food Safety Authority (EFSA), the body for risk assessment in food safety in the EU.

EFSA has given scientific advice highlighting advantages and disadvantages of different control options for *Salmonella* in poultry and in slaughter pigs. Some of the treatments considered were the use of vaccines or antimicrobials to control *Salmonella* in poultry. No universal mitigation option capable of eliminating *Salmonella* entirely from the harvest and post-harvest level in pigs was identified. A combination of measures aimed at the prevention of vertical and horizontal transmission is likely to be the most effective approach, as is the case with most other foodborne pathogens.



# *Award Nominations*

The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. You do not have to be an IAFP Member to nominate a deserving professional. To request nomination criteria, contact:

International Association for Food Protection  
6200 Aurora Ave., Suite 200W  
Des Moines, Iowa 50322-2864, USA  
Phone: 800.369.6337; 515.276.3344  
Fax: 515.276.8655  
Web site: [www.foodprotection.org](http://www.foodprotection.org)  
E-mail: [info@foodprotection.org](mailto:info@foodprotection.org)

***Nominations deadline is March 12, 2007.***

You may make multiple nominations. All nominations must be received at the IAFP office by **March 12, 2007**.

- ◆ Persons nominated for individual awards must be current IAFP Members. Black Pearl Award nominees must be companies employing current IAFP Members. GMA-FPA Food Safety Award nominees do not have to be IAFP Members.
- ◆ Previous award winners are not eligible for the same award.
- ◆ Executive Board Members and Awards Committee Members are not eligible for nomination.
- ◆ Presentation of awards will be during the Awards Banquet at IAFP 2007 – the Association's 94th Annual Meeting in Lake Buena Vista, Florida on July 11, 2007.

## ***Nominations will be accepted for the following Awards:***

### **Black Pearl Award**

Award Showcasing the Black Pearl, *Sponsored by Wilbur Feagan and FEH Food Equipment Company*  
Presented in recognition of a company's outstanding commitment to, and achievement in, corporate excellence in food safety and quality.

### **Fellow Award**

Distinguished Plaque

Presented to Member(s) who have contributed to IAFP and its Affiliates with distinction over an extended period of time.

### **Honorary Life Membership Award**

Plaque and Lifetime Membership in IAFP

Presented to Member(s) for their dedication to the high ideals and objectives of IAFP and for their service to the Association.

### **Harry Haverland Citation Award**

Plaque and \$1,500 Honorarium, *Sponsored by Zep Manufacturing Co.*

Presented to an individual for many years of dedication and devotion to the Association ideals and its objectives.

### **Harold Barnum Industry Award**

Plaque and \$1,500 Honorarium, *Sponsored by Nasco International, Inc.*

Presented to an individual for dedication and exceptional service to IAFP, the public, and the food industry.

### **Elmer Marth Educator Award**

Plaque and \$1,500 Honorarium, *Sponsored by Nelson-Jameson, Inc.*

Presented to an individual for dedicated and exceptional contributions to the profession of the Educator.

### **Sanitarian Award**

Plaque and \$1,500 Honorarium, *Sponsored by Ecolab Inc.*

Presented to an individual for dedicated and exceptional service to the profession of Sanitarian, serving the public and the food industry.

### **Maurice Weber Laboratorian Award**

Plaque and \$1,500 Honorarium, *Sponsored by Weber Scientific*

Presented to an individual for outstanding contributions in the laboratory, recognizing a commitment to the development of innovative and practical analytical approaches in support of food safety.

### **International Leadership Award**

Plaque, \$1,500 Honorarium and Reimbursement to attend IAFP 2007, *Sponsored by Cargill, Inc.*

Presented to an individual for dedication to the high ideals and objectives of IAFP and for promotion of the mission of the Association in countries outside of the United States and Canada.

### **Food Safety Innovation Award**

Plaque and \$2,500 Honorarium, *Sponsored by 3M Microbiology*

Presented to a Member or organization for creating a new idea, practice or product that has had a positive impact on food safety, thus, improving public health and the quality of life.

### **GMA-FPA Food Safety Award**

Plaque and \$3,000 Honorarium, *Sponsored by GMA-FPA*

This Award alternates between individuals and groups or organizations. In 2007, the award will be presented to a individual in recognition of a long history of outstanding contributions to food safety research and education.

# Call for Abstracts



## IAFP 2007

### The Association's 94th Annual Meeting

July 8-11, 2007

Lake Buena Vista, Florida

#### General Information

1. Complete the Abstract Submission Form Online.
2. All presenters must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
3. There is no limit on the number of abstracts individuals may submit. However, one of the authors must deliver the presentation.
4. Accepted abstracts will be published in the Program and Abstract Book. Editorial changes may be made to accepted abstracts at the discretion of the Program Committee.
5. Membership in the Association is not required for presenting a paper at IAFP 2007.

#### Presentation Format

1. Technical — Oral presentations will be scheduled with a maximum of 15 minutes, including a two to four-minute discussion. LCD projectors will be available and computers will be supplied by the convenors.
2. Poster — Freestanding boards will be provided for presenting posters. Poster presentation surface area is 48" high by 96" wide (121.9 cm x 243.8 cm). Handouts may be used, but audiovisual equipment will not be available. The presenter will be responsible for bringing pins and velcro.

Note: The Program Committee reserves the right to make the final determination on which format will be used for each presentation.

#### Instructions for Preparing Abstracts

1. All abstracts must be written in English.
2. All abstracts must be approved and signed off by all authors before submission.
3. Title — The title should be short but descriptive. The first letter in each word in the title and should be capitalized.
4. Authors — List all authors using the following style: first name or initials followed by the surname.
5. Presenter Name and Title — List the full name and title of the person who will present the paper.
6. Presenter Address — List the name of the department, institution and full postal address (including zip/postal code and country).

7. Phone Number — List the phone number, including area, country, and city codes of the presenter.
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9. E-mail — List the E-mail address for the presenter.
10. Format preferred — Check the box to indicate oral or poster format. The Program Committee reserves the right to make the final determination of presentation format.
11. Category — The categories are used by the Program Committee to organize the posters and technical sessions. Please check the box which best describes the category for which the abstract is suitable.
12. Developing Scientist Awards Competition — Check the box to indicate if the presenter is a student wishing to be considered in this competition. The student will make the initial submission, and IAFP will E-mail the abstract to the major professor, who will complete the submission process. For more information, see "Call for Entrants in the Developing Scientist Awards Competitions."
13. Abstract — Key the abstract into the web-based system. In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to IAFP at the time of submission. Use no more than 300 words. Abstracts are most often rejected because of a failure to follow the instructions below.

In addition to following these instructions, authors should carefully review the sections on selection criteria and rejection reasons as well as the sample abstracts (available online) before submitting the abstract. Original research abstracts MUST be in the following format:

*Introduction:* State the reason for pursuing this work (2-3 sentences)

*Purpose:* State the purpose or objectives of the study (1-2 sentences)

*Methods:* State the methodology used in the study (2-3 sentences). The methods should be specific enough that researchers in the same or similar field would understand the basic experimental design or approach.



**Results:** Describe the results obtained in the study (2–3 sentences). **NOTE:** Specific results, with statistical analysis (if appropriate), **MUST** be provided. A statement of “results pending” or “to be discussed” is not acceptable and will be grounds to abstract rejection. Results should be summarized, do **NOT** use tables or figures. **Significance:** State the significance of the findings to food safety and/or public health (1–2 sentences) **NOTE:** Do not include reference citations in the Abstract. Please see sample abstracts for further guidance on abstract structure.

Education abstracts **MUST** present an improvement or innovation on a proven method in order to educate others (about a food protection related topic). There should be a way to measure the outcomes and substantiate the improvements and/or outcomes. If measured, the sample size should be sufficiently large to represent the intended population.

### Abstract Submission

Abstracts submitted for IAFP 2007 will be evaluated for acceptance by the Program Committee. Please be sure to follow the instructions above carefully; failure to do so may result in rejection. Information in the abstract data must not have been previously published in a copyrighted journal.

Abstracts must be received no later than January 16, 2007. Completed abstract and information must be submitted online. Use the online submission form at [www.foodprotection.org](http://www.foodprotection.org). In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to IAFP at the time of submission. You will receive an E-mail confirming receipt of your submission.

