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FOOD PROTECTION TRENDS

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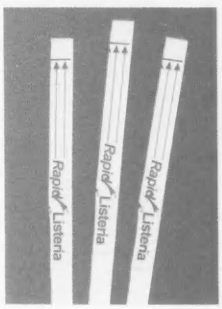

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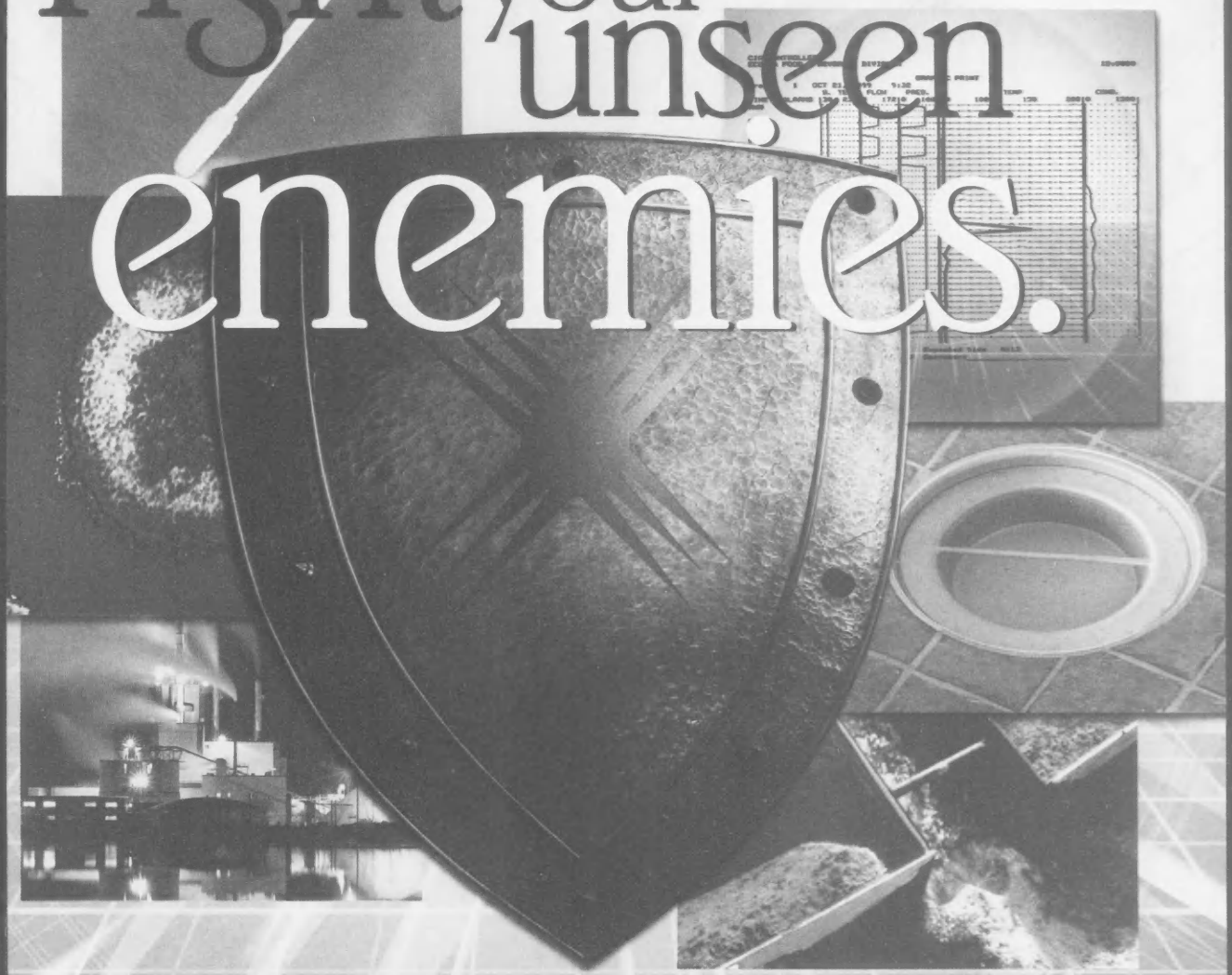

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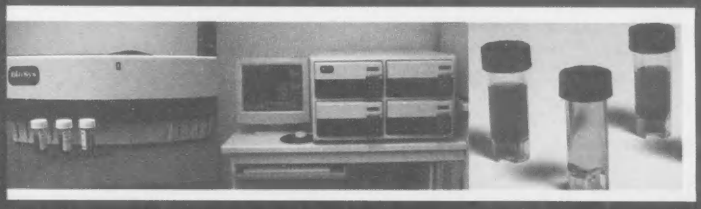

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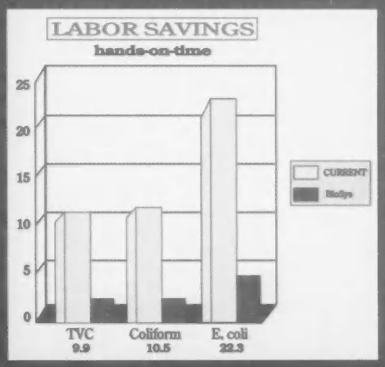

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FOOD PROTECTION TRENDS
SCIENCE AND NEWS
FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

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"PRESIDENT'S" PERSPECTIVE

By PAUL A. HALL
PRESIDENT

"Seminars Among the Saguaros"

It's hard to believe that it's been almost one year since our last IAFP Annual Meeting in New Orleans! It only seems like yesterday we were enjoying great scientific presentations on the Mississippi and sipping Hurricanes on Bourbon Street. IAFP 2003, by several measures, was one of the most successful annual meetings ever and IAFP 2004 promises to be even better!

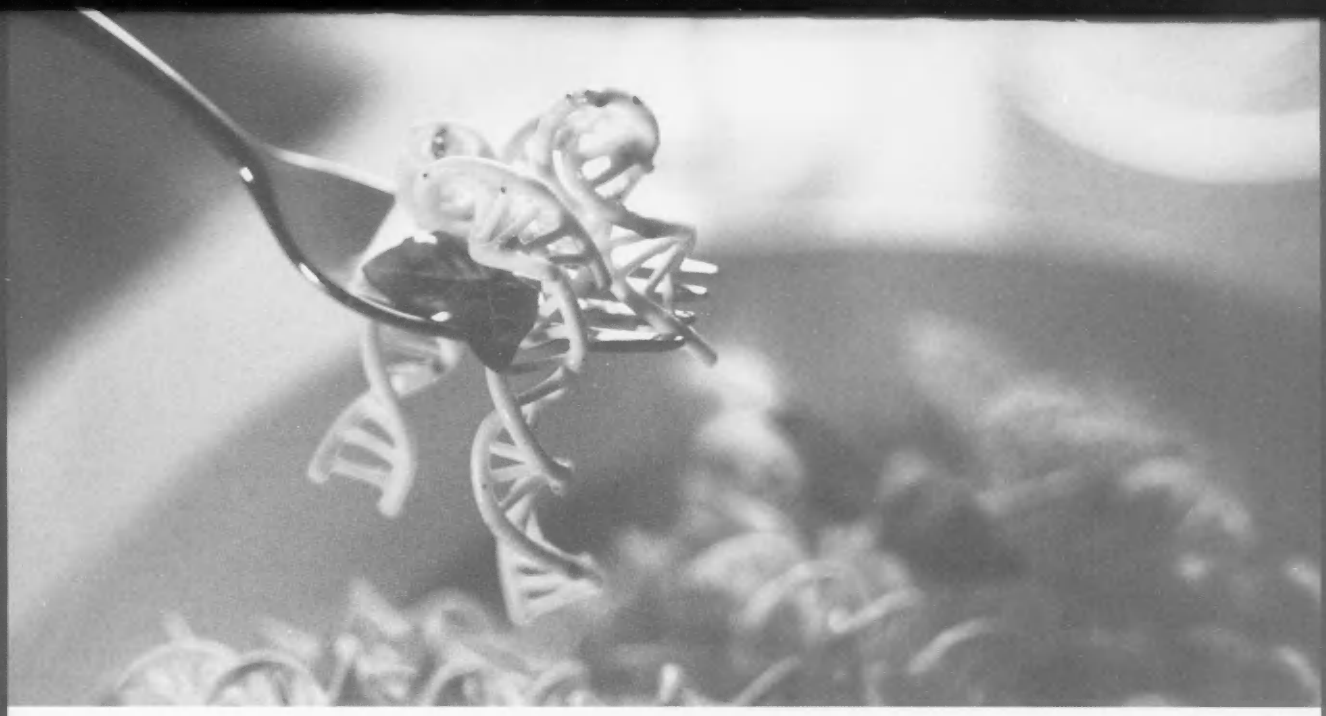
The Program Committee, chaired by Gary Acuff, has done a stellar job putting this year's program together. Our technical program offers something for everyone including topics on dairy, meat, poultry and produce safety. There are also sessions on emerging pathogens such as *Enterobacter sakazakii* and viral and parasitic pathogens. We have three excellent workshops on Friday and Saturday before the meeting – Workshop I is "Your Data, Your Job: Quality Systems for Microbial Food Analysis" (one which benefits any of us who generates and/or analyzes microbiological data for decision making), Workshop II, "Best Practices for Safe and High Quality Aquaculture Products" (a session that includes a field trip to a working shrimp farm in the Sonoran Desert!), and Workshop III, "Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection" (an exciting new approach to managing dairy safety that became effective this year). Please take advantage of these educational workshops as you plan your itinerary. They are a great way to learn from some of the most esteemed food safety experts in our profession.

I am particularly delighted to have Martin Cole from Food Science Australia join us to deliver the 2004 Ivan Parkin Lecture. Martin has held a number of senior food safety positions within the industry around the world. He has also been a long-time contributor to a number of international organizations including the Codex Food Hygiene for the Microbiological Specifications for Foods. We are all looking forward to Martin sharing his insights and experiences with us on opening night.

Another event that I am thoroughly excited about is the very first "John H. Silliker" Lecture to be delivered during the plenary session on Tuesday, August 10. I can think of no other person more deserving to deliver this inaugural lecture than my friend and colleague R. Bruce Tompkin. Bruce's illustrious career serves as an example for all of us. I'm truly pleased to have this lecture established in honor of John Silliker, an icon in the profession of food microbiology and further, to have Bruce Tompkin delivering the inaugural address. It doesn't get better than that!

I would also encourage all of you to stay for the Annual Meeting Awards Banquet on Wednesday evening. This banquet honors a number of our friends, colleagues, and also organizations for their achievements in our profession. It's a great way to close the Annual Meeting and a great way for you to join in the celebration of their achievements.

David Tharp and our IAFP staff have been working hard for the past year to make IAFP 2004 a memorable event. This year's venue, the JW Marriott Desert Ridge Resort in Phoenix, Arizona is an outstanding location. It is a full-service resort with world-class amenities that you will thoroughly enjoy. Don't worry about the summertime heat in Phoenix! I assure you it will be a constant 70°F (21°C) indoors! There are also plenty of swimming pools in which to cool off. Come to the meeting, have a great time with your old friends and make new friends. Enjoy the learning experience and get caught up on the latest leading edge scientific food safety information available anywhere. Enjoy a prickly pear margarita (regular or virgin) and enjoy IAFP's "Seminars among the Saguaros" — it will be a memorable experience! As always, I welcome your thoughts and comments at phall@kraft.com. Until next month…



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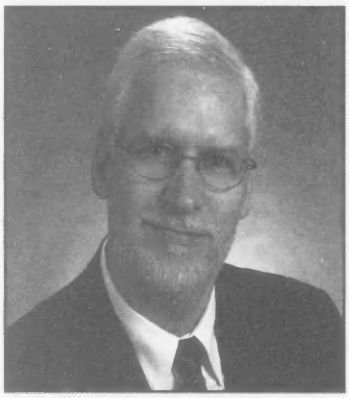
"COMMENTARY"
FROM THE EXECUTIVE DIRECTOR

IAFP 2004 is quickly approaching as our planning timeline is coming to an end. We have worked together with many organizers, exhibitors, and our Local Arrangements Committee – the Arizona Environmental Health Association to ensure that all attendees receive the educational scientific information they desire in a fun, festive environment. The resort property is the newest, brightest and most beautiful in all of the Phoenix Valley area. This is one Annual Meeting that you will want to be sure to attend!

In an earlier column, I explained that the JW Marriott Desert Ridge Resort has four pools and a lazy river for you to relax and unwind in after a day in the session rooms. The Resort also boasts a full-service spa to treat those sore muscles after a day in the session rooms. You will want to schedule your time carefully to take advantage of all that this stunning resort has to offer.

Please take a look at page 554 to learn all about the various tours and activities offered this year. On Saturday, August 7 you can choose between the IAFP Golf Tournament, a daylong tour to Sedona and Verde Valley and a trip to the ballpark to see the Arizona Diamondbacks take on the Atlanta Braves (don't forget that the Bank One Ballpark is air conditioned!). Our daytime tour options this year include the City Tour and Old Town Scottsdale, a Desert Botanical Garden and Heard Museum Tour, a trip to Frank Lloyd Wright's Taliesin West Studios, and on Wednesday, we have a Southwestern Cooking Class scheduled.



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"We look forward to seeing you in Phoenix next month"

Don't forget that the Opening Session, including the Ivan Parkin Lecture, begins at 7:00 p.m. on Sunday night (August 8) and is followed by a reception in the Exhibit Hall. This is a great way to begin the meeting by reestablishing old friendships and beginning new ones. The Exhibit Hall promises to be filled with new technology, new products and product launches. You will want to set aside ample time to visit with the exhibiting companies this year – we have over 15 exhibitors that have been with IAFP for more than 10 years and in addition, there will be close to 20 new exhibitors! A listing of exhibitors is shown on page 564 to help you plan your stops.

Be sure to take a moment of your time to thank the sponsors for IAFP 2004. Their support has enabled the IAFP Annual Meeting to grow by leaps and bounds over the past seven years. It is amazing how companies want to be involved with IAFP and we are so very appreciative of their support! We have been able to add coffee and pastries to the Exhibit Hall in the mornings and a reception in the Exhibit Hall on Monday afternoon. In addition, we have nice name badge holders, a program materials bag and note pads thanks to our sponsors.

Other events that are sponsored are the New Member Reception, Affiliate Educational Reception, Student Luncheon, Opening Reception, Monday Night Social, President's Reception, and the Awards Banquet Flowers. Each of these items is costly to the Association and we are indeed grateful to the sponsors for helping to support each of these events. A listing of sponsors is shown on page 566.

One last event that I want to encourage you to attend is the Awards Banquet on Wednesday night. This is a great way to wrap up IAFP 2004 by honoring our Award Recipients in a public setting. This year's Award Recipients are announced on page 507. You will want to be sure to offer your congratulations to them and help recognize their lifetime achievements.

We look forward to seeing you in Phoenix next month – for IAFP 2004!

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ARTICLES

Food Protection Trends, Vol. 24, No. 7, Pages 482–486

6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864

International Association for Food Protection

Validation of a Procedure Using CO_2 for Rapid Cooling of Cheese Sauce

O. PETER SNYDER, JR.,* and ROBIN MARK JOHNSON

Hospitality Institute of Technology and Management, 670 Transfer Road, Suite 21A, St. Paul, MN 55114, USA; 16658 Hearthside Way, Lakeville, MN 55440, USA

SUMMARY

Cheese sauces are commonly produced in commercial kitchens. These sauces must be handled as potentially hazardous foods, unless challenge tests with *Clostridium botulinum* and *Bacillus cereus* are performed to demonstrate their microbial stability. Although there are inhibitors in many cheese sauces (e.g., salt and exudates from lactic acid bacteria fermentations), the FDA 2001 Food Code requires that all potentially hazardous food be cooled from 140 to 70°F in 2 hours and from 70 to 41°F in 4 hours. Actually, this is a straight-line exponential cooling curve from 140 to 41°F in 6 hours. Because cooling a large quantity of cheese sauce in 2-inch pans requires overnight refrigerated storage, during which time the sauce may be handled multiple times, the cooling process increases the risk of bacterial growth while placing a burden on the cooling capacity of refrigeration units. This study examined two cooling methods: cooling of cheese sauce in an ice bath followed by further cooling in refrigerated storage, and addition of CO_2 (dry ice) to cheese sauce to cool it rapidly.

The latter method of cooling was found to be more rapid, less labor intensive, and more cost effective. CO_2 (dry ice) can also be used for cooling other potentially hazardous liquid or semi-liquid food products.

INTRODUCTION

Cheese sauces are commonly produced in commercial kitchens. These sauces must be handled as potentially hazardous foods, unless challenge tests with *Clostridium botulinum* and *Bacillus cereus* are performed to demonstrate their microbial stability. Although there are inhibitors in many cheese sauces (e.g., salt and exudates from lactic acid bacteria fermentations), the FDA 2001 Food Code requires that all potentially hazardous food be cooled from 140 to 70°F in 2 hours and from 70 to 41°F in 4 hours. Actually, this is a straight-line exponential cooling curve from 140 to 41°F in 6 hours.

Cooling food in an ice bath has been used as a rapid cooling method. An even more rapid method is to use dry ice pellets, which consist of compressed, food-grade quality CO_2 and are available from local vendors. The pellets can be added directly to liquid or semi-liquid foods such as sauces. CO_2 has been shown to both inactivate microorganisms responsible

A peer-reviewed article

*Author for correspondence: Phone: 651.646.7077; Fax: 651.646.5984
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FIGURE 1. Sauce made in 10-gallon electric steam kettle

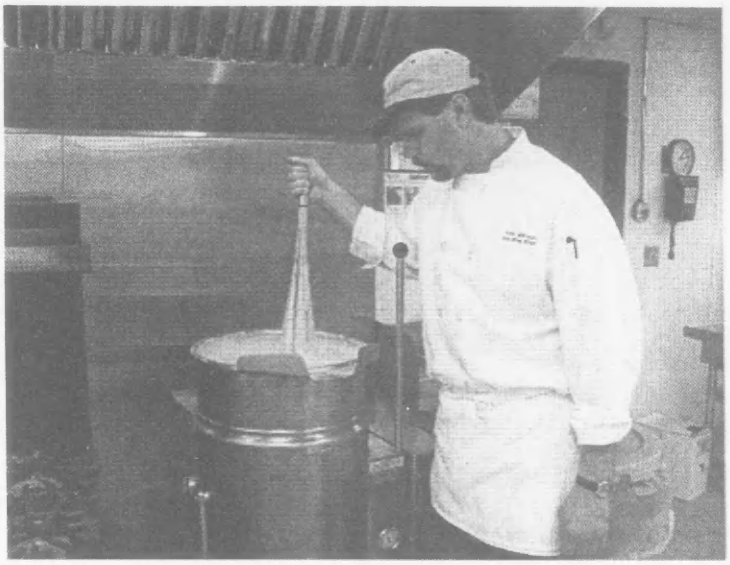
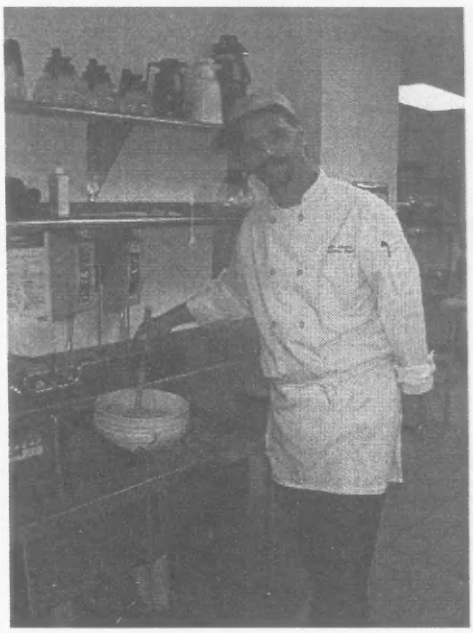


FIGURE 2. Five gallons cheese sauce in fruit and vegetable sink for ice bath cooling



for foodborne illness and inhibit bacterial growth *(1, 3)*. When dry ice is used to cool food, some of the CO_2 combines with the H_2O in the food to form H_2CO_3 (carbonic acid), thus, extending the shelf life of the product. This particular aspect was not studied in this test, but based on other studies, an extension of the refrigerated shelf life of the sauce would be expected. The flavor of foods cooled in this manner is not adversely affected and, in some cases, may be enhanced.

METHODS

The recipe for the sauce used in this study is as follows:

Ingredients:

2 cups chicken base
5 gal water
1/2 cup chopped garlic (sauteéd in olive oil)
1/2 cup prepared mustard
8 lb processed American cheese
1.2 qt heated heavy cream
16 oz cornstarch slurry
5.5 lb flour roux
Salt and pepper to taste

Method:

1. Sauté garlic in olive oil.
2. Add chicken base and water.
3. Bring to a boil.
4. Add American cheese.
5. Thicken with flour roux.
6. Reinforce with cornstarch.
7. Add heavy cream.
8. Strain and cool to 41°F.

Figure 1 shows the sauce being made in a 10-gallon electric steam kettle.

Five gallons of cheese sauce were cooled in a 5-gallon container in an ice bath. Figure 2 shows the container of cheese sauce surrounded by ice and water in a fruit-and-vegetable washing sink. The sauce was stirred about every 15 to 20 minutes to mix the warmer sauce in the middle of the container with the cool sauce along the edge of the container, thus assuring a uniform temperature throughout the product.

FIGURE 3. Five gallons cheese sauce to be cooled with dry ice pellets

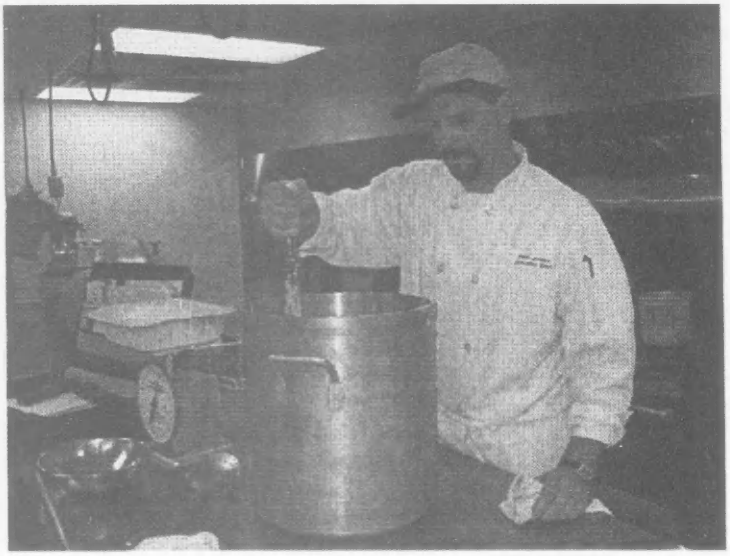


FIGURE 4. Cheese sauce at 50°F

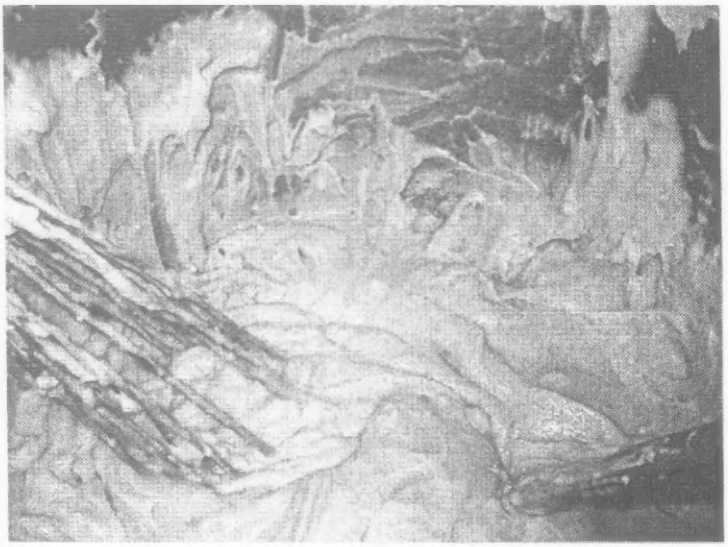


Figure 3 shows the other 5 gallons of sauce, to which CO_2 pellets were added in a 10-gallon pot. The dry ice pellets are shown on the scale to the left of the pot. The CO_2 pellets were added to the sauce in 5-pound increments, because, as gaseous CO_2 is evolved through sublimation, there is vigorous bubbling and spattering of the hot sauce, which may initially be at a temperature above 200°F.

Figure 4 shows the sauce in the pot at a temperature of about 50°F. The sauce became very viscous as it cooled and was difficult to stir toward the end of the cooling.

RESULTS

Figure 5 and Table 1 show the cooling curve and time-temperature results for the 5 gallons of sauce cooled in the ice bath in the sink followed by continued cooling during refrigerated storage.

The cooling time was much shorter for CO_2-pellet-cooled sauce. Table 2 shows the temperature of the sauce as the dry ice pellets were added.

Although all of the CO_2 pellets could have been added at the same time, this was not a practical solution with this very thick sauce. An alternative that would have allowed this, shown in Fig. 6, is use of a Hobart 40-quart/10-gallon mixer.

It would have been possible to put 5 gallons of sauce in the mixer and, using a dough hook, slowly stir the sauce while adding the CO_2 pellets. This would have avoided the problems of the increased viscosity of the sauce as it cooled and the difficulty in stirring it, and would have permitted rapid incorporation of the pellets.

It can be seen from Table 2 that 18 lb of pellets were sufficient to cool the 5 gallons (42 lb) sauce to about 40°F. It took approximately 1 h, but, as stated previously, this was due mostly to the difficulty in manipulating the thick sauce at the end of the cooling period.

Note that in the first 15 minutes, the cheese sauce was left in the kettle. However, it was recognized almost immediately that cooling the kettle jacket, with its hot water and hot stainless steel, would require a great deal of cooling energy. For this reason, the sauce was removed from the kettle and placed in a 10-gallon pot for cooling.

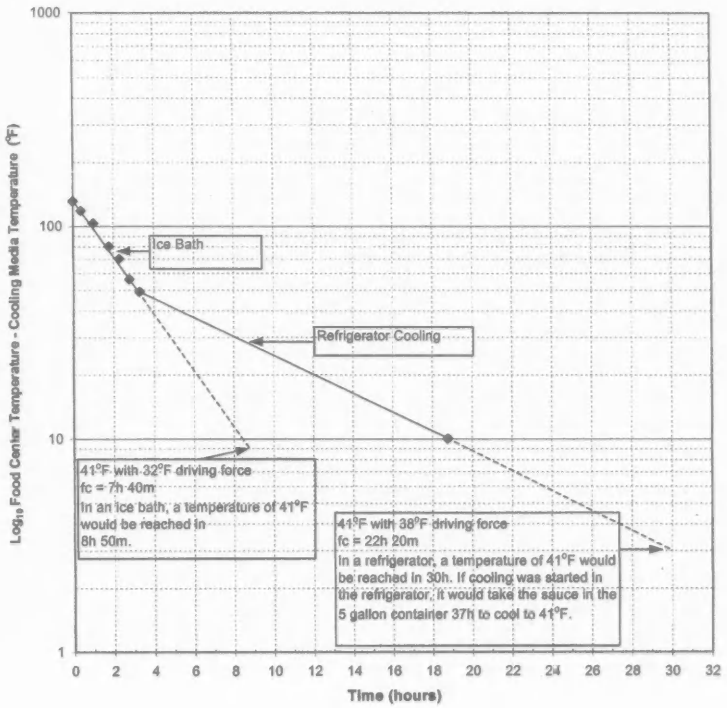
DISCUSSION

The results of this experiment show that cooling and stirring cheese

TABLE 1. Cooling of 5 gallons sauce in ice bath

Clock Time (24 hours)	Δt h:m	ΔT Ctr-Air	Food Ctr Temp.	Cooling Media Temp.
1:13 p		131	163	32
1:37 p	24 m	118	150	32
2:14 p	1 h 1 m	103	135	32
3:00 p	1 h 47 m	80	112	32
3:30 p	2 h 17 m	70	102	32
4:00 p	2 h 47 m	56	88	32
4:30 p	3 h 17 m	49	81	32
8:00 a	18 h 47 m	10	48	38

FIGURE 5. Cheese sauce cooled in 5-gallon plastic container in an ice bath and refrigerator



sauce in a 5-gallon container in an ice bath with further cooling overnight in a refrigerator is a very labor-intensive and time-consuming cooling process. It requires that food be made the day before and cooled so that it can be combined with chilled meals to be sent out to subsidiary kitchens for client feeding.

In contrast, adding CO_2 pellets to the hot, freshly prepared sauce is a simple method of cooling the sauce rapidly so that the sauce can be combined much sooner with other ingredients, and the final product can be finished and packaged without a storage delay of many hours.

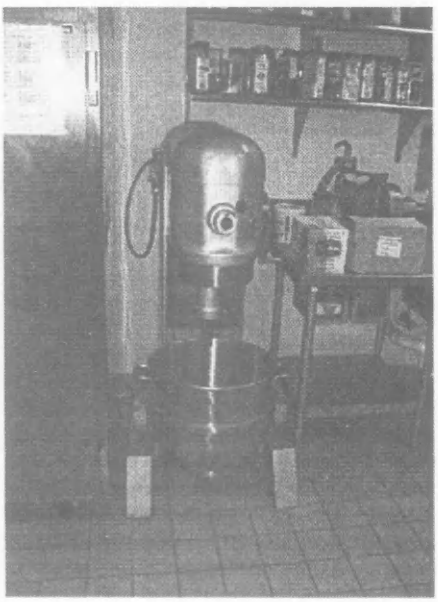
To cool the cheese sauce in this study from 163 to 38°F took approximately 1 lb of dry ice pellets per 2 lb of cheese sauce. When the dry ice sublimes as CO_2, it provides about 246 Btus cooling per 1 lb of pellets. Food such as cheese sauce is expected to have a specific heat (amount of energy to cool 1 lb of food 1°F) of about 0.84 Btu. In this case, the equation that predicts this cooling from 163°F to approximately 38°F (a change in temperature of 125°F) is as follows:

$$\frac{246 \text{ Btus / lb } CO_2 \text{ pellets} \times 18 \text{ lb pellets}}{42 \text{ lb sauce} \times 0.84 \text{ Btu to cool 1 lb. of sauce 1°F}} = 125°F$$

TABLE 2. Cooling time for sauce cooled with dry ice pellets

Time	Pounds of pellets added	Resulting temperature (°F)
1:13 p	—	163
Added	5	126
1:26 p	5	100
1:35 p	5	62
1:45 p	3	38

FIGURE 6. Hobart 40-quart/10-gallon mixer



One pound of pellets costs approximately $0.30. Hence, the cost of the CO_2 pellets used for cooling the 5 gallons of cheese sauce in this study was about $5.40. The labor time required for the CO_2 cooling is simply the time needed to add the pellets and stir the sauce, which is approximately 15 minutes; at $10.00 labor cost per hour, this is equivalent to $2.50. Thus, the total cost of cooling the food by use of this method was $7.90.

The sauce cooled in the ice bath in the sink was stirred at timed intervals throughout the afternoon, then moved into a walk-in refrigerated storage unit and cooled to a lower temperature. Labor time associated with the ice-bath-cooled sauce was approximately 1 h at a cost of $10.00. The savings in labor cost alone more than covers the cost of the dry ice pellets used to cool the cheese sauce rapidly.

CONCLUSION

This study examined two methods of cooling cheese sauce: in an ice bath followed by further cooling in refrigerated storage, and addition of CO_2 (dry ice) to cool cheese sauce rapidly. The latter method of cooling was found to be more rapid, less labor intensive, and more cost effective. Cooling food with CO_2 (dry ice) can also be applied to cooling other potentially hazardous liquid or semiliquid food products.