### Selection Criteria

1. Abstracts must be structured as described above.
2. Abstracts must report the results of original research pertinent to the subject matter. Papers should report the results of new, applied studies dealing with: (i) causes (e.g., microorganisms, chemicals, natural toxicants) and control of all forms of foodborne illness; (ii) causes (e.g., microorganisms, chemicals, insects, rodents) and control of food contamination and/or spoilage; (iii) food safety from farm-to-fork (including all sectors of the chain including production, processing, distribution, retail, and consumer phases); (iv) novel approaches for the tracking of foodborne pathogens or the study of pathogenesis and/or microbial ecology; (v) public health significance of foodborne disease, including outbreak investigation; (vi) non-microbiology food safety issues (food toxicology, allergens, chemical contaminants); (vii) advances in sanitation, quality control/assurance, and food safety systems; (viii) advances in laboratory methods; and (ix) food safety risk assessment. Papers may also report subject matter of an educational nature.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting. Papers should not appear in print prior to the Annual Meeting.

### Rejection Reasons

1. Abstract was not prepared according to the “Instructions for Preparing Abstracts.” This includes abstracts that are too lengthy.
2. Abstract reports inappropriate or unacceptable subject matter.
3. Abstract is not based on accepted scientific or educational practices and/or the quality of the research or scientific/educational approach is inadequate.
4. Potential for the approach to be practically used to enhance food safety is not justified.
5. Work reported appears to be incomplete and/or data and statistical validity are not presented. Percentages alone are not acceptable unless sample sizes (both numbers of samples and sample weight or volume) are reported. Detection limits should be specified when stating that populations are below these limits. Indicating that data will only appear in the presentation without including them in the abstract is **NOT** acceptable.
6. Abstract was poorly written or prepared. This includes spelling and grammatical errors or improper English language usage.
7. Results have been presented/published previously.
8. Abstract was received after the deadline for submission.
9. Abstract contains information that is in violation of the International Association for Food Protection Policy on Commercialism.
10. Abstract subject is similar to other(s) submitted by same author. (The committee reserves the right to combine such abstracts.)
11. Abstracts that report research that is confirmatory of previous studies and/or lacks originality will be given low priority for acceptance.

### Deadlines and Notification Dates

- Abstract Submission Deadline: January 16, 2007.
- Submission Confirmations: Within 48 hours of submission.
- Acceptance/Rejection Notification: February 28, 2007.

### Contact Information

Questions regarding abstract submission can be directed to Tamara P. Ford, 515.276.3344 or 800.369.6337; E-mail: [tford@foodprotection.org](mailto:tford@foodprotection.org)

### Program Chairperson

Lee-Ann Jaykus  
Food Science Department  
North Carolina State University  
Raleigh, NC 27695-7624  
Phone: 919.513.2074; Fax: 919.513.0014

# Call for Entrants in the Developing Scientist Awards Competitions

Supported by the International Association for Food Protection Foundation

The International Association for Food Protection is pleased to announce the continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the oral or poster competition.

## Purpose

1. To encourage students and recent graduates to present their original research at the Annual Meeting.
2. To foster professionalism in students and recent graduates through contact with peers and professional Members of the Association.
3. To encourage participation by students and recent graduates in the Association and the Annual Meeting.

## Presentation Format

**Oral Competition** — The Developing Scientist Oral Awards Competition is open to graduate students (enrolled or recent graduates) from M.S. or Ph.D. programs or undergraduate students at accredited universities or colleges. Presentations are limited to 15 minutes, which includes two to four minutes for discussion.

**Poster Competition** — The Developing Scientist Poster Awards Competition is open to students (enrolled or recent graduates) from undergraduate or graduate programs at accredited universities or colleges. The presenter must be present to answer questions for a specified time (approximately two hours) during the assigned session. Specific requirements for presentations will be provided at a later date.

## General Information

1. Competition entrants cannot have graduated more than a year prior to the deadline for submitting abstracts.
2. Accredited universities or colleges must deal with environmental, food or dairy sanitation, protection or safety research.
3. The work must represent original research completed and presented by the entrant.
4. Entrants may enter only one paper in either the oral or poster competition.
5. All entrants must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
6. Acceptance of your abstract for presentation is independent of acceptance as a competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the chairperson by April 30, 2007.

7. Entrants who are full time students, with accepted abstracts will receive a complimentary, one-year Student Membership with *JFP* Online.
8. In addition to adhering to the instruction in the "Call for Abstracts," competition entrants must check the box to indicate if the paper is to be presented by a student in this competition. A copy of the abstract will be E-mailed to the major professor for final approval.
9. You must also specify full-time student or part-time student.

## Judging Criteria

A panel of judges will evaluate abstracts and presentations. Selection of up to ten finalists for each competition will be based on evaluations of the abstracts and the scientific quality of the work. All entrants will be advised of the results by April 30, 2007. Only competition finalists will be judged at the Annual Meeting and will be eligible for the awards.

## Judging criteria will be based on the following:

1. Abstract — Clarity, comprehensiveness and conciseness.
2. Scientific Quality — Adequacy of experimental design (methodology, replication, controls), extent to which objectives were met, difficulty and thoroughness of research, validity of conclusions based upon data, technical merit and contribution to science.
3. Presentation — Organization (clarity of introduction, objectives, methods, results and conclusions), quality of visuals, quality and poise of presentation, answering questions, and knowledge of subject.

## Finalists

Awards will be presented at the International Association for Food Protection Annual Meeting Awards Banquet to the top three presenters (first, second and third places) in both the oral and poster competitions. **All finalists are expected to be present at the banquet where the award winners will be announced and recognized.**

## Awards

First Place — \$500 and an engraved plaque  
Second Place — \$300 and a framed certificate  
Third Place — \$100 and a framed certificate

Award winners will receive a complimentary, one-year Membership including *Food Protection Trends*, *Journal of Food Protection*, and *JFP* Online.

# Policy on Commercialism

## for Annual Meeting Presentations

### 1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or other related types of forums and discussions offered under the auspices of the International Association for Food Protection (hereafter referred to as to Association forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the express permission of the staff or Executive Board. The Association enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for the Association forums.

### 2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

#### 2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convener, and/or staff on the basis of originality before inclusion in the program.

#### 2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the Program Committee chairperson and/or technical reviewers selected by the Program Committee chairperson to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available, as only those conclu-

sions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

#### 2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this would make the submission or presentation significantly more difficult to understand, the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convener, and/or staff, will judge whether the use of trade names, etc., is necessary and acceptable.

#### 2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services; however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

#### 2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

#### 2.6 Proprietary Information (See also 2.2.)

Some information about products or services may not be publishable because it is proprietary to the author's agency or company or to the user. However, the scientific principles and validation of performance parameters must be described for such products or services. Conclusions and/or comparisons may be made only on the basis of reported data.

#### 2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.

### 3. GRAPHICS

#### 3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

### **3.2 Source**

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

### **3.3 Company Identification**

Names or logos of agencies or companies supplying goods or services must not be the focal point of the slide. Names or logos may be shown on each slide so long as they are not distracting from the overall presentation.

### **3.4 Copies**

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the Program Committee chairperson, session convenor, and/or staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convenor to verify that all graphics to be shown have been cleared by Program Committee chairperson, session convenor, staff, or other reviewers designated by the Program Committee chairperson.

## **4. INTERPRETATION AND ENFORCEMENT**

### **4.1 Distribution**

This policy will be sent to all authors of submissions and presentations in the Association forums.

### **4.2 Assessment Process**

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both staff and technical reviewers selected by the Program Committee chairperson. All reviewer comments shall be sent to and coordinated by either the Program Committee chairperson or the designated staff. If any submissions

are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

### **4.3 Author Awareness**

In addition to receiving a printed copy of this policy, all authors presenting in a forum will be reminded of this policy by the Program Committee chairperson, their session convenor, or the staff, whichever is appropriate.

### **4.4 Monitoring**

Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convenor that a violation or violations have occurred or are occurring, he or she will publicly request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.) and will notify the Program Committee chairperson and staff of the action taken.

### **4.5 Enforcement**

While technical reviewers, session convenors, and/or staff may all check submissions and presentations for commercialism, ultimately it is the responsibility of the Program Committee chairperson to enforce this policy through the session convenors and staff.

### **4.6 Penalties**

If the author of a submission or presentation violates this policy, the Program Committee chairperson will notify the author and the author's agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, the Association reserves the right to ban the author and the author's agency or company from making presentations in the Association forums for a period of up to two (2) years following the violation or violations.

## Highlights of the Executive Board Meeting November 9, 2006 Lake Buena Vista, Florida

The following is an unofficial summary of actions from the Executive Board Meeting held at Walt Disney World on November 9, 2006.