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Acid and Alkaline pH Enhance Adhesion of Spores of Alkaline-tolerant *Bacillus cereus* to Different Surface Types

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SUMMARY

Few studies have addressed the effect of pH on adhesion of *Bacillus (B.)* spores to surfaces. In this study, spore adhesion of *B. cereus* DL5, isolated from alkaline dairy wash solutions, and *B. cereus* NCTC 2599 was studied at pH 4, 7 or 10 on stainless steel, glass and polyurethane surfaces. Spores of each strain were suspended in sterile distilled water adjusted to pH 4, 7 or 10 and stored at 4°C overnight. Stainless steel, glass and polyurethane surfaces that had been conditioned with one-tenth strength Tryptone Soya Broth were then exposed to the spore suspensions at each pH value for 1 hour. Adhering spores were enumerated by the standard plate count method at all pH values. Results indicated that pH had little effect on adhesion of *B. cereus* NCTC 2599 spores to any of the surface types. By contrast, *B. cereus* DL5 spores showed enhanced adhesion at pH 4 and 10 to polyurethane and glass surfaces. Acid or alkaline pH values in food processing environments may exist on food contact surfaces after cleaning-in-place procedures, such as in dilute cleaning solution residues overnight. The adhesion of spores of *Bacillus* spp. to food contact surfaces constructed of materials such as stainless steel and polyurethane is already a concern for food manufacturers. Thus, enhanced spore adhesion potential of *B. cereus* strains under certain pH conditions may have important spoilage and safety implications.

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INTRODUCTION

Post-pasteurization spoilage of food products and foodborne disease result in large-scale economic losses, especially in developing countries *(4)*. *Bacillus (B.) cereus* is a particularly important cause of post-pasteurization spoilage of dairy products due to enzyme production *(7, 12, 19)* and of foodborne illness due to toxin production *(8, 19, 20)*. *Bacillus cereus* causes both diarrheal and emetic syndromes (caused, respectively, by heat-labile or stable toxin) that have been associated with the consumption of a variety of foods, including dairy products, meat and meat pies, soup, puddings and starchy foods such as rice *(19)*.

It has been suggested that spores, notably dormant spores of *B. cereus* strains, readily adhere to a variety of surfaces *(1, 5, 11, 22)* and several studies have evaluated the effect of environmental conditions on adhesion of *B. cereus* spores to different surfaces *(5, 11, 22)*. One such study noted that pH may be a determining factor in the adhesion of *B. cereus* NCTC 2599 spores to hydrophobic and hydrophilic glass *(11)*. Another determining factor may be the hydrophobicity of the spore surface itself *(2, 11)*. Spore surface hydrophobicity is most often measured by use of a hydrocarbon-aqueous partition system, in which a spore suspension is partitioned between an aqueous and a hydrocarbon, such as hexadecane, phase *(2, 11)*.

In a previous study, a number of *Bacillus* strains were isolated from alkaline wash solutions (pH 11 to 13) used for cleaning in place (CIP) in South African dairy factories *(13, 21)*. Cell attachment of these isolates to stainless steel was enhanced under alkaline and acidic conditions *in vitro*, the isolates displayed milk spoilage potential due to protease and lipase production *(13)*, and several strains exhibited cytotoxicity to mammalian cells *(14)*. Further, one such isolate (*B. cereus* DL5) was tolerant to alkaline conditions, and cells attached to glass slides at pH 10 or 10.5 *(15)*. However, the adhesion of spores of such alkaline-tolerant *Bacillus* isolates to various materials commonly used in food processing (e.g., stainless steel and polyurethane) *(17)* at different pH values has not been studied to date. Practically, enhanced spore adhesion potential of *B. cereus* strains under different pH conditions may have important spoilage and safety implications. For example, typical cleaning programs for food processing equipment often include both alkaline and acidic wash cycles *(7)*. Knowing at which pH values spore adhesion is stimulated may aid in decisions regarding which cleaning programs are most appropriate for eliminating *B. cereus* adhesion potential.

This study compared the adhesion of *B. cereus* DL5 spores and of *B. cereus* NCTC 2599 spores to stainless steel, glass and polyurethane surfaces at pH 4, 7 or 10. The hydrophobicity of the spores prior to adhesion was also determined at all three pH values.

MATERIALS AND METHODS

Bacterial cultures and preparation of spore suspensions

Bacillus (B.) cereus NCTC 2599 (also designated as *B. cereus* ATCC 14579, the type strain of *B. cereus*) and *B. cereus* DL5, a strain isolated from alkaline wash solutions in a South African dairy and capable of forming biofilms *(21)*, were used in this study. Stock suspensions of dormant spores of each *Bacillus* strain were prepared according to Stumbo *(23)* and Bayliss et al. *(3)* and stored in sterile distilled water at 4°C (approximately 2 months). The absence of vegetative cells in each spore suspension was verified by the Schaffer-Fulton method utilizing staining with malachite green followed by microscopic observation *(9)*.

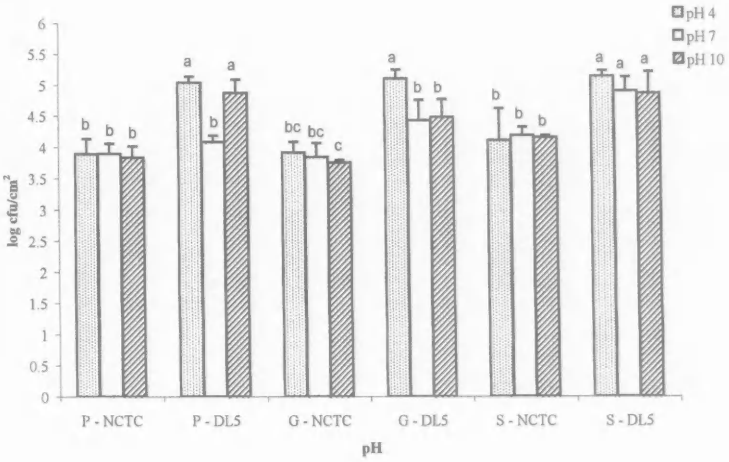
Preparation of test surfaces

Three stainless steel (Grade 304L), polyurethane or glass (4 cm^2) test surfaces were de-greased, washed as previously described *(16, 17)* and autoclaved for 20 min in distilled water. To simulate conditions that might occur on food contact surfaces in food processing plants during the production cycle, due to residues of proteins and fats being deposited on equipment surfaces *(10)*, each test surface was conditioned according to a modification of the method of Andersson and Rönner *(2)* by suspension in one-tenth strength Tryptone Soya Broth (1/10 TSB) (Oxoid, Basingstoke, UK) for 30 seconds. Test surfaces were then rinsed by manually dipping each surface four times into 20 ml sterile distilled water.

Adhesion studies

Spore suspensions (1 ml) were diluted in 20 ml chilled (4°C) sterile distilled water to a concentration of approximately 7 log CFU/ml. The pH of each diluted suspension was then adjusted, by use of sterile HCl or NaOH, 4 to 7 or to 10 until stable, and left overnight (18 h) at 4°C. Each spore suspension was mixed in a vortex mixer for 15 s for uniform distribution of the spores before use. After conditioning, a test surface of each material was placed vertically in the spore suspension with a pH of either 4 or 7 or 10 for 1 h at room temperature (23°C) *(2)*. Surfaces were then dipped manually four times into 20 ml sterile distilled water to remove loosely attached spores *(2)*. Spores were subsequently dislodged from each test surface in 10 ml peptone saline solution by use of 20 g of glass beads and vigorous shaking by hand for 10 min *(16, 21)*. Dislodged spores were enumerated by the droplet plate technique *(17)* on Tryptone Soya

FIGURE 1. Counts (log CFU/cm²) of *B. cereus* DL5 (DL) and *B. cereus* NCTC 2599 (NCTC) spores prepared in sterile distilled water at pH 4, 7 or 10 at 4°C overnight, adhering to polyurethane (P), glass (G) or stainless steel (S) surfaces, conditioned with one tenth strength Tryptone Soya Broth, within 1 h at 23°C. Means with different superscripts are significantly different ($P < 0.05$)



Agar (Oxoid) supplemented with 1.5% Commercial Agar Gel (Biolab, Midrand, South Africa) after heating of the dislodged suspension in a water bath at 80°C for 10 min *(9, 19)*. Plates were incubated at 37°C for 24 h. Each experiment was carried out on three separate occasions. Statistical comparisons (multifactor ANOVA, Statgraphics 7.0) between counts of spores attached to the different surfaces and at the different pH values were performed at the 95% confidence level for each strain.

Hydrophobicity determination

Twenty-ml aliquots of the spore suspensions (7–8 log CFU/ml) of both isolates were prepared as previously described, the pH was adjusted to 4 or 7 or 10, and the suspensions were left overnight (18 h) at 4°C. The hydrophobocity of each spore suspension was then determined according to López et al. *(18)* and the percentage of spores attaching to *n*-hexadecane calculated according to Faille et al. *(6)*. Each experiment was carried out on three separate occasions. Statistical comparisons (multifactor ANOVA, Statgraphics 7.0) between the percentage hydrophobicity of spores at the different pH values were performed at the 95% confidence level for each strain.

RESULTS

Adhesion studies

On the polyurethane surfaces, *B. cereus* DL5 spore counts were significantly ($P < 0.05$) higher at pH 4 or 10 than at pH 7, whereas, counts of *B. cereus* NCTC 2599 spores did not differ significantly ($P > 0.05$) from each other at the 3 pH values (Fig. 1). Differences between the bacterial strains were noted: *Bacillus cereus* DL5 spore counts at pH 4 or 10 were significantly higher ($P < 0.05$) than *B. cereus* NCTC 2599 spore counts at all three pH values (Fig. 1). *Bacillus cereus* DL5 spore counts at pH 7 were similar to ($P > 0.05$) *B. cereus* NCTC 2599 spore counts at all three pH values (Fig. 1). The highest overall spore count on polyurethane surfaces was obtained for *B. cereus* DL5 at pH 4 (5.17 log CFU/cm²).

On the glass surfaces, *B. cereus* DL5 spore counts were significantly ($P < 0.05$) higher at pH 4, and marginally higher at pH 10, than at pH 7. Counts of *B. cereus* NCTC 2599 spores again did not differ significantly ($P > 0.05$) from each other at the three pH values (Fig. 1). In addition, *B. cereus* DL5 spore counts at pH 4 or 10 were significantly higher ($P < 0.05$) than *B. cereus* NCTC 2599 spore counts at all three pH values (Fig. 1). The highest spore count on glass surfaces was obtained for *B. cereus* DL5 at pH 4 (5.25 log CFU/cm²).

On the stainless steel surfaces, *B. cereus* DL5 and *B. cereus* NCTC 2599 spore counts did not differ significantly from each other ($P > 0.05$) at all three pH values (Fig. 1). However, at all three pH values, *B. cereus* DL5 spore counts were significantly higher ($P < 0.05$) than *B. cereus* NCTC 2599 spore counts (Fig. 1). The highest count on the stainless steel surfaces was obtained for *B. cereus* DL5 at pH 4 (5.17 log CFU/cm²).

Hydrophobicity determination

B. cereus DL5 spores exposed to pH 4 or 7 overnight at 4°C were approximately 70% hydrophobic. In contrast, corresponding *B. cereus* DL5 spores exposed to pH 10, and *B. cereus* NCTC 2599 spores exposed to all three pH values, were significantly less hydrophobic ($P < 0.05$) (approximately 40 to 50%) (Table 1). The hydrophobicity of *B. cereus* NCTC 2599 spores at all three pH values did not differ significantly ($P > 0.05$).

DISCUSSION

Previous studies have suggested that *B. cereus* spores are highly hydrophobic *(6, 22)* and adhere to a variety of surfaces, particularly those of a hydrophobic nature *(2, 5, 6, 11, 22)*. In this study, spores of *B. cereus* DL5 and *B. cereus* NCTC 2599 ad-

TABLE 1. Percentage *Bacillus* spores bound to *n*-hexadecane at pH 4, 7 or 10 as a measure of spore hydrophobicity *(6, 19)*

pH	*B. cereus* NCTC 2599	*B. cereus* DL5
4	46 ± 11^a	70 ± 6^b
7	39 ± 11^a	71 ± 2^b
10	52 ± 4^a	52 ± 8^a

Means with different superscripts indicate statistically significant differences ($P < 0.05$).

hered to hydrophobic (polyurethane), inert (stainless steel) and hydrophillic (glass) surfaces conditioned with 1/10 TSB. However, spores of the isolate obtained from alkaline dairy wash solutions always adhered in significantly higher numbers than spores of the NCTC strain. It has been shown that spores of different strains of *B. cereus* do not adhere to surfaces in similar numbers; for example, Andersson and Rönner *(2)* found that of the four *B. cereus* strains tested in their study, the spores of the most hydrophobic strain attached best to their glass test surfaces *(2)*. In our study, *B. cereus* DL5 spores were overall more hydrophobic than *B. cereus* NCTC 2599 spores (Table 1), which may account for the greater number of attached spores of *B. cereus* DL5 than of *B. cereus* NCTC 2599 on all surfaces.

Generally, the hydrophobicity results obtained for *B. cereus* spores in this study correlated with values obtained in previous studies. For example, Rönner et al. *(22)* determined that the hydrophobicity of *B. cereus* NCTC 2599 spores was 40 to 50%; in this study, the spore hydrophobicity of the NCTC strain was also 40 to 50%. In contrast, Faille et al. *(6)* determined that the hydrophobicity of spores of *B. cereus* CUETM 98/4, an environmental strain isolated from dairy processing lines, was approximately 80%. Similarly, in this study, the spore hydrophobicity of the environmental strain *B. cereus* DL5 was approximately 70%, except at pH 10.

In this study, the three surface materials used were all conditioned with 1/10 TSB prior to exposure to the spore suspensions. Because such surface conditioning alters the original properties, such as hydrophobicity, of a surface *(10)*, the adhesion of the spores to each surface type was attributed to the pH of the spore suspension rather than to the inherent hydrophobicity of the attachment surface. Thus, it was found that pH had little effect on the adhesion of *B. cereus* NCTC 2599 spores to polyurethane, glass or stainless steel surfaces conditioned with 1/10 TSB. Hüsmark and Rönner suggested that spores of *B. cereus* NCTC 2599 attached best at pH 3, which was speculated to be the isoelectric point of the *B. cereus* NCTC 2599 spore surface and that at pH values above 3, the spore surface may be negatively charged *(11)*. Thus, if *B. cereus* NCTC 2599 spores in our study also exhibited a negatively charged surface at pH values above 3, it follows that pH values of 4, 7 or 10 may not greatly affect adhesion of the NCTC spores. In contrast, counts of *B. cereus* DL5 spores on all three surface types were always highest at pH 4, perhaps suggesting that the isoelectric point of the *B. cereus* DL5 spore was different (e.g., occurs at pH 4) from that of the *B. cereus* NCTC spore *(11)*. However, results from this study also showed that spore counts of *B. cereus* DL5 at pH 10 were higher on polyurethane and glass, and similar on stainless steel surfaces, compared with spore counts on these surfaces at neutral pH. Thus, pH 10 appeared to also enhance adhesion of alkaline tolerant *B. cereus* DL5 spores to surfaces. This latter result correlated with the known nature of the *B. cereus* DL5 isolate used in this study; it has been shown that it is an alkaline-tolerant neutrophile, its attachment of vegetative cells is greater at pH 4 and 10 than at pH 7, and it is able to adapt to and grow in laboratory growth media at pH values above 10 *(13, 15)*.

Typical cleaning programs for food processing equipment include both alkaline and acidic wash cycles *(7)*. It has been proposed that introduction of alkaline-tolerant *B. cereus* to food processing environments, as has previously been recorded in dairy processing *(13, 24)*, may occur via alkaline wash solutions. Spores of alkaline-tolerant *Bacillus* strains present within food processing environments and in contact with acidic or alkaline solutions, such as dilute cleaning solution residues, may thus have a greater potential to adhere to equipment surfaces. *Bacillus* spores adhering to on-line processing equipment are suggested to be a major problem for food industries *(22)*, since subsequent germination of attached *Bacillus* spores may lead to endemic biofilms that contribute to contamination of food products, resulting in spoilage and food safety implications *(1, 7, 13, 14)*. Thus, the practical implications of our results would include the need to screen alkaline cleaning solutions for the presence of spores of alkaline-tolerant *B. cereus* strains so as to avoid their initial introduction onto food contact surfaces. Further, results from this study highlight the importance of strictly enforcing thorough cleaning and sanitation regimes in food processing industries as the only means to limit the attachment potential of spores of *B. cereus* strains.

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International Association for Food Protection

Pilot-plant Evaluation of Acidified Sodium Chlorite for Sanitizing Beef Trim

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SUMMARY

Citric acid activated acidified sodium chlorite (C-ASC) has been approved for sanitizing beef trim. In this study, the efficacy of 1000 ppm C-ASC spray treatments against total aerobic microorganisms and *E. coli* was evaluated while optimizing a newly developed SANOVA® system for spraying beef trim. Spray treatments consisted of combinations of 74, 147, or 221 ml C-ASC/kg delivered during 5, 10, or 15 s. Additionally, two feed rates, 0.75 kg/s and 2.5 kg/s, were investigated. Reductions by C-ASC spray treatments on 90% lean/10% fat [90/10] beef trim were compared to reductions by the same treatment on 50% lean/50% fat [50/50] beef trim. At a feed rate of 0.75 kg/s, the SANOVA® system reduced total aerobic microorganisms by as much as 1.2 log CFU/50 cm^2 (treatment with 221 ml C-ASC/kg for 10 s) and reduced *E. coli* by as much as 1.4 log CFU/50 cm^2 (treatment with 221 ml C-ASC/kg for 15 s). At a feed rate of 2.5 kg/s, the SANOVA® system reduced total aerobic microorganisms by as much as 1.3 CFU/50 cm^2 (treatment with 221 ml C-ASC/kg for 15 s) and reduced *E. coli* by 2.3 CFU/50 cm^2 (treatment with 147 ml C-ASC/kg for 10 s). Reductions of both aerobic microorganisms and *E. coli* were higher at feed rates of 2.5 kg/s than at 0.75 kg/s for most matrices tested. Preliminary evaluations suggest that higher reductions may be possible on [50/50] beef trim than on [90/10] trim.

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TABLE 1. Treatment combinations of spray volume and application time

Treatment	Spray Volume	Application Time
Treatment 1	74 ml C-ASC/ kg	5 s
Treatment 2	147 ml C-ASC/kg	5 s
Treatment 3	221 ml C-ASC/kg	5 s
Treatment 4	74 ml C-ASC/ kg	10 s
Treatment 5	147 ml C-ASC/kg	10 s
Treatment 6	221 ml C-ASC/kg	10 s
Treatment 7	74 ml C-ASC/ kg	15 s
Treatment 8	147 ml C-ASC/kg	15 s
Treatment 9	221 ml C-ASC/kg	15 s

INTRODUCTION

Beef and poultry processors are required to develop hazard analysis and critical control point plans as part of the United States Department of Agriculture, Food Safety and Inspection Service's (USDA-FSIS) pathogen reduction plan *(14)*. The effectiveness of these plans is verified by the ability to meet reduction criteria for *Escherichia coli* biotype 1 and *Salmonella* spp. *(14)*.

Recent studies have investigated the incidence rates of *E. coli* biotype 1 and *Salmonella* spp. on fresh beef and poultry *(21, 22, 25)*. Sofos et al. *(21)* found the average percentages for pre-evisceration beef carcass samples with *E. coli* biotype 1 counts > 100 CFU/cm^2 to be 0.8 to 6.7 % for steer and heifer plants and 2.2 to 23.4% for cow and bull plants. In another study, Sofos et al. *(22)* found the incidence of *Salmonella* positive beef carcass samples to be between 1.1 and 8.5% for cow and bull plants, and between 0.3 to 3.6% for steer and heifer plants. In a retail survey study, Zhao et al. *(25)* found that 19.0% of retail beef samples tested positive for *Escherichia coli* and 1.9% tested positive for *Salmonella* spp., while incidence rates were 38.7% and 4.2%, respectively, for retail chicken. Notably, an association between the mesophilic aerobic plate count and the incidence of *E. coli*-positive samples of beef carcasses has also been demonstrated *(20)*.

Numerous methods for decontaminating beef carcasses and/or trim have been investigated. Steam pasteurization was shown to be effective in reducing aerobic plate counts as well as generic *E. coli (19)*. Similarly, steam vacuuming treatments reduce indicator organisms by as much as 3.0 log cycles *(4)* and have been demonstrated effective against *E. coli* O157:H7 *(13)*. Hot water alone *(3, 15)* and hot water in conjunction with hot air *(15)* were studied for decontaminating beef. Previous studies examined the use of organic acids, such as lactic acid and/or acetic acid for the sanitization of beef carcasses and beef trim *(6, 7, 8, 12)*. The effectiveness of these organic acids was shown to be associated with carcass temperature *(7)*. Adaptation of *E. coli* O157:H7 to the effects of lactic acid treatments has also been studied *(1, 23)*. Chemical sanitizers such as chlorine *(18, 24)*, Tween 20 with lactic acid *(2)*, cetylpyridinium chloride *(10)*, trisodium phosphate *(9, 24)*, hydrogen peroxide *(11)*, chlorhexidine *(11)*, and acidified sodium chlorite (ASC) *(5, 17)* have also been studied.

ASC, when applied following water wash, has been shown to be effective in reducing the levels of *E. coli* O157:H7 and *Salmonella* Typhimurium on beef carcasses by 4.5 to 4.6 log cycles when activated by citric acid (5). Lower reductions (3.8 to 3.9 log cycles) were reported for phosphoric acid-activated ASC following water wash *(5)*. Kemp et al. *(17)* also studied the efficacy of ASC dip treatments for the sanitation of broiler carcasses and found that ASC provided a 99.4 to 99.6% reduction of *E. coli* and 86.1 to 98.5% reduction of total coliforms. The focus of the present study was to optimize spray time/spray volume for the SANOVA® system for spraying beef trim with citric acid activated-ASC (C-ASC).

MATERIALS AND METHODS

Testing location

All treatments and samplings were performed at Emmpak Foods, Inc. Research and Development Facility (Milwaukee, WI). Samples for microbial analysis were prepared and shipped overnight to ABC Research Corp. (Gainesville, FL) for microbial analysis using methods described by Karr et al. *(16)*.

Experimental design

Ninety percent lean/10% fat [90/10] and 50% lean/50% fat [50/50] beef trim were subjected to various treatments of 1000 ppm C-ASC (0.10% sodium chlorite/0.6% citric acid). The nine treatments studied were combinations of spray volume (74, 147, or 221 ml C-ASC/kg) and application time (5, 10, or 15 s). Treatment combinations are shown in Table 1. All treatments were conducted on one of three identical, specially modified augers (3.05 m long, 0.61 m diameter). Each auger was angled at 15° and was equipped with a variable

speed motor. Feed rates of 0.75 kg/s and 2.5 kg/s were evaluated. Not all treatment combinations of spray volume and application time were tested at both feed rates.

Inoculum preparation

A 5-strain, non-pathogenic *E. coli* cocktail was prepared using ATCC 15597, ATCC 12435, ATCC 8677, ATCC 14998, and ATCC 35270. Each strain was individually propagated in Brain Heart Infusion broth and incubated at 35°C for 24 h before each experiment. Cultures were then pooled and centrifuged (10,000 × g for 10 minutes), after which the pellets were re-suspended twice in Butterfield's Phosphate Buffer (pH 7.2) to obtain a target inoculum level of 1.0×10^8 colony forming units (CFU) per ml suspension. A 4.0 ml aliquot of the inoculum was then added to an 8-liter reservoir tank to yield a cell titer of approximately 5×10^4 CFU/ml.

Trim selection and preparation

[90/10] beef trim was obtained from the company's packing facility in 27.3 kg fiberboard boxes. To eliminate the variable of portion size during initial testing at the 0.75 kg/s feed rate, pieces larger than 4.6 kg were sectioned to produce average 4.6 kg size portions. For the 2.5 kg/s feed rate testing, no sectioning of the [90/10] trim was performed. [50/50] beef trim was obtained in bulk containers from the company's slaughtering facility and weighed into 27.3 kg tubs. No sectioning was necessary for the [50/50] trim. All trim was less than 48 hours old at the time of treatment.

For each non-inoculated study (TPC), six pieces of beef trim were selected at random from a 27.3 kg batch (box of [90/10] or tub of [50/50]). Three of the pieces were tagged with commercial plastic wirewraps, and the other three pieces were left non-tagged. The non-tagged pieces were microbiologically sampled at 10 different locations on each piece prior to treatment to determine the initial microbial load for the beef trim. The three tagged pieces were treated as per experimental design, and then microbiologically sampled at 10 different locations per piece to determine post-treatment microbial load.

For each inoculated trial (*E. coli*), nine pieces of beef trim were selected at random from a 27.3 kg batch (box of [90/10] or tub of [50/50]). Three pieces were tagged with commercial plastic wirewraps. These three tagged pieces plus three non-tagged pieces were immersed into the inoculation solution for 30 s on each side, and then allowed to drain at 4°C for 1 h to facilitate microbial attachment. At the end of the attachment period and prior to treatment, each of the three non-tagged inoculated pieces was microbiologically sampled at 10 different locations to provide a pre-treatment level of inoculation. Each of the three tagged inoculated samples was treated as per experimental design and then microbiologically sampled at 10 different locations to determine inoculation levels remaining post-treatment. Additionally, three non-tagged, non-inoculated pieces were assayed microbiologically in the same manner as a control prior to treatment, to determine the level of natural *E. coli* contamination, if any.

Microbiological and statistical analysis

Microbiological sampling was performed using sterile sponge kits (International BioProducts (IBP) # BP-237-SPG) and 50 cm^2 sterile templates (IBP # USDA-100). For each piece of beef trim to be sampled, a sterile template was placed on the meat surface. The dehydrated sponge was moistened with 10 ml of sterile 1.% BPW containing 0.1% sodium thiosulfate (Fisher Chemicals, S446-500) had been added. The moistened sponge was then used to swab the 50 cm^2 area. A minimum of 3 strokes in each of three separate directions was employed, with the sponge flipped over midway to maximize the contact area. After sampling was complete, the sponge was returned to its individual sterile bag and an additional 15 ml of BPW was added. The bag was sealed, labeled, and packed on gel-ice for shipment to ABC Research Corp.

Upon receipt, samples were checked for proper temperature and package integrity. Aerobic plate count (APC) was determined using standard methods (AOAC Official Method 966.23). *E. coli* counts were determined by use of Petrifilm™ (3M, St. Paul, MN) (AOAC Official Method 991.14). All counts were converted to $\log_{10}$ CFU/50 cm^2 and the geometric mean was used for statistical analysis. Treatments that resulted in significantly different results were identified by use of the Duncan's multiple range test.

RESULTS AND DISCUSSION

This study investigated the use of C-ASC in sanitizing beef trim with the SANOVA® system. Various treatments of C-ASC volume and application time were applied to both inoculated and uninoculated [90/10] beef trim. Reduction values for aerobic plate count and *E. coli* were calculated. One treatment was applied to inoculated [50/50] beef trim.

C-ASC treatments significantly reduced the level of aerobic microorganisms on the beef trim. The significance groupings for total plate count (TPC) reductions are shown in Fig. 1. At the 5 s and 10 s (feed rate of 0.75 kg/s) application times, the 221 ml C-ASC/kg dosage significantly reduced TPC over the 147 ml C-ASC/kg ($P \leq 0.0136$) and 74 ml C-ASC/kg ($P \leq 0.0014$) treatments. At the 15 s (feed rate of 0.75 kg/s) application time, there was no significant difference ($P \geq 0.2377$) between the 221

FIGURE 1. Reductions of natural aerobic microorganisms (TPC) from [90/10] beef trim by treatment with C-ASC. Flow rates of 0.75 kg/s and 2.5 kg/s were evaluated. Significance groupings were determined using Duncan's multiple range test

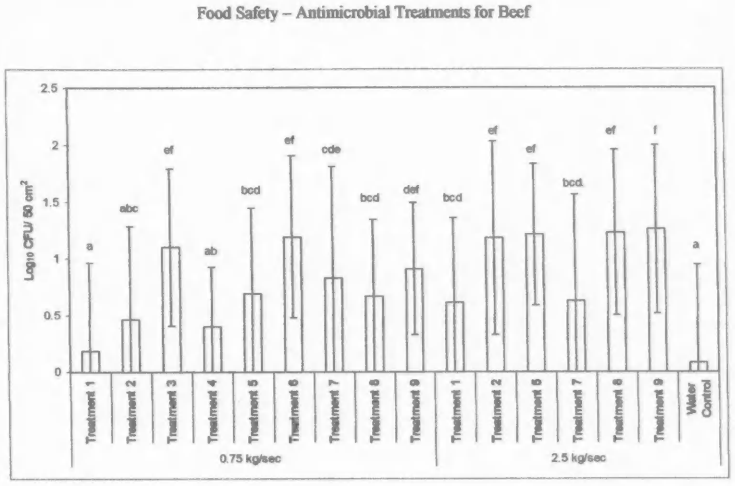
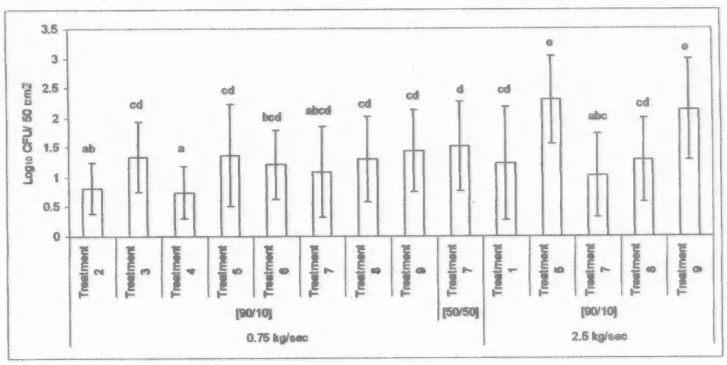


FIGURE 2. Reductions of inoculated *E. coli* from [90/10] or [50/50] beef trim by treatment with C-ASC. Flow rates of either 0.75 kg/s or 2.5 kg/s were evaluated. Significance groupings were determined using Duncan's multiple range test



ml C-ASC/kg, 147 ml C-ASC/kg, and 74 ml C-ASC/kg treatments.

At the higher feed rate of 2.5 kg/s and 5 s application time, the 147 ml C-ASC/kg dose reduced TPC more ($P = 0.0056$) than the 74 ml C-ASC/kg dose. At the 15 s (feed rate of 2.5 kg/s) application time, there was no difference between the 221 ml C-ASC/kg and the 147 ml C-ASC/kg treatments; however, both reduced TPC more ($P \leq 0.0033$) than the 74 ml C-ASC/kg treatment.

The 221 ml C-ASC/kg treatments (feed rate of 0.75 kg/s) provided higher TPC reductions than the lower volume treatments at each of the three application times. Longer application times did not significantly increase TPC reduction with the 221 ml C-ASC/kg treatment. Longer application times did, however, increase the TPC reduction values for the 147 ml C-ASC/kg and the 74 ml C-ASC/kg treatments. This suggests that the most effective and efficient C-ASC treatment (feed rate of 0.75 kg/s) for removing aerobic microorganisms on beef trim was Treatment 3 (221 ml C-ASC/kg for 5 s).

At the higher feed rate of 2.5 kg/s, a lower dose could be used to achieve the same TPC reduction. At a dosage of 147 ml C-ASC/kg applied for 5 s, the TPC reduction of 1.2 logs is no different ($P = 0.6709$) from the reduction achieved by Treatment 3 (feed rate of 0.75 kg/s). Additionally, greater reductions could not be achieved with dosages of 147 ml C-ASC/kg applied for either 10 or 15 s ($P \geq 0.7782$), or a dose of 221 ml C-ASC/kg for 15 s ($P = 0.6926$). At the higher feed rate of 2.5 kg/s, the most effective and efficient C-ASC treatment for removing aerobic microorganisms from beef trim was Treatment 2 (147 ml C-ASC/kg for 5 s).

C-ASC treatments were also effective at removing inoculated *E. coli* from beef trim surfaces. Figure 2 shows the significance groupings for the reduction of *E. coli* associated with the various C-ASC treatments. At an application time of 5 s (feed rate 0.75 kg/s), treatment with 221 ml C-ASC/kg reduced TPC more ($P = 0.0160$) than did 147 ml C-ASC/kg. At an application time of 10 s (feed rate 0.75 kg/s), treatment with 221 ml C-ASC/kg and 147 ml C-ASC/kg achieved the same reduction of *E. coli* ($P = 0.5111$), while treatment with 74 ml C-ASC/kg was less effective ($P \leq 0.0260$). By 15 s application time (feed rate of 0.75 kg/s), C-ASC reached its maximum effectiveness against *E. coli* with the tested dosages of 221 ml C-ASC/kg, 147 ml C-ASC/kg, or 74 ml C-ASC/kg. There was no difference ($P \geq 0.1336$) between these treatments.