### Approved the following:

- Minutes of August 11–17, 2006 Executive Board Meeting
- Member dues effective January 1, 2007
- Revisions to the *JFP* Instructions for Authors
- Allergy Icon development
- Review of IAFP 2006 — survey and financial results
- Leafy Greens Symposium — survey and financial results

### Discussed the following:

- E-mail votes taken since the last meeting
- Committee recommendations and follow-up work
- Revision to the Procedures to Investigate Foodborne Illness
- Paper on Food Worker Hygiene
- Foundation Committee fundraising efforts
- Proposed changes to the Constitution passed the Membership vote
- Committees use of new technologies
- National Drinking Water Council appointment
- IAFP 2007 time schedule
- Ivan Parkin and John Silliker Lecturers for IAFP 2007
- Potential new Affiliate groups
- Non-compliant Affiliates
- Affiliate picture presentations
- European Symposium–Barcelona, November 30–December 1, 2006
- China International Food Safety and Quality 2007
- Press Issues
- Consumer group involvement
- International meeting strategy
- ISOPOL XVI–Savannah, Georgia
- ICMSF meeting–Singapore
- Reciprocal meeting registrations with SfAM
- Benefits of base IAFP Membership
- *FPT* cover design
- Relationship with publishing company
- Staff retirement contribution
- Audit report for FYE August 31, 2006

### Reports received:

- *Food Protection Trends*
- *Journal of Food Protection*
- IAFP Web Site
- Membership
- Board Members attending Affiliate meetings
- Affiliate Newsletter
- Future Annual Meeting schedule
- Exhibiting (IAFP on the Road)

Next Executive Board meeting — January 28–29, 2007.



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# NEW MEMBERS

## AUSTRALIA

**Grant M. Brown**  
Food Laboratories Australia Pty. Ltd.  
Abbotsford, Victoria

## CANADA

**Treena Abdellatif**  
Saskatoon Health Region  
Saskatoon, Saskatchewan

## CHINA

**Antonio To**  
HKDNA Chips Limited  
Shau Kei Wan

## NEW ZEALAND

**David P. Lowry**  
Ecolab, Inc.  
Hamilton

## SOUTH KOREA

**Sae Hun Kim**  
Korea University  
Seoul

## UNITED KINGDOM

**Stephen J. Forsythe**  
Nottingham Trent University  
Nottingham, Nottinghamshire

## UNITED STATES

### ALABAMA

**Marjorie S. Fullerton**  
Alabama A&M University  
Huntsville

### COLORADO

**Brooke V. Houston**  
MATRIX MicroScience Inc.  
Golden

### ILLINOIS

**David Ayres**  
Roxana

### MASSACHUSETTS

**Ronald Labbe**  
University of Massachusetts  
Amherst

### MINNESOTA

**Nancy H. Eggink**  
3M Company  
St. Paul

## NEBRASKA

**Marsha R. Wilderdyke**  
University of Nebraska-Lincoln  
Gretna

## NEW YORK

**Nick Walker**  
Ecolab, Inc.  
Glenwood

## OHIO

**Nora T. Bricker**  
The G'mani Crust Co., LLC  
Brook Park

## OREGON

**Charles Benbrook**  
The Organic Center  
Enterprise

## WASHINGTON

**Martin Rowen**  
Wesmar Co., Inc.  
Bothell

## WISCONSIN

**Tom Leitzke**  
Wisconsin Dept. of Agriculture  
Sun Prairie

## NEW GOLD SUSTAINING MEMBERS

### George Wilson

BD Diagnostics  
Sparks, MD, USA

(This membership was previously  
a Silver Sustaining Member)

### Emilia Rico-Munoz

BCN Research Laboratories, Inc.  
Knoxville, TN, USA

### Shawn A. Johnson

Universal Sanitizers  
& Supplies, Inc.  
Knoxville, TN, USA

## NEW SUSTAINING MEMBERS

### Eric D. Martin

Jimmy Buffett's Margaritaville  
Orlando, FL, USA

# UPDATES

## Flowers, Sans to Lead Ongoing Global Expansion of Silliker Group Corp.

Dr. Russell S. Flowers, chief executive officer and president of Silliker Group Corp. (SGS), has announced the appointment of Philippe Sans, senior corporate vice president of bioMérieux, as the organization's new CEO. Dr. Flowers was promoted to chairman of the board and chief scientific officer (CSO) by the SGC board of directors. Both appointments were effective January 1, 2007.

"As part of our ongoing global expansion, I am pleased to welcome Philippe to the Silliker organization," Dr. Flowers said. "With over 22 years experience in industrial microbiology, he brings an outstanding portfolio of international expertise and innovative leadership to his new role. As chairman and CSO, I will focus on strategic growth opportunities, keeping SGC on the forefront of scientific developments, and working with professional associations and key customers."

## Sargento Names New Vice President to the Board of Directors and Development Chef

Sargento chairman and owner, Lou Gentine has announced the board appointment of Gail A. Lione, currently vice president, general council and secretary at Harley-Davidson, Inc.

Ms. Lione who graduated from the University of Rochester with a B.A. in political science and J.D. degree from the University of Pennsylvania Law school, also serves as the president of Harley-Davidson Foundation and as a member of the boards of Harley-Davidson Financial Services and H-D Michigan, Inc. Prior to joining Harley-Davidson, she was general counsel and secretary of US News and World Report and its affil-

iates, the Atlantic Monthly Company, Applied Graphics Technologies, Inc. and Applied Printing Technologies.

Sargento also announced the hiring of Anthony M. Benedict as development chef in its research and development department. Mr. Benedict's primary focus will be to provide development of concepts and products across all divisions.

Before joining Sargento, Mr. Benedict was the corporate executive chief and director of research and development at Carla's Pasta, Inc., in South Windsor, CT. He also held a number of different positions at the New England Culinary Institute between 1997-2004.

## John Anstead Rejoins Bettcher Industries as Training and Applications Specialist

Bettcher Industries has announced that John R. Anstead has rejoined the company. Mr. Anstead has been named training and application specialist for the company's Whizard™ line of modular meat trimmers and AirShirz® air-powered scissors. In this position, he is responsible for training new users, as well as presenting new trimming applications designed to increase plant yields, profits and productivity.

Mr. Anstead has a 25+ year background in the food processing industry. He was employed at Bettcher Industries in the 1980s and 1990s in a variety of sales and field operations positions, all of which involved extensive in-plant interaction with customers. He has also served as an industry consultant to food processing companies, as well as holding operational positions at Routh Packing Co. and Hormel Co.

Mr. Anstead holds B.A. degrees in animal science and business administration both from Michigan State University. He also managed the Michigan State Meat Laboratory for

four years, during which time he served on a variety of championship meat judging teams.

## Gainco Appoints Cal Krefft National Field Service Coordinator

Gainco, Inc. announces the appointment of Cal Krefft as national field service coordinator for the company's Blue Ribbon Service division.

In his new position, Mr. Krefft will be responsible for implementing various service programs in support of customers, including managing the help desk and remote diagnostics activities, plus coordinating the service training program. He has a strong background in customer service in several industries, including scales and weighing systems. Prior to joining Gainco, Mr. Krefft's positions included the national service manager for Scanvaegt US, as well as a variety of training and customer service positions for ALTO, a manufacturer of pressure washing systems.

## Silliker Announces New Additions

David Meekings, Ph.D. has joined the consulting division at Silliker, Inc. as a technical director. Prior to joining Silliker, he held management, quality assurance, and R&D positions with several companies, including RJR Nabisco, Delmonte Foods, and Rich-Sea Pak Corp. Dr. Meekings specializes in food safety development programs, supplier certification programs, food spoilage investigations, crisis management, and due diligence evaluations.

Jeanna Kilmer was named technical sales manager, and will be based at the organization's Modesto, CA operation. She most recently served as an industry consultant and a food technologist with Fresh Express, Inc.

## 2007 Crumline Award Criteria Released

The Foodservice and Packaging Institute, Inc. (FPI) has released the criteria for the 2007 Samuel J. Crumline Award for Excellence in Food Protection at the Local Level, which annually recognizes excellence in food protection services by local environmental health jurisdictions in the United States and Canada.

Named for one of America's most renowned health officers and health educators — Samuel J. Crumline, M.D. (1862–1954) — the Award has elevated the importance of food protection programs within government departments and agencies and has inspired excellence in the planning and delivery of those services.

Entries for the Crumline Award competition are limited to US and Canadian environmental health jurisdictions (county, district, city, town, or township) that provide food protection services to their communities under authority of a statute or ordinance. Past winners may apply five years after receiving the award.