At the higher feed rate of 2.5 kg/s, greater reductions of *E. coli* could be achieved using C-ASC. Treatment 5 (147 ml C-ASC/kg for 10 s) and Treatment 9 (221 ml C-ASC/kg for

15 s) were more effective ($P \leq 0.0013$) than the other tested parameter combinations at reducing levels of inoculated *E. coli* from beef trim surfaces, producing reductions of 2.3 and 2.1, log cycles, respectively. Based on patterns exhibited in TPC reductions, a more efficient reduction might be possible by using Treatments 3 and/or 6 at a feed rate of 2.5 kg/s; however these matrices were not tested in this study. It is of note that Treatment 8 (147 ml C-ASC/kg for 15 s) provided a significantly lower reduction of *E. coli* than Treatment 5 (147 ml C-ASC/kg for 10 sec) or Treatment 9 (221 ml C-ASC/kg for 15 s). This inconsistency in the data is most likely attributed to variations on the beef trim surfaces. In future studies, a larger sample size could be used to reduce variability.

One inoculated trial was conducted using [50/50] beef trim. Treatment 7 (74 ml C-ASC/kg, 15 s) was applied to the [50/50] trim at a feed rate of 0.75 kg/s, yielding a reduction of *E. coli* of 1.5 log cycles. Trials using identical parameters on [90/10] beef trim resulted in reductions of *E. coli* of 1.1 log cycles. Statistical analysis revealed no significant difference ($P = 0.0594$) between the reduction of *E. coli* on [50/50] beef trim and [90/10] beef trim by Treatment 7.

In related studies, Kemp et al. *(17)* sprayed broiler carcasses with 5 oz of C-ASC (1200 ppm) for 15 s. The effects of this treatment were a 0.5 log cycles reduction in total aerobic microorganisms, a 0.8 log cycles reduction of *E. coli*, and a 0.5 log cycles reductions of total coliforms. Slightly higher reductions were demonstrated in the present study. Kemp et al. *(17)* also studied the effects of dipping broiler carcasses in a C-ASC solution and found that dipping carcasses was more effective than spraying them. Similar reductions were also demonstrated by Castillo et al. *(5)*. Beef carcasses inoculated with *E. coli* O157: H7 and *Salmonella* Typhimurium were sprayed with 1200 ppm C-ASC (4.67 oz for 10 s) after receiving a water wash. Reductions by water wash followed by C-ASC spray were 4.5 to 4.6 log cycles; however, the water wash alone achieved a 2.3 log cycles reduction in both pathogens. This demonstrates the reduction potential of the C-ASC spray to be 2.2 to 2.3 log cycles, which is in agreement with the findings in this study.

This study demonstrates the ability of acidified sodium chlorite to significantly reduce both natural microbial populations and artificially inoculated *E. coli* on beef trim. The higher feed rate used in this study resulted in greater reductions than comparable treatments at the lower feed rate. A preliminary evaluation suggests the reduction of *E. coli* on [50/50] beef trim is at least as efficient as on [90/10] beef trim.

SANOVA® is the registered trademark for Alcide Corporation's system for application of acidified sodium chlorite antimicrobial solutions.

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Ethics of Differences in Risk Perception and Views on Food Safety

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SUMMARY

Conventional risk analysis presupposes that uniform definitions of risks can be reached on the basis of scientific consensus; it does not take consumers' definitions of risks seriously. However, risk definitions can vary widely, depending on national cultures and their influence on scientific communities. In addition, risks must be accepted by members of society, both individually and jointly. The issue is then no longer one of costs and benefits, but of mutual respect of rights and of achieving trust and reasonable agreement among members of society. In this paper the controversies between scientific and cultural risk perception will be considered, and the issue of the ethical acceptability of different risk definitions. A key element for consumers is trust in the authority that defines and sets out the risks for policy purposes, and trust is not upheld by dismissing their definitions as irrational. For consumers, but for scientists as well, cultural background, basic assumptions, expectations, and lifestyles play a major role here. Subsequently, the ethical legitimation of pluralism in risk perception is discussed. Consumers not only have money to buy products but hold varying views about freedom of food choice and diversity of the food supply. In democratic societies, legitimately developed risk definitions of consumers are entitled to recognition, and such definitions cannot be set aside by scientific, free-market, or utilitarian considerations (such as cost-benefit analyses prepared by others). Implications for risk assessment and risk communication are explained in detail.

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INTRODUCTION

It seemed so easy, making a risk assessment. A *scientist* calculates the probability of a disaster occurring, estimates the costs of the disaster, and multiplies the two. That yields the risk level of a future disaster. A *producer*, by applying risk-benefit analysis, in which costs and benefits are likewise expressed in monetary terms and compared, can decide whether a product or innovation should be brought onto the market, where a *consumer* can buy it. If necessary, a group of consumers can be asked to prepare an estimate of the monetary costs and benefits of the product (and so they are supposed to express their particular 'willingness to pay').

But it no longer works like that. In the first place, risks must be defined and then positioned somewhere between what we accept as inevitable and what must be prevented at all (or extremely high) costs. This definition is culturally determined. Roquefort, for example, is not allowed in the United States because it is a raw-milk cheese, but in France it is considered a cultural good and therefore accepted despite the risks. Conversely, in a culture where science has high status, the use of hor-

mones and Genetically Modified Organisms (GMOs) in food is considered scientifically and therefore socially acceptable. In some parts of the United States, one must wear a helmet when riding a bicycle, whereas in Europe no helmet is required, since bicycling is considered an everyday activity. Secondly, risks must be accepted by members of society, both individually and jointly. The issue is then no longer one of costs and benefits, but of mutual respect of rights and of achieving trust and reasonable agreement among members of society.

In this paper I will consider the controversies between scientific and cultural risk perception and then investigate how perceptions of risk come about. A key element is trust in the authority that defines and sets out the risks for policy purposes. Cultural background, basic assumptions, expectations, and lifestyles play a major role here. Finally, I will show that, in ethical terms, pluralism in risk perception is permitted and, to a certain extent, even mandatory. Consumers not only have money to buy products, but they hold varying views about freedom of food choice and diversity of the food supply. Therefore, we must get away from a policy of strictly uniform risk warnings. I will also argue that, in democratic societies, legitimately developed risk definitions of consumers are entitled to recognition, and such definitions cannot be set aside by scientific, free-market, or utilitarian considerations (such as cost-benefit analyses prepared by others). I therefore plead in favor of an approach based on rights and against the utilitarian approach to risks that is so often applied.

DIFFERENT RISK PERCEPTIONS AND RISK ASSESSMENTS

The scientific community, those who set government policy, and the general public hold quite different views and definitions of risks and of how risks must be estimated and handled. A dominant approach is to apply a calculation of probability times costs, including a cost-benefit analysis. But even within this approach there is disagreement about the definition of risk. In American food safety policy, the fundamental role of microbiological science in resolving societal controversies related to risk translates into what is called *substantial equivalence*. A food product is considered to involve only risk with regard to the one ingredient with regard to which it differs from a similar but traditional food product. A food product is thus never tested in its totality, but only with regard to that one ingredient.

In European policy, another type of risk assessment is gaining ground. The *precautionary principle* (meaning that uncertainty about the safety of a product does not mean discharge from the obligation to act) is increasingly applied here, under the impact of the ecological sciences *(1)*. In the various European countries, with their different cultures, the accent sometimes lies on substantial equivalence and at other times on the precautionary approach. Each of these two scientific approaches has its advantages, but they also present problems. Scientists tend to emphasize the microbiological risks *(5)*. Experts in the field of zoonotic diseases thus express their concern about the fact that, in countercultural (read: organic) production processes, all sorts of pathogens (such as *Campylobacter*, *Salmonella*, and *Toxoplasma*) are often uncontrolled, in contrast to conventional cattle farms.

For consumers, the issues likewise differ. Depending on the culture, not only hard data play a role in the acceptance of scientific information about risks, but also the trust in the person who prepares and presents the data, plus the climate between the recipient and the presenter of the information. Cultural background, assumptions, expectations, lifestyles: these all play a major role. Most people will continue to barbecue, despite the fact that scientists keep warning against acrylamide, because you'd be really fussy to call off a pleasant eating event for fear of acrylamide. It is impossible to separate the data and the message from the broader value context, which affects both the producers and the final assessors of the data, namely the general public and the political authorities.

Non-experts see different risks than experts do. They take much greater notice of potential risks to biodiversity, of additives, and of the limitation of food choices. Sometimes they get recognition for this. A good example is the history around the introduction of GMOs in Europe. A commission of the European Union consisting of health experts initially ruled that genetically modified foods did not involve health risks. But various parties, including Greenpeace, warned of risks other than those that had been investigated by the experts, such as biodiversity problems. These risks were ultimately recognized by the EU to be just as legitimate as those that had been investigated. This is not the only situation in which non-experts won their case, but generally speaking they are not taken seriously in risk assessments *(11)*.

Based on the level of trust that the public has in the messenger, countercultural forms of production that meet higher animal welfare standards may be considered less risky with regard to health as well. Nutritional risks are often compared in scientific literature with other risks, but it is clear that the general public does not accept such comparisons. The public regards nutrition as a unique aspect of life that applies to our lives every single day. Comparing food-related risks with the risks of bicycling, car driving, or mobile telephones is therefore meaningless to non-experts and often considered ridiculous *(7)*. Public perceptions of

	Government	Scientists	General public	Producers
Government	Regulates at distance	One-sided	To be protected	To be regulated
Scientists	Short-term success	Sole source of knowledge	Irrational	
General public	Slow, only reacts to media	One-sided (tunnel vision)	Diverse	Profit-oriented
Producers	Exacting regulator	Too fussy	To win for themselves	Against profiteers

food safety are much broader. Food risks are not only mentioned among the usual consumer concerns (such as health and mortality, future generations, or the environment), but also among aspects that cannot be defined in terms of physics, such as personal food choice and the right to diversity in food. To the lay public, food safety is not just a microbiological issue; it also involves the entire set of values that relate to autonomy in food choice and to a broad range of foodstuffs.

This breadth has a reason: By definition, the public is always lagging in information or is even kept uninformed. That is why factors such as lifestyle and trust in the reliability of people play an important role. Also, the media contribute to the buildup, maintenance, or breakdown of trust. And think of history, as specific events are stored in our collective memory, giving direction to future assessments. Risk evaluations related to nuclear energy are an example (think of Chernobyl), but other technological disasters (e.g., Challenger and Columbia) and recent events such as the premature death of Dolly (cloning and aging are risks that lay people feel directly affected by) also impact our assessment of risk. As to food safety, issues such as the sordid cover-up attempts in the United Kingdom of mad cow disease (BSE) and Monsanto's aggressive attempts to get GMOs accepted have contributed greatly to a confidence breakdown. The actions on the part of Greenpeace (which was the first groups to hammer on the potentially negative effects on the environment of GMOs, while official scientific reports ignored these) and of Friends of the Earth (which started the Starlink corn affair rolling in the United States by testing store-bought tacos) have likewise undermined the level of trust in the official sciences. Once again, collective experiences from the past cannot be reflected in cost-benefit analyses.

The cultural background of our collective memory also plays a role in the definition of risks. In the United Kingdom, the BSE affair left such deep wounds because the British have long regarded beef as a national icon (cf. "beef and beer give heavier blows than soup and roasted frogs" *(9)*. In Italy, the pasta culture lies at the core of a very national view of eating, and of eating around la Mamma: 'dove ce Barilla, ce casa' (where Barilla — a well-known pasta brand — is, is home). Foreign eating habits and products are thus slow to penetrate into Italy, as they are often regarded as risky and unsafe *(2)*.

THE DEBATE ABOUT THE DEFINITION OF RISK AND FOOD SAFETY

The differences in perception, among scientists as well as between scientists and lay people, lead to deep conflicts at times. These conflicts are exacerbated when food manufacturers try to sell a certain product image that turns out to be misrepresented. Scientists tend to call the general public's perception irrational and extensively criticize the lack of logic and information that lead, in the minds of scientists, to strange risk assessments on the part of non-experts. Calling these ideological and cultural backgrounds irrational and claiming that science transcends these backgrounds does not evidence great insight. Scientists are also led by ideological and cultural prejudices; worse, such assertions wash away the basis for trust and thereby make communication impossible.

The table above presents the various ideological fronts regarding risks and food safety. What government officials, scientists, the general public, and producers think about each other with regard to food safety leads to interesting reflections that often mirror each other.

The literature about risk perception hardly mentions the broad concept of risk and food safety that many consumers apply. In general, researchers point out that consumers recognize and assess risks only in a routine way *(3)*. Typical comments stress the limited rationality of consumers and the partial information on which they base their assessment of risk, as well as the level of trust that they reserve for those informants that are relevant for them. Such comments fail to mention, however, that other than purely technical factors about illness or death are involved in questions of food safety, such as food diversity and respect for food choice.

This last item refers to the circumstance that the market is open to different food styles, such as organic, traditional, fast-food, and cosmopolitan *(6)*.

Despite these differences, I do not consider it meaningful to speak of a culture of scientists versus that of lay people, such as Nestlé *(8)* does. First, scientists are also non-experts when it comes to fields outside their expertise, and, second, the views and underlying values and behavioral patterns of lay people are quite diverse. Different emphases are applied, depending on population group, lifestyle, and age. Young parents are more concerned about the effects of nutrition on their children, while older people are more inclined to focus on free choice and diversity. Adolescents lay great emphasis on free choice, and social climbers have high regard for fast-acting and decisive entrepreneurs. Risks are also defined differently, depending on the social category to which a person belongs, such as young children, pregnant women, elderly people, and single men. Perceptions of risk always clearly differ between women and men, since men are willing to accept higher risk levels than women *(10)*.

FIVE ISSUES IN PRESENT-DAY EUROPEAN FOOD SAFETY POLICY AND TECHNOLOGY

Current food safety policy, which focuses fully on total or at least optimal food safety for everyone (very often according to HACCP: Hazard Analysis Critical Control Point), is characterized by a number of issues *(4)*.

First, it assumes a level of food safety that applies to everyone, whereas it is becoming increasingly clear that consumers can differ greatly in medical risk profile.

Second, technological (such as the emergence of functional foods) and societal developments (such as internationalization) in the chain lead to new food safety risks, thus calling for a more dynamic and proactive approach.

Third, and in response to the developments just mentioned, technologies such as genomics and biological information science are enabling scientists and policymakers to predict specific risks and develop early warning systems in a more focused way.

Fourth, food safety issues are directly linked with other socio-ethical issues in the food chain, such as sustainability, animal welfare, human health, and respect for small farmers in developing countries (where increasing the requirements can drive farmers to the slums). Technologists make implicit assessments among the various ethical issues (which often compete with each other) when they decide that a particular risk level is acceptable, but the reductionist approach is not explicit in this.

Fifth (and directly related to the fourth issue), many consumers have integrated or holistic views, rather than reductionist views, about food safety and risks, and these integrated views sometimes lead to total distrust with regard to official food safety statements. Consumers also differ greatly in the emphasis that they place on the various ethical questions (thus applying different risk definitions or risk profiles) and on the level of risk that they tolerate (risk-avoiding or risk-seeking, i.e., the formal risk profile).

These five issues call for a safety policy that differentiates; that is preventive, international, and chain-oriented; that inspires trust; and that systematically responds to different groups of consumers with regard to their medical, content-related, and formal risk profiles. The central question then becomes: Are consumer groups entitled to their own risk perception, regardless of what science concludes?

RESPECT FOR AND ACCEPTANCE OF DIFFERENCES IN RISK PERCEPTION

How do we deal with differences in risk perception in an ethically responsible way? If scientists were indeed the only group that could assess risks, then respect for other risk perceptions would be unnecessary and even interfere with good policy. At best, the specific ideological sensitivities of lay persons would have to be taken into account during risk communication. But as I have pointed out, the situation is different. Within the sciences themselves, various risk definitions are used, and, in a number of crucial areas, the viewpoints of non-experts have had major corrective impact on the definition of risks and food safety.

In view of this, it makes sense to demand respect for views about risks that are not based on science. Respect for differences between risk definitions has its limits, however. Is every opinion legitimate, even if it clearly harms others? Does anything go? How do we ethically prevent a producer from appealing to his right to a personal definition of safety and risk when offering a product that is clearly unsafe? And how do we prevent a protest group from calling a safe product unsafe only in order to trip up the producer? To what extent are individuals and collectives entitled to their own views on risk?

In broad terms, there are three approaches in ethics that can serve to answer this question. These are utilitarianism, the deontological ethic, and the deliberative approach. According to the *utilitarian* or *consequential-ethical perspective*, an act is proper if its effects are good. This perspective focuses on the consequences of a certain action. The consequences must be evaluated according to the principle of the greatest possible well-being. Jeremy

Bentham (1748–1832), the patriarch of this approach, speaks of "the greatest good for the greatest number." If the greatest possible well-being is promoted, even if it does not apply to every person to the same degree and even if some people might be worse off because of it, then the action can still be considered proper if the majority is better off.

Utilitarianism thus leads to a consideration of consequences (and only indirectly of principles). It comes close in that way to the cost-benefit analysis as advocated by certain economic movements. There are many variants of utilitarianism, and, according to one variant, principles and general rules (as laid down, for example, by law) are definitely meaningful, because they reduce the risk of a breach of well-being. However, utilitarianism does not take fundamental rights, principles, or obligations into account in a principled way. In general, utilitarianism is permeated by the idea of not causing damage. It is a negative approach, in which the main effort goes into limiting the negative consequences of an action. For food risks, this means that lay persons cannot derive rights from their own risk definitions and do not need to be consulted.

Second, there is the *deontological approach*. This strongly emphasizes principles and obligations, in the assessment of whether an act is correct or good. Well-known general principles are the autonomy of the individual person and justice, in the sense that all persons are entitled to their own share. The best-known representative of the principle-ethical approach is Immanuel Kant (1724–1804). He does not start out by preparing a list of obligations. Instead, he identifies a criterion that morally acting persons use to judge whether something represents an obligation. This criterion he calls the categorical imperative. It reads as follows: "Act only according to the maxim about which you can wish that it becomes a general law." In other words: Can I wish that everyone acts as I now wish to act? For example, if I wish to borrow money from someone without wanting to return it, I must ask myself, applying the categorical imperative, whether I indeed wish that everyone would act this way (borrowing money without ever returning it). The answer to this is obviously "no", since no one would then lend money to another person ever.

Individuals can thus demand respect for their personal risk perceptions; collective risk perceptions that are based on individual (equal and just) contributions are likewise to be respected. If a group, on the basis of respect for individual rights, comes to the conclusion that organic products are safe, despite scientific advice to the contrary, then such conclusion must be respected. Scientific advice is then simply not convincing enough, or the scientists have not done their work well enough.

In contrast to these, there is a third approach that is less directed at principles, the individual person, and individual choice, and more at the social context, at human solidarity and obligations that have historically grown – in short, an approach that seeks to give an answer to the question of what constitutes good living in a world full of risks. This *deliberative approach* takes these insights into account, but it also incorporates aspects of the other two movements, such as respect for autonomy and a certain appreciation of costs and benefits. Individual rights are not, however, considered to possess ultimate value; neither is the cost-benefit analysis. Interests and rights must be made flexible in forms of deliberation, by responding to each other and to the issue to be solved.

In the end, principles cannot help us to resolve dilemmas; they have an analytical but not constructive and synthetic meaning since they are not directed at concrete solutions. Principles operate as heuristics rather than as absolute rules. They help us to look at specific aspects of specific situations, and they focus our attention to specific characteristics. But of themselves they do not cover the entire field of meaningful and productive ethical concepts. In applying norms and principles, we always use the ideals or value aspects thereof, making it clear that ethical dimensions other than those of principles (such as feasibility, lifestyle, and limited rationality) are similarly relevant. On top of that, the ethical issues in nutrition are so complex and interwoven with so many different matters that searching for universal and exhaustive principles is likely to lead us down the wrong path.

Based on the deliberative ethic, I see two main issues. First, individuals and the general public must have trust in the nutritional system that is managed by experts. Trust does not, however, come about strictly by providing information or by issuing principles. Rather, it grows on the basis of transparency, openness, honesty, and accountability forums, in other words, the presence of public spaces where responsible persons account for their decisions. Tackling an ethical dilemma is a process that requires compromise, where not only principles but also values, biases, and ideals play a role. It implies attention to the social and cultural contexts within which ethical problems occur. The strong emphasis in the deontological approach on the rights and obligations of individually acting persons ignores the fact that rights have ethical and factual limits. Consumers and producers may well be entitled to information, but they cannot search out, check, and monitor everything. It is impossible for the average person to determine which information is correct and which is not, which claims are justified, and what consequences certain food products have. It is specifically in light of the limits to the autonomy of consumers and producers that confi-

dence-inspiring, impartial, and independent institutions and forums are needed to assist consumers and producers. However, these are generally lacking. Risk assessments based on deliberative analysis are therefore limited when it comes to individual rights and collective rights derived from these. These boundaries are provisional because compromises must still be made about what constitutes an acceptable risk, about the way risk is defined, and about how it is managed. But this must take place in open and reasonable discussion, without exclusion of certain themes or parties, and without secret agendas.

There is still a second point. Individuals differ greatly from the contexts within which they live, so it is quite possible that a particular person can handle greater risk than another, both in physical and psychological terms and in terms of ideals. As it is becoming increasingly clear that a general risk assessment can no longer be given even in the science of microbiology, we see both a social and a scientific development coming together. General risk assessments are no longer being accepted. A risk message should no longer say that a certain substance presents so much chance of a certain illness, but that a certain substance presents so much chance of a certain illness for specific populations. People who wish to run less risk, or more for that matter, can thus accommodate themselves. Personal perception and free acceptance of the risk type can then be taken into account. This excludes the possibility of abuse of the respect that should consequently be given to other views of risk, for such abuse of respect implies tolerance for every possible definition of risk, even if it is ultimately harmful.

CONCLUSION

The definition of food safety and risk differs by culture and age group. A certain product can thus be identified as hazardous and unsafe within one culture, but not within another. This cultural multiformity of scientific and lay perceptions of risks and food safety leads to problems when everyone can appeal to the right to a personal definition of risk. In this paper I have pleaded for a deliberative approach to risks, in which public perceptions are provisionally respected while being subjected to testing in public debates. The concept of the autonomous consumer has not been thrown overboard in this approach, but it has been stretched somewhat: Freedom of choice is shaped within a social context and is thus dependent on meanings, cultural paradigms, and forums. The communication process between the parties involved calls for mutual trust, based on transparent control mechanisms. The principles of respect for rights and obligations serve in this approach as heuristic tools.

Second, the communication of risk situations must be much more specific, identifying a certain substance as having a certain effect on certain people. On the other hand, risk definition and communication must also take into account social and cultural aspects, such as autonomy in food choice, food diversity, and the potential consequences for the environment and future generations.

Lastly, the financial and commercial background of risk assessments must be clearly identified. Risk-benefit analyses may be useful (just as are studies based on willingness to pay). Much more valuable, however, are attempts to bridge the gap between producers, scientists, and consumers through intensive mutual involvement.

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Dr. John H. Silliker: A Celebration of a Distinguished Career in Food Science

By John Williams, Jr.

Although Dr. John H. Silliker "officially" retired in 1987 from the food testing and consulting organization he founded, he has spent the last 17 years as an educator, technical consultant, writer, and researcher.

It's hard to believe that this admired member of the food science community once gave serious consideration to pursuing other career paths.

Born in Canada, but raised in Hollywood, CA, where he counted future movie stars like Jason Robards, Jr. among his high school classmates, Dr. Silliker enrolled as a pre-med student at the University of Southern California in 1940. Three years into his studies, he had second thoughts of becoming the next Dr. Kildare and switched majors.

"I wanted to be an engineer, which was a joke and a half," he recalled. "In fact, I practically flunked out of school."

Tossing aside his slide ruler, Dr. Silliker made what would turn out to be a life-altering decision. He enlisted in the United States Army and was assigned to serve in the prestigious Combat Engineers.

At Fort Leonard Wood, MO, Buck Private Silliker was put to work in the medical department at the base. It was there that he befriended a young scientist, Hiroshi Sugiyama, and was mesmerized by a complex microorganism that would one day stand the food industry on its ear: *Salmonella*.

Dr. Silliker credits Sugiyama, who went on to a distinguished career at the University of Wisconsin's Food Research Institute, with teaching him the "first microbiology I ever knew." Together, the young soldiers read Topley and Wilson's *Principles of Bacteriology and Immunity* from cover to cover and – just for the fun of it – the inquisitive pair made batches of *Salmonella antisera* in the laboratory. Through a fortuitous stint in army fatigues, Dr. Silliker's future would take on a new and challenging course.

Following an honorable discharge from the army, Dr. Silliker returned to USC and majored in microbiology. He earned his doctorate from the Southern California learning institution in 1950. Three years later, he landed his first big career break with Chicago-based Swift and Company.

After nine highly productive years at the company, he held the position of chief microbiologist and associate director of research. Despite his successful climb up the corporate ladder, Dr. Silliker, a dedicated scientist with the heart of an entrepreneur, yearned for greener pastures.

"It was a delightful experience working for Swift," he said, "but I really wanted to go into business for myself."

At this time, St. James Hospital in south suburban Chicago Heights, IL, was looking for someone with his credentials to work in its pathology department. On paper, joining a hospital staff didn't

The International Association for Food Protection is pleased to announce the establishment of the John H. Silliker Lecture to honor Dr. Silliker for his contributions to food microbiology. On Tuesday, August 10 at 3:45 p.m. during IAFP 2004, the Inaugural Lecture will be delivered by R. Bruce Tompkin, retired vice president–product safety, ConAgra Refrigerated Prepared Foods. Dr. Tompkin will deliver his presentation, "Guess Who's Come to Stay – The Resident Pathogen Issue" during a plenary session. IAFP thanks Silliker, Inc. for their contribution to the IAFP Foundation in support of this Lecture.

appear to be a logical step for a man with entrepreneurial ambitions. But as part of his employment, St. James agreed he could use its lab to moonlight as a food microbiology consultant.

"They didn't think I would get any consulting work," he said, "but I did and things went pretty well for about three years." A 1965 decree from the Food and Drug Administration (FDA), however, placed his days at the hospital on life support.

"That's when the FDA stated there shall not be any *Salmonella* in any processed food," he explained.

Due to his extensive *Salmonella* expertise, Dr. Silliker's small consulting business was soon swamped in samples and the hospital wanted him gone – quick, fast, and in a hurry.

"I had to venture out on my own and I found a two-floor building down the road from the hospital. It was a wholesale place with 5,000 square feet of empty space on the first floor. I contacted the owner and asked if I could take half of it and the answer was: 'Take it all or go somewhere else.' Well I was absolutely scared to death, but I took it and never looked back," he said.

The focus on food safety took on greater dimensions in the United States following the FDA's declaration of open warfare on *Salmonella*. Over the next two decades, Silliker Laboratories opened new operations in Pennsylvania, New Jersey, California, and Canada. Dr. Silliker also squeezed in enough time to hire two young scientists – Damien A. Gabis and Russell S. Flowers – both of whom would go on to helm the company with distinction.

Even while his company was growing by leaps and bounds, Dr. Silliker was committed to making meaningful contributions to food safety outside the confines of his laboratory. He was an early and staunch proponent of the Hazard Analysis Critical Control Point (HACCP) system and counted Pillsbury's Howard Bauman, "the father of HACCP," as a trusted friend and colleague. Dr. Silliker was also a frequent guest on Capitol Hill, lending his respected voice to congressional hearings that resulted in the passage of landmark food safety legislation.

A strong believer in safety training for plant employees, Dr. Silliker, with the cooperation of company management, would often visit facilities and instruct workers on proper aseptic sampling techniques. (The cellulose sponge swab, now a fixture in numerous environmental sampling kits, was conceived and introduced in the mid-1970s by Silliker Laboratories.) As part of his on-site plant visits, he would deliver practical, impromptu lectures on *Listeria*, *Salmonella*, and other problematic organisms. This microbiologist was a natural teacher.

Dr. Silliker (right) is pictured with Dr. F. S. Thatcher, the first chairman of ICMSF (circa 1970).

When Silliker Laboratories decided to sponsor its first public short course – "Principles of Food Microbiology" in 1987 – Dr. Silliker, who had recently "retired" and returned to his adopted home state of California, was the one obvious choice to write the course manual and serve as the lead instructor. He remains an integral part of the organization's education and training program to this very day. Not too long ago, a Silliker short course student wrote glowingly of him:

"Dr. Silliker's presentations were most beneficial and extremely enjoyable. The stories he told were much more impressionable than the written materials could ever be... I will leave you with a quote from Andy Rooney that recently crossed my desk: 'I've learned the best classroom in the world is at the feet of an elderly person.'"

The author of over 80 peer-reviewed publications, Dr. Silliker served on numerous scientific committees and groups, including several years on the highly influential International Commission on Microbiological Specifications for Foods (ICMSF). During his exceedingly productive tenure, he served as ICMSF editorial committee chairman for the highly acclaimed two-volume monograph, *Microbial Ecology of Food* (Microorganisms in Foods 3), which was published in 1980.

Dr. Silliker (second from right) listens intently during a World Health Organization meeting held in Geneva, Switzerland, in the mid-1980s.

For his outstanding contributions, the Institute of Food Technologists (Fellow), American Academy of Microbiology (Fellow), NSF International (Lifetime Achievement Award), International Association for Food Protection (Harold Barnum Award) and numerous other scientific groups have recognized his six decades of sterling service.

The now "semi-retired" Dr. Silliker enjoys keeping in touch with an impressive list of industry professionals who got their start at Silliker Laboratories, sharing his encyclopedic knowledge with young scientists, and enjoying the phenomenal growth of his namesake company. Today, with 27 locations in North America, Europe and Australia, Silliker, Inc. is widely recognized as the leading food safety and quality assurance organization in the world.

It's ironic to think that the food science community as we know it might be much different today if Dr. Silliker had taken a shining to becoming an engineer. All of us are richer because he found the right path.

John Williams Jr. is a Silliker, Inc. Senior Communications Specialist

2004 IAFP Award Winners

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New York State Association for Food Protection

MEMBERSHIP ACHIEVEMENT FOR AFFILIATES

British Columbia Food Protection Association

Committee Meetings

Sunday, August 8, 2004

TIMES	COMMITTEE MEETING	ROOM	FLOOR
7:00 AM – 10:00 AM	Affiliate Council	Grand Sonoran AB	Ballroom Level
8:00 AM – 5:00 PM	Communicable Diseases Affecting Man	Desert Suite III	Lobby Level
10:00 AM – 12:00 PM	3-A Committee on Sanitary Procedures	Chairman's Board Room	Lobby Level
10:00 AM – 12:00 PM	Applied Laboratory Methods	Desert Suite V	Lobby Level
10:00 AM – 12:00 PM	Food Safety Network	President's Board Room	Lobby Level
10:00 AM – 12:00 PM	*JFP* Management	Pinnacle Peak I	Lobby Level
10:00 AM – 12:00 PM	Microbial Risk Analysis	Pinnacle Peak II	Lobby Level
10:00 AM – 12:00 PM	Retail Food Safety and Quality	Desert Suite IV	Lobby Level
10:00 AM – 12:00 PM	Viral and Parasitic Foodborne Disease	Desert Suite VII	Lobby Level
12:00 PM – 1:30 PM	Student	Grand Sonoran CD	Ballroom Level
1:00 PM – 3:00 PM	Dairy Quality and Safety	Desert Suite V	Lobby Level
1:00 PM – 3:00 PM	Food Sanitation	Desert Suite IV	Lobby Level
1:00 PM – 3:00 PM	Foundation Fund	Chairman's Board Room	Lobby Level
1:00 PM – 3:00 PM	Fruit and Vegetable Safety and Quality	Pinnacle Peak II	Lobby Level
1:00 PM – 3:00 PM	Meat and Poultry Safety and Quality	Pinnacle Peak I	Lobby Level
1:00 PM – 3:00 PM	Seafood Safety and Quality	President's Board Room	Lobby Level
1:00 PM – 3:00 PM	Water Safety and Quality	Desert Suite VII	Lobby Level
2:00 PM – 4:00 PM	*FPT* Management	Grand Sonoran AB	Ballroom Level
3:00 PM – 4:00 PM	Past Presidents'	President's Board Room	Lobby Level
3:00 PM – 5:00 PM	Audiovisual Library	Chairman's Board Room	Lobby Level
3:00 PM – 5:00 PM	Awards	Desert Suite VII	Lobby Level
3:00 PM – 5:00 PM	Constitution and Bylaws	Desert Suite V	Lobby Level
3:00 PM – 5:00 PM	Nominating	Desert Suite VIII	Lobby Level
3:00 PM – 5:00 PM	Outreach Education	Pinnacle Peak II	Lobby Level
4:00 PM – 5:00 PM	Program	Desert Suite IV	Lobby Level

Note: Food Toxicology and Food Allergens Organizational Meeting – 3:00 PM – 5:00 PM in the Pinnacle Peak I Room on the Lobby Level

THE Black Pearl AWARD

RECOGNITION FOR CORPORATE EXCELLENCE IN FOOD SAFETY AND QUALITY

The Black Pearl Award is presented annually to a company for its efforts in advancing food safety and quality through consumer program, employee relations, educational activities, adherence to standards and support of the goals and objectives of the International Association for Food Protection. We invite you to nominate your company for this prestigious recognition. Contact the Association office for nomination information.