The criteria are to be used as the basis for all applications for the Crumline Award and must be followed strictly in order to be considered for the award. The basic criteria, by which achievement is measured, are:

- Sustained improvements and excellence, as documented by specific outcomes and achievements, over the preceding four to six years, as evidenced by continual improvements in the basic components of a comprehensive program;
- Innovative and effective use of program methods and problem solving to identify and reduce risk factors that are known to cause food-borne illness;
- Demonstrated improvements in planning, managing, and evaluating a comprehensive program; and
- Providing targeted outreach; forming partnerships; and participating in forums that foster communication and information exchange among the regulators, industry and consumer representatives.

The winner of the Award is selected by an independent panel of food protection practitioners who are qualified by education and experience to discern excellence in a program of food and beverage sanitation. They represent various interests, including leading public health and environmental health associations, past Crumline Award winners, consumer advocates and the food industry. The jury makes its award selection each spring in a judging process administered by FPI. The application deadline for the award is March 15, 2007.

The Crumline Award is supported by the Conference for Food Protection in cooperation with the American Academy of Sanitarians, American Public Health Association, Association of Food and Drug Officials, Foodservice and Packaging Institute, Inc., International Association for Food Protection, International Food Safety Council, National Association of County and City Health Officials, National Environmental Health Association, NSF International, and Underwriters Laboratories, Inc.

## Chlorate Compound Found to Quell Microbes in Meat Animals

A patented compound developed by Agricultural Research Service (ARS) scientists could help reduce the risk of *Salmonella* and *Escherichia coli* O157:H7 infection from meat or poultry products.

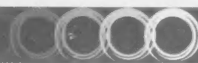
Researchers led by microbiologist Robin Anderson at the ARS Food and Feed Safety Research Unit (FFSRU) in College Station, TX, mixed a chlorate-based compound into livestock feed or water two days before slaughter. When fed at roughly 0.5 to 5 percent of an animal's diet, this powder-like additive was very effective in reducing *Salmonella* and *E. coli* O157:H7 in the animal's gastrointestinal tract.

In studies with cattle, levels fell from 100,000 *E. coli* cells per gram of fecal material to 100 cells per gram. Anderson's team obtained similar results in reducing the amount of *E. coli* and *Salmonella* bacteria in tests with 100 swine and 100 sheep.

To test the chlorate compound in poultry, FFSRU microbiologist Allen Byrd gave it to more than 200 market-age turkeys and 2,000 broiler chickens 48 hours before they went to processing. The incidence of *Salmonella* dropped from 35 percent to zero in turkeys, and from 37 percent to 2 percent in broilers.

Anderson developed this experimental chlorate five years ago, at the urging of the National Cattlemen's Beef Association, which supports research on novel ways to reduce *E. coli* and other problematic microbes in beef. The swine research was financially supported with funding from the National Pork Board.





ARS has patented the technology, and FFSRU researchers are working to further develop it to make it ready for approval by regulatory agencies.

Read more about this and other ARS food safety research in the October 2006 issue of *Agricultural Research* magazine, available online at <http://www.ars.USDA.gov/is/AR/archive/oct06/Salmonella1006.htm>.

### Agency Talks Science with Its Chief Scientist Blog

FSA Chief Scientist Dr. Andrew Wadge has launched a blog to demonstrate how the Agency's consumer advice and policies are underpinned by the latest scientific evidence.

Aimed at stakeholders including the general public, fellow scientists, food industry and enforcement professionals, Andrew Wadge's blog aims to show the importance of robust scientific research, and how it's used at the Agency to develop policy.

More importantly, feedback on his regular postings will be used to develop the Agency's thinking on a range of scientific issues.

Dr. Wadge will update the blog as often as possible, using it to let people know what he and his scientist colleagues at the Agency are up to, what the emerging issues are, and how the FSA proposes to handle them.

He said, "It's vital that we share our thinking about science, and I want the blog to be a forum where people feel they can comment, question and discuss the science behind the issues of the day."

The blog aims to complement other channels of engagement used by the Agency to demonstrate its core values of openness, being an independent voice, and putting consumers first.

These include open Board meetings, stakeholder forums, and regular updates to its newly-redesigned Web site [food.gov.uk](http://food.gov.uk).

### The American Association of Insurance Services Filing a New "Virus or Bacteria"

The exclusion, now being filed countrywide under AAIS commercial lines and farm insurance programs, was developed in light of the possibility of a pandemic of avian flu. However, it addresses contamination from any disease-causing agent, including, but not limited to, SARS, rotavirus, *Listeria*, legionella, and anthrax. Specifically, the endorsement states that coverage is excluded for loss, cost, or expense caused by, resulting from, or relating to any virus, bacterium, or other microorganism that causes or is capable of causing disease, illness, or physical distress.

In addition, the exclusion explicitly applies to any loss, cost or expense arising from denial of access to property because of any virus, bacterium, or other microorganism.

The virus or bacteria exclusion also states that, with respect to disease-causing agents, it supersedes the terms of any other exclusions, such as those addressing pollutants and contamination, and coverage limitations, including those addressing fungus and related perils. "Property policies were never intended to a source of recovery for losses arising from organisms that cause disease," says Alma Gordon-Smith, AAIS director of inland marine and one of the developers of the virus and bacteria exclusion.

"With the possibility of a pandemic, there is concern over potential efforts to create an avenue for loss payment where none was originally intended."

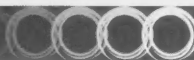
AAIS is a national advisory organization that develops policy forms and rating information used by more than 600 P/C companies throughout the United States. The virus or bacteria endorsement is being filed with a proposed effective date of May 1, 2007 in most states under the following AAIS programs: Agricultural Output <<http://www.aaisonline.com/ag/agop.html>>

### JEMRA (Joint FAO/WHO Experts Meet on Microbiological Risk Assessment)

Microbiological risk management is a dynamic process, using data inputs and decision-making parameters that may change over time. As microbiological food safety issues are brought to the attention of risk managers, there needs to be a systematic preliminary process that brings particular issues into focus and guides further action. Using microbiological risk assessment in food safety risk management is an area that is still developing. For MRA to become a truly useful decision-support tool there is a need for risk managers to understand when and how it can be used.

Report of the FAO/WHO meeting on "The Use of Microbiological Risk Assessment Outputs to Develop Practical Risk Management Strategies; Metrics to Improve Food Safety," April 3-7, 2006 in Kiel, Germany is now available.

This report describes some of the recent international activities, which included undertaking case studies and convening an expert meeting, and the outcomes of discussions on the use of MRA in microbiological risk management. In particular, it addresses the progress



made and the challenges being faced in elaborating practical guidance on the use of MRA outputs to develop practical risk management strategies. It should be noted that the meeting was only able to begin the process of developing practical guidance in this area. The participants (a) summarized the current state of play, (b) used case studies prepared in advance of the meeting to identify the technical areas where guidance is needed, (c) identified priority issues which will need further discussion and elaboration in order to provide the practical guidance requested by the Codex Committee on Food Hygiene and required by FAO and WHO member countries. Thus, this report should be considered a step in the continuing international process to establish a sound technical basis for adopting a risk analysis approach to microbiological food safety concerns.

### **New FAO/WHO Guidelines on HACCP in Small Food Businesses**

**T**he Food and Agriculture Organization of the United Nations (FAO) supports the continual development of national policies to improve food safety and quality with the overall objective of protecting consumer's health and furthering economic development. This document provides guidance to governments and relevant stakeholders and proposes the development of national HACCP strategies to include the implementation of HACCP systems in SLDBs.

Other language versions are currently under preparation, including Chinese, French and Spanish.

The Hazard Analysis Critical Control Point (HACCP) system is a widely accepted food safety management system to assure the safety of food. As part of the FAO program to support countries in strengthening production systems and assure the safety of the food supply, the Food Quality and Standards Service (ESNS) has worked with government bodies and the food industry in the implementation of HACCP.

A major part of this program has been the development of tools and implementation of training courses in member countries to strengthen national capacity in HACCP application and auditing. The training course curriculum includes components on training skills, good hygiene practices and the development of a HACCP system. The objective of the training course is to promote good hygiene practices and the HACCP system through the understanding and application of the Codex General Principles of Food Hygiene, including the Codex guidelines for the application of the HACCP system, which are currently being revised to take into account the application of HACCP in small and medium-sized businesses.

The training materials and further explanation of the Codex General Principles of Food Hygiene are contained in the manual "Food Quality and Safety Systems – A Training Manual on Food Hygiene and the Hazard Analysis Critical Control Point (HACCP) System." The manual serves as a reference for trainers and those with responsibility for HACCP plan development. The target groups include among others, food control officials, food industry personnel, academia, consultants to the food industry, trainers.

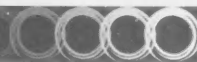
### **Genome Sequencing of Lactic Acid Bacteria is Boon for Food Processing**

**S**ome of our favorite fermented foods — wine, cheese, sourdough bread, yogurt, pickles and coffee — are at the heart of important new research that has determined the genetics and evolution of many of the lactic acid bacteria responsible for the fermentation of foods.

David Mills, a microbiologist and professor of viticulture and enology at the University of California, Davis, working with 11 colleagues in the national Lactic Acid Bacteria Genomics Consortium, led a landmark study that determined the genomic DNA sequences of nine important lactic acid bacteria. According to Mills, "Understanding these sequences enables terrific scientific and evolutionary insight on this cluster of organisms and lays the foundation for huge advances that will benefit us in many ways."

Tens of billions of dollars in food product sales each year involve the use of lactic acid bacteria during production, and processing methods can be time-consuming and costly. Results of the study could lead to more efficient fermentation processes for wine and foods, shorter ripening times for cheeses, more diverse and better-tasting foods, and more economical processing methods.

Mills notes that, "Having the genome sequences of these organisms helps improve the production of many of the foods that people love. Researchers around the world working on lactic acid bacteria will be able to use this information to improve a long list of food products."



Lactic acid bacteria have a number of functions: they occur naturally in the gut of people and animals, providing beneficial effects; they are used to ferment beverages and food, but they also can spoil food. Long before refrigeration, canning processes, or plastic wrapping materials, people relied on fermentation as a method of preserving food. Today, such fermentations with lactic acid bacteria are carried out in a more controlled fashion, not only to preserve foods but to alter the flavors in many desirable ways. A better understanding of the fundamental nature of these beneficial microorganisms enhances the ability of food scientists and artisans to innovate and produce flavorful and healthful food products.

This new genomic understanding of lactic acid bacteria is important not only for food processing and preservation, but it also provides a basic understanding of lactic acid bacteria in the gut and could lead to important health discoveries.

This study was published in the October 17 issue of the *Journal of the Proceedings of the National Academy of Sciences of the USA*.

## Transition to New Food Regime under Discussion

New Zealand is a step closer to the implementation of its new food regulatory environment with the release of a final New Zealand Food Safety Authority (NZFSA) Domestic Food Review discussion paper on 'Transition Policy and Related Implementation.'

"With the NZFSA proposals approved by Government, work is underway to draft required changes to legislation," says Carole Inkster, NZFSA director (Policy). "In parallel, NZFSA is continuing work

on Food Control Plans (for food businesses) and Food Handler Guidance (for low risk activities like sausage sizzles and small bed and breakfasts)."

"We have also released a key discussion document that outlines when different categories of businesses and activity will be transitioned from the current regime to the new. It's vital that people involved with food for sale have their say."

The paper describes how it is proposed to implement food control plans and national programs, sets out whether food sellers are in the categories that will be required to have a Food Control Plan or Food Handler Guidance, or be subject to a National Program. It also covers the general timing of implementation, by sector and year, over the proposed five year transition period.

The sequence of categories of businesses proposed draws heavily on a risk-ranking and prioritization model developed by NZFSA. The methodology for the model was published in March 2006 and draws on a vast range of foodborne illness and other available data. This was to ensure that the sequence had some logical and scientific basis to it and not just a random selection.

Carole Inkster says that, once implemented, New Zealand will have an enviable domestic food safety system. "What we are doing will give New Zealand a world-class system that also has the flexibility to adapt to new foods, styles of eating and food preparation and storage technologies. It will take five years because we realize that New Zealand – both local and national government and the food business sector – does not have the resources to do this in one hit. Our intention is to get this right, to make it workable and practical, and to minimize costs."

"It will also have a full range of sanctions (options range from prohibition notices to complete closure of a business or activity) to deal appropriately with any type or level of non-compliance. In addition, we are working with local authorities, public health units and representative industry organizations to ensure that this system is practical, robust and cost effective."

"Our intention is to keep overall costs of food regulation as low as possible while achieving safe food for consumers. We also want to ensure that those doing a good job receive a positive incentive through lower compliance costs. A smooth and carefully planned transition is key to achieving these, and we want to hear views on the transition proposals in the discussion paper."

"We're particularly keen to hear suggestions that will help us ensure that the appropriate risk management tool is applied to each food operation; the sequence of the transition for food sectors is reasonable; there are sufficient skills available for the implementation; the new regulatory regime provides a level playing field for industry and is as cost-effective as possible while improving efficiency and effectiveness; and the outcomes for safety and suitability across New Zealand are facilitated in a timely manner."

The 'Transition Policy and Related Implementation' discussion document is available from [www.nzfsa.govt.nz](http://www.nzfsa.govt.nz) or in hard copy by calling 0800.693.721. The closing date for submissions is February 9, 2007.

Information on the Domestic Food Review is at <http://www.nzfsa.govt.nz/policy-law/projects/domestic-food-review/index.htm>.

The discussion document can be downloaded from <http://www.nzfsa.govt.nz/policy-law/consultation/dfr-transition/index.htm>.

# INDUSTRY PRODUCTS



Biotrace International

## Biotrace Clean-Trace® Repeatability Lights the Way

Clean-Trace®, an ATP surface hygiene test from Biotrace International has proved to be the most repeatable in a recent independent study carried out by Cara Technology Limited.

Repeatability, the measure of how well a test provides the same result under the same circumstances is a vital aspect of any test's performance. It broadly indicates the level of reliability a test can provide. Clean-Trace® allows food and beverage manufacturers to objectively assess the cleanliness of a surface in seconds to allow positive release of production facilities. When placed against three competing products in the study Clean-Trace® showed itself to be the most repeatable.

Commenting on the news, Colin Hunt, international product manager at Biotrace International said, "We are delighted that our dedicated focus on ensuring very high technical performance from the Clean-Trace® test has been recognized by this study. Our

customers across the world place Clean-Trace® at the heart of their hygiene programs and these results show they can have every confidence they have made the right decision."

Biotrace International offers a complete line of the products needed to check the safety and quality of food production processes; these include rapid pathogen, toxin and allergen kits, products for environmental and carcass sampling, dilution and enrichment and ATP testing that gives a "real time" assessment of plant sanitation.

**Biotrace International**

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Bothell, WA

[www.biotraceamericas.com](http://www.biotraceamericas.com)

## Strategic Diagnostics Inc. Announces NPIP Technical Approval and First Commercial Orders for RapidChek® SELECT® Salmonella

Strategic Diagnostics Inc. has announced that their new RapidChek® SELECT® Salmonella testing product has been approved by the Technical Committee of the National Poultry Improvement Plan (NPIP) as an analytical method for the detection of *Salmonella* species in NPIP samples. The method was approved at the NPIP 38th Biennial Meeting held in Portland, Oregon. The company also announced full commercial adoption of the method by four food processing companies within the first four weeks of commercialization, each with an average annual account value of \$50,000.

Adoption of the method by NPIP is a strong endorsement of perfor-

mance attributes of the RapidChek® SELECT® Salmonella product. The NPIP is a cooperative federal-state-industry program developed for controlling certain poultry diseases. NPIP consists of a variety of programs intended to prevent and control egg-transmitted, hatchery-disseminated poultry diseases. One such program is monitoring environmental samples for the detection of *Salmonella* species in poultry hatcheries.

NPIP samples tend to be high in non-*Salmonella*, background bacteria, which interferes in the performance of many rapid detection methods that compete with SDI's RapidChek® SELECT® Salmonella. These interferences produce costly, high "false positive" results not seen with the SDI method. In addition to the NPIP approval, the SELECT® technology will be added to Title 9 of the Code of Federal Regulations, Section 147.12 (b)(3).

"Strategic Diagnostics invented the SELECT® technology as a result of direct input from NPIP and other customers experiencing test specificity and sensitivity issues in their *Salmonella* testing programs. Its ability to generate exceptionally accurate results in the most challenging samples, and to do so in a highly cost-effective manner, continues to earn us new business opportunities and industry recognition," commented Matthew Knight, president and CEO of SDI. The NPIP market segment for SDI has an estimated value of \$6MM dollars, and the overall domestic *Salmonella* market has been estimated at \$74MM annually.