Presented by

The International Association for Food Protection

Proudly sponsored by

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Black Pearl Recipients

2004 Jack in the Box Inc.
San Diego, California

2003 Wegmans Food Markets Inc.
Rochester, New York

2002 Darden Restaurants
Orlando, Florida

2001 Walt Disney World Company
Lake Buena Vista, Florida

2000 Zep Manufacturing Company
Atlanta, Georgia

1999 Caravelle Foods
Brampton, Ontario, Canada

1998 Kraft Foods, Inc.
Northfield, Illinois

1997 Papetti's of Iowa Food Products, Inc.
Lenox, Iowa

1996 Silliker, Inc.
Homewood, Illinois

1995 Albertson's Inc.
Boise, Idaho

1994 H-E-B Grocery Company
San Antonio, Texas

NEW MEMBERS

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University of Guelph
Guelph, Ontario

FINLAND

Marjatta T. Rahkio
Finnish Meat Research Institute

GERMANY

Susan M. Freund
Kraft Foods
Munich

JAPAN

Hiroshi Urakami
Niigata College of Pharmacy
Niitsu, Niigata

Fuminori Yamazaki
Morinaga & Co., Ltd.
Yokohama, Kanagawa

MEXICO

Agustin A. Girard
Silliker-AQL
Mexico City, Distrito Federa

Julio C. Limon
Universidad Autonoma De Nuevo Leon
Gral. Escobedo, Nuevo Leon

NEW ZEALAND

Angela J. Cornelius
ESR
Christchurch, Canterbury

Peter J. Cressey
ESR
Christchurch, Canterbury

Andrew Hudson
ESR Ltd.
Christchurch, Canterbury

Rosemary J. Whyte
Institute of Environmental Science and Research
Christchurch

SOUTH KOREA

Kiseon Han
Seoul National University
Seoul

UNITED KINGDOM

Christine Little
Health Protection Agency
London

Linda V. Thomas
Danisco Beaminster Ltd.
Beaminster, Dorset

UNITED STATES

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Xiali Liu
University of Arkansas
Fayetteville

Susan E. Oldfather
Consumer Testing Laboratories
Bentonville

CALIFORNIA

Keith Refsnider
Driscoll Strawberry Associates, Inc.
Watsonville

COLORADO

Alexandra Lianou
Colorado State University
Fort Collins

DISTRICT OF COLUMBIA

Anthony O. Flood
International Food Information Council
Washington

GEORGIA

Ruth Morrow
University of Georgia
Athens

Dharmendrasingh M. Pawar
University of Georgia
Griffin

Doug Smith
USDA-ARS
Athens

Kaye V. Sy
University of Georgia
Griffin

Tong Zhao
University of Georgia
Griffin

ILLINOIS

Thomas G. Fortman
Bell Flavors & Fragrances, Inc.
Northbrook

Shivani Gupta
National Center for Food Safety
Summit Argo

INDIANA

Sol Kim
Purdue University
West Lafayette

Jonathan N. Roth
Micrology Laboratories LLC
Goshen

IOWA

Ainura Ornozalieva
Iowa State University
Ames

Theresa M. A. Sikinyi
Iowa State University
Ames

NEW MEMBERS

KANSAS

Erin M. Harvey
Kansas State University
Manhattan

MARYLAND

Yun-Yun Diana Hao
FDA-CFSAN
College Park

Thomas A. Hill
FDA
College Park

MINNESOTA

Donald R. Goldsmith
FDA-USHHS
Miltona

MISSOURI

Jodi Daniel
Springfield/Green Co. Health Dept.
Springfield

NEW HAMPSHIRE

Will Sasser
Handgards Inc.
Merrimack

NEW JERSEY

Rhyannon R. Witzel
Masterfoods USA
Hackettstown

NORTH CAROLINA

Christina M. Moore
North Carolina State University
Durham

Michael D. Sussman
USDA-AMS-S&T
Gastonia

NORTH DAKOTA

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Sterilox Technologies Inc.
Radnor

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Global Logic, LLC
Media

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University of Tennessee
Midway

Dustin W. Carnahan
University of Tennessee
Knoxville

Lilia M. Santiago
University of Tennessee
Knoxville

TEXAS

Lindsay M. Chichester
West Texas A&M University
Canyon

Ricki J. Combs
Handgards Inc.
El Paso

Greg Herring
The Herring Group
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URUGUAY

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LATU
Montevideo

UPDATES

Chr. Hansen Promotes Tim Harried to Product Manager for Dairy and Jim Funk to Director of Sales for Sweeteners

Chr. Hansen, Inc. promotes Tim Harried to product manager, cheese ingredients for the company's dairy business. In this role, Mr. Harried will be responsible for the pricing, promotion and inventory management for all Chr. Hansen ingredients related to the cheese market, including Chy-Max® and Hannilase® coagulants, Easy-Set® cultures and Penzyme® test kits. He has been with Chr. Hansen for seven years, most recently as territory manager selling the full line of Chr. Hansen ingredients to customers in the south central region of the United States.

Jim Funk is promoted to director of sales, Sweeteners for Chr. Hansen's food and beverage business area. Mr. Funk has been in specialty sweetener and carbohydrate sales for 26 years, and has been with this product line since before Chr. Hansen acquired it from Crompton & Knowles. He most recently was account manager for Chr. Hansen, handling the majority of the company's brokers and key accounts for sweeteners.

Atkinson Oversees Ansell Food Processing and Food Service Division

Scott Atkinson has been named business development manager for the Food Processing and Food Service Division of Ansell Occupational Healthcare. He will be responsible for developing strategies that meet market and customer needs, segmenting Ansell opportunities, sales support and creating awareness of the Ansell brand in key verticals.

Mr. Atkinson brings more than 14 years of marketing experience to Ansell, with a background in strategic planning, market segmentation, communications and product development. He was previously operations marketing manager with Host Marriott Services, and was the director of marketing with two venture capital based start-up companies. He also served as marketing manager with The Rouse Company.

A graduate of West Chester University, Mr. Atkinson earned a Bachelor of Science degree in marketing. He is a certified marketing director and is presently completing his master's degree in business administration from Temple University's Fox School of Business

Andrew Flanders Joins Steritech Group as Vice President of National Accounts

Andrew Flanders, Ph.D., has been named vice president of National Accounts for The Steritech Group, Inc., one of the premier providers of food safety and environmental hygiene services in North America. He brings to the position more than 20 years of experience in the fields of quality assurance, safety and certification.

In his new role, Dr. Flanders' duties will consist of consulting, support for advancements in Steritech's GMP (Good Manufacturing Practices) program and account management in the areas of food safety and auditing. Previously, he served as the director of operations at SGS, a global food safety auditing company.

Dr. Flanders holds food safety instructor certifications from ServSafe (USA) and the Chartered Institute of Environmental Health (UK). He is also a certified Hazard Analysis Critical Control Point (HACCP) auditor and trainer.

Dr. Flanders earned his doctoral degree in food science from the University of South Bank in London.

Moran becomes Chair of IAFIS Board of Directors, New Officers and Directors Elected

Virginia "Jean" Moran, CEO and chair of the Board, Label Makers, Inc., Pleasant Prairie, WI, presided over her first annual conference as chair of the International Association of Food Industry Suppliers (IAFIS) Board of Directors March 25–28. Ms. Moran, the first woman to serve as IAFIS Board Chair, will fulfill a two-year term as leader of the 22-member board.

Along with Ms. Moran, the IAFIS Board chose Viggo Nielsen, Tampa, FL, as chair-elect, and Ivan Larsh, Charlotte, NC, as treasurer. Each will serve a two-year term in these Board leadership roles.

IAFIS members elected two new directors and re-elected four directors to the Board during the IAFIS 2004 Annual Conference in Scottsdale, AZ.

Of the six seats available this year on the IAFIS Board of Directors, two were industry segment director seats and four were at-large seats.

UPDATES

Each of the following directors will serve a three-year term: Lou Beaudette, Manchester, NH, was re-elected as the processing segment director; David Bryant, Roswell, GA was re-elected as the support services segment director; Gunther Brinkman, Columbus, OH, was elected as an at-large director; Bill Wilson, Fultonville, NY, was elected as an at-large director; Tom Riggins, Davenport, IA, was re-elected as an at-large director; and John Rooney, Cedar Rapids, IA, was re-elected as an at-large director.

International Association for Food Protection® NEWS

Food Safety Award Presented to the Food Allergy & Anaphylaxis Network

Food Allergy & Anaphylaxis Network (FAAN) is the 2004 recipient of the National Food Processors Association Food Safety Award, in recognition of their demonstrated commitment to improving the safety of food. FAAN's broad-based coalition has brought together allergic consumers, the food industry, regulatory agencies and academia to advance awareness and improve safety with respect to food allergies.

"FAAN is particularly effective in supporting families of young allergic individuals. FAAN works with schools to make a safe environment for allergic children by distributing educational books, pamphlets, videos, newsletters and recipes," commented senior principal scientist at General Mills, Thomas Trautman.

Founded in 1991, FAAN has grown to become a leader in food allergy information and is the key food allergy consumer organization in the US. FAAN recently organized a workshop to advance knowledge and understanding among the medical profession on advancements in pediatric allergy; the proceedings were published in *Pediatrics* in June 2003.

FAAN will be honored at the annual meeting of the International Association for Food Protection in Phoenix, AZ, August 8–11, 2004.

Executive vice president and chief science officer Rhona Applebaum, Ph.D. remarked, "We congratulate FAAN on their accomplishments, which have done so much to enhance and ensure the safety of the food supply for food-allergic consumers."

Bernard S. Horton Honored at 2004 ADPI/ ABI Annual Conference with Award of Merit

The American Dairy Products Institute presented its 2004 Award of Merit to Bernard S. Horton for his significant contributions to the dairy industry during his 36-year career. Born on Manhattan Island, Bernie graduated from Cornell University's five-year chemical engineering program.

Bernie's entire career has been devoted to leading-edge technologies and products, starting in the aerospace industry (The Boeing Company and Avco Corp.) with the development of the first composite wing structure for commercial jet airliners, the first ablative heat shields for ICBM's and the Apollo vehicle, and of commercial spin-offs for aerospace materials. At the start-up company Abcor, Inc. he was a member of the team that developed and built the world's first WPC plant (in New Zealand), first tandem whey UF and RO plant (Crowley Foods), first continuous WPC plant (in France) and several of the earliest milk UF plants, including the first commercial UF yogurt plant. He was VP and GM of Abcor's Membrane Equipment Group.

Horton International focuses on advanced separation and conversion processes for whey and milk, markets for new dairy products, and dairy products price forecasting. Bernie has been active on the US national committee of IDF for 18 years. He has also been a member of the ADPI technical committee for more than 10 years. Bernie was on the organizing committee for the 1997 and 2001 International Whey Conferences and is currently co-chair of the 2005 conference. He has more than 50 publications on membrane processes, the utilization of whey and whey processing.

Horton received this award during the 2004 ADPI/ABI Annual Conference which was held April 18–21, 2004 in Chicago, IL.

Nickel Institute Launched: To Include Services Formerly Offered by the Nickel Development Institute

Dr. Ivor Kirman has announced the launching of the Nickel Institute. The Institute, whose members represent over 70% of current world nickel production, will generate and communicate knowledge required to support safe and sustainable production, use and reuse of nickel. The new organization incorporates activities previously undertaken by the Nickel Development Institute (NiDI) and the Nickel Producers Environmental Research Association (NiPERA).

The Nickel Institute will continue to offer free-of-charge a number of technical bulletins. Some 375 are available in PDF format and may be requested by contacting the Nickel Institute, 414.591.7999 or www.ni-i.org. A new web site has been added with items of particular interest to the food and beverage industries at www.hygienicstainless.org. Some of the topics addressed at the site are: codes and specifications, design and fabrication and care and cleaning of nickel-containing stainless steels. In addition, there is an industry news and events section where the Nickel Institute

encourages an interchange of industry-related comments and suggestions.

Keener Chosen for IAFIS Foundation/FPEI Food Engineering Award

The 2004 IAFIS Foundation-FPEI Award recognizes Kevin M. Keener, Ph.D., P.E., of North Carolina State University as an emerging food engineer. The award is sponsored by the Foundation of the International Association of Food Industry Suppliers (IAFIS) and the Food and Process Engineering Institute (FPEI), a unit of the American Society of Agricultural Engineers (ASAE). Dr. Keener accepted the award on March 26 at the IAFIS 2004 Annual Conference in Scottsdale, AZ.

Dr. Keener, an associate professor in the NC State Food Science Department, provides technical support to the food industry through his extension, research and teaching programs. His food engineering program has trained over 1,000 professionals in food safety, FDA and USDA processing requirements, and he has worked with various food processors on efforts to save money and jobs and prevent plant closings.

Dr. Keener consults with a number of international food companies and the US government on HACCP, food safety, and food process development. His recent efforts with Praxair, Inc. aided in the design of its cryogenic egg cooling system, which won an AE 50 Design award in 2001. He developed an online food sanitation course that has trained over 30 QA/QC and plant managers in the food industry and is currently being used by Tyson Foods. Dr. Keener is also a consultant to one of the largest Russian-owned poultry processors on HACCP, food safety and food process development issues. Last year, he worked with three other universities and the US Poultry and Egg Export Council to develop radionuclide testing procedures for exported poultry.

Upon his arrival at North Carolina State in 1997, Dr. Keener developed the food safety training laboratory for environmental health specialist intern training (health inspectors), as well as a food service equipment laboratory. This program has been very successful in providing hands-on training to over 230 inspectors and is being replicated by other states.

Additionally, Dr. Keener has produced 56 technical meeting presentations, 16 refereed publications, a book chapter, 10 patents (two US patents pending and eight international), 29 non-refereed publications and 13 extension publications. Dr. Keener received a Ph.D. in food process engineering from Purdue University, and a B.S. and M.S. in agricultural engineering from The Ohio State University.

The award recognizes outstanding accomplishments of those who have made engineering contributions in research, development or design of food processes significant to the food industry; or in outstanding leadership, management or education to advance the food engineering profession.

As the IAFIS Foundation/FPEI Food Engineering Award recipient, Dr. Keener received a gold medal, a certificate, $2,000 cash, and paid travel expenses to the IAFIS Annual Conference to accept the award. He will also be honored with a bronze medal at the ASAE International Annual Meeting, which will be held August 1–4 in Ottawa, Ontario, Canada.

2004 ADPI/ABI Annual Conference – A Great Success!

Excellent speakers, an outstanding turnout and informative exhibits were some of the ingredients that helped make the 2004 ADPI/ABI Annual Conference a great success. This three-day meeting was held April 18–21 in Chicago, IL.

Highlights of this year's conference included the informative Dairy Market Outlook Breakfast and industry recognition luncheon where Bernard S. Horton of Horton International, Inc. received the prestigious Award of Merit. Other highlights included a number of speakers who addressed a variety of issues currently facing the manufactured dairy products industry.

The 2005 ADPI/ABI Annual Conference will be held May 1–4, 2005, at the Fairmont Hotel in Chicago, IL. For more information regarding this conference, contact the American Dairy Products Institute at 630.530.8700 or visit www.adpi.org.

Carcass Breaking Research Could Pave Way for Safer Beef

New research points to the beef carcass breaking process as a major source of disease-causing bacteria, not the carcass dressing process, as is often thought to be the case. The research findings lead Dr. Colin Gill, an Agriculture and Agri-Food Canada researcher in Lacombe, Alberta, to believe that redesigned carcass breaking equipment could significantly reduce the levels of *E. coli* contamination, and therefore result in safer beef.

Gill conducted his research to help the beef industry find ways to reduce the risk of beef being contaminated with pathogenic bacteria in the wake of increased food safety concerns. Safer beef means a more saleable, marketable product, which is good for producers, and it means fewer product recalls, which is good for processing

plants and the stores that sell the beef.

E. coli is a common bacterium that lives in the intestines of cattle, but it can be transferred to the surface of beef during processing. Most strains of *E. coli* are harmless, but some, such as *E. coli* O157:H7 can cause disease. Usually, proper handling and cooking of beef is the best defense against *E. coli* infection in humans.

Because beef is pasteurized after the carcass dressing process, very few *E. coli*-infected carcasses enter the breaking facilities; however, that hasn't completely eliminated the *E. coli* threat. Since *E. coli* tend to reappear on the meat after carcass breaking, Gill decided to take a closer look at the carcass breaking process — to determine why intestinal bacteria sometimes contaminate meat during carcass breaking. "Traditionally, efforts to prevent beef contamination have focused on the carcass dressing process or on the cattle before they come for processing," says Gill. "It seemed that further bacterial contamination of meat could occur during carcass breaking. The research results showed the levels of *E. coli* on beef were often higher after carcass breaking than before."

Gill used two beef packing plants for his research. At Plant A, where approximately 120 carcasses are broken per hour, samples were taken after carcass breaking to determine total aerobic counts, coliforms and *E. coli*. For each group of bacteria, numbers were greater on trimmings than on carcasses entering the breaking process. "Not only were the numbers greater after breaking, but the numbers of bacteria recovered from the cattle trimmings tended to increase at successive stages of trimmings collection," says Gill.

At Plant B, where 240 carcasses are broken per hour, the microbiological effects of six out of 16 sequential breaking operations (operations 1, 4, 5, 7, 8 and 12 were examined) on random hanging beef carcasses were evaluated. Each carcass tested was swabbed at specific sites before and after six breaking operations.

At five of the six sites swabbed, the operation related to each did not increase the numbers of the few coliforms or *E. coli* at the site, and in fact, operation 7 (trimming the rump), decreased the numbers of coliforms and *E. coli* at a site in the anal area. However, samples were also taken from cotton gloves worn by workers involved in the breaking of hanging carcasses and those findings were the opposite.

"For the glove samples, *E. coli* was recovered in rather large numbers from the water in which gloves were rinsed and in small numbers from swabs of those same gloves," says Gill. "This leads us to believe that the gloves must become contaminated with *E. coli* from surfaces within the breaking facility, as the numbers are too high to be derived from the carcasses."

Gill says this information points to two sources of contamination. One, fixed carcass breaking equipment, such as conveyors, and two, equipment worn or used by workers, such as steel mesh gloves and knives.

Finding the sources of contamination leads to a need for solutions. Gill suggests that carcass breaking equipment be redesigned to improve cleanability, to assure that the equipment can be wholly cleaned during each working day. A lot of carcass breaking equipment is currently not designed to be cleanable, therefore it cannot be adequately cleaned during routine daily cleaning. In the interim, though, Gill says merely keeping the product and the carcass breaking equipment dry will reduce the risk of contamination.

In the future, Gill suggests that appropriate microbiological sampling be used to determine whether equipment is adequately clean and not the current method, which is largely based on inspection of meat contacting surfaces for visible cleanliness.

CABIDF is a joint $16.4 million fund of Alberta Agriculture, Food and Rural Development and Agriculture and Agri-Food Canada. The Fund is administered by Alberta Beef Producers and has supported more than 50 projects in five major categories identified to benefit the Alberta beef industry.

FDA to Determine Health Significance of Low Furan Levels in Foods

The Food and Drug Administration has announced that it will embark on a thorough scientific assessment of the health significance of very low levels of furan, a chemical that is produced through the heating process in certain foods. FDA has initiated this process through a notice on display at the Office of the Federal Register. The notice solicited scientific data and announced a June 8, 2004 Food Advisory Committee meeting on furan.

Some animal data suggests that high levels of furan exposure might have a carcinogenic effect in humans, but its true effects in humans, especially at such very low levels, are not known. A new method developed by FDA scientists has revealed that very low levels of furan are found in a wider range of foods than previously suspected. FDA scientists discovered that furan forms in a variety of foods that undergo heat treatment, including certain canned and jarred foods. FDA tested a variety of foods and the results ranged from non-detectable levels in some foods to approximately 100 parts per billion in other foods.

"FDA will continue to thoroughly evaluate its preliminary data and conduct additional studies to better determine the potential risk. Until more is known, FDA does not advise consumers to alter their diet," said Dr. Lester M. Crawford, Acting FDA Commissioner.

"We need to learn more about whether furan, particularly at these very low levels, poses any significant problem to human health. It's important to stress that FDA's preliminary estimate of consumer exposure is well below the level that would be expected to cause harmful effects," said Dr. Robert Brackett, director of the FDA's Center for Food Safety and Applied Nutrition.

FDA is soliciting information on the best available and most-up-to-date science on furan including human exposure, why furan forms in certain foods, and the effect of furan on humans at the low levels found in food. FDA held the June 8, 2004, Food Advisory Committee meeting to seek the committee's expert input on the data necessary to fully assess the risk posed by furan.

After the advisory committee meeting, and after evaluating all the available data, FDA will decide on the appropriate next steps, which may include an expanded food survey, studies to address how furan forms in foods, potential strategies to reduce furan levels, and toxicology studies to address mechanisms of toxicity and dose response.

The new data and the method used to measure the furan levels, and questions and answers on the occurrence of furan in foods, are posted on FDA's Web site at http://www.cfsan.fda.gov/~lrd/pestadd.html#furan.

Bacterial Proteins Combat *Campylobacter*

Proteins from harmless microorganisms can reduce *Campylobacter* and other pathogenic bacteria in poultry intestines, a team of Agricultural Research Service and Russian scientists has discovered. ARS microbiologist Norman J. Stern of the Poultry Microbiological Safety Research Unit in Athens, GA used the proteins, called bacteriocins, to reduce *Campylobacter* numbers in bird intestines by 99.999 percent in small research trials. Large research trials will be necessary to determine if the technology is commercially feasible.

According to Stern, this is the first treatment used in the last 25 years to achieve a significant reduction of *Campylobacter* in research trials on chickens. The bacteriocins reduce the numbers of *Campylobacter* by a millionfold when fed to chickens. Bacteriocins could provide an effective alternative to antibiotics the poultry industry uses to control pathogenic bacteria. Foodborne bacterial infections are responsible for billions of dollars of economic losses in the United States and worldwide. The Centers for Disease Control and Prevention (CDC) notes that *Campylobacter* is one of the most common bacterial causes of diarrheal illness in humans in the United States.

CDC has identified poultry as the primary vehicle for its transmission to humans. Controlling *Campylobacter* in poultry would reduce public exposure to the bacteria. Preliminary data indicate bacteriocins may be effective in reducing other foodborne bacteria such as *Salmonella* and *Escherichia coli*. The patented technology to utilize the bacteriocins is available for licensing for commercial development.

USDA Opens New Biosafety Level 3 Facility

Agriculture Secretary Ann M. Veneman has announced the opening of a new $1.65 million Food Safety and Inspection Service (FSIS) Biosafety Level 3 (BSL-3) facility in Athens, GA that will conduct analyses on a wide range of potential biological threat agents.

"As part of the Bush Administration's efforts to enhance homeland security, USDA has implemented an extensive program to secure American agricultural production and protect consumers," Veneman said. "This new lab will enhance our surveillance program, while expanding our nation's capability to respond quickly to unforeseen events."

"FSIS has been testing for a variety of threat agents as part of its extensive microbiological sampling program to combat foodborne illness. This facility creates the capacity to test for additional substances and to test in higher volumes when necessary," said USDA Under Secretary for Food Safety Dr. Elsa Murano

Facilities with the designation BSL-3 use pathogens in research and diagnostic activities that could constitute a threat to either human health or productivity of the agriculture system. Laboratory personnel at BSL-3 facilities have specialized training in handling pathogens and toxins and are supervised by scientists experienced in working with these agents.

The new BSL-3 facility in Athens uses state-of-the-art technology to maintain a high level of containment and control. BSL-3 facilities prevent contamination using a broad range of techniques and barriers, including tightly controlled and restricted access to facilities, techniques that require handling of infectious materials in sealed containers or biosafety cabinets, special clothing and advanced training.

Funding for the new laboratory was provided in the Public Health Security and Bioterrorism Preparedness and Response Act of 2002.

To outline many of the Agency's accomplishments in food security, Dr. Murano also released a document entitled, "Protecting America's Meat, Poultry and Egg Products: A Report to the Secretary on the Food Security Initiatives of the Food Safety and Inspection Service" at the laboratory.

In addition to the new BSL-3 facility in Athens, FSIS has four laboratories staffed by approximately 200 microbiologists, chemists and veterinary pathologists. Three of the labs, located in Athens, GA, St. Louis, MO, and Alameda, CA, conduct continuous regulatory testing on meat, poultry, and egg products. Additionally, the Microbial Outbreaks and Special Projects Laboratory (MOSPL), also located in Athens, GA, performs analyses related to foodborne illness outbreaks and conducts special projects for the agency.

Declines in Foodborne Illnesses Affirm Success of Industry Food Safety Strategies

New data released by the Centers for Disease Control and Prevention (CDC) showing marked decline in foodborne illnesses between 2002 and 2003 affirm the effectiveness of in-plant food safety strategies, according to the American Meat Institute Foundation (AMIF). In particular, data show a one-year 36 percent drop in *E. coli* O157:H7 infections from 2002 to 2003 and a 42 percent drop overall since 1996.

While a variety of foods have been linked to these infections, efforts by the meat industry to reduce *E. coli* O157:H7 on beef products clearly are contributing to this encouraging downward trend, according to AMIF. CDC also said that *Campylobacter* illnesses have dropped 28 percent, *Salmonella* illnesses have decreased by 17 percent and *Yersinia* illnesses dropped 49 percent since 1996. Illnesses caused by *Listeria monocytogenes*, which have been sharply decreasing for the last decade and which have very nearly reached the US Department of Health and Human Services Healthy People 2010 public health goal of no more than 2.5 cases per million people, saw no statistically significant increase. These data confirm that efforts to control *Listeria monocytogenes* in the meat industry are having a sustained and measurable impact on meat safety.

"In 2001, the AMI Foundation declared that its two priorities would be to reduce and ultimately eliminate *E. coli* O157:H7 on fresh beef products and *Listeria monocytogenes* on ready-to-eat products. Data collected by USDA have demonstrated sustained decreases over time in bacteria on the products themselves. CDC's new data tell us that the enhanced safety of our products is having public health benefits," said AMI Foundation President James H. Hodges.

Vaccines against Foodborne Disease on Horizon

Researchers are making promising steps towards the development of a number of vaccines against foodborne disease, according to several studies released at the 104th General Meeting of the American Society for Microbiology. "Vaccines have been proven to be an effective means of prevention for many infectious diseases, but there are no effective vaccines for most common foodborne diseases. The development of a single vaccine that provides protection against the most common foodborne pathogens would greatly enhance human health and well-being worldwide," says John Gunn of the Ohio State University who presents research on a new vaccine against multiple bacteria.

Gunn and his colleagues have developed a strategy using a live, crippled strain of *Salmonella* bacteria that do not cause disease and outfit it with "pieces" of other bacterial pathogens to stimulate immunity to multiple pathogens. "We have already developed a highly attenuated *Salmonella* Typhimurium strain which functions as an effective live, oral vaccine against *S.* Typhimurium," says Gunn.

The researchers modified the vaccine strain so that it also contains a gene from another foodborne pathogen, *Listeria monocytogenes*. When they administered the modified oral vaccine to mice, it protected them 100 percent against lethal doses of both foodborne bacteria.

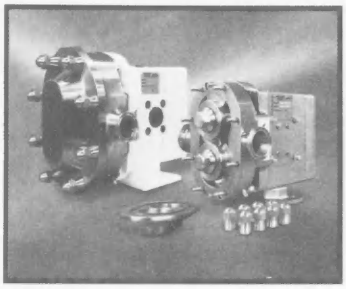
Another group of researchers at the meeting announced they were one step closer toward the development of an edible vaccine against the most virulent forms of the *Escherichia coli* bacteria, known as shiga toxin-producing *E. coli*, which include the destructive *E. coli* O157:H7.

These bacteria, because of the shiga toxin they produce, can cause mild to bloody diarrhea and in some cases are responsible for a complication known as hemolytic uremic syndrome, which is characterized by kidney failure, brain damage and sometimes death.

Sharon Wen and her colleagues at the Uniformed Services University of the Health Sciences in Bethesda, MD, successfully transferred a modified version of one of the shiga toxin genes into tobacco plants. This plant-derived vaccine was effective in producing antibodies against the toxin when administered to mice.

"Next the immunized mice will be challenged with the toxin or toxin-producing bacteria to determine if the plant vaccine is protective," says Wen. "Once the protective efficacy of these plant-based vaccines is established, the bacterial genes can then be moved into other plants such as bananas or corn for delivery to humans or animals."

INDUSTRY PRODUCTS



Wright Pump

Wright Pump® Introduces Universal 2 Series Clean-in-Place Positive Displacement Pumps

Wright Pump® has responded to the success of its Universal 1 (U1) Series sanitary positive displacement pumps with the new Universal 2 (U2) Series. The U2 Series pumps provide clean-in-place capabilities, unlike the U1 Series pumps, which are designed exclusively for strip cleaning. The U2 Series also conforms to 3-A Sanitary Standards making it ideal for food, beverage, dairy, personal care, biotech, and pharmaceutical applications.

The U2 Series showcases several features including Wright 808-non-galling alloy rotors and helical timing gears for higher torque carrying capacity and quieter operation. The one-piece shafts are either 316L stainless steel or high-strength 17-4 PH steel, depending on pump size. A four-way mounting feature allows for more flexibility in matching pump shaft height to motor or reducer. The U2 Series also offers single and double mechanical seal options in a variety of materials.

Three sizes are currently available, providing capacities to 36 GPM, with additional sizes to be released throughout 2004. Wright also offers U2 replacement parts that fit leading-brand positive displacement pumps, as well as complete remanufacturing services.

Wright Pump
262.650.1925
www.wrightpump.com
Waukesha, WI

New 3M™ Petrifilm™ Plate Yields Environmental Results for *Listeria* in 31 Hours

A new Petrifilm™ Plate designed to detect environmental *Listeria* is now available from 3M Microbiology.

Designed for use in food processing plants, the new 3M™ Petrifilm™ Environmental Listeria Plate method is faster, easier and positively more informative than current methods of *Listeria* detection. This easy-to-use method delivers results within 31 hours of sampling and provides you with three powerful ways to interpret results. The new plates require no enrichment, making them a safer method for testing. Other methods such as chromogenic agars and immunoassay tests can take many more hours and may require more steps.

The new 3M Petrifilm Environmental Listeria Plates cost less than traditional methods and use the familiar Petrifilm Plate design that has been proven for almost 20 years to improve productivity and reduce costs. Sample preparation is fast and easy. Interpretation is similar to other Petrifilm Plates and there's no complicated techniques or time-consuming training requirements.

Traditional *Listeria* testing methods provide you with a single qualitative (detected/not detected) result. The new 3M Petrifilm Environmental Listeria Plate provides you with three powerful ways to interpret results: (1) Qualitative (detected or not detected) (2) Semi-Quantitative (relative levels) and (3) Quantitative (actual *Listeria* count). This expanded ability allows food plants to develop baselines, monitor trends and keep tighter surveillance on hot spots.

Most testing methods for environmental *Listeria* require an enrichment process, in which *Listeria* multiply to high concentrations. With this enrichment process comes a higher risk of contamination. Because new 3M Petrifilm Environmental Listeria Plates do not require an enrichment, the risk of contamination is lower, making it a safer method to use.

3M Microbiology
800.328.6553
www.3m.com/microbiology
St. Paul, MN

Be sure to mention, "you saw it in *Food Protection Trends*"!

DuPont Qualicon BAX® System for Detecting *E. coli* O157:H7 Certified as AOAC-RI Performance Tested Method

The BAX® system, a genetics-based diagnostic tool developed by DuPont Qualicon, has been validated by the AOAC Research Institute as a *Performance Tested* method for detecting *Escherichia coli* O157:H7.