**Strategic Diagnostics Inc.**

302.456.6789

Newark, DE

[www.sdix.com](http://www.sdix.com)

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## INDUSTRY PRODUCTS

### Bio-Rad's RAPID' Staph™ Agar Granted Performance Tested Method Status by AOAC Research Institute

**R**APID' Staph agar, manufactured by Bio-Rad Laboratories, was granted Performance Tested Method status by the AOAC Research Institute (certificate # 080602). RAPID' Staph is a medium for detection and enumeration of *Staphylococcus aureus* in food in 24 hours. It is a rapid method producing accurate and easy-to-read results. Standard methods for enumeration of *S. aureus* take 48 hours for results.

RAPID' Staph is validated for enumeration of *S. aureus* in pasteurized whole milk, custard pie, processed ham and smoked salmon.

The principle of RAPID' Staph medium relies on the capacity of *S. aureus* to reduce tellurite (production of black colonies) and to provoke proteolysis of egg yolk (production of clear halo around the colony). The proprietary peptone mixture, in addition to the meat and yeast extract, provides nutrients to the bacteria, allowing for growth in 24 h. Glycine and lithium chloride inhibit the growth of competitors adding to the selectivity of the medium while sodium pyruvate stimulates the growth of *S. aureus*, increasing sensitivity.

RAPID' Staph is available in two formats, dehydrated media (Item # 356-4704) or prepared plates (Item # 356-3960).

#### Bio-Rad Laboratories

800.424.6723

Hercules, CA

[www.foodscience.bio-rad.com](http://www.foodscience.bio-rad.com)



FKI Logistex North America

### FKI Logistex Launches GS100 Series of Case Palletizers

**F**KI Logistex® a provider in integrated material handling solutions, announces the launch of the new GS100 family of low-price, entry-level case palletizers. The GS100 series provides a cost-effective, fully automated palletizer for those organizations looking to convert from manual palletizing, as well as larger, multi-line operations where high-speed palletizing is not cost-justified.

Capable of speeds up to 30 cases per minute, and priced from USD 52,000 for the GS120 model, the GS100 series is ideal for a wide array of applications, including food, beverage, consumer goods, and general manufacturing. It offers the same heavy-duty construction, flexibility and reliability that are the trademarks of FKI Logistex's industry-leading mid- and high-speed palletizers.

"The launch of the GS100 series is a testament to our commitment to material handling equipment innovation, and to our reputation for quality palletizing solutions," says Ted Clucas, president, FKI Logistex Manufacturing Systems North America. "No other material handling company provides as broad a range of equipment choices as FKI Logistex."

The GS100 series includes three models for a complete range of pallet-handling options – the GS120 (manual pallet handling), GS130 (semi-

automated pallet handling), and the GS140 (fully automated pallet handling). All three models feature all-metric designs, pattern utility and layer-editing functions, and premium drive components for reduced maintenance requirements. GS100 series palletizers are backed by the complete, 24/7 service and support of the industry-leading FKI Logistex Customer Service and Support (CSS) team.

#### FKI Logistex North America

314.993.4700

St. Louis, MO

[www.fkilogistex.com](http://www.fkilogistex.com)

### E-Control Systems, Inc. Presents for Immediate Delivery Its New Low Cost IntelliCheck™ HACCP PDA and IntelliProbe™ Wireless Temperature Probe

E-Control Systems, Inc., a provider of monitoring hardware and software products for the foodservice industry, presents its new generation IntelliCheck™ PDA with full corrective action support and the IntelliProbe™ Wireless Temperature Probe now available for immediate delivery.

E-Control Systems, Inc., a monitoring hardware and software products for the foodservice industry, presents its new generation IntelliCheck™ PDA with full-corrective action support and the IntelliProbe™ Wireless Temperature Probe, now available for immediate delivery.

IntelliCheck™ is a complete web-based handheld PDA for taking product temperature readings, managing and deploying HACCP inspection programs for the Food Service Industry. IntelliCheck™ includes an integrated corrective action system that makes sure operators fix problems as soon as they are detected.

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IntelliCheck™ is designed to eliminate cumbersome form-based data collection. No more filling out check-list by hand and stuffing them into a filing cabinet. With this Intelli PDA you simply press a single button and let the system do the rest. All the data is automatically uploaded to the central server.

Temperature readings are done through the IntelliProbe™, E-Control Systems new Bluetooth Wireless Temperature Probe, the only completely wireless temperature logging solution on the market. No need to worry about dangling wires into food or burning wires on the stove. The IntelliProbe™ features an iButton™ reader at its base for reading iButton™ data tags. Coin-sized buttons can be easily installed at any inspection station. Operators checking that station simply touch the base of the IntelliProbe™ to the button which automatically brings up that station's checklist or schedule.

IntelliCheck™ PDA is designed to work in conjunction with E-Control Systems IntelliSense™ family of wireless temperature monitoring solutions, which are low cost and provide all the hardware and software elements needed to monitor equipment and processes in the foodservice industry. Targeted markets include school districts, healthcare, and QSRs. Temperature monitoring and other data is collected through Wireless Temperature Sensor Units (IntelliSensor™), transmitted wirelessly to an IntelliGate™ Unit that consolidates, encrypts and sends the data over Ethernet or Wireless Ethernet (WiFi) networks. Data can then be viewed with a standard web browser anywhere over the web. Abnormal conditions (alerts) generated by the system are sent over e-mail, cell phones, or pagers.

**E-Control Systems, Inc.**  
888.384.3274  
Chatsworth, CA  
[www.econtrolsystems.com](http://www.econtrolsystems.com)

### Advanced Instruments' New, Free White Paper Examines Technological Innovations in Dairy Product Analysis

**D**ramatic changes in the nature of daily laboratory operations are underway driven by a host market and regulatory forces ranging from shifting consumer tastes, stricter government health and safety regulations, and increasing pricing pressures.

A new, free white paper, entitled "Technological Innovation in Dairy Product Analysis," examines the resulting demands that lab managers will face "regarding both product testing and procedures and analytical instrumentation" and the technological innovations they'll need to employ successfully respond.

"Each day, dairy labs around the globe are testing continuously to meet content, quality, health and recipe standards throughout the production process from the time the truck unloads raw milk to the packing of the finished product. Failure to perform these analyses quickly and accurately can mean production disruptions, poor quality, or even consumer injury," said Ken Micciche of Advanced Instruments, Inc.

"Dairy laboratories and test instruments must be increasingly more versatile and precise, particularly in the four common tests that represent a large percentage of work in most cooperative, regulatory, and dairy company laboratories. These are: cryoscopy testing, pasteurization testing, chemical component analysis, and microbiological profiling," he said.

**Advanced Instruments, Inc.**  
800.225.4034  
Norwood, MA  
[www.aicompanies.com](http://www.aicompanies.com)

### Hickory Hardware Introduces Faultless Caster's Reinforced Thermoplastic Wheel

**H**ickory Hardware™, a designer, manufacturer and marketer of decorative, functional and industrial hardware, introduces the Faultless® Caster Reinforced Thermoplastic (RT) wheel, designed for use in Faultless 400, 800 and 1400 standard and stainless steel caster series. The RT wheel, an industry-first design, combines high performance, durability and cost effectiveness, three critical factors in today's demanding industrial applications.

Resistant to water, chemical absorption, and steam cleaning, RT wheels are ideally suited for food processing, tool storage, sanitary maintenance, warehousing, and other applications that require durability and easy mobility under heavy loads. With a durometer rating of 65D, these wheels can bear load capacities of 600 to 1,400 lbs and withstand significantly more impact than phenolic wheels.

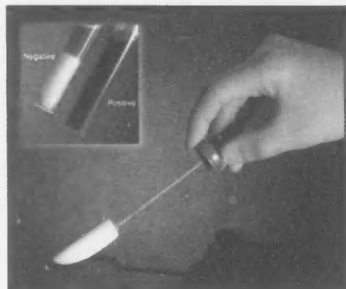
The RT wheel's unique waffle design of specially blended, reinforced thermoplastic materials allows standard operating temperatures ranging from -20 to +250°F. A high-temperature version that can operate in temperatures up to +480°F is also available.

RT wheels are available from Hickory Hardware in a range of configurations and sizes, as blanks, with delrin bushings, with roller bearings, and with sealed precision radial ball bearings.

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## INDUSTRY PRODUCTS



Hardy Diagnostics

### **PDX-LIB *Listeria*: The Easiest *Listeria* Test Available from Hardy Diagnostics**

**P**resumptive results are available for the most common *Listeria* spp., within 30 hours. *Listeria* Indicator Broth (PDX-LIB) is intended to be used in the food processing environ-

ment on food contact surfaces to detect the presence of *Listeria* species. Simply swab the surface, add the *Listeria* Indicator Broth to the sample and incubate. No complicated sub-culturing, or specimen transfers required, thus reducing any chance of cross contamination. A color change from yellow to brown or black is considered presumptive positive. The *Listeria* Indicator Broth contains a patented formula of antibiotics, growth enhancers and color-changing compounds. The antibiotics function synergistically to inhibit most non-*Listeria* microorganisms. Growth enhancers provide recovery nutrients to support the growth of sublethally injured *Listeria*. Indicator compounds will turn the broth from yellow to black by utilizing the  $\beta$ -glucosidase enzyme produced by *Listeria* species. A brown or

black color after 30 h at 37°C indicates a presumptive positive test for *Listeria* spp. The PDX-LIB media has recently earned AOAC approval. Compared to UVM and BLEB, the new PDX-LIB provides equivalent or superior recovery and faster detection as low as 10–50 heat injured *Listeria monocytogenes* organisms per mL within 24 to 30 h of incubation. This testing method is 98% sensitive and 99% specific, and pr A methods. The PDX-LIB can be used as an economical pre-screen for environmental *Listeria* instead of performing expensive PCR or other more complicated assays on every sample.

**Hardy Diagnostics**

800.266.2222

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## ***Student Travel Scholarship Program***

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Full details of the scholarship program are available on the IAFP Web site at [www.foodprotection.org](http://www.foodprotection.org).

***Application deadline is March 12, 2007.***

# COMING EVENTS

## FEBRUARY

- **4-8, Dairy Technology Workshop**, Randolph Associates, Inc., Birmingham, AL. For more information, call 205.595.6455; E-mail: HERConsult@aol.com.
- **12-13, HACCP Essentials Course**, Edmonton, Canada. For more information, contact Michael Loreto at 416.747.2705; E-mail: michael.loreto@csagroup.org.
- **13-14, AIB Food Plant GMP/Sanitation Workshop**, Hilton Austin Airport, Austin, TX. For more information, call 800.633.5137 or go to [www.aibonline.org](http://www.aibonline.org).
- **13-15, Fresh Produce GAPs and GMPs for HACCP-based Food Safety Workshop**, University of Georgia Food Science Outreach Program, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- **15, Georgia Association for Food Protection 25th Anniversary Meeting**, Atlanta, GA. For more information, contact Oscar Garrison at 404.656.3627; E-mail: ogarris@agr.state.ga.us.
- **15-16, AIB HACCP Workshop**, Hilton Austin Airport, Austin, TX. For more information, call 800.633.5137 or go to [www.aibonline.org](http://www.aibonline.org).
- **24-28, AFFI Frozen Food Convention**, Monterey, CA. For more information, call AFFI at 703.821.0770; E-mail: affi-con@affi.com.

## MARCH

- **5-6, ISO 22000 Food Safety Essentials**, Edmonton, Canada. For more information, contact Michael Loreto at 416.747.2705; E-mail: michael.loreto@csagroup.org.
- **6-7, AIB Food Plant GMP/Sanitation Workshop**, Marriott Ontario Airport Hotel, Ontario, CA. For more information, call 800.633.5137 or go to [www.aibonline.org](http://www.aibonline.org).
- **6-9, Better Process Control School**, University of Georgia Food Science Outreach Program, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- **7-8, ISO 22000 Food Safety Internal Auditor**, Mississauga,

Ontario, Canada. For more information, contact Michael Loreto at 416.747.2705; E-mail: michael.loreto@csagroup.org.

- **8-9, AIB HACCP Workshop**, Marriott Ontario Airport Hotel, Ontario, CA. For more information, call 800.633.5137 or go to [www.aibonline.org](http://www.aibonline.org).
- **14-15, Arizona Environmental Health Association Meeting**, Tempe, AZ. For more information, contact Mohammed Heydari at 602.867.1780; E-mail: president@azeha.org.
- **20-23, ISOPOL XVI**, Marriott Riverfront Hotel, Savannah, GA. For more information, contact Terry Reamer at 240.485.2776; E-mail: terry.reamer@aphl.org.
- **27-30, Michigan Environmental Health Association's 63rd Annual Education Conference**, Radisson Plaza, Kalamazoo, MI. For more information, contact Kristen Schweighoefer at 734.222.3968; E-mail: schweig@washtenaw.org.

## APRIL

- **3-4, Hands-On HACCP Workshop**, University of Georgia Food Science Outreach Program, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- **11, The Society for Applied Microbiology Spring Meeting**, Manchester Metropolitan University, London. For more information, call 44.(0)1234.326661; or go to [www.sfam.org.uk/springmeeting.html](http://www.sfam.org.uk/springmeeting.html).
- **26-28, United Fresh Tech**, Palm Springs Convention Center, Palm Springs, CA. For more information, call 202.303.3400 or go to [www.unitedfresh.org](http://www.unitedfresh.org).

## MAY

- **5-8, United Fresh Marketplace**, McCormick Place Convention Center, Chicago, IL. For more information, call 202.303.3400 or go to [www.unitedfresh.org](http://www.unitedfresh.org).

- **5-10, The 31st National Conference on Interstate Milk Shipments**, Little America Hotel, Salt Lake City, UT. For more information, contact Leon Townsend at 502.695.0253; E-mail: ltownsend@ncims.org.
- **15-17, Fresh-cut Produce Hands-on HACCP Workshop**, University of Georgia Food Science Outreach Program, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.

## JUNE

- **4-6, Texas Association for Food Protection's 26th Annual Meeting**, Omni Southpark, Austin, TX. For more information, contact Howard Depoy at 936.756.6455; E-mail: hwdepoy@milkproductslp.com.
- **7-8, Food Mycology 2007: Emerging Mold Problems and Spoilage in Food and Beverages**, Westin Key West, Key West, FL. For more information, contact BCN Research Laboratories at 800.236.0505; E-mail: emilia.rico@bcnlabs.com.
- **15-22, XXVII International Workshop/Symposium on Rapid Methods and Automation in Microbiology**, Kansas State University, Manhattan, KS. For more information, contact Daniel Y.C. Fung at 785.532.1208; E-mail: dfung@ksu.edu.

## IAFP UPCOMING MEETINGS

**JULY 8-11, 2007**  
Lake Buena Vista, Florida

**AUGUST 3-6, 2008**  
Columbus, Ohio

**JULY 12-15, 2009**  
Grapevine, Texas



banned for three weeks, raw mung bean sprouts were back on grocery store shelves and being placed ever so gingerly on gourmet, supposedly health-conscious sandwiches. This fall, it was spinach, lettuce and tomatoes sickening hundreds across North America. So why aren't government-types, who treat an outwardly eco-friendly and holistic health product like raw milk as a major biohazard, setting their sights on fresh produce?

Part of the answer is that the risks associated with fresh produce have only been recognized in the past decade; the risks associated with raw milk have been recognized for more than a century. Further, unlike fresh produce, there is a relatively simple and benign solution: pasteurization.

In the United States and in Canada health officials are adamant that raw milk is pasteurized

for human consumption simply because there are not enough resources to manage all the microbial food safety outbreaks that strike down between one-in-three and one-in-four North Americans each year.

The only things lacking in pasteurized milk are the bacteria that make people, especially kids, seriously ill. At the end of the day, adults are free to do whatever they think works to ensure a natural and healthy lifestyle, but they shouldn't impose their dietary regimes on those incapable of protecting themselves: kids. And it's incumbent on IAFP members to inform public discussions of food safety. The dairy sanitarians would have appreciated that.

Douglas Powell is scientific director and Brae Surgeoner is a research assistant with the Food Safety Network at Kansas State University.

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# THOUGHTS

## ON TODAY'S FOOD SAFETY...

### Not Strong Enough; There's Nothing to Debate – Raw Milk Still a Raw Deal

Douglas Powell  
Kansas State University  
Manhattan, Kansas

Brae V. Surgeoner  
University of Guelph  
Guelph, Ontario, Canada

IAFP is rooted in *Dairy, Food and Environmental Sanitation*. So the state-by-state (and province) discourses over the virtues and vices of raw milk connect *DFES*' past with IAFP's future as the leading association advocate for the production of safe food.

It has long been recognized that raw milk is a vehicle for transmission and spread of diseases such as tuberculosis, brucellosis, *Listeria*, salmonellosis, *Campylobacter*, and *E. coli* O157:H7. Additional problems with raw milk include the potential for staphylococcal and streptococcal infection. It is for these milkborne diseases that nearly half of US states and Canada require the pasteurization of milk.