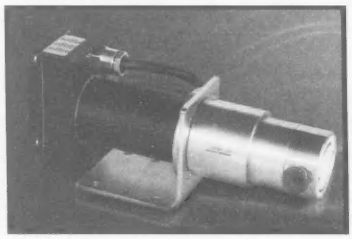
The AOAC Research Institute is a non-profit, international, scientific organization that administers the *Performance Tested Methods*℠ program, which provides an independent, third-party assessment of proprietary analytical methods to ensure that products perform as claimed.

E. coli O157:H7 is a foodborne pathogen, often found in raw ground beef and unpasteurized juice, that can cause serious, sometimes fatal, illness at a very low infectious dose (as few as 10 organisms). These very low levels are often difficult to detect with traditional culture methods, especially where *E. coli* O157:H7 must be distinguished from a high level of competing bacteria. The AOAC-RI comparison studies validated that the DNA-based BAX® system performed as well or better than culture methods on juice, cider and raw ground beef samples. Further, the time-to-result was reduced by half on ground beef enriched with proprietary BAX® system media.

The DNA-based BAX® system detects target bacteria in raw ingredients, finished food products and environmental samples. In addition to *E. coli* O157:H7, assays are also available for detecting *Salmonella*, *Enterobacter sakazakii*, *Listeria* and *L. monocytogenes*. The automated system is user-friendly and fits easily onto a laboratory bench top. Available since November 2000, hundreds of BAX® systems are already in use by governments, food companies and laboratories around the world.

In addition to the BAX® system, DuPont Qualicon markets the patented RiboPrinter® system, an automated DNA fingerprinting instrument to track and trend bacterial contamination in pharmaceuticals, personal care products and food.

DuPont Qualicon
800.863.6842
www.qualicon.com
Wilmington, DE



Micropump

Micropump Miniature High Pressure Ultra-Low Flow Pumps

Micropump® introduces a new line of high-pressure micro annular gear pumps offering you greater flexibility and ease in equipment integration. Because of their incredibly compact size and lower mass, you can now place these pumps anywhere within a piece of equipment.

Offering precise and accurate fluid delivery, these new pumps help you conserve your valuable liquids, including flavorings, reagents, solvents, inks, dyes and cleaning agents. For maximum dosage accuracy, the micro annular gear pumps feature high precision rotors that provide tight flow rate control, even at differential pressures as high as 80 bar (1,160 psi). These rotors allow the pumps to dispense volumes as small as 0.5 microliters and handle flow rates from 0.3 to 288 ml/min, with accuracies within +/- 1%.

In addition, the pumps use external gear technology that keeps pulsations to a minimum. This provides the smooth, constant flow necessary in applications such as analytical lab instruments, medical diagnostics, fuel cell and micro reaction technology, chemical processing, biotechnology and other critical application processes.

Micropump Inc.
360.253.2008
www.micropump.com/pr
Vancouver, WA

Labconco Corporation New Protector® XVS™ Ventilation Stations Provide Two Height and Three Width Options for User Protection from Fumes and Vapors

Labconco Corporation introduces the new Protector XVS Ventilation Stations in 22.75" and 32" heights and in 2-, 3- , and 4-foot widths to provide user protection by keeping powders and fumes contained during light-duty procedures.

Protector XVS Ventilation Stations feature a deep 23" interior to accommodate a variety of apparatus. The patented Clean-Sweep™ air foil sweeps the work surface for maximum containment. Airflow openings pull inflow air from under the air foil

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Labconco Corporation

so clean air creates a constant barrier of protection from contaminants. Other containment features include an upper sash foil to bleed air into the enclosure to direct contaminants away from the user's breathing zone; an upper dilution air supply to introduce room air at the top of the sash; zone-perforated rear baffle that creates horizontal laminar-like airflow; and side-entry air foils to sweep interior glass surfaces.

The frame is sturdy glacier white and gray, dry powder epoxy-coated aluminum with a steel rear plenum and baffle to dissipate static and resist corrosion. Tempered safety glass front sash, sides and top offer excellent visibility and provide better fire, scratch and corrosion resistance than acrylic and do not promote static charge. The ergonomic-angled sash allows a closer view, reduces glare and provides a more comfortable operating position than vertical sashes. The enclosure may be ducted to the outside or connected to the FilterMate™ portable exhauster outfitted with carbon and/or HEPA filter(s). Accessories include guardian airflow monitors and fluorescent light kit.

Labconco Corporation
800.821.5525
www. labconco.com
Kansas City, MO

Reichert Introduces New Literature on Full Line of Bench-top Refractometers

Reichert, Inc., Analytical Instruments, has introduced new literature detailing the company's full line of bench-top refractometers for a wide range of applications in the food and beverage, pharmaceutical, industrial fluid, chemical, petrochemical and other industries. The new literature highlights the accuracy, reliability and ease of use of Reichert instruments including key features and ordering information.

Details are provided on Reichert's AR700 Temperature Controlled Automatic Refractometer offering exceptional accuracy for a broad range of samples, from fruit juices to polymers. The literature also highlights the AR600 Automatic Refractometer, ideal for quality assurance and research applications, and the AR400 Automatic Refractometer, offering precision concentration measurements for a wide variety of applications.

Other featured instruments include Reichert's ARIAS 500 Automatic Refractive Index Analysis System, the first transmitted light refractometer capable of automatic readings with precision comparable to high-end reflected light refractometers. The literature is rounded out by information on the Abbe Mark II plus refractometer, specifically designed to combine consistency and accuracy with high throughput.

Reichert, Inc.
716.686.4500
www.reichert.com
Depew, NY

R & F Laboratories Offers New Line of Chromogenic Media

R & F Laboratories is now offering its own line of chromogenic plating media for more specific isolation and differentiation of pathogenic organisms. Chromogenic media are becoming more popular throughout the world. Traditional and recently developed chromogenic and fluorogenic substrates used to identify a variety of enzymes allow for a unique system in a broth and/or plating medium to differentiate the sought after microorganism from other closely related organisms.

R & F Laboratories is introducing a line of chromogenic medium used to isolate and identify pathogenic bacteria. All media have either received patents or are in the patent application process. The first medium is R & F® *Listeria monocytogenes* Chromogenic Plating Medium which has been licensed from Biosynth. This plating medium uses the chromogen 5-Bromo-4-chloro-3-indoxyl-*myo*-inositol-1-phosphate to detect the virulence factor phosphatidylinositol phospholipase C found in *L. monocytogenes* and *L. ivanovii*. These two *Listeria* species form turquoise colonies on the plating medium, whereas the other *Listeria* species pro-

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duce white colonies. The R & F® *Listeria monocytogenes* Chromogenic Plating Medium is FDA recommended and has been collaboratively validated by the FDA using 8 laboratories. In addition, R & F® *Listeria monocytogenes* Confirmatory Medium and acid from rhamnose can be used to easily differentiate *L. monocytogenes* from *L. ivanovii* within 6 hours.

R & F® *Escherichia coli* O157:H7 Chromogenic Plating Medium (formally BCM® *Escherichia coli* O157:H7(+) agar) uses a patented detection system for the isolation of *E. coli* O157:H7. This plating medium utilizes a series of chromogens and an enhancer for the detection of ß-galactosidase coupled with sugar fermentation and a pH indicator to isolate *E. coli* O157:H7. Therefore, a ß-glucuronidase positive *E. coli* O157:H7 would not produce a false negative reaction. This plating medium has been on the market for 5 years and extensively investigated by many laboratories throughout the world with excellent results.

R & F® *Bacillus cereus/Bacillus thuringiensis* Chromogenic Plating Medium uses the chromogen, 5-Bromo-4-chloro-3-indoxyl-*myo*-inositol-1-phosphate for the detection of phosphatidylinositol phospholipase C. *Bacillus cereus/Bacillus thuringiensis* produce flat dull turquoise colonies on this patented plating medium after 24 hours of incubation. Colony enumeration and isolation are easier on the R & F® *Bacillus cereus/Bacillus thuringiensis* Chromogenic Plating Medium than traditional *Bacillus cereus* agars because of higher selectivity and formation of discrete, non-coalescing colonies.

R & F® *Salmonella* Chromogenic Plating Medium uses a series of chromogens and an enhancer for the detection of ß-galactosidase and sugar fermentation quite unique for *Salmonella enterica* strains. This patent applied for plating medium isolates *S.* Typhi as well as other *Salmonella* serovars (subspp. I, II, IV, IIIa, IIIb, IV and VI) while either differentiating from or inhibiting the growth of many similar bacteria.

R & F® *Bacillus anthracis* Chromogenic Plating Medium detects the virulence factor phosphatidylcholine phospholipase C, by using 5-Bromo-4-chloro-3-indoxyl-choline-phosphate hydrolysis. This patented plating medium can differentiate *B. anthracis* from the closely related *Bacillus cereus/Bacillus thuringiensis* strains and other *bacilli* after a 24 to 48 hour incubation period. This chromogenic plating medium has been investigated by the bioterrorism division of the FDA.

R & F Laboratories
630.293.4000
www.rf-labs.com
West Chicago, IL

Walchem Introduces the WBL 310 Boiler Controller

Walchem Corporation introduces the WBL310 boiler controller with four feed/alarm outputs, allowing four different chemical feed methods to occur simultaneously, providing ultimate flexibility and high efficiency.

WBL boiler controllers are low cost, microprocessor-based, menu-driven industrial controllers. They offer the flexibility of four feed/alarm outputs, the efficiency of a unique time proportional blowdown method of sampling, and reliability due to automatic checks on conductivity, eliminating flushing problems. WBL310 controllers are exceptionally versatile and easily customized on site.

Walchem Corporation

Efficiency is achieved by use of the WBL310's unique time proportional blowdown method of water consumption sampling. This keeps boiler water at the correct conductivity. Automatic temperature compensated conductivity ensures accuracy and the WBL310 may be utilized with either a contacting or Hall Effect style watermeter.

WBL310's simultaneous control of chemical feed inhibits corrosion, solids precipitation and scale build-up. The extra relays allow the user to feed multiple chemicals (e.g., oxygen scavengers, chelants, phosphates, amines) with one controller, using different feed methods for each if they want. The feed methods are: Feed in proportion to blowdown time, Feed

after blowdown, feed based on a water meter, feed based on a paddle-wheel flowmeter (Hall Effect), and feed as a % of time.

Walchem Corporation
508.429.1110
www.iwakiwalchem.com
Holliston, MA

Steritech Upgrades Online Food Safety Management System

The Steritech Group Inc., has upgraded its online food safety management system, PracticeFood Safety.com. The easy-to-use, web-based training system now offers training modules on topics such as HACCP, Allergens, Food Code and Types of Germs (including a separate module on germs and their interactions with foods), in English and Spanish. Users can take advantage of a free trial at www. PracticeFoodSafety.com.

The HACCP (Hazard Analysis Critical Control Point) training module provides an overview of how HACCP can be used to help keep food safe. The Allergens training module ensures that food workers are aware of the typical foods that cause allergic reactions and covers how to deal with customer inquiries on the topic as well as how to safely prepare foods to keep allergens separate. The Food Code module provides a brief description of the scope of the government's authority relating to regulation of health and sanitation issues in food production and directs each user to further resources for finding specific regulations in their local area. The Types of Germs training module covers different types of germs and the conditions under which they grow. The Germs and Food training module helps food workers understand how various germs get into food and how they cause illness.

"These new modules provide food service businesses with a comprehensive, easy-to-use, self-paced training program that ensures every employee is equipped with the knowledge necessary to keep food preparation a safe and prosperous business. In addition, the Spanish language capabilities of the system are important for a large portion of the food service industry employee base," says Mark Jarvis, president, Steritech Food Safety Division.

Along with the new training modules, PracticeFoodSafety.com includes training modules on the following topics: hand washing, personal hygiene, thermometers, receiving, food protection, cross contamination, thawing, food handling, cooking, holding temperatures, cooling, cleaning and sanitizing, utensils and disposables, manual warewashing, chemical storage, pest prevention, and sink preparation.

With PracticeFoodSafety.com users are able to conduct self-audits and monitor operations as well as compare in-house practices to standard operating procedures. Through an Ask the Expert function, subscribers gain easy access to Steritech's team of food science Ph.D.s, microbiologists, entomologists, registered sanitarians, dietitians and nutritionists.

For management, PracticeFood Safety.com provides tests that allow supervisors to audit their facility to determine how well it is meeting food safety standards. It also automatically grades trainees, logging the results to create a permanent training record for each trainee. Reference guides including easy-to-search versions of the US FDA Model Food Code and Steritech's food safety manual are included, providing managers with quick references to the written standards they must meet. In addition, a team of Steritech experts is available for consultation to PracticeFoodSafety.com clients.

The Steritech Group Inc.
704.544.1900
www.steritech.com
Charlotte, NC

Be sure to mention, "you saw it in *Food Protection Trends*"!

Come Early for some FUN!

Golf Tournament
Arnold Palmer Signature Course at Wildfire Golf Club
Saturday, August 7
6:00 a.m. – 11:00 a.m.

Sedona and Verde Valley Tour
Saturday, August 7
8:00 a.m. – 4:00 p.m.

Diamondbacks Baseball Game
Saturday, August 7
12:00 p.m. – 4:00 p.m.

Visit the Web site at **www.foodprotection.org** to sign up.

Announcing

The inaugural "John H. Silliker Lecture"

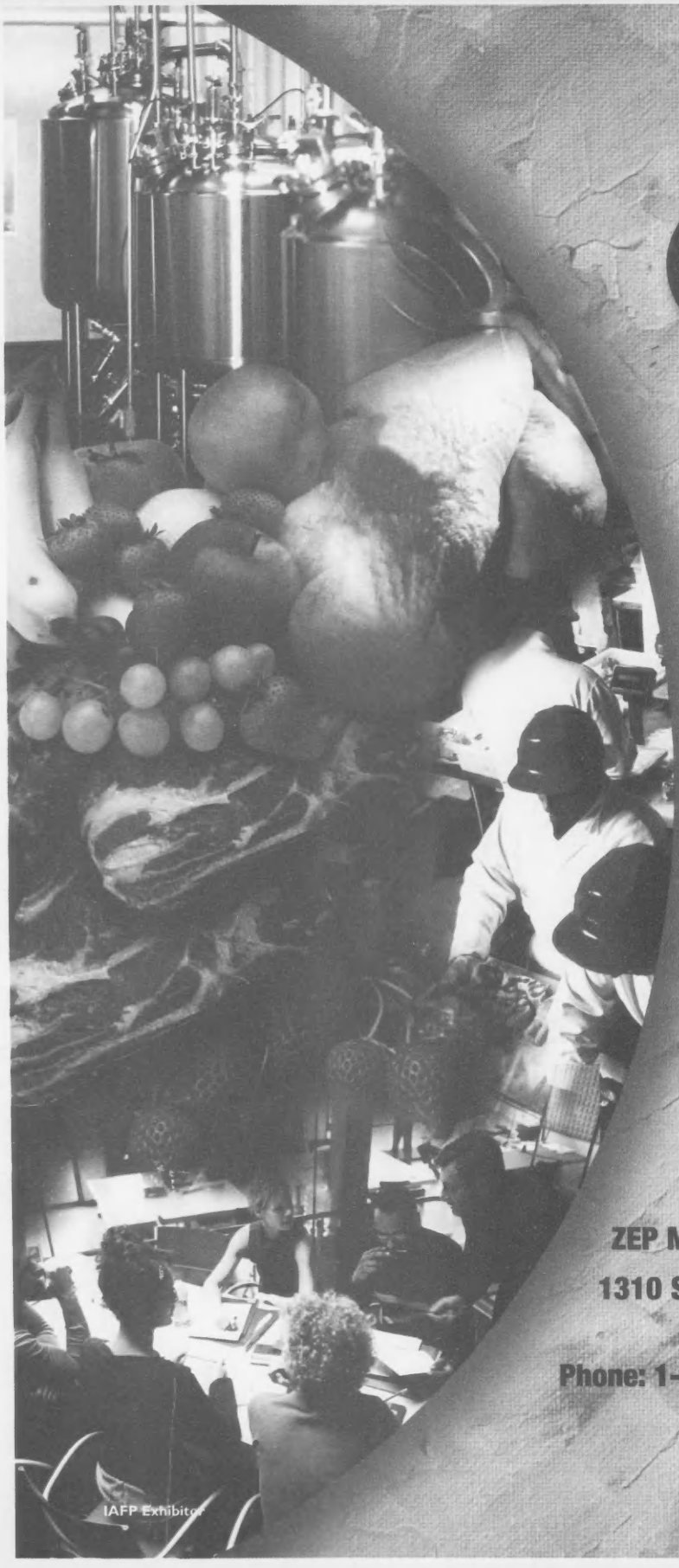
To be held at IAFP 2004 during a Plenary Session on Tuesday, August 10, 2004 in Phoenix, Arizona

Featured Speaker: R. Bruce Tompkin
Retired Vice President–Product Safety
ConAgra Refrigerated Prepared Foods

Presentation Title: "Guess Who's Come to Stay – The Resident Pathogen Issue"

Tuesday, August 10, 2004
3:45 p.m.
Phoenix, Arizona

IAFP thanks Silliker, Inc. for their contribution to the IAFP Foundation in support of this Lecture.



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Ivan Parkin Lecture

Advancing Food Protection Technology

Sunday, August 8, 2004
7:00 p.m. – 8:00 p.m.

Presented by

Dr. Martin B. Cole
Chief Research Scientist
Food Science Australia
North Ryde, New South Wales, Australia

It has been said that in times of change, learners inherit the earth, while the learned will find themselves beautifully equipped to deal with a world that no longer exists. In the case of microorganisms, their ability to learn or adapt to a changing world has certainly been a key factor in the emergence of new foodborne pathogens that were not of concern even a decade or so ago. The rapid globalization of the food processing and retailing industries, consumer demand for more natural and more convenient products and an overall increase in the susceptibility of the population are believed to be the most important factors that have led to fundamental changes in the nature of foodborne disease itself. Industry, government and academia have responded by advancing the science and technology of food protection in an attempt to combat these new food safety challenges.

Advances in microbial genomics, proteomics, metabolomics and single cell responses are being channelled into bioinformatic networks to bring a new systems biology approach to food protection. Through the integration of statistical analysis, databases, pattern recognition and whole cell simulations, these networks hold the promise for the development of new preservation and intervention strategies, measurement of bio-variability within microbial population, better interpretation of microbial resistance and stress data, and improved detection of microorganisms in complex matrices. Increasingly, the systems biology approach will influence food safety management strategies introducing a new dimension to the validation of new food safety control measures, risk assessment procedures, and regulation.

Developments in the areas of predictive modelling and risk assessment now offer the potential to link exposure to a microbial hazard to the likely number of cases of illness in the population and are leading to nothing less than a paradigm shift in the way that food safety risks are managed based on the new concept of Food Safety Objectives (FSOs). Although quantitative aspects of the scheme are still being advanced the framework will facilitate the transparent communication of food safety responsibilities of different stakeholders across the food chain.

Finally, advances in non-thermal preservation technologies such as ultra-high pressure processing and pulsed electric field treatment as well as renewed interest in food irradiation offer the promise of foods that have improved freshness, in terms of flavor, color, texture and nutritional value closer to non-heated products while at the same time exhibiting enhanced microbiological safety.

Developments in food science offer exciting new possibilities to meet the consumer drivers of health, convenience, pleasure and environment. In delivering these possibilities, it is important that we do not introduce new food safety hazards. Food protection technology will therefore play a crucial role in trying to predict and prevent new concerns as well allowing us to respond quickly and effectively to emerging threats. This will require not only the use of the technologies described but also an intricate networking and collaboration among all stakeholders involved.

IAFP 2004 Preliminary Program

DSC–Developing Scientist Competition

SUNDAY EVENING — AUGUST 8, 2004
7:00 P.M. — 8:00 P.M.

OPENING SESSION — *Grand Sonoran EFG*

Ivan Parkin Lecture — Advanced Food Protection Technology, Dr. Martin B. Cole, Chief Research Scientist, Food Science Australia, North Ryde, New South Wales, Australia

Cheese and Wine Reception will follow in the Exhibit Hall

MONDAY MORNING — AUGUST 9, 2004
8:30 A.M. — 12:00 P.M.

Late Breaking Session

***Mycobacterium paratuberculosis* – The Latest on a Potential Foodborne Pathogen**
Grand Sonoran A-B

Sponsored by IAFP Foundation Fund
Organizers/Convenors: Paul A. Hall and Allen Sayler

10:00 Detection of *Mycobacterium avian* subsp. *paratuberculosis* in Retail Pasteurized Whole Milk from California, Minnesota, and Wisconsin by Two Culture Methods and PCR — JAY ELLINGSON, Marshfield Clinic Laboratories, Marshfield, WI, USA

10:30 Heat Sensitivity of *Mycobacterium avian* subsp. *paratuberculosis* in Dairy Products — JOSEPH ODUMERU, University of Guelph, Guelph, ON, Canada

11:00 Association of *Mycobacterium avian* subsp. *paratuberculosis* and Human Crohn's Disease — SALEH NASER, University of Central Florida, Orlando, FL, USA

11:30 Roundtable Discussion

S01 Molecular Subtyping of Foodborne Pathogens: Tying It All Together
Grand Sonoran E

Sponsored by ILSI N.A.
Organizer: Catherine Nnoka
Convenors: J. Stan Bailey and Martin Wiedmann

8:30 PulseNet for Human Isolates — BALA SWAMINATHAN, CDC, Atlanta, GA, USA

9:00 PulseNet for Animal Isolates — PAULA J. FEDORKA-CRAY, USDA-ARS-RRC, Athens, GA, USA

9:30 The Future of Molecular Subtyping — MARTIN WIEDMANN, Cornell University, Ithaca, NY, USA

10:00 Break

10:30 Legal Implications of Molecular Subtyping Methods That Track Microorganisms in Food Processing Environments — FRED DEGNAN, King & Spalding, Washington, D.C., USA

11:00 Developments in PCR Diagnostics and DNA/RNA Arrays for Detection of Foodborne Viruses and Bacteria — JOHN COVENTRY, Food Science Australia, Werribee, Victoria, Australia

11:30 Application of Molecular Subtyping Techniques in Outbreak Investigations — CRAIG HEDBERG, University of Minnesota, Minneapolis, MN, USA

S02 Retail Food Safety Risks: Protecting Public Health and Changing Behavior
Grand Sonoran F

Sponsored by IAFP Foundation Fund
Organizer: Joseph D. Eifert
Convenors: Joseph D. Eifert and Alfred R. Fain, Jr.

8:30 Retail Risk-based Audits — DAVID ABNEY, NSF International, Ann Arbor, MI, USA

9:00 Control of *Listeria monocytogenes* at the Retail Level — CATHERINE N. CUTTER, Pennsylvania State University, University Park, PA, USA

9:30 EHS-Net: Discovering Antecedents to Foodborne Illness — CAROL A. SELMAN, CDC, Atlanta, GA, USA

10:00 Break

10:30 Conference for Food Protection Issues: How Do They Affect You? — H. WAYNE DERSTINE, Florida Department of Agriculture and Consumer Services, Tallahassee, FL, USA

11:00 Assessing Trends on the Occurrence of Foodborne Illness Risk Factors within Institutuional Foodservice, Restaurants and Retail Food Store Facilities — JOHN A. MARCELLO, FDA, Phoenix, AZ, USA

Program subject to change

11:30 Putting Solutions into Practice: Successes, Failures, and Tools — O. PETER SNYDER, JR., Hospitality Institute of Technology and Management, St. Paul, MN, USA

S03 Validation and Verification of Pathogen Interventions in Meat and Poultry Processing
Grand Sonoran G

Organizer: Ann Marie McNamara
Convenors: Gary Acuff and Ann Marie McNamara

8:30 Validation of Carcass Interventions — GARY ACUFF, Texas A&M University, College Station, TX, USA

9:00 Validation of Carcass and Hot-boned Cut Chilling — KERRI HARRIS, International HACCP Alliance, College Station, TX, USA

9:30 Validation of Pathogen Control in Ready-to-Eat Products — RANDALL PHEBUS, Kansas State University, Manhattan, KS, USA

10:00 Break

10:30 Validation of Cooling Processes for Ready-to-Eat Meat Products — WARREN DORSA, John Morrell & Company, Cincinnati, OH, USA

11:00 Initial and Continued Verification and Data Collection — ANN MARIE MCNAMARA, Silliker, Inc., Homewood, IL, USA

11:30 Regulatory Perspective of Validation and Verification Activities — DANIEL ENGELJOHN, USDA-FSIS-OPPDE, Washington, D.C., USA

S04 Extending the Shelf Life of Fluid Dairy Products
Grand Sonoran H-K

Organizers: David Blomquist and Debra Henyon
Convenor: John C. Bruhn

8:30 Milk Quality Evaluation from Farm to Table — STEVEN C. MURPHY, Cornell University, Ithaca, NY, USA

9:00 Cleaning and Sanitizing Regimens for Critical Extending Shelf-life Production — DAVID BLOMQUIST, Ecolab Research Center, St. Paul, MN, USA

9:30 Packaging Parameters and Equipment for Extending Shelf-life Dairy Products — DEBRA HENYON, Elopak, Inc., New Hudson, MI, USA

10:00 Break

10:30 Procedures for Approving Milk and Milk Products Plants for Extended Runs — CHRIS NEWCOMER, New-Tech Consulting, Inc., Cincinnati, OH, USA

11:00 Refrigeration and Distribution Controls — KRISTIN PHILLIPS, Publix Super Markets, Lakeland, FL, USA

11:30 Pathogens and Spore Formers — A Growing Concern — MANSEL GRIFFITHS, University of Guelph, Guelph, ON, Canada

T01 Don't be Sonoran — Antimicrobials and Produce
Grand Sonoran C-D

Antimicrobials

T01 8:30 Reduction of *Campylobacter* on Commercial Broiler Carcasses by Postchill-dip Application of Acidified Sodium Chlorite — O. A. OYARZABAL, C. Hawk, S. F. Bilgili, and C. Warf, Auburn University, Auburn, AL, USA

T02 8:45 DSC Inhibition of *Clostridium perfringens* Spore Germination and Outgrowth by Salts of Organic Acids in Roast Beef during Chilling and Refrigerated Storage — MARCOS X. SANCHEZ-PLATA and Harshavardhan Thippareddi, University of Nebraska-Lincoln, Lincoln, NE, USA

T03 9:00 Antimicrobial Blend to Control *Listeria* in Deli Salads — GEORGE WEBER, Georgetown Technology Group, Portland, OR, USA

T04 9:15 Natamycin: An Effective Preservative for the Control of Wine Spoilage Yeasts — LINDA THOMAS, Richard Ingram, Helen Bevis, Paul Brightwell, Nicola Wilson, and Joss Delves-Broughton, Danisco Beaminster Ltd., Beaminster, Dorset, UK

T05 9:30 The Effect of Ozone against *Pseudomonas* sp. and *Bacillus globigii* Spores — LOUISE FIELDING, Roger Bailey, Andy Young, and Chris Griffith, University of Wales Institute-Cardiff, Cardiff, UK

T06 9:45 Disinfection Failures Associated with Cotton Cloth Wipers When Compared to Non-Woven Wiper Products — Ginny Moore, Elizabeth Redmond, Christopher Griffith, and BARRY MICHAELS, The Michaels Consulting Group, Palatka, FL, USA

10:00 Break

Produce

T07 10:30 Efficacy of Volatiles Produced by *Muscodor albus* in the Disinfection of Edible Horticultural Commodities — TREVOR SUSLOW, Paula Martins de Freitas, and Lorena Fernandez, University of California, Davis, CA, USA

T08 10:45 DSC Attachment and Infiltration of *Salmonella* Poona to Surface Tissues of Cantaloupe as Affected by Temperature Differential, and Migration into Edible Tissues as Affected by Co-infection with Phytopathogens — GLENNER M. RICHARDS and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

T09 11:00 Critical Steps in Development of Effective Methods for Detection of Foodborne Viruses in Soft Fruit — A. RZEZUTKA and N. Cook, DEFRA Central Science Laboratory, Hutton, York, UK

T10 11:15 Detection of *Cryptosporidium parvum* Oocysts on Fresh Produce Using a Parasite Viral Protein — K. E. KNIEL and M. C. Jenkins, University of Delaware, Newark, DE, USA

T11 11:30 DSC Managing Food Safety and Environmental Risk on Ontario Fruit and Vegetable Farms: Implications for Nutrient Management Regulation — STACEY SMITH and Douglas Powell, University of Guelph, Guelph, ON, Canada

T12 11:45 DSC Improving On-farm Food Safety through the Development and Evaluation of an Agricultural Worker Training Video — Lisa Mathiasen, KATIJA BLAINE, Benjamin Chapman, Christian Battista, and Douglas Powell, University of Guelph, Guelph, ON, Canada

P01 DSC Antimicrobials and Foods of Animal Origin

Exhibit Hall — Grand Canyon

9:00 a.m. — 1:00 p.m.
(Authors present 10:30 a.m. — 12:30 p.m.)

Convenors: Wendy Duff and Carrie Hew

Antimicrobials

P001 DSC The Combined Effects of Temperature, Sodium Lactate, Sodium Diacetate and Pediocin on the Heat Inactivation of *Listeria monocytogenes* on the Surface of Frankfurters — Sadhana Ravishankar and SHIVANI GUPTA, Illinois Institute of Technology, Summit-Argo, IL, USA

P002 Hot Water Post-process Pasteurization of Cook-in-Bag Turkey Breast Treated with Potassium Lactate and Sodium Diacetate (Opti-Form®) and Acidified Sodium Chlorite for Control of *Listeria monocytogenes* — John B. Luchansky, George J. Cocoma, and JEFFREY E. CALL, USDA, Wyndmoor, PA, USA

P003 Partial Control of *Listeria monocytogenes* on the Surface of Full Fat Turkey Frankfurters Held at 4°C Using Zein Coatings Containing Nisin, Sodium Lactate and Sodium Diacetate — BWALYA LUNGU and Michael G. Johnson, University of Arkansas, Fayetteville, AR, USA

P004 Control of *Listeria monocytogenes* in Wiener and Turkey Slurries by Combinations of Antimicrobials — KATHLEEN GLASS, Jeffrey Veesenmeyer, Lindsey McDonnell, Patrick Eimerman, and Eric Johnson, University of Wisconsin-Madison, Madison, WI, USA

P005 DSC Effects of Frankfurters Manufactured Using Cellulose Casings Impregnated with Buffered Sodium Citrate on *Listeria monocytogenes* and Shelf Life — VIDYA KETHIREDDY, Randall Phebus, James Marsden, and Thomas Herald, Kansas State University, Manhattan, KS, USA

P006 Antimicrobial Treatments to Control the Growth of *Listeria monocytogenes* following Post-processing Contamination of Commercial Bologna and Ham — IFIGENIA GEORNARAS, Ioanna M. Barmpalia, Keith E. Belk, John A. Scanga, Patricia A. Kendall, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P007 Application of Glucono-delta-lactone (GDL) and Other Antimicrobial Ingredients to Control *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products — ROBIN M. KALINOWSKI and W. Payton Pruett, ConAgra Foods, Downers Grove, IL, USA

P008 DSC The Reduction of *Listeria monocytogenes* on Ready-to-Eat Roast Beef Treated with Acidified Sodium Chlorite — RICHELLE BEVERLY and Marlene E. Janes, Louisiana State University Agricultural Center, Baton Rouge, LA, USA

P009 DSC Fate of *Listeria monocytogenes* in Different Vanilla-flavored Products Stored at 4°C — PRAVEENA MUNUKURU, Nicole Maks, and Sadhana Ravishankar, Illinois Institute of Technology, Summit-Argo, IL, USA

P010 Preparation of Polylactic Acid Nanoparticles and Their Effect on the Growth of *Listeria monocytogenes* — DUSTIN CARNAHAN, P. Michael Davidson, and Jochen Weiss, University of Tennessee, Knoxville, TN, USA

P011 Evaluation of Short-chain Fatty Acids on *Listeria monocytogenes* Cell Invasion and Cell Association to Green Monkey Kidney Cells — DEBRA L. BYRD, Leonard L. Williams, and Parisea Story, Alabama A&M University, Normal, AL, USA

P012 Antilisterial Activities of Vanillin and Vanillic Acid — PASCAL DELAQUIS, Kareen Stanich, and Peter Toivonen, Agriculture and Agri-Food Canada, Summerland, BC, Canada

P013 Enhancing the Bactericidal Effect of Lactoferrin against *Escherichia coli* O157:H7 — Anas Al-Nabulsi and RICHARD HOLLEY, University of Manitoba, Winnipeg, MB, Canada

P014 DSC Chitosan as an Antimicrobial Coating to Control *Escherichia coli* O157:H7 on the Surface of Lettuce — AISHA A. ABUSHELAIBI and Marlene E. Janes, Louisiana State University Agricultural Center, Baton Rouge, LA, USA

P015 Decontamination Interventions to Reduce *Escherichia coli* O157:H7 and *Salmonella* Typhimurium on Beef Carcass Tissue — JARRET D. STOPFORTH, Laura V. Ashton, Panagiotis N. Skandamis, Keith E. Belk, John A. Scanga, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P016 Ethanol-mediated Variations in Cellular Fatty Acid Composition and Protein Profiles of Genotypically Different Strains of *Escherichia coli* O157:H7 — Robin Y.-Y. Chiou, R. Dixon Phillips, Ping Zhao, Michael P. Doyle, and LARRY R. BEUCHAT, University of Georgia, Griffin, GA, USA

P017 DSC The Influence of Trisodium Phosphate Adaptation on Changes in Membrane Lipid Composition, Verotoxin Secretion, and Acid Resistance of *Escherichia coli* O157:H7 — HYUN-GYUN YUK and Douglas L. Marshall, Mississippi State University, Mississippi State, MS, USA

P018 Inhibitory Effects of Buffered Sodium Citrate and Buffered Potassium Citrate on *Clostridium perfringens* Spore Germination and Outgrowth during Chilling of Roast Beef — ANDRES M. VARGAS, Marcos X. Sanchez, and Harshavardhan Thippareddi, University of Nebraska-Lincoln, Lincoln, NE, USA

P019 Inhibition of *Clostridium perfringens* Type A Associated with Chicken and Its Alpha Toxin Activity by Hen Egg White Lysozyme — GUOPENG ZHANG, Susanne Darius, and Stephen R. Smith, Inovatech Bioproducts, Abbotsford, BC, Canada

P020 Cross-contamination Determined by PFGE and the Antibiotic Susceptibility Patterns of Enteric Bacteria Recovered from Feedlot Cattle and Carcasses — W. M. Fluckey, M. M. BRASHEARS, and G. H. Loneragan, Texas Tech University, Lubbock, TX, USA

P021 Activated Lactoferrin Effects against Resident Microflora of Ready-to-Eat Chicken — R. UNAL, J. R. Knowles, and A. S. Naidu, N-terminus Research Laboratory, Pomona, CA, USA

P022 Efficacy of Nisin as a Preservative in Pasteurized Tofu — LINDA THOMAS, Richard Ingram, Nicola Wilson, Helen Bevis, and Joss Delves-Broughton, Danisco Beaminster Ltd., Beaminster, Dorset, UK

P023 Shelf-life Extension of Farm-raised Atlantic Salmon Fillets by the Application of SANOVA (Acidified Sodium Chlorite) — CHRIS HAWK, Morten Blomso, Cayce Warf, Kere Kemp, Christian Gonzalez, and Paulina Sazo, Alcide Corporation, Redmond, WA, USA

P024 DSC Validation of Controlled-phase Carbon Dioxide against *Listeria monocytogenes*, Generic *Escherichia coli*, *E. coli* O157:H7 and *Salmonella* spp. on Paper Disks — CARLOS TANUS, Randall Phebus, James Marsden, Larry Franken, and Erin Harvey, Kansas State University, Manhattan, KS, USA

P025 Antibacterial Activity of Thymol, Eugenol, Vanillin, Carvacrol, Citral, Potassium Sorbate and Sodium Benzoate against *Listeria innocua* and *Escherichia coli* — Angelica Santiesteban-López, Stella M. Alzamora, ENRIQUE PALOU, and Aurelio López-Malo, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

P026 Bacterial Inhibition with Ternary Mixtures of Phenolic Compounds and Potassium Sorbate — Elizabeth Baltazar-Fernández, Enrique Palou, and AURELIO LÓPEZ-MALO, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

P027 Lethality of Chlorine, Chlorine Dioxide, and a Commercial Fruit and Vegetable Sanitizer to Vegetative Cells and Spores of *Bacillus* Species — LARRY R. BEUCHAT, Charles A. Pettigrew, Mario E. Tremblay, Brian J. Roselle, and Alan J. Scouten, University of Georgia, Griffin, GA, USA

P028 Activated Lactoferrin Antimicrobial Efficacy against *Campylobacter jejuni* — J. R. KNOWLES, H. T. Moes, D. C. Clark, and A. S. Naidu, N-terminus Research Laboratory, Pomona, CA, USA

P029 Antimicrobial Activities of *Zanthoxylum schinifolium* Extract against *Vibrio parahaemolyticus* — Jeong Soon Kim, Kyoung Mo Koo, Yong Hyun Jung, Jae Gil Yang, and GANG GWEON LEE, Samsung Everland Inc., Yongin-si, Kyunggi-do, Korea

P030 DSC The Effect of Trans-cinnamaldehyde and Carvacrol on Cell Membrane Lipids of *Salmonella* Typhimurium — VALERIE W. LING, D. Carolina Naar, P. Michael Davidson, David C. White, and F. Ann Draughon, University of Tennessee-Knoxville, Knoxville, TN, USA

P031 Susceptibility of Antibiotic Resistant Strains of *Salmonella* Typhimurium to Lactic Acid at 37°C — KAREN M. KILLINGER MANN, Mindy M. Brashears, and Lacey M. Smith, Texas Tech University, Lubbock, TX, USA

P032 *Zygosaccharomyces bailii* Inhibition with Selected Antimicrobials, Water Activities, and pHs — Karla Rivera-Carriles, Stella M. Alzamora, Enrique Palou, and AURELIO LÓPEZ-MALO, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

P033 *Aspergillus flavus* Inhibition with Ternary Mixtures of Thymol, Eugenol and Potassium Sorbate — Reyna León-Cruz, ENRIQUE PALOU, and Aurelio López-Malo, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

Foods of Animal Origins

P034 USDA FSIS In-depth Verification Reviews, 2000-2003 — KRISTINA BARLOW and Denise Eblen, USDA-OPHS-FSIS, Washington, D.C., USA

P035 FSIS *Salmonella* Pathogen Reduction/Hazard Analysis Critical Control Point Data 1998 — 2003: A Summary — DENISE EBLEN and Kristina Barlow, USDA-OPHS-FSIS, Washington, D.C., USA

P036 Effect of Single or Combined Antimicrobial Washes and Their Sequence of Application on Microbial Reduction and Survival during Storage of Beef — Konstantinos P. Koutsoumanis, Laura V. Ashton, IFIGENIA GEORNARAS, Patricia A. Kendall, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P037 Validation of Multiple Antimicrobial Treatments to Reduce *Escherichia coli* O157:H7 and *Salmonella* spp. in Beef Trim and Ground Beef — MINDY BRASHEARS, Kristina Harris, Mark Miller, and Jason Mann, Texas Tech University, Lubbock, TX, USA

P038 Reduction of *Escherichia coli* O157:H7 on Vacuum-packaged Ground Rabbit Meat — Cornelius Howard, LEONARD L. WILLIAMS and Debra L. Byrd, Alabama A&M University, Normal, AL, USA

P039 A Novel Continuous Intervention System for the Reduction of *Escherichia coli* O157:H7 and *Salmonella* Typhimurium in Ground Beef — JOELLEN M. FEIRTAG and Michael M. Pullen, University of Minnesota, St. Paul, MN, USA

P040 Reduction of *Salmonella* Enteritidis in Powdered Egg, Dehydrated Egg Yolk and Egg White Using Gamma Irradiation — Angela Froehlich, Maria T. Destro, Bernadette D. G. M. Franco, and MARIZA LANDGRAF, Faculdade de Ciências Farmac uticas-USP, São Pãulo, Brazil

P041 Low-dose Ionizing Irradiation to Control *Listeria* spp. and *Escherichia coli* O157:H7 on Meat Trimmings Used for Dry Fermented Sausage Production — JOHN SAMELIS, Athanasia Kakouri, Ioannis N. Savvaidis, Kyriakos Riganakos, and Michael G. Kontominas, National Agricultural Research Foundation, Ioannina, Greece

P042 Evaluation of a Peroxyacetic Acid-based Antimicrobial Treatment for the Reduction of *Escherichia coli* O157:H7 on Beef Trimmings — JASON E. MANN and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

P043 Use of Ultraviolet Light for the Inactivation of *Listeria monocytogenes* and Lactic Acid Bacteria in a Model Meat Brine Chiller System — Karol M. Gailunas, Susan S. Sumner, Christine Z. Alvarado, and ROBERT C. WILLIAMS, Virginia Tech, Blacksburg, VA, USA

P044 Poultry Disinfection Using Gaseous Ozone — EDWARD STEINER and James Yuan, American Air Liquide, Countryside, IL, USA

P045 DSC Multistate Study to Determine the Presence of *Salmonella* in Poultry and Dairy Cattle Fecal Swabs and Environmental Samples — ANDRES RODRIGUEZ, Harold Richards, Phillipus Pangloli, John R. Mount, F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P046 Microbial Analysis of Chicken Carcasses in Ontario Poultry Processing Plants — PAT JOHNSON, Abdullahi Mahdi, Joseph Odumeru, and Tom Baker, Ontario Ministry of Agriculture and Food, Guelph, ON, Canada

P047 The Microbiological Examination of Modified Atomosphere Packed and Vacuum-packed Cooked Ready-to-Eat Meats at End of Shelf Life — SATNAM SAGOO, Christine Little, Kathie Grant, Kevin Williamson, and G. Allen, Communicable Disease Surveillance Center, London, UK

P048 Undercooked Chicken Livers as a Vehicle for Campylobacteriosis — ROSEMARY WHYTE, J. Andrew Hudson, and Chris Graham, Institute of Environmental Science and Research, Christchurch, Canterbury, New Zealand

P049 *Campylobacter* spp. in New Zealand Raw Sheep Liver and Human Campylobacteriosis Cases — ANGELA HOUGH, Carolyn Nicol, and J. Andrew Hudson, Institute of Environmental Science and Research Ltd., Christchurch, Canterbury, New Zealand

P050 Comparison of Psychrotrophic Bacterial Flora of Fresh and Marinated Chicken Breast Fillets during Refrigerated Storage — ARTHUR HINTON, JR., Louis L. Young, Doug Smith, and Kimbery D. Ingram, USDA-RRC, Athens, GA, USA

P051 Application of a Universal PCR Method as a Complementary Tool to the Microscopic Technique for the Detection of Bones and Other Animal Tissues in Animal Feeds — Marta Prado, Jos Casqueiro, Yolanda Iglesias, JORGE BARROS-VELÀZQUEZ, and Alberto Cepeda, University of Santiago de Compostela, Lugo, Spain

P052 DSC Survival of *Escherichia coli* O157:H7 in Salami and Roast Beef after Exposure to an Alkaline Cleaner — MANAN SHARMA, Glenner M. Richards, Barbara B. Adler, and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P053 DSC Influence of Inoculum Preparation Procedure and Spoilage Flora on *Escherichia coli* O157:H7 on Fresh Beef Stored under Anaerobic Conditions at 0, 4, 12, or 25°C — LAURA V. ASHTON, Jarret D. Stopforth, Panagiotis N. Skandamis, Keith E. Belk, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

MONDAY AFTERNOON — AUGUST 9, 2004
1:30 P.M. — 5:00 P.M.

S05 Postprocessing Intervention Technologies
Grand Sonoran E

Sponsored by ILSI N.A.
Organizer: Catherine Nnoka
Convenors: Jean Anderson and Paul Hall

1:30 In-package Heat Pasteurization of Meat Products — TIM FREIER, Cargill, Minneapolis, MN, USA

2:00 High Pressure Treatment — CINDY STEWART, Food Science Australia, North Ryde, NSW, Australia

2:30 Processing Brine Treatment — JOSEPH MEYER, Kraft Foods-Oscar Mayer, Madison, WI, USA

3:00 Break

3:30 Active Packaging — PAUL DAWSON, Clemson University, Clemson, SC, USA

4:00 Chemical Treatments — LARRY BEUCHAT, University of Georgia, Griffin, GA, USA

4:30 Panel Discussion — Future Needs

S06 Water's Role in Food Contamination
Grand Sonoran F

Organizers: Susan McKnight and Isabel Walls
Convenor: Michael Brodsky

1:30 Microbiological Standards for Irrigation Water — CHARLES GERBA, University of Arizona, Tucson, AZ, USA

1:55 Survival of Waterborne Pathogens on Crops after Contamination in the Fields — CHRIS CHOI, University of Arizona, Tucson, AZ, USA

2:20 A Processor's Perspective on Water Safety Management — LARRY COHEN, Kraft Foods, Glenview, IL, USA

2:45 Ice — A Key Factor in Food Safety from Food Processing to Consumption — JANE MCEWEN, International Packaged Ice Association, Tampa, FL, USA

3:10 Break

3:40 Panel Discussion – Moderator, Michael Brodsky
RITA SCHOENY, EPA, Washington, D.C., USA
RICHARD J. GELTING, CDC, Atlanta, GA, USA
ANN MARIE GEBHART, Underwriters Laboratories, Northbrook, IL, USA
DOUGLAS PARK, FDA-DETDO-GR-RP, Grand Rapids, MI, USA

S07 Recent Developments in *Listeria monocytogenes* Research
Grand Sonoran G

Sponsored by 3M Microbiology
Organizer: Lee-Ann Jaykus
Convenors: James Denton and Richard Linton

1:30 Environmental, Host, and Bacterial Factors That Influence the Virulence of *Listeria monocytogenes* — CHARLES J. CZUPRYNSKI, University of Wisconsin, Madison, WI, USA

2:00 Construction and Validation of Microarrays for *Listeria monocytogenes* — F. CHRIS MINION, Iowa State University, Ames, IA, USA

2:30 Developments in *Listeria monocytogenes* Growth Modeling — MARK TAMPLIN, USDA-ARS-ERRC, Wyndmoor, PA, USA

3:00 Break

3:30 Designing Effective *Listeria monocytogenes* Risk Communication Messages Based on Risk Assessment — PETER COWEN, North Carolina State University, Raleigh, NC, USA

4:00 Prevalence and Persistence of *Listeria monocytogenes* in the Turkey Processing Environment — LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

4:30 The *Listeria monocytogenes* Dose-response Relationship: Novel Animal Models — MARY ALICE SMITH, University of Georgia, Athens, GA, USA

S08 Integrating Genomic Data into Quantitative Risk Assessments
Grand Sonoran A-B

Organizers: Yuhuan Chen, Ruff Lowman, and Donald W. Schaffner
Convenors: Yuhuan Chen and Donald W. Schaffner

1:30 *Salmonella* DT 104 Subtyping as a Means for Hazard Identification in Quantitative Risk Assessment — TINE HALD, Danish Institute for Food and Veterinary Research, Soborg, Denmark

2:00 Modeling Cross Contamination of *Listeria monocytogenes* Subtypes in Processing Plants — DONALD W. SCHAFFNER, Rutgers University, New Brunswick, NJ, USA

2:30 Use of Genomics to Define Biologically Meaningful Pathogen Subpopulations for a *Listeria monocytogenes* Quantitative Risk Assessment — MARTIN WIEDMANN, Cornell University, Ithaca, NY, USA

3:00 Break

3:30 *Listeria monocytogenes*: A Model for Attributing Risk to Pathogen Subgroups — WILLIAM H. ROSS, Health Canada, Ottawa, ON, Canada

4:00 Integration of Molecular Subtype Analysis with a *Campylobacter* Quantitative Risk Assessment: Molecular Data and Format — KELLI L. HIETT, USDA-ARS-RRC, Athens, GA, USA

4:30 Challenges for Integrating Genomic Data in Causal Inference Modeling and Systems Models — AAMIR FAZIL, Health Canada, Guelph, ON, Canada

S09 Sanitary and Hygienic Design, Construction, and Fabrication of Dairy and Food Equipment
Grand Sonoran C-D

Organizers/Convenors: Ron Schmidt and Joe Smucker

1:30 An Overview of Equipment Standards and Sanitary Design/Fabrication Criteria and Current Issues — LYLE CLEM, ESC, An Entegris Co., South Beloit, IL, USA

2:00 3-A Sanitary Standards, Inc.: New Directions for 3-A — TIM RUGH, 3-A Sanitary Standards, Inc., McLean, VA, USA

2:30 The 3-A Third Party Verification Process — A Progress Report — F. TRACY SCHONROCK, Consultant, Fairfax Station, VA, USA

3:00 Break

3:30 Evaluating Cleanability of Food Contact Surfaces — DEB HENYON, Elopak Inc., New Hudson, MI, USA

4:00 The NCIMS Third Party Pilot Program for Dairy Imports: Meeting 3-A and Pasteurized Milk Ordinance Standards — KEN ANDERSON, Harold Wainess and Assoc., Northfield, IL, USA

4:30 Panel Discussion

DAN ERICKSON, Harold Wainess and Assoc., Northfield, IL, USA
ALLEN SAYLER, International Dairy Food Association, Washington, D.C., USA
LYLE CLEM, ESC, an Entegris Co., South Beloit, OH, USA
SHERRY ROBERTS, Texas Dept. of Health, Palmer, TX, USA
PHIL WOLFF, USDA, Manassas, VA, USA

T02 General Microbiology and Sanitation
Grand Sonoran H-K

T13 1:30 — An Evaluation of New Microbiological Surface Sampling Kits — CHRIS GRIFFITH and Ginny Moore, University of Wales Institute-Cardiff, Cardiff, South Glamorgan, Wales, UK

T14 1:45 DSC — Transfer of *Listeria monocytogenes* from a Delicatessen Slicer to Ready-to-Eat Meat Products — KEITH L. VORST, Ewen C. D. Todd, Fernando Perez, Robert L. McMasters, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

T15 2:00 DSC — Impact of Biofilm-forming Ability on Transfer of Surface-dried *Listeria monocytogenes* Cells from Knife Blades to Smoked Turkey Breast — LINDSEY A. KESKINEN, Ewen C. D. Todd, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

T16 2:15 — Reducing the Risk of Microbial Cross-contamination Using Conveyor Belts Containing a Microbial Inhibitor — BRIAN SHELDON and Xin Li, North Carolina State University, Raleigh, NC, USA

T17 2:30 DSC — Protocol for Evaluating Relative Performance of Footwear Materials Used in Food Processing Environments Based on the Efficacy of Cleaning/Sanitation Compounds for Elimination of *Listeria monocytogenes* — DAVID NYACHUBA, Catherine Donnelly, Scott Hardy, and Jeff Alpert, University of Vermont, Burlington, VT, USA

T18 2:45 — The Cleaning Efficacy and Particle Spread of Dry Cleaning Techniques — J. T. HOLAH and D. Smith, Campden & Chorleywood Food Research Association, Gloucestershire, UK

3:00 — Break

T19 3:30 — English Butchers' Beliefs and Perceptions about HACCP — GORDON HAYBURN and Chris Griffith, University of Wales Institute-Cardiff, Cardiff, South Glamorgan, Wales, UK

T20 3:45 — Standards of Surface Cleanliness in English Butchers' Shops — CHRIS GRIFFITH and Gordon Hayburn, University of Wales Institute-Cardiff, Cardiff, South Glamorgan, Wales, UK

T21 4:00 DSC — Comparison in the Recovery of *Vibrio vulnificus* under Different Microbial Stresses with the Use of Sodium Pyruvate — STEPHENIE DRAKE, Lee-Ann Jaykus, Maryanne Drake, and David Green, North Carolina State University, Raleigh, NC, USA

T22 4:15 — Detection of *Listeria monocytogenes* in Foodstuffs by a Validated PCR-based Method — M. D'Agostino and N. COOK, DEFRA Central Science Laboratory, Sand Hutton, York, UK

T23 4:30 — Internal Amplification Controls in PCR-based Detection Methods — M. D'Agostino, J. Hoorfar D. A. Rodriguez, A. Rzezutka, and N. COOK, DEFRA Central Science Laboratory, Sand Hutton, York, UK

T24 4:45 DSC — Multi-virulence-locus Sequence Typing: A Portable and Discriminatory Tool for Molecular Subtyping of *Listeria monocytogenes* — WEI ZHANG and Stephen J. Knabel, The Pennsylvania State University, University Park, PA, USA

P02 Rattlesnake Roundup — General Microbiology, Sanitation, Methods, and Toxicology
Exhibit Hall — Grand Canyon

2:00 p.m. — 6:00 p.m.
(Authors present 3:30 p.m. — 5:30 p.m.)
Convenors: Brooke Hettenhouser and Renee Raiden

General Microbiology and Sanitation

P054 — Inhibition of *Shigella sonnei* by UVC Radiation on Agar, Liquid Media and Fresh Produce — KATHLEEN T. RAJKOWSKI, USDA-ARS-ERRC-FSITRU, Wyndmoor, PA, USA

P055 — Drying Stress-dependent Expression of Proteins of *Shigella sonnei* and *Salmonella enterica* serovar Enteritidis — STEPHAN FLESSA, Rudi F. Vogel, and Linda J. Harris, University of California, Davis, CA, USA

P056 — Synergistic Action of Ozone and Ultraviolet Radiation against *Salmonella enterica* Serovar Enteritidis on Shell Eggs — LUIS A. RODRIGUEZ-ROMO and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P057 — Efficiency of Different Sanitizers on the Microbial Control of "Cheiro Verde" Minimally Processed — SILVANA SREBERNICH, Antenor Pizzinato, Neliane Silveira, and Rosana Siqueira, Pontif'cia Universidade Católica de Campinas, Campinas, São Pãulo, Brazil

P058 — Fate of Aerosolized *Listeria monocytogenes* in a Closed Bioaerosol Chamber — Zhinong Yan, JEFFREY KORNACKI, Chia-Min Lin, and Michael Doyle, University of Georgia, Madison, WI, USA

P059 — Prevalence of *Campylobacter* and *Salmonella* on Raw Meat Packaging: A Potential Public Health Problem — CHRISTINE LITTLE, Fay Burgess, Trudi Allen, Kevin Williamson, and Robert Mitchell, Communicable Disease Surveillance Centre, London, UK

P060 DSC — Population Diversity of *Pseudomonas* spp. in Bottled Water from Office Coolers — HUGH GRIFFITHS, Louise Fielding, Neil Burton, and Adrian Peters, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P061 DSC — Microbiological Contamination of Beverage Dispenser Tips in University Foodservice Operations — CHITHRA LAKSHMANAN and Donald W. Schaffner, Rutgers University, New Brunswick, NJ, USA

P062 — Enumeration of Aerobic Microorganisms, Total Coliforms, Fecal Coliforms, and Fecal *Streptococcus* in Animal and Environmental Samples — PHILIPUS PANGLOLI, Felix Jackson, Jacob H. Stevens, C. A. Doane, Harold Richards, John R. Mount, Stephen P. Oliver, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P063 — Bacterial Survey in Sponges Used in Industrial Restaurant Kitchens from Campinas, São Pãulo, Brazil — SILVANA SREBERNICH, Gislaine Balioni and Tha's Santos, Pontificia Universidade Cat— lica de Campinas, Campinas, São Pãulo, Brazil

P064 School Food Service Employees: Food Safety Training, Knowledge, and Practices — KYUNG RYU and Kyung-Eun Lee, Dongnam Health College, Suwon, Kyunggi, Korea

P065 Quantitative Microbiological Risks Associated with Food-handling Behaviors Implemented during Domestic Food Preparation — ELIZABETH C. REDMOND, Christopher J. Griffith, Jenny Slader, and Tom Humphrey, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P066 Protective Effect of Pepsin on Survival of Non-encapsulated and Encapsulated *Bifidobacterium lactis* in Simulated Gastrointestinal Conditions — Alcina Maria Liserre, Maria Inês Ré and BERNADETTE DORA GOMBOSSY DE MELO FRANCO, University of São Pãulo, São Pãulo, Brazil

P067 Influence of Up-regulation MUC2 by *Lactobacillus* spp. on Adherence of *Escherichia coli* O157:H7 — Young Hoon Kim, Kyung Sik Han, Sejong Oh, Seungkwon You, and SAE HUN KIM, Korea University, Seoul, South Korea

P068 Hen Egg White Lysozyme as a Germinant for Spores of *Clostridium sporogenes* — GUOPENG ZHANG, Susanne Darius, and Steve R. Smith, Inovatech Bioproducts, Abbotsford, BC, Canada

P069 Acid and Alkaline pH Enhance Spore Adhesion of an Alkaline Tolerant *Bacillus cereus* — D. Lindsay, V. S. Brozel, and A. VON HOLY, University of the Witwatersrand, Wits, South Africa

P070 Spore Formation in *Bacillus subtilis* Biofilms — D. Lindsay, V. S. Brozel, and A. VON HOLY, University of the Witwatersrand, Wits, South Africa

P071 DSC Mathematical Models for Hot Water, Electron Beam Radiation, and Hydrogen Peroxide Treatments on the Survival of *Fusarium* spp. and Germinative Energy in Malting Barley — BALASUBRAHMANYAM KOTTAPALLI, C. E. Wolf-Hall, and M. B. Rao, North Dakota State University, Fargo, ND, USA

P072 Modeling the Synergistic Effects of High Pressure, Temperature, pH, and Time on the Inactivation of *Bacillus subtilis* ATCC 6633 Spores during High Pressure Processing — BALASUBRAHMANYAM KOTTAPALLI, B. Sundar, and V. M. Balasubramaniam, North Dakota State University, Fargo, ND, USA

P073 Production and Emission of the Long-chain Alcohols Decanol and Dedecanol, Putative Antimicrobial Compounds, by *Escherichia coli* — HESHAM ELGAALI, T. R. Hamilton-Kemp, C. N. Melissa, W. C. Randol, Keshun Yu, and D. D. Archbold, University of Kentucky, Lexington, KY, USA

P074 Development of Hybridoma for the Production of Monoclonal Antibody against Sulfamethazine — WON-BO SHIM, Zheong-You Yang, Jung-Sook Kim, Baik-Sang Nam, and Se-Ri Kim, Graduate School of Gyeongsang National University, Chinju, Gyeongnam, Korea

P075 Growth/No Growth Interface of *Penicillium digitatum* and *Fusarium culmorum* as a Function of pH, Water Activity and Incubation Temperature — Enrique Palou and AURELIO LÓPEZ-MALO, Universidad de las Américas-Puebla, Cholula, Puebla, Mexico

Methodology

P076 DSC Evaluation of Reduced Toxicity of Zearalenone by Extrusion Processing Using a Human Breast Cancer Cell Line (MCF-7) as Measured by the MTT Bioassay — Yuksel Cetin, DOJIN RYU, and Lloyd B. Bullerman, University of Nebraska-Lincoln, Lincoln, NE, USA

P077 Fumonisins in Corn-based Food for Infant Consumption — MA. FERNANDA PENTEADO M. DE CASTRO, Gordon S. Shephard, Vikash Sewram, Eduardo Vicente, Taíssa Alvim Mendonca, and Audrey C. Jordan, Instituto de Tecnologia de Alimentos, Campinas, São Pãulo, Brazil

P078 Monitoring of Aflatoxin B1 on Grains, Peanuts, Foodstuffs and Feeds in Korea — WON-BO SHIM, Zheong-You Yang, Baik-Sang Nam, Jung-Sook Kim, Se-Ri Kim, and Seon-Ja Park, Graduate School of Gyeongsang National University, Chinju, Gyeongnam, Korea

P079 DSC Detection and Identification of Histamine producing Bacteria Associated with Harvesting and Primary Processing of Mahi-mahi and Yellowfin Tuna in North Carolina — D. GREY ALLEN, David Green, Greg Bolton, Lee-Ann Jaykus, and Greg Cope, North Carolina State University, Morehead City, NC, USA

P080 DSC Evaluation and Reduction of Biogenic Amines in Korean Traditional Fermented Foods — JAE-HYUNG MAH and Han-Joon Hwang, Korea University, Seoul, Korea

Toxicology

P081 Advances in Detection of Psychrophilic *Clostridium* spp. Causing "Blown Pack" Spoilage of Chilled Vacuum-packed Meats — J. A. BOEREMA and D. M. Broda, AgResearch, Hamilton, New Zealand

P082 Recovery and Detection of Microorganisms in Aseptic Low Acid Food Products Using an Automated Microbial Detection System — Scott Jeffrey, ANN PROFFITT, and John Walsh, bioMérieux, Durham, NC, USA

P083 Recovery and Detection of Microorganisms in Aseptic High Acid Food Products Using an Automated Microbial Detection System — Ania Massey, SCOTT JEFFREY, Ann Proffitt, and John Walsh, bioMérieux, Durham, NC, USA

P084 Comparison of an Automated System (TEMPO) with Aerobic Plate Count for Enumeration of Microorganisms in Ground Beef and Poultry — SCOTT JEFFREY, Barbara Robison, Ann Proffitt, Ania Massey, and Maria Chi, bioMérieux, Durham, NC, USA

Monday p.m., *continued*

P085 3M™ Petrifilm Plate Reader for the Enumeration of Petrifilm Aerobic, Coliform, and *Escherichia coli*/Coliform Count Plates — SONYA GAMBREL-LENARZ, Cynthia Zook, and Kathryn Lindberg, 3M, St. Paul, MN, USA

P086 Evaluation of the 3M Petrifilm Environmental *Listeria* Plate for Use in Detecting *Listeria monocytogenes* — STEVEN INGHAM and Jill Losinski, University of Wisconsin-Madison, Madison, WI, USA

P087 Evaluation of the DOX System for Detection of Acidophilic Bacteria in Juice — MEGUMI AKAMATSU, Masakazu Yoshida, Susumu Kawasaki, and Shinichi Kawamoto, Daikin Environmental Laboratory, Limited, Taukubashi, Ibaraki, Japan

P088 Qualitative and Quantitative Analysis of Spoilage Microflora on Ready-to-Eat Chicken by Molecular Bioscaping Techniques — R. R. GALASSO, J. R. Knowles, J. Tulpinski, and A. S. Naidu, N-terminus Research Laboratory, Pomona, CA, USA

P089 Evaluation of VIDAS Staph Enterotoxin II (VIDAS SET 2) Method — Ann M. Schultz, Victoria A. Aleo, WENDY A. MCMAHON, and Ronald L. Johnson, Silliker, Inc., South Holland, IL, USA

P090 Comparison of the BAM/FDA and Bax System Methods for *Salmonella* sp. Detection in Food Samples — Neusely da Silva, M. FERNANDA P. M. DE CASTRO, Neliane F. A. Silveira, Ivone Francisca da Silva, and Marta Mitsui Kushida, Instituto de Tecnologia de Alimentos, Campinas, São Pãulo, Brazil

P091 Comparison of an Automated MPN-based System with the USDA/FSIS Microbiology Laboratory Guidebook Method for Enumerating *Escherichia coli* in Ground Beef and Poultry — Barbara Robison, Scott Jeffrey, ANN PROFFITT, Ania Massey, and Maria Chi, bioMérieux, Durham, NC, USA

P092 Comparison of the Automated TEMPO® System with Conventional Plate Counts for the Enumeration of Enterobacteriaceae in Food Products — FRÉDÉRIC DEREPAS, Christophe Meunier, Christine Cotte, and Jean-Claude Raymond, bioMérieux, La Balme-les-Grottes, France

P093 Development of a New Light-cycler Real-time PCR-based Detection Method of *Alicyclobacillus* sp. — KATALIN PERKÀTAI, Róbert Deák, Péter Becságh, and Zoltán Syposs, MikroMikoMed Ltd., Budapest, Hungary

P094 A Molecular Beacon-based Real Time NASBA Assay for *Mycobacterium avium* subsp. *paratuberculosis* — D. A. RODRIGUEZ, J. Lloyd, M. D'Agostino, A. Herreweg, J. Ikonompoulos, M. Pla, and N. Cook, University of Girona, Girona, Spain

P095 Development of a DNA Microarray-based Platform for the Simultaneous Detection and Genotyping of Noroviruses — Franco Pagotto, Nathalie Corneau, Kalavathi Karthikeyan, and SABAH BIDAWID, Health Canada, Ottawa, ON, Canada

P096 Detection of Attached Bacteria on Food Contact Surfaces Using a Biosensor — NICOLE MAKS, Sadhana Ravishankar, and Susanne Keller, Illinois Institute of Technology, Summit-Argo, IL, USA

P097 DSC Comparison of Methods for Recovery of *Salmonella* from Cantaloupe Rinds — ERIKA A. BIBLE, Faith M. Johnson, Bruce J. Bradley, and David A. Golden, University of Tennessee, Knoxville, TN, USA

TUESDAY MORNING — AUGUST 10, 2004
8:30 A.M. — 12:00 P.M

Late Breaking Session

Bovine Spongiform Encephalopathy — The North American Experience

Grand Sonoran A-B

Sponsored by IAFP Foundation Fund

Organizer/Convenor: Gary Acuff

8:30 The Science Driving North America BSE Policy — WILL HUESTON, Center for Animal Health and Food Science, University of Minnesota, St. Paul, MN, USA

9:15 BSE in Canada: An Educational Moment — BRIAN EVANS, Canadian Food Inspection Agency, Ottawa, ON, Canada

10:00 Break

10:30 The US Response to BSE — PAUL CLAYTON, US Meat Export Federation, Denver, CO, USA

11:15 Panel Discussion

S10 Food Safety for Immunocompromised Populations

Grand Sonoran E

Sponsored by ILSI N.A.