Despite known human health risks and government regulation, a growing number of people choose to consume raw milk. In the last year, two dairy farmers (in Michigan and Ontario) have caused a media frenzy following charges of selling unpasteurized milk to people who mistakenly believe it has significant health benefits that are lost during the pasteurization process.

In September, two children who drank raw milk from a Whatcom County dairy in Washington state became ill with *E. coli* O157:H7. At the same time, four children, including two 8-year-olds in San Diego County, CA, were hospitalized with *E. coli* infection after consuming raw milk products.

In December 2005, 18 people in Washington and Oregon, including six children, were infected with *E. coli* O157:H7 after drinking unlicensed raw milk. Two of the kids almost died.

In April 2005, four cases of *E. coli* linked to unpasteurized milk were reported to Ontario health officials — in this case, from an individual who routinely sold raw milk from the back of a vehicle parked in a city north of Toronto.

Raw-milk advocates maintain that their crusade is about choice. Choice is a good thing. But as the 19th-century English utilitarian philosopher, John Stuart Mill noted, absolute choice has limits, stating, "if it (in this case the consumption of raw unpasteurized milk) only directly affects the person undertaking the action, then society has no right to intervene, even if it feels the actor is harming himself." Excused from Mill's libertarian principle are those people who are incapable of self-government — children.

Raw-milk farmers, celebrity chefs and the wannabe fashionable can devoutly state that grass-fed cattle are safer than grain-fed by spinning select scientific data, except cattle raised on diets of grass, hay and other fibrous forage do contain *E. coli* O157:H7 bacteria in their feces as well as *Salmonella*, *Campylobacter* and others. All things natural are not synonymous with safe.

Poop happens, especially in a barn, and when it does people, usually kids, will get sick. That's why drinking water is chlorinated and milk is pasteurized.

Science can be used to enhance what nature provided. Further, society has a responsibility to the many — philosopher Mill also articulated how the needs of the many outweighed the needs of the one — to use knowledge to minimize harm.

There are lots of other foods that make people sick. On the one-year anniversary of *Salmonella*-in-sprouts outbreak that sickened 650 people in Ontario, raw sprouts are widely available and no one seems to notice. After being

*Continued on page 63*

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West, Key West, FL**

*Organized by the IUMS International Commission of Food Mycology (ICFM)*

The International Commission of Food Mycology (ICFM) is organizing a special symposium for the food and beverage industry. An internationally recognized group of mycologists will present topics of interest concerning emerging problems with molds and yeast.

Registration includes:

- Technical Sessions
- Welcome Reception and Cocktails
- Program and Abstract Book

For additional information and registration go to [www.foodmycology2007.com](http://www.foodmycology2007.com)



**IN THE U.S. CONTACT:**

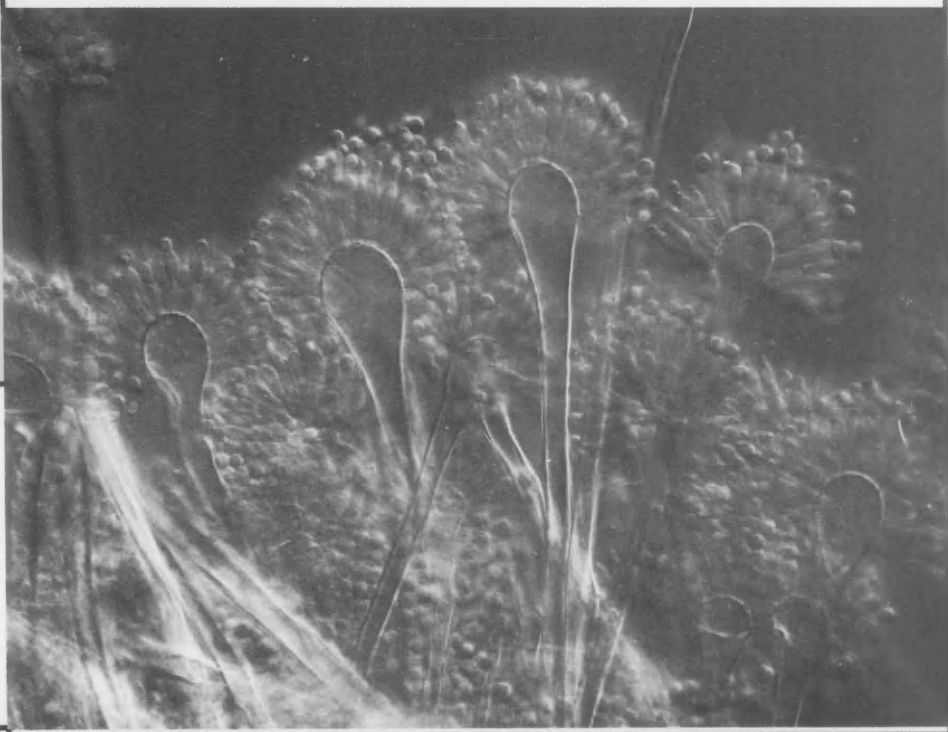
**BCN Research Laboratories  
P.O. Box 50305  
Knoxville, TN 37950-0305**

**Phone: 800-236-0505**

**Fax: 865-584-3203**

**E-mail:**

**[emilia.rico@bcnlabs.com](mailto:emilia.rico@bcnlabs.com)**



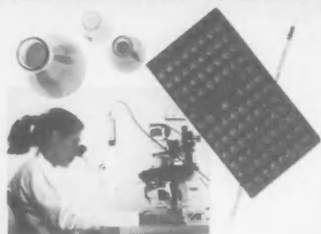


# BCN Research Laboratories, Inc.

**CONTACT US**  
800-236-0505  
info@bcnlabs.com

*Quality Testing and Training*

BCN Research Laboratories, Inc. is a **food and water testing laboratory** located in Knoxville, Tennessee that has been providing unparalleled service to the food and beverage industry since 1988.



BCN Labs specializes in **food and beverage mycology**. Our strong background in beverage and other acid food spoilage makes us the most qualified independent testing laboratory for these sectors of the industry.

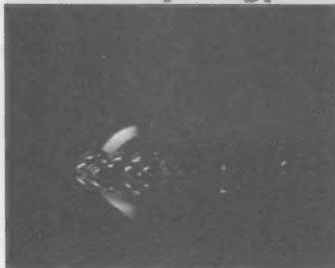
## **Food Microbiology**



*Aspergillus versicolor*

BCN Labs offers high quality **customized training courses** in the areas of food microbiology and mycology.

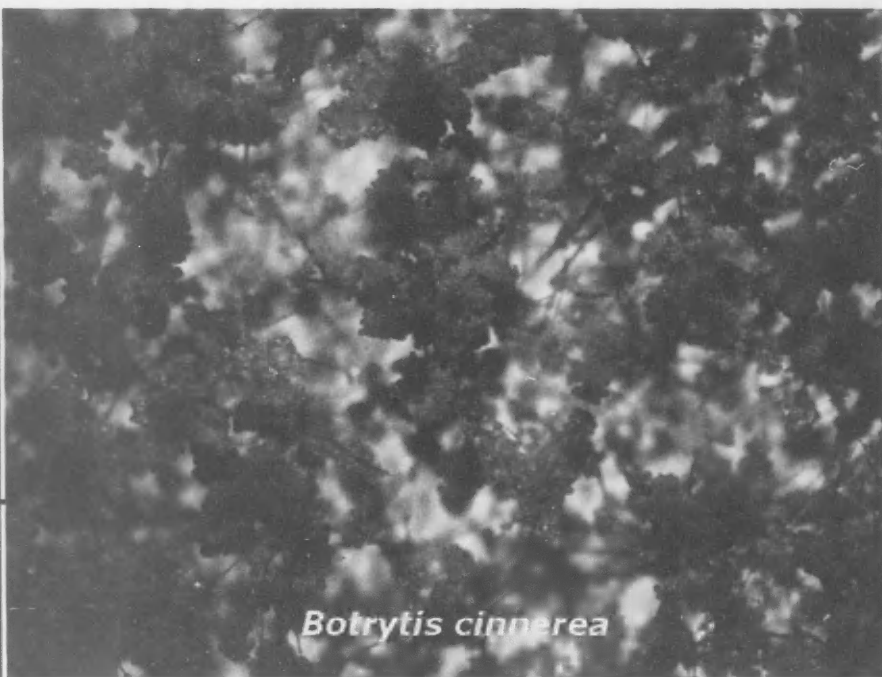
## **Food Mycology**



## **Water Testing**

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