Organizer: Catherine Nnoka
Convenors: Marguerite Neill, Isabel Walls, and Martin Wiedmann

8:30 Immunocompromised Populations: Definitions, Demographics, and Trends — MARGUERITE NEILL, Brown University/Memorial Hospital, Pawtucket, RI, USA

9:00 Mechanisms of Immunosuppression: Defining Immunocompromised Populations and Their Susceptibility to Foodborne Disease — CHARLES J. CZUPRYNSKI, University of Wisconsin, Madison, WI, USA

9:30 What Data are There to Show That Immunocompromised Patients are Getting Sick from Food? — MORRIS E. POTTER, FDA-CFSAN, Atlanta, GA, USA

10:00 Break

10:30 Outreach and Education to Decrease Risk in Immunocompromised Populations — Rationale and Evidence — CHRISTINE BRUHN, University of California-Davis, Davis, CA, USA

11:00 Risk Assessment as Applied to Immunocompromised Subpopulations — ROBERT L. BUCHANAN, FDA-CFSAN, College Park, MD, USA

11:30 Panel Discussion

S11 Chatterbugs: Quorum Sensing and Food Safety
Grand Sonoran F

Sponsored by IAFP Foundation Fund
Organizers/Convenors: Pina M. Fratamico and John S. Novak

8:30 Chatterbugs: Quorum Sensing and Food Spoilage — LONE GRAM, Danish Institute for Fisheries Research, Kongens Lyngby, Denmark

9:00 Communication among Bacterial Spores during Germination — DONALD W. SCHAFFNER, Rutgers University, New Brunswick, NJ, USA

9:30 Quorum Sensing Mechanisms and Virulence of *Listeria monocytogenes* — MANSEL W. GRIFFITHS, University of Guelph, Guelph, ON, Canada

10:00 Break

10:30 Quorum Sensing Regulators in *Escherichia coli* O157:H7 — VANESSA SPERANDIO, University of Texas Southwestern Medical Center, Dallas, TX, USA

11:00 AI-2 Quorum Sensing Response in *Campylobacter* spp. — CHIN-YI CHEN, USDA-ARS-ERRC, Wyndmoor, PA, USA

11:30 Microbial Quorum Sensing on Foods: Interpreting Language from Noise — SURESH D. PILLAI, Texas A&M University, College Station, TX, USA

S12 Transfer and Spread of Pathogens in Food Environments
Grand Sonoran G

Organizer: Ewen Todd
Convenors: Pete Cook and Ewen Todd

8:30 Routes of Transfer in the Spread of Pathogens — Relative Risks — CHRIS GRIFFITH, University of Wales-Cardiff, Cardiff, Wales, UK

9:00 The Dynamics, Modeling and Pathogen Transfer and Surface Cleansing — BARRY MICHAELS, The Michaels Group, Palatka, FL, USA

9:30 Persistence and Survival of Pathogens in Food and the Environment — SABAH BIDAWID, Health Canada, Ottawa, ON, Canada

10:00 Break

10:30 Transfer Coefficients for *Listeria monocytogenes* in Ready-to-Eat Foods — EWEN TODD, Michigan State University, East Lansing, MI, USA

11:00 Transmission of Pathogens in an Integrated Food System from Food Animals to Humans — H. MORGAN SCOTT, Texas A&M University, College Station, TX, USA

11:30 Self-acquired Infections by Food Workers — Risks from Raw Foods — SERVÈ NOTERMANS, TNO Nutrition and Food Research Institute, Bilthoven, The Netherlands

S13 Indicator Organisms and Testing — Where's the Value?
Grand Sonoran H-K

Organizer: Lori Ledenbach
Convenors: Lori Ledenbach and Vickie Lewandowski

8:30 Indicator Organisms for Meat and Poultry Products — TIMOTHY FREIER, Cargill Inc., Minneapolis, MN, USA

9:00 Indicator Organisms for Dairy Products — EDWARD ARNOLD, Land O' Lakes Inc., St, Paul, MN, USA

9:30 Indicator Organisms for Low A_w Products — MARK MOORMAN, Kellogg Co., Battle Creek, MI, USA

10:00 Break

10:30 Indicator Organisms for Food Processing Environments — LARRY COHEN, Kraft Foods, Inc., Glenview, IL, USA

11:00 Alternatives to Indicator Organism Testing — CLIFF COLES, California Microbiological Consulting, Walnut Creek, CA, USA

11:30 Cost Benefit Analysis of Indicator Organism Testing — LORI LEDENBACH, Kraft Foods, Inc., Glenview, IL, USA

T03 Foods of Animal Origin
Grand Sonoran C-D

T25 8:30 DSC A Real-time PCR Assay for *Mycobacterium avium* subsp. *paratuberculosis* — D. A. RODRIGUEZ-LAZARO, M. Pla, J. Ikonompoulos, A. Herreweg, M. D'Agostino, and N. Cook, University of Girona, Girona, Spain

T26 8:45 A Novel and Sensitive PCR-based Method for the Specific Identification of Cattle in Foodstuffs and Specific High-risk Materials — Ananias Pascoal, MARTA PRADO, Pilar Calo, Alberto Cepeda, and Jorge Barros-Velázquez, University of Santiago de Compostela, Lugo, Spain

T27 9:00 The Effect of Fecal Contamination and Immersion Chilling on *Escherichia coli*, Coliform, *Campylobacter*, and *Salmonella* Counts of Broiler Carcasses — DOUGLAS P. SMITH, John A. Cason, Mark E. Berrang, USDA-ARS-RRC, Athens, GA, USA

T28 9:15 *Salmonella* spp. and *Listeria monocytogenes* in Raw Liquid Egg Products in Federally Inspected Processing Establishments — L. VICTOR COOK, Priscilla Levine, and Nisha Oatman, OPHS-FSIS, USDA, Washington, D.C., USA

T29 9:30 DSC Effects of Pre- and Post-cooling Treatments on CO_2 Cryogenically Cooled Table Eggs Inoculated with *Salmonella* Enteritidis Held at 10°C for 56 Days — JOSHUA B. GURTLER and Don E. Conner, Auburn University, Auburn, AL, USA

T30 9:45 Comparison of Hygiene Performance of Two Cattle Abattoirs Based on Relationship between Microbial Counts on Hides and on Dressed Carcasses — Luis Vivas and SAVA BUNCIC, University of Bristol, Bristol, UK

10:00 Break

T31 10:30 Effects of Feeding Whole Cottonseed on the Prevalence of *Escherichia coli* O157 among Finishing Beef Steers — SPRING M. YOUNTS-DAHL, Jake J. Cranston, J. Daniel Rivera, Michael L. Galyean, Guy H. Loneragan, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

T32 10:45 Prevalence of *Escherichia coli* O157 among Finishing Beef Cattle Supplemented with a *Lactobacillus*-based Direct-fed Microbial — SPRING M. YOUNTS-DAHL, J. Daniel Rivera, Paul Defoor, Michael L. Galyean, Guy H. Loneragan, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

T33 11:00 DSC Reduction of *Escherichia coli* O157 in Finishing Beef Cattle by Various Doses of *Lactobacillus acidophilus* in Direct-fed Microbials — SPRING M. YOUNTS-DAHL, Gary Osborn, Michael L. Galyean, J. Daniel Rivera, Guy H. Loneragan, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

T34 11:15 DSC Potential Legal Ramifications of the Development of Pre-harvest Food Safety Interventions in the Beef Industry — KYLE DAHL, Mindy Brashears, Victoria Sutton, Conrad Lyford, and Kevin Pond, Texas Tech University, Lubbock, TX, USA

T35 11:30 Tissue Distribution, Elimination, and Metabolism of Dietary Sodium (36Cl) Chlorate in Beef Cattle — DAVID J. SMITH, Robin C. Anderson, Dee A. Ellig, and Gerald Larsen, USDA-ARS, Fargo, ND, USA

T36 11:45 Comparison of Rapid Test Methods and Validation of Composite Sampling for Detection of *Escherichia coli* O157:H7 in Raw Beef Trims and Raw Ground Beef — ANN MARIE MCNAMARA, Wendy McMahon, Anne Schultz, and Vicki Aleo, Silliker, Inc., South Holland, IL, USA

P03 Saguaro Soire — Risk Assessment, Education and Pathogens
Exhibit Hall — Grand Canyon
9:00 a.m. — 1:00 p.m.
(Authors present 10:30 a.m. — 12:30 p.m.)
Convenors: Laura J. Bauermeister and Yash Burgula

Risk Assessment

P098 Modeling Growth and Reduction of Microorganisms in Foods as Functions of Temperature and Time — Robert McMasters and EWEN TODD, Michigan State University, East Lansing, MI, USA

P099 Potential Non-uniform Distribution of *Escherichia coli* O157:H7 in Feces and Underestimation of Prevalence — ALEJANDRO ECHEVERRY, Guy H. Loneragan, Mindy M. Brashears, and Bruce A. Wagner, Texas Tech University, Lubbock, TX, USA

P100 Contributions of Primary and Secondary Model Uncertainty to the Robustness of a Broth-based Microbial Growth Model for *Listeria monocytogenes* and *Escherichia coli* O157:H7 in Meat and Poultry Products — KARINA G. MARTINO, Bradley P. Marks, Danilo T. Campos, and Mark L. Tamplin, Michigan State University, East Lansing, MI, USA

P101 Modeling the Effects of Food Handling Practices on the Incidence of Foodborne Illness: Version 2.0 of the Food Handling Practices Model — ANGELA RITZERT, David Kendall, Shawn Karns, and Catherine Viator, FDA-CFSAN, College Park, MD, USA

P102 Quantitative Risk Assessment for *Salmonella* Brandenburg in Sheep Meat — Peter van der Logt, ROGER COOK, and Steve Hathaway, New Zealand Food Safety Authority, Wellington, New Zealand

P103 National Typing Database for Zoonotic Foodborne Pathogens in New Zealand — Brent Gilpin, Angela Hough, Philip Carter, Alexander Kouzminov, and ROGER COOK, New Zealand Food Safety Authority, Wellington, New Zealand

P104 Probabilistic Analysis of Cross Contamination during Cooking — KUNIHIRO KUBOTA, Fumiko Kasuga, and Kaoru Morikawa, National Institute of Health Sciences, Setagaya-Ku, Tokyo, Japan

P105 Top Ten Food Safety Problems in the US Food Processing Industry — AYLIN SERTKAYA, Ayesha Berlind, Rachel Lange, and Don L. Zink, Eastern Research Group, Inc., Lexington, MA, USA

P106 Residues of Antibiotic in Muscle, Kidney and Liver in Pigs — Delia González, Agustín Ramírez, CARLOS PACHECO, Michael Kühne, Lourdes Huerta, Susana Medina, and Tania Merino, Universidad de Guadalajara, Zapopan, Jalisco, Mexico

P107 A PCR-ELISA for Detection of Potential Sterigmatocystin and Aflatoxin Producing Fungi — ZHENG-YOU YANG, Won-Bo ShimBam-Song Nam, and Duck-Hwa Chung, Graduate School of Gyeongsang National University, Chinju, Gyeongnam, Korea

P108 DSC Production and Characterization of Monoclonal Antibody against Pirimiphos Methyl — ZHENG-YOU YANG, Won-Bo Shim, Jung-Suk Kim, Se-Li Kim, and Duck-Hwa Chung, Graduate School of Gyeongsang National University, Chinju, Gyeongnam, Korea

P109 Ranking Microbiological Food Safety Risks in New Zealand — PETER CRESSEY and Rob Lake, Institute of Environmental Science and Research, Christchurch, Canterbury, New Zealand

P110 Mutagenicity and Recombinogenicity of the Unique Radiolytic Compound 2-Dodecylcyclobutanone in Short-term Genetic Toxicology Assays — Christopher Sommers and BRENDAN NIEMIRA, USDA-ARS-NAA-ERRC, Wyndmoor, PA, USA

P111 Patulin Reduces Glutathione Level and Enzyme Activities in Rat Liver Slices and Induces Lipid Peroxidation — Erika Pfeiffer, Tabea T. Diwald, and MANFRED METZLER, University of Karlsruhe, Karlsruhe, Germany

Education

P112 Development of a Consumer Food Safety Communication Strategy Using a Triangulation of Formative Research Methods — ELIZABETH C. REDMOND and Christopher J. Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P113 Survey Respondents' Attributions about Foodborne Illness: What Leads People to Believe That Certain Meals Made Them Sick? — LAURA R. GREEN and Carol Selman, RTI International, Atlanta, GA, USA

P114 Status Quo of Food Safety Management in Small to Medium-sized South African Food Processing Companies — A. VON HOLY, University of the Witwatersrand, Wits, South Africa

P115 Evaluation of a "Train-the-Trainer" Project: HACCP Training for Food Service Managers — HEA-RAN L. ASHRAF, Sandra Atwood, Jim Bloom, and Dave Blaise, Southern Illinois University at Carbondale, Carbondale, IL, USA

P116 Efficacy of a HACCP-based Foodhandling Training Program for Front-line Food Service Workers — HEA-RAN L. ASHRAF, Sandra Atwood, Jim Bloom, and Dave Blaise, Southern Illinois University at Carbondale, Carbondale, IL, USA

Pathogens

P117 DSC A Predictive Model to Determine the Effect of Drying Temperature and Marination in Reducing *Listeria monocytogenes* Population during Drying of Beef Jerky — YOHAN YOON, Panagiotis N. Skandamis, Patricia A. Kendall, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P118 Modeling the Effect of Aerobic and Anaerobic Storage on Growth/No Growth Interface of *Listeria monocytogenes* as a Function of Temperature, Sodium Lactate, Sodium Diacetate and NaCl — PANAGIOTIS N. SKANDAMIS, Yohan Yoon, Jarret D. Stopforth, Patricia A. Kendall, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P119 Evaluation of Home-preparation Methods for Reduction of *Listeria monocytogenes* on Artificially Inoculated Frankfurters — MARCOS X. SANCHEZ-PLATA, Andres M. Vargas, and Harshavardhan Thippareddi, University of Nebraska-Lincoln, Lincoln, NE, USA

P120 DSC Five State Epidemiological Survey of Four Farm Animal Types for *Listeria monocytogenes* — DAVID RASMUSSEN, John Mount, Svetlana Zivanovic, John New, Harry Richards, Philipus Pangloli, and Ann Draughon, University of Tennessee, Knoxville, TN, USA

P121 DSC Development of Predictive Models for the Survival of *Listeria monocytogenes* on Broth and Sausage as a Function of Temperature, pH and Antimicrobials — S. S. JIN, B. K. Park, and D. H. Oh, Kangwon National University, Chunchon, Kangwon, Korea

P122 Cross-contamination of Deli Meat by *Listeria monocytogenes* on a Commercial Slicer — CHIA-MIN LIN, Kazue Takeuchi, Michael P. Doyle, Cynthia B. Dohm, Joseph D. Meyer, and Paul A. Hall, University of Georgia, Griffin, GA, USA

P123 Acquisition of Multi-drug Resistance in the Foodborne Pathogen *Salmonella* Newport — MARK MAMMEL, Eric Brown, J. Eugene LeClerc, John Besser, David Boxrud, Kirk Smith, and Thomas Cebula, FDA, Laurel, MD, USA

P124 A Comparative Study of a New Automated Rapid Test Method and an FDA/BAM Method for the Detection of Staphylococcal Enterotoxins in Food Samples — JILL GEBLER, Murray Goulburn Co-op Co. Ltd., Yarram, Victoria, Australia

P125 DSC Evaluation of Gaseous Chlorine Dioxide for Its Effectiveness in Killing *Salmonella* on Blueberries, Raspberries, and Strawberries — KAYE V. SY and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P126 DSC Fate of *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella* spp. in Reduced Sodium Beef Jerky — RUTH ANN MORROW, Mark A. Harrison, and Judy A. Harrison, University of Georgia, Athens, GA, USA

P127 DSC Variation in Acid Resistance among *Escherichia coli* O157:H7 Strains in a Model Stomach System — TERESA M. LARGE and Thomas S. Whittam, Michigan State University, East Lansing, MI, USA

P128 DNA-based Microarray Detection of *Escherichia coli* O157:H7 — HARRY A. RICHARDS, Jake Stevens, C. Neal Stewart Jr., and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P129 DSC Occurrence of *Escherichia coli* O157:H7 in Multiple Farm Environments across the United States — C. A. DOANE, Harold Richards, Phillipus Pangloli, John R. Mount, and F. Ann Draughon, University of Tennessee, Strawberry Plains, TN, USA

P130 An Eight-hour Presence/Absence Test for *Escherichia coli* O157:H7 in Ground Beef — KELLEY A. HARRIGAN and Kristi R. Harkins, Advanced Analytical, Ames, IA, USA

P131 DSC Comparison of Antibiotic Resistance and Genotyping of *Campylobacter jejuni* Isolated from Chickens and Turkeys at Retail — X. LIU, C. Gilbert, H. Wang, I. Rhodes, A. O'Leary, and M. F. Slavik, University of Arkansas, Fayetteville, AR, USA

P132 The Effect of *Campylobacter jejuni* Population Density on Survival and AI-2 Production at Varying Oxygen Levels — CHIN-YI CHEN and Peter L. Irwin, USDA-ARS-ERRC, Wyndmoor, PA, USA

P133 DSC Occurrence and Resistance to Antibiotics of Thermophilic *Campylobacter* spp. in Farm Animals — WILLIE J. TAYLOR, Harry Richards, Philipus Pangloli, Stephen P. Oliver, David A. Golden, Ming Huang, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P134 DSC Identification of the Cause of Apparent Growth of *Clostridium perfringens* at 4.4°C — SARAH SMITH-SIMPSON and Donald Schaffner, Rutgers University, New Brunswick, NJ, USA

P135 Fate of *Enterobacter sakazakii* ATCC 12868 in Temperature-abused Reconstituted Infant Formula Containing Selected Probiotic Cultures — MAKUBA A. LIHONO, Bledar Bisha, Aubrey Mendonca, LaTanya Bankston, and Terri Boyston, University of Arkansas-Pine Bluff, Pine Bluff, AR, USA

P136 DSC Prevalence of Zoonotic Enteric Bacterial Pathogens in Dogs and Cats with Diarrhea — OMAIMA AHMED, John New, Joseph Bartges, and F. Ann Draughon, University of Tennessee-Knoxville, Knoxville, TN, USA

P137 Critical Parameters in Collaborative Ring Trials of PCR-based Methods for Detection of Foodborne Pathogens — M. D'Agostino, J. Hoorfar, and N. COOK, DEFRA Central Science Laboratory, Sand Hutton, York, UK

P138 3M™ Petrifilm™ Environmental Listeria Plate for the Rapid Enumeration of *Listeria* from Environmental Surfaces — BARBARA HORTER, Henry Lubrant, and Kathryn Lindberg, 3M Microbiology, St. Paul, MN, USA

P139 Comparison of Polymerase Chain Reaction and USDA Culture Procedure to Detect *Listeria monocytogenes* in Deli Meats — CHIA-MIN LIN, Lei Zhang, Michael P. Doyle, Cynthia B. Dohm, Joseph D. Meyer, and Paul A. Hall, University of Georgia, Griffin, GA, USA

P140 Evaluation of a Lateral Flow Immunoassay for the Detection of *Listeria* spp. in a Variety of Foods — J. Li, C. Figard, M. Sutzko, L. Tran, and G. TEANEY, Strategic Diagnostics Inc., Newark, DE, USA

P141 Detection of *Listeria* spp. in Environmental Samples by a Combination of Wet Composites and a Novel Immunocapture Method — John Murray, Nicole Prentice, MICHELLE GORDON, and Adrian Parton, Matrix MicroScience, Golden, CO, USA

P142 Evaluation of CHROMagar *Listeria* with Spiked Hot Dogs — VICKI RITTER, Nancy Dick, Susan Kircher, Krista Sturm, and Patty Warns, Becton Dickinson, Cockeysville, MD, USA

P143 Evaluation of a New Chromogenic Medium for the Detection of *Listeria monocytogenes* — Tamsin Baalham, Caroline Willis, Frances Presland, Melody Greenwood, and PETER STEPHENS, Oxoid Limited, Basingstoke, UK

P144 Evaluation of a New Rapid Screening Kit for the Differentiation of *Listeria monocytogenes* from Other *Listeria* Species — Lieve Herman, Ann Vanhee, Tamsin Baalham, and PETER STEPHENS, Oxoid Limited, Basingstoke, UK

P145 A Rapid Method for Detection of *Escherichia coli* O157:H7 Using Dynabeads® and FT-IR Spectroscopy — Y. BURGULA, D. M. Khali, S. Kim, B. R. Reuhs, and L. J. Mauer, Purdue University, West Lafayette, IN, USA

P146 Automated Microwell-format DNA Hybridization Assays and Immunoassays for Pathogens in Foods — Ann Stafford, Susan Alles, Heather Donohue, and MARK MOZOLA, Neogen Corporation, Lansing, MI, USA

P147 DSC Comparison of Conventional Culture Methods and FTA® Filtration-nested PCR for the Detection of *Shigella* spp. on Tomato Surfaces — BENJAMIN WARREN, Mickey Parish, and Keith Schneider, University of Florida, Gainesville, FL, USA

TUESDAY AFTERNOON — AUGUST 10, 2004
1:30 P.M. — 3:30 P.M.

S14 Update on Foodborne Disease Outbreaks
Grand Sonoran E

Organizers/Convenors: Jeff Farrar and Jack Guzewich

1:30 Hepatitis A and Imported Green Onions — The Epi Investigations — ANTHONY FIORE, CDC, Atlanta, GA, USA and THOMAS HILL, FDA-CFSAN, College Park, MD, USA

2:10 A Summary of Lettuce Related Outbreaks in the United States — CAROL SELMAN, CDC, Atlanta, GA, USA

2:50 Late Breaking News: An Investigation of Multidrug Resistant *Salmonella* Typhimurium DT104 Infections and Ground Beef in the Northeastern United States — AMY DECHET, CDC, Atlanta, GA, USA

The FSIS Investigation and Perspective on the *S.* Typhimurium DT104 Outbreak — KRISTIN HOLT, USDA-FSIS, Atlanta, GA, USA

An outbreak of *Salmonella* Typhimurium DT 104 Gastroenteritis Associated with Whole Beef Consumption, Virginia, 2003 — ASIM JANI, CDC, Richmond, VA, USA

S15 Everything You Wanted to Know about Adopting New Methods... But Were Afraid to Ask!
Grand Sonoran F

Organizers/Convenors: Philip Coombs and Ruth Eden

1:30 The Innovation Process from an Idea to a New Rapid Method on the Market — RUTH FIRSTENBERG-EDEN, BioSys, Ann Arbor, MI, USA

1:50 Preparing New Methods for the Microbiology Laboratory — JAY ELLINGSON, Marshfield Clinic Laboratories, Marshfield, WI, USA

2:10 Getting a New Method Accepted: The United States and International Regulatory Approval Process — SHARON BRUNELLE, Brunelle Biotech Consulting, Woodinville, WA, USA

2:30 Generating Independent Data for Regulatory Approvals: Types of Data Required — The Ruggedness of the Process — ROY BETTS, Campden & Chorleywood Food Research Association, Gloucestershire, UK

2:50 Implementation of a Novel Method: The Kraft Experience — MARK CARTER, Kraft Foods, Inc., Glenview, IL, USA

3:10 Implementation of a Novel Method: The Nestlé Experience — TIM JACKSON, Nestlé Research Center, Lausanne, Switzerland

S16 Food Toxicology 101: Basics for the Food Safety Professional
Grand Sonoran G

Organizer/Convenor: Catherine Nnoka

Topics and Speakers to be determined

S17 *Salmonella* Control in Broiler Chickens: What Can We Learn from the Scandanavian Experience
Grand Sonoran H-K

Sponsored by IAFP Foundation Fund
Organizer: J. Stan Bailey
Convenors: J. Stan Bailey and Tanya Roberts

1:30 Swedish and Danish *Salmonella* Control Programs — JOHAN LINDBLAD, The Swedish Poultry Meat Association, Stockholm, Sweden

2:10 Practical Options for the United States On-farm *Salmonella* Control Program — J. STAN BAILEY, USDA-ARS, Athens, GA, USA

2:50 Economic Impact of Swedish and Danish *Salmonella* Control Programs and Possible Alternative United States Approaches — TANYA ROBERTS, USDA-ERS, Washington, D.C., USA

T04 Education
Grand Sonoran A-B

T37 1:30 Managing Food Safety: USFDA HACCP Guides for Operators and Regulators of Retail and Food Service Establishments — ALAN M. TART, FDA, Atlanta, GA, USA

T38 1:45 Evaluation of Novel Information Resources to Assist SMEs and Microbusinesses with Hazard Analysis — LEANNE ELLIS, Louise Fielding, Cliff Beveridge, and Adrian Peters, University of Wales Institute Cardiff, Cardiff, UK

T39 2:00 Grower and Farm Worker Surveys Highlight the Need for Personal Hygiene Training Programs — ELIZABETH A. BIHN and Robert B. Gravani, Cornell University, Ithaca, NY, USA

T40 2:15 DSC Secret Shopper: Grocery Store Employee Food Handling Practices from a Customer's Perspective — LISA MATHIASEN and Douglas Powell, University of Guelph, Guelph, ON, Canada

T41 2:30 DSC An Evaluation of Food Safety Information Transfer to Employees: One-page Media Summary Sheets in Food Service and Agriculture — BENJAMIN CHAPMAN and Douglas Powell, University of Guelph, Guelph, ON, Canada

T42 2:45 Food Safety Education in the United Arab Emirates — SANDRA POIRIER and Thamir Alnajjar, Zayed University, Dubai, United Arab Emirates

T43 3:00 DSC The Design and Evaluation of Food Safety Messages and Media for Canadian Restaurant Take-out Consumers — BRAE SURGEONER and Doug Powell, University of Guelph, Guelph, ON, Canada

T44 3:15 Handling and Storage Practices for Frankfurters, Deli Meats, and Deli Salads: Results of a Consumer Survey — SHERYL C. CATES, Roberta A. Morales, Shawn A. Karns, Peter Cowen, Lee-Ann Jaykus, Toby Teneyck, Katherine M. Kosa, and Hong Yang, RTI International, 3040 Cornwallis Road, Research Triangle Park, NC 27709, USA

T05 Risk Assessment
Grand Sonoran C-D

T45 1:30 *Bacillus cereus*: A Quantitative Risk Assessment-based Approach to the Development of Infant Formula Safety Standards — JOANNA SHEPHERD, Bruce Hill, and Peter Wiles, Fonterra Research Centre, Palmerston North, New Zealand

T46 1:45 DSC Application of Decision Analysis Tools to the Decision of Whether to Test for the Presence of *Listeria monocytogenes* in Smoked Fish — KELLY A. STEVENS and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

T47 2:00 The Food Safety Universe Risk Assessment and Risk Ranking Database — Bruce McNab, Grant Campbell, Ana Matu, and MICHAEL CASSIDY, Ontario Ministry of Agriculture and Food, Guelph, ON, Canada

Tuesday p.m., *continued*

T48 2:15 Deploying Risk Assessment Modeling to Determine Safe Shelf Life — JOHN BASSETT, Christelle Billon, and Chris Jones, Unilever Research and Development, Bedford, Bedfordshire, UK

T49 2:30 Modeling the Frequency and Duration of Microbial Contamination Events: Considering Uncertainty and Variability in Censored Data — MARK POWELL and Greg Paoli, USDA, Washington, D.C., USA

T50 2:45 Verification of a Tertiary Model for Growth of *Salmonella* — THOMAS P. OSCAR, USDA-ARS, Princess Anne, MD, USA

T51 3:00 Rapid Pathogen Quantification in Meat Swabs and Rinsates Using Real-time PCR — REBECCA A. GUY, Anita Kapoor, and Paul. A. Horgen, University of Toronto-Mississauga, Mississauga, ON, Canada

T52 3:15 Survival of Pathogenic Bacteria on Contaminated Gloves — DAVID MACINGA, James Arbogast, Terri Eastman, Daryl Paulson, and Michael Dolan, GOJO Industries, Inc., Akron, OH, USA

TUESDAY AFTERNOON — AUGUST 10, 2004
3:45 P.M. — 4:30 P.M.

John H. Silliker Lecture
Grand Sonoran FG

Guess Who's Come to Stay — The Resident Pathogen Issue — R. Bruce Tompkin, Retired Vice President of Product Safety, ConAgra Refrigerated Foods

4:45 p.m. — 5:30 p.m.
Business Meeting
Grand Sonoran E

WEDNESDAY MORNING — AUGUST 11, 2004
8:30 A.M. — 12:00 P.M.

S18 Credibility in Science
Grand Sonoran E
Organizer/Convenor: International Food Information Council (IFIC)

8:30 Topic to be determined — SYLVIA ROWE, International Food Information Council, Washington, D.C., USA

9:00 Research under the Microscope: An Academic Perspective — ROBERT B. GRAVANI, Cornell University, Ithaca, NY, USA

9:30 Addressing the Issue First Hand: The Industry's Approach — DAVID M. THENO, Jack in the Box, San Diego, CA, USA

10:00 Break

10:30 USDA-FSIS Perspective — To be announced

11:00 FDA-CFSAN Approach — BOB BRACKETT, FDA-CFSAN, College Park, MD, USA

11:30 Panel Discussion

S19 Risk and Control of *Enterobacter sakazakii*
Grand Sonoran F

Sponsored by IAFP Foundation Fund
Organizers/Convenors: Tim Jackson and Maria Nazarowec-White

8:30 History and Ecology of *Enterobacter sakazakii* — MARIA NAZAROWEC-WHITE, Agriculture and Agri-Food Canada, Nepean, ON, Canada

9:00 Development of Methods for the Detection of *Enterobacter sakazakii* — STEVE FORSYTHE, Nottingham Trent University, Nottingham, UK

9:30 Control of *Enterobacter sakazakii* in Infant Formula Production — LES SMOOT, Nestlé USA, Dublin, OH, USA

10:00 Break

10:30 Control of *Enterobacter sakazakii* in a Clinical Setting — JATINDER BHATIA, Medical College of Georgia, Augusta, GA, USA

11:00 Risk Assessment of *Enterobacter sakazakii* — MARCEL ZWIETERING, Wageningen University, Wageningen, The Netherlands

11:30 Regulatory Perspectives on *Enterobacter sakazakii* and Other Opportunistic Pathogens — DON ZINK, FDA-CFSAN, College Park, MD, USA

S20 Impact of Environmental Viral and Parasitic Contamination on Food Safety
Grand Sonoran G

Sponsored by IAFP Foundation Fund
Organizer: Nigel Cook
Convenors: Nigel Cook and Doris D'Souza

8:30 Prevalence and Survival of Viruses in the Environment — ALBERT BOSCH, Virus Enterics, Microbiologia UB, Barcelona, Spain

9:00 Environmental Routes of Food Contamination with Viruses and Related Outbreaks of Viral Disease — WIM VAN DER POEL, National Institute of Public Health and the Environment, Bilthoven, The Netherlands

9:30 Control and Intervention Strategies to Combat Virus Transmission through the Environment — SABAH BIDAWID, Health Canada, Ottawa, ON, Canada

10:00 Break

10:30 Prevalence and Survival of Parasites in the Environment — TONY GRIMASON, University of Strathclyde, Glasgow, Scotland

11:00 Environmental Routes of Food Contamination with Parasites and Related Outbreaks of Parasitic Disease — HUW SMITH, Scottish Parasite Diagnostic Laboratory, Glasgow, Scotland

11:30 Control and Intervention Strategies to Combat Parasite Transmission through the Environment — JAMES TROUT, USDA-ARS, Beltsville, MD, USA

S21 Safety of Raw Milk Cheeses — The State of the Science
Grand Sonoran H-K

Sponsored by California Dairy Research Foundation
Organizer/Convenor: John C. Bruhn

8:30 Introduction — JOHN C. BRUHN, University of California-Davis, Davis, CA, USA

8:35 The National Academy of Sciences Report — An Overview of Its Dairy Food Recommendations — LINDA J. HARRIS, University of California-Davis, Davis, CA, USA

9:00 History of the Sixty Day Aging Requirement — KATHRYN J. BOOR, Cornell University, Ithaca, NY, USA

9:20 What the Literature Shows Regarding the Survival of Pathogens in Cheese — The Aging Effects — ELLIOT T. RYSER, Michigan State University, East Lansing, MI, USA

10:00 Break

10:30 Current Findings on Cheese Outbreaks and Current Knowledge of Risk Assessments — CATHERINE W. DONNELLY, University of Vermont, Burlington, VT, USA

11:10 Perspectives on Cheeses Made from Raw Milk — Comments of Keeping Raw Milk Cheeses — DEBRA DICKERSON, SINGULAR 3D Cheese, Oakland, CA, USA

11:30 Cheese Tasting

S22 Packaging Innovations, Safety Concerns and Seafood
Grand Sonoran A-B

Organizer: Marlene E. Janes
Convenors: Marlene E. Janes and Kathleen O'Donnell

8:30 Modified Atmosphere Packaging and *Listeria monocytogenes* — DOUGLAS L. MARSHALL, Mississippi State University, Mississippi State, MS, USA

9:00 Reduced Oxygen Packaging and *Clostridium botulinum* Safety Concerns for Seafood Processors — JON BELL, Louisiana State University, Baton Rouge, LA, USA

9:30 Industry Perspective of Regulations on Reduced Atmosphere Packaging of Seafood — JEFFERY RHODEHAMEL, Cryovac/Sealed Air Corp., Duncan, SC, USA

10:00 Break

10:30 Technological Perspectives: Reduced Oxygen Packaging of Seafood — JAMES COX, All QA Products, LLC, Belmont, NC, USA

11:00 Antimicrobial Edible Coatings for Protection from Foodborne Pathogens — MARLENE E. JANES, Louisiana State University, Baton Rouge, LA, USA

11:30 Regulatory Perspective on Reduced Oxygen Packaging of Seafood — MARY LOSIKOFF, FDA-CFSAN, College Park, MD, USA

S23 Heat-resistant Spoilage Microorganisms in the Juice and Beverage Industry
Grand Sonoran C-D

Organizers: Mickey Parish, Jena Roberts, Pamela A. Wilger, and Randy W. Worobo
Convenors: Pamela A. Wilger and Randy W. Worobo

8:30 Overview of Heat-resistant Microorganisms in the Juice and Beverage Industry — DALE MORTON, PepsiCo Beverages & Foods Quality, Barrington, IL, USA

9:00 Addressing Zero Tolerance for Heat-resistant Microorganisms during Production of Juice and Beverage Ingredients — JOE SHEBUSKI, Cargill, Inc., Minneapolis, MN, USA

9:30 The Struggle towards a Universal Method for Detection and Confirmation of *Alicyclobacillus* spp. — MICKEY PARISH, University of Florida, Lake Alfred, FL, USA AND RANDY WOROBO, Cornell University, Geneva, NY, USA

10:00 Break

10:30 The Continual Persistence — Heat-resistant Molds in Juices and Beverages — LARRY BEUCHAT, University of Georgia, Griffin, GA, USA

11:00 Evaluation of *Alicyclobacillus* spp. Mediated Defects in Formulated Juice Products — PAUL GERHARDT, The National Food Laboratory, Inc., Dublin, CA, USA

11:30 Panel Discussion

P04 Pathogens
Grand Canyon

8:00 a.m. — 12:00 p.m.
(Authors present 9:30 a.m. — 11:30 a.m.)
Convenors: Stephan Flessa and Aaron Uesugi

P148 Antibiotic Resistance Patterns of *Yersinia enterocolitica* Farm Isolates — J. H. STEVENS, Harold Richards, Saumya Bhaduri, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P149 Serotype, Antimicrobial Resistance Patterns, Genotype and Virulence Characteristics of Pathogenic *Yersinia enterocolitica* Isolated from Swine Feces — SAUMYA BHADURI, Irene V. Wesley, F. Morgan Wallace, Harry Richards, and Ann Draughon, USDA-ARS, Wyndmoor, PA, USA

P150 Evaluation of a New Chromogenic Medium for the Isolation of *Bacillus cereus* from Foods — Jonathan Cloke, Martin Ring, Shainaz Campbell, Elizabeth Smith, James Stringer, and PETER STEPHENS, Oxoid Limited, Basingstoke, UK

P151 Antibiograms and Epidemiological Analysis for the *Bacillus cereus* Strains Isolated from Foods and Foodborne Outbreaks or Cases in Taiwan — HAU-YANG TSEN, You-Miin Hsieh, and Yi-Cheng Ho, Hung-Kuang University, Taichung County 433, Taiwan, R.O.C.

P152 Survival and Control of *Escherichia coli* O157:H7 in Drinking Water for Cattle — TONG ZHAO, Michael P. Doyle, and Ping Zhao, University of Georgia, Griffin, GA, USA

P153 Comparison of Five *Escherichia coli* O157 Enrichment Media: Growth Rate, Selectivity with Pure Cultures and Recovery in Spiked Beef Samples — JINGKUN LI, Wendy Lauer, Sharon Brunelle, Ken Wikler, George Teaney, Orla Cloak, Meredith Sutzko, Tony Joaquim, and Jim Stave, Strategic Diagnostics Inc., Newark, DE, USA

P154 Vaccination as an Intervention Strategy for Reduction of *Escherichia coli* O157 during a 45-day Pre-conditioning Period — WILLIAM CHOAT, John Paterson, Keith Belk, and Gary Smith, Packerland Packing Company, Green Bay, WI, USA

P155 Role of Curli Fimbriae in Attachment of Enterohemorrhagic *Escherichia coli* Cells to Raw and Cooked, Ready-to-Eat Beef Products — DHARMENDRASINGH M. PAWAR and Jinru Chen, University of Georgia, Griffin, GA, USA

P156 DSC Phenotypic and Genotypic Characterization of Curli-expressing Enterohemorrhagic *Escherichia coli* — DHARMENDRASINGH M. PAWAR, and Jinru Chen, University of Georgia, Griffin, GA, USA

P157 Serotypes and Virulence Genes of Ovine Non-O157 Shiga Toxin-producing *Escherichia coli* in Switzerland — CLAUDIO ZWEIFEL, Jesus E. Blanco, Miguel Blanco, Jorge Blanco, and Roger Stephan, University of Zurich, Zurich, Zurich, Switzerland

P158 Heat Resistance Kinetics Variation among Various Isolates of *Escherichia coli* — VIJAY K. JUNEJA and Harry M. Marks, USDA-ARS-ERRC, Wyndmoor, PA, USA

P159 Expression of Caspase-3 during Enterohemorrhagic *Escherichia coli*-induced Apoptosis — LEONARD L. WILLIAMS, Wendy Lang, Krishaun Caldwell, Vamsi K. Vasireddy and Brandee N. Hunter, Alabama A&M University, Normal, AL, USA

P160 Evaluation of the Genevision™ *Escherichia coli* O157 Real-time PCR Assay — D. Plante, G. Taylor, A. H bert, P. Constant, M. Huber, Y. P. Côte, J. Bosley, S. Shaw, and B. W. BLAIS, Canadian Food Inspection Agency, Ottawa, ON, Canada

P161 Improved Method for Enrichment of *Escherichia coli* O157:H7 Using Acidification — MICHAEL A. GRANT, FDA, Bothell, WA, USA

P162 Altered Resistance of Acid-adapted *Escherichia coli* O157:H7 and *Listeria monocytogenes* to Hydrogen Peroxide and PRO-SAN™ — MARIA ROMERO, Ainura Orozalieva, and Aubrey Mendonca, Iowa State University, Ames, IA, USA

P163 Influence of Acid Adaptation on Survival and Injury of *Escherichia coli* O157:H7 in Physiological Saline following Exposure to Ultraviolet Radiation — NATALIA WEINSETEL and Aubrey Mendonca, Iowa State University, Ames, IA, USA

P164 Effect of Drying on Survival and Acid Tolerance of *Escherichia coli* O157:H7 Biofilms Formed in Beef Decontamination Runoff Fluids — PANAGIOTIS N. SKANDAMIS, Jarret D. Stopforth, Laura V. Ashton, Ifigenia Geornaras, Patricia A. Kendall, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P165 DSC Acid Tolerance Response of Acid-adapted or Nonadapted *Escherichia coli* O157:H7 Strains Grown as a Mixture or as Individual Strains and Mixed Prior to Inoculation on Beef Tissue or in Beef Decontamination Runoff Fluids — JARRET D. STOPFORTH, Panagiotis N. Skandamis, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P166 Survival of *Bacillus anthracis* in Foods — Y.-Y. DIANA HAO and Richard C. Whiting, FDA-CFSAN, College Park, MD, USA

P167 The Efficiency of Conventional Pasteurization Treatment of Water, Media, and Milk Deliberately Contaminated with *Bacillus anthracis* (Sterne) Spores — JOHN S. NOVAK, Jeffrey Call, Morgan Wallace, Peggy Tomasula, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P168 Capillary Isoelectric Focusing: A Novel Analytical Method for Rapid Detection of the Noroviruses — Carolyn Goodridge, LAWRENCE GOODRIDGE, Jiaqi Wu, Mansel Griffiths, and Janusz Pawliszyn, University of Wyoming, Laramie, WY, USA

P169 Long-term Survival of *Enterobacter sakazakii* in Powdered Infant Formula — SHARON G. EDELSON-MAMMEL and Robert L. Buchanan, HHS-FDA-CFSAN, College Park, MD, USA

P170 Acid Resistance of Twelve Strains of *Enterobacter sakazakii* — SHARON G. EDELSON-MAMMEL and Robert L. Buchanan, DHHS-FDA-CFSAN, College Park, MD, USA

P171 Novel Selective Medium for Isolation of *Enterobacter sakazakii* — SE-WOOK OH, Sun Young Lee, and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

P172 A New Method for Next Day Detection of *Listeria* in Food — DENISE HUGHES, Keith Tan, and Selina Begum, DH Micro Consulting, Peelwood, NSW, Australia

P173 Evaluation of the Vidas *Listeria* Species Xpress (LSX) Test for the Detection of *Listeria* Species in Foods — R. A. GREEN, C. L. Baylis, and R. P. Betts, Campden & Chorleywood Food Research Association, Chipping Campden, Glos, UK

P174 Phenotypic Analyses of the Putative CRP/FNR Family of Transcriptional Regulators of a Serotype 4b Strain of *Listeria monocytogenes* — GAYLEN A. UHLICH, Laura D. Wonderling, Nancy G. Faith, Brien L. Neudeck, Jennifer M. Loeb, Charles J. Czuprynski, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P175 Modeling the Interaction of the Physiological State of the Inoculum and CO_2 Atmosphere on the Lag Phase and Growth of *Listeria monocytogenes* — ANTONIO J. DE JESUS and Richard C. Whiting, FDA-CFSAN, College, Park, MD, USA

P176 Colonization of Various Sprouts by *Listeria monocytogenes* — LISA GORSKI, USDA-ARS-WRRC, Albany, CA, USA

P177 Effect of Competitive Microflora on the Growth and Cold Shock Response of *Listeria monocytogenes* — Tina Y. Girard and LISBETH TRUELSTRUP HANSEN, Dalhousie University, Halifax, NS, Canada

P178 Heat and Acid Tolerance Response of *Listeria monocytogenes* as Affected by Sequential Exposure to Hurdles during Growth — PANAGIOTIS N. SKANDAMIS, Jarret D. Stopforth, Yohan Yoon, Ifigenia Geornaras, Patricia A. Kendall, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P179 Acid Tolerance Response of Inoculated *Listeria monocytogenes* during Storage in Vacuum Packages at 10°C of Pork Sausage or Frankfurters Treated with Antimicrobials — LAURA V. ASHTON, Ifigenia Geornaras, Panagiotis N. Skandamis, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P180 Regulation of *Vibrio vulnificus* cadBA Operon Required for Acid Tolerance by cadC and Leucine-Responsive Regulatory Protein — Jee Eun Rhee, URyung Park, Sang-Do Ha, and SANG HO CHOI, Seoul National University, Seoul, South Korea

P181 Identification of the *Vibrio vulnificus* putAP Operon and Evaluation of Its Role in Survival under Osmotic Stress — Jeong Hyun Lee, URyung Park, Sang-Do Ha, and SANG HO CHOI, Seoul National University, Seoul, South Korea

P182 Comparison of BBL CHROMagar *Vibrio* and TCBS for the Recovery of *Vibrio cholerae* and *Vibrio parahaemolyticus* from Spiked Oyster Samples — KRISTA STURM, Nancy Dick, Susan Kircher, Vicki Ritter, and Patty Warns, Becton Dickinson, Cockeysville, MD, USA

P183 Study on Detection and Identification of Foodborne Pathogens by Gene Chip Assay — DA-ZHI JIN, Ji-Juan Cao, Ming-Jie Xie, Ning-Ning Ma, Wei Han, and Ming Gu, Liaoning Normal University, Dalian, Liaoning, China

P184 Fecal Bacterial Pathogens and Indicators in Commercially Available Compost — DAVID T. INGRAM and Patricia D. Millner, USDA-ARS, Beltsville, MD, USA

P185 The Survival of *Escherichia coli* O157:H7, *Salmonella* Typhimurium, and *Listeria monocytogenes* in Angelica Keiskei and Sliced Carrot after Electron Beam Irradiation — DONG KWAN JEONG and Key Whang, Kosin University, Busan, Korea

P186 Development of a Multiplex PCR Assay for the Detection of *Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* Typhimurium, and *Campylobacter jejuni* in Artificially Contaminated Food Samples — H. WANG and M. Slavik, University of Arkansas, Fayetteville, AR, USA

P187 Preliminary Study: Effectiveness of Ferrioxamine E as a Supplement to Isolate *Salmonella* Enteritidis from Shell Eggs — IRIS ENID VALENTêN-BON, Kun Ho Seo, and Robert E. Brackett, FDA-CFSAN, College Park, MD, USA

P188 Selective Isolation of *Salmonella* Enteritidis from Mixed Cultures in Eggs, Using Ferrioxamine E Supplementation — KUN-HO SEO, Iris Valentin-Bon, and Robert Brackett, FDA-CFSAN, College Park, MD, USA

P189 DSC Differentiation and Classification of the Crude Lipopolysaccharides from *Salmonella* Species Using Fourier Transform Infrared Spectroscopy and Canonical Variate Analysis — S. KIM, Y. Burgula, T. Ojanen-Reuhs, B.L. Reuhs, M.A. Cousin, and L. J. Mauer, Purdue University, West Lafayette, IN, USA

P190 Evaluation of Competitive Exclusion and Water Acidification on *Salmonella* in Live Turkey Operations — PATRICK J. KRAKAR, W. Payton Pruett, and R. Bruce Tompkin, ConAgra Foods, South Holland, IL, USA

P191 *Salmonella* Typhimurium DT104 and Non-DT104 in Ontario, 2000 — MARILYN B. LEE, Dean Middleton, and Bruce Ciebin, Ryerson University, Toronto, ON, Canada

P192 Significant Reduction in Incidence and Numbers of Total *Campylobacter* and Ciprofloxacin-resistant *Campylobacter* in Rinses from Retail Raw Chicken Carcasses in 2003 — RAMAKRISHNA NANNAPANENI, Robert Story, Keith C. Wiggins, and Michael G. Johnson, University of Arkansas, Fayetteville, AR, USA

P193 Use of a Hybridoma Cell Model to Assess the Virulence of *Campylobacter jejuni* Isolates from Broiler Samples — Dontraniece M. Guyton and LEONARD L. WILLIAMS, Alabama A&M University, Normal, AL, USA

P194 Development of a Novel Therapeutic Treatment of Chickens to Control *Campylobacter jejuni* Colonization — N. J. STERN, E. A. Svetoch, B. V. Eruslanov, Y. N. Kovalev, L. I. Volodina, V. V. Perelygin, E. V. Mitsevich, I. P. Mitsevich, V. D. Pokhilenko, V. N. Borzenkov, V. P. Levchuk, O. E. Svetoch, and T. Y. Kudriavtseva, USDA-ARS-RRC, Athens, GA, USA

P195 Prevalence and Types of *Campylobacter jejuni* in Potential Reservoirs and Transmission Routes of Human Campylobacteriosis — Megan Devane, Carolyn Nicol, Andrew Ball, John Klena, Paula Scholes, JOHN HUDSON, Marion Savill, Michael Baker, Brent Gilpin, and Nick Garrett, ESR Ltd., Ilam, New Zealand

P196 Genetic Characterization of Multi-drug Resistant Strains of *Campylobacter coli* from Turkeys — CAROL D'LIMA, Bong Choon Lee, Donna K. Carver, and Sophia Kathariou, North Carolina State University, Raleigh, NC, USA

WEDNESDAY AFTERNOON — AUGUST 11, 2004 1:30 P.M. — 5:00 P.M.

S24 Sanitation — Because You Have to Be Clean to Be Safe
Grand Sonoran E

Sponsored by IAFP Foundation Fund
Organizer: Mark A. Moorman
Convenors: Dennis Bogart and Lynn Helmers

1:30 Sanitation — How Clean is Clean? — ANN MARIE MCNAMARA, Silliker, Inc., Homewood, IL, USA

2:00 Operational Challenges in Sanitation — Changing Stress to Success — FRED REIMERS, H-E-B Grocery Co., San Antonio, TX, USA

2:30 Culture-based Sanitation — How to Make It a Core Value — WILLIAM E. MCCULLOUGH, Arby's Inc., Fort Lauderdale, FL, USA

3:00 Break

3:30 Mr./Ms. CEO — Help Me Help You. How to "Make the Case" for Sanitation — DENNIS STEARNS, Marler and Clark, Seattle, WA, USA

4:00 Sanitation Technological Building Blocks — CHRIS REMUS, Johnson Diversey, Detroit, MI, USA

4:30 Panel Discussion — Making the Case — ZEB E. BLANTON, JR., Florida Dept. of Agriculture and Consumer Services, Tallahassee, FL, USA

S25 The Global Food Safety Initiative
Grand Sonoran F

Sponsored by IAFP Foundation Fund
Organizer: Gordon Hayburn
Convenors: Louise Fielding and David Lloyd

1:30 The Global Food Safety Initiative and the Currently Approved Audit Standards — GORDON HAYBURN, University of Wales-Cardiff, Cardiff, UK

2:00 Undertaking the Audits: Getting the Right Decision — CAROL PAYNE, EFSIS Certification, Milton Keynes, UK

2:30 The Supermarket's Perspective — RAJAN KAMALANATHAN, Wal-Mart Stores Inc., Bentonville, AR, USA

3:00 Break

3:30 Benefits to Business – The Manufacturer — LOUISE FIELDING, University of Wales-Cardiff, Cardiff, UK

4:00 Challenges to the Adoption of Third Party Safety Assurance Certification in the USA and Canada — PAUL RYAN, Food Marketing Institute, Washington, D.C., USA

4:30 Panel Discussion – Interpretation and Clarification of Audit Standard Requirements

S26 Optimizing Data and Minimizing Risk
Grand Sonoran G

Organizers/Convenors: Michael Brodsky and Don Schaffner

1:30 Introduction — MICHAEL BRODSKY, Brodsky Consultants, Thornhill, ON, Canada

1:40 Using Data Management and Trend Analysis Techniques to Drive Continuous Improvement — CINDY M. RYAN, Nestlé USA, Dublin, OH, USA

2:25 Microbial Control: Where and How Raw Ingredient and Finished Product Testing Fit into the Big Picture — ROBERT BEHLING, Kornacki Food Safety Associates, LLC, Madison, WI, USA

3:05 Break

3:30 Microbial Control: Where and How Environmental/Investigation Sampling Fit into the Big Picture — JEFF KORNACKI, Kornacki Food Safety Associates, Madison, WI, USA

4:00 Solving Food Safety Problems in the Food Processing Environment Using Modeling and Risk Assessment — DON SCHAFFNER, Rutgers University, New Brunswick, NJ, USA

4:30 Utilizing Microbial Mapping and Six Sigma for Food Risk Assessment — LYNN LEGER, DuPont Canada, Mississauga, ON, Canada

S27 Biofilms and Their Impact on Food Safety
Grand Sonoran A-B

Sponsored by IAFP Foundation Fund
Organizers/Convenors: Robert B. Gravani and Katrina Vlahovich

1:30 Biofilms: An Overview of New Research Developments in Microbial Attachment — JOHN DUTCHER, University of Guelph, Guelph, ON, Canada

2:00 Microbial Attachment to Fruits and Vegetables — MARIA BRANDL, USDA-ARS-WRRC, Albany, CA, USA

2:30 Microbial Attachment to Meat and Poultry — JAMES S. DICKSON, Iowa State University, Ames, IA, USA

3:00 Break

3:30 Effectiveness of Cleaners and Sanitizers in Controlling Biofilms — DAVID HERWEYER, Wayne Chemical Inc., McBain, MI, USA

4:00 Practical Solutions to Control Microbial Attachment in Food Processing Plants — JOE M. STOUT, Kraft Foods, Northfield, IL, USA

4:30 Panel Discussion

T06 Chips and Salsa — General Food Microbiology and Methods
Grand Sonoran H-K

General Food Microbiology

T53 1:30 DSC Comparison of Bacteria Identified from Dairy Cattle, Swine, and Poultry Confinement Facilities — BETH ANN CROZIER-DODSON and Daniel Y. C. Fung, Kansas State University, Manhattan, KS, USA

T54 1:45 *Escherichia coli* and Shiga Toxin-producing *E. coli* in Livestock Forages — S. M. AVERY, L. D. Walters, B. Rarata, D. J. I. Thomas, and M. L. Hutchison, Direct Laboratory Services, Wolverhampton, England

T55 2:00 Association between the Microbial Profile of Freshly Dressed Beef Carcasses and Regulatory Compliance Ratings of Ontario Abattoirs — ABDULLAHI MAHDI, Pat Johnson, Joseph Odumeru, and Tom Baker, Ontario Ministry of Agriculture and Food, Guelph, ON, Canada

T56 2:15 Supercritical Carbon Dioxide Inactivation of Microorganisms in Liquid Food — KAZUE TAKEUCHI and James Yuan, Air Liquide, Countryside, IL, USA

T57 2:30 Sensory Evaluation of Irradiated Watercress (*Nasturtium officinallis*) — C. G. Martins, J. H. Behrens, L. C. Aragon-Alegro, V. S. Vieira, D. M. Vizeu, B. M. Hutzler, B. D. G. M. Franco, M. T. Destro, and M. LANDGRAF, Universidade de São Pãulo, São Pãulo, Brazil

T58 2:45 Changes in *Listeria monocytogenes* Heat Resistance during Cold Storage — SU-SEN CHANG and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

3:00 Break

Methods

T59 3:30 Growth Characteristics and Guaiacol Production Ability of *Alicyclobacillus* spp. — SU-SEN CHANG and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

T60 3:45 DSC Simple Detection Method for Guaiacol Producing *Alicyclobacillus* spp. — SU-SEN CHANG and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

T61 4:00 DSC Flow Cytometric Assessment of Dead, Viable and Injured *Listeria* Cells during Heat Injury — VERA K. PETROVA and Catherine W. Donnelly, University of Vermont, Burlington, VT, USA

T62 4:15 Comparative Analysis of Modified Ecolite Method and MPN Method for Detecting *Escherichia coli* in Orange Juice — Gregory W. Durbin and ROBERT S. SALTER, Charm Sciences Inc., Lawrence, MA, USA

T63 4:30 Microfluidics-based Optical Immunosensor for Detection of Foodborne Pathogens — YANBIN LI and Xiaoli Su, University of Arkansas, Fayetteville, AR, USA

T64 4:45 Rapid and Quantitative *Campylobacter* Detection Using an Interferometric Biosensor — Jie Xu and DAVID S. GOTTFRIED, Georgia Tech Research Institute, Atlanta, GA, USA

T07 Pathogens
Grand Sonoran C-D

T65 1:30 Direct Detection of *Listeria monocytogenes* from Artificially Contaminated Frankfurters — KELLY A. STEVENS and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

T66 1:45 A Solid Agar Overlay Method for Recovery of *Listeria monocytogenes* — Zhinong Yan, Joshua B. Gurtler, and JEFFREY L. KORNACKI, University of Georgia, Madison, WI, USA

T67 2:00 Thermal Resistance of *Salmonella* spp., *Listeria monocytogenes* and *Staphylococcus aureus* in High Solids Egg Mixes — XIN LI and Brian W. Sheldon, North Carolina State University, Raleigh, NC, USA

T68 2:15 DSC Survival of *Escherichia coli* O157:H7 in Manure under Different Storage Conditions — ALEJANDRO ECHEVERRY, Guy H. Loneragan, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

T69 2:30 Factors Affecting Survival/Growth of *Escherichia coli* O157:H7 in Fresh Beef Decontamination Runoff Waste Fluids and the Resistance of Pathogen Cells to a Subsequent Lactic Acid (pH 3.5) Stress — JOHN SAMELIS, John N. Sofos, Patricia A. Kendall, and Gary C. Smith, National Agricultural Research Foundation, Ioannina, Greece

T70 2:45 Phage Instability in *Escherichia coli* O157:H7: Implications for Both Phage-directed and Culture-based Methods of Identification — FRANK R. BURNS, Nisha Patel, Timothy R. Dambaugh, Mitch White, and Bridget Andalaro, DuPont Qualicon, Wilmington, DE, USA

3:00 Break

T71 3:30 DSC An Integrated Mathematical Model of Heat Transfer and Dynamic Growth of *Clostridium perfringens* during the Cooling of Ready-to-Eat Meat Products: Combining Engineering and Microbiological Modeling — ALEJANDRO AMEZQUITA, Curtis L. Weller, Lijun Wang, Harshavardhan Thippareddi, and Dennis E. Burson, University of Nebraska-Lincoln, Lincoln, NE, USA

T72 3:45 DSC A Longitudinal Study of Genetic Diversity of *Campylobacter jejuni* Isolates from Turkeys — SHILPA JOSHI, Donna K. Carver, Lee Shepard, and Sophia Kathariou, North Carolina State University, Raleigh, NC, USA

T73 4:00 DSC Survival of Bacterial Foodborne Pathogens in Chorizos — CARRIE HEW, Maha Hajmeer, and Dean Cliver, University of California-Davis, Davis, CA, USA

T74 4:15 Survival, Attachment and Internalization of *Salmonella* on Oranges — Reema Singh and SURESH D. PILLAI, Texas A&M University, College Station, TX, USA

T75 4:30 Genetic Basis of Dry Stress Resistance of *Enterobacter sakazakii* — PIETER BREEUWER, Lise Michot, and Han Joosten, Nestl Research Center, Vers-chez-les-Blanc, Vaud, Switzerland

T76 4:45 Growth of Foodborne Pathogens during Production of Compost Tea — DAVID T. INGRAM and Patricia D. Millner, USDA-ARS, Beltsville, MD, USA

P05 Prickly Pear Potpourri — Dairy, Produce, and Other Commodities
Exhibit Hall — Grand Canyon

1:00 p.m. — 5:00 p.m.
(Authors present 2:30 p.m. — 4:30 p.m.)
Convenors: Ben Chapman and Michelle Danyluk

Dairy

P197 Withdrawn

P198 DSC Electrochemical Sensor Method for Rapid Detection of Coliforms in Milk — SUN YOUNG LEE, Jose I. Reyes-De-Corcuera, and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

P199 Phenotypic and Genotypic Traits of *Staphylococcus aureus* Strains Isolated from Raw Bulk-tank Milk Samples of Small Ruminants — Dante Scherrer, Sabrina Corti, Jeannine Elsa Muehlherr, CLAUDIO ZWEIFEL, and Roger Stephan, University of Zurich, Zurich, Zurich, Switzerland

P200 DSC Efficacy of Ultraviolet Light Treatment for the Reduction of *Listeria monocytogenes* in Raw Fluid Goat Milk — KRISTEN E. MATAK, John J. Churey, Randy W. Worobo, Susan S. Sumner, Merle D. Pierson, Cameron R. Hackney, and Ernest Hovingh, Virginia Tech, Blacksburg, VA, USA

P201 Evaluation of the Microbiological Safety in Three Ultra-pasteurized Milk Companies — PAOLA SABINA CONTRERAS ROMO, Karina Valdez Villegas, and Angel R. Trigos-Landa, Michigan State University, Xalapa, Veracruz, Mexico

P202 Effectiveness of *Enterococcus faecium* M-74 for Controlling *Listeria monocytogenes* in Re-hydrated Dried Milk during Temperature Abuse — BLEDAR BISHA, Aubrey Mendonca, Makuba Lihono, and Terri Boylston, Iowa State University, Ames, IA, USA

P203 Survival of *Mycobacterium avium* subsp. *paratuberculosis* during Manufacture and Ripening of Laboratory-produced Cheddar Cheese — JOHN A. DONAGHY, Natalie L. Totton, and Michael T. Rowe, Department of Agriculture and Rural Development for Northern Ireland, Belfast, N. Ireland, UK

P204 Fate of *Salmonella* spp. in Oaxaca Cheese during Refrigeration and Abusive-temperature Storage — LEOPOLDO OROZCO R., J. Alberto Rangel C., and Eduardo F. Escart'n, Universidad Autonoma de Queretaro, Queretaro, Mexico

P205 Survival of *Escherichia coli* O157:H7 in Galotyri, a Traditional Greek Soft Acid-curd Cheese — Charidimos Lekkas, JOHN SAMELIS, Athanasia Kakouri, Evaggelos Palaiologos, and Michael G. Kontominas, National Agricultural Research Foundation, Ioannina, Greece

P206 DSC Ambient Storage of Aged Hard Cheese at Retail: A Food Safety Assessment — E. GROVES and C.W. Donnelly, University of Vermont, Burlington, VT, USA

P207 Survival of *Listeria monocytogenes* in Cow and Goat Milk as Well as in Cottage Cheese Made from Cow and Goat Milk during Storage at Various Temperatures — SUDEEP JAIN and Jinru Chen, University of Georgia, Griffin, GA, USA

P208 DSC An Artificial Neural Network Approach to Predict *Clostridium botulinum* Toxin Production in Process Cheese Spreads — WEI ZHANG and John Norback, University of Wisconsin-Madison, Madison, WI, USA

P209 Laboratory Investigation of a *Listeria monocytogenes* Outbreak Associated with Consumption of Soft Cheese — K. B. HISE, C. M. Lin, L. Zhang, P. A. Bordoni, L. Mauro, D. M. Norton, J. Sobel, A. Toguchi, S. Barth, S. Avashia, M. Richardson, L. Gaul, A. Abell, S. McAndrew, D. T. Rowe, W. Sorenson, M. P. Linn, S. Long, L. M. Graves, and B. Swaminathan, CDC, Atlanta, GA, USA

P210 Survival of *Listeria monocytogenes* in Commercial and Laboratory-scale Prepared Galotyri, a Traditional Greek Soft Acid-curd Cheese, Stored Aerobically at 4 and 12°C — Kondylia J. Rogga, JOHN SAMELIS, Athanasia Kakouri, Maria C. Katsiari, Ioannis N. Savvaidis, and Michael G. Kontominas, National Agricultural Research Foundation, Ioannina, Greece

P211 A Comparative Study of a New Next Day Method and the ISO 11290-1 Method for the Detection of *Listeria* sp. in Meat and Dairy Products — JOSE DELAVAL, Bernard Volant, Aurelie Chassin, Marie Hoppenreys, and Jean-Louis Bind, Laboratoire de Touraine, Tours, France

Produce

P212 The Detection and Survival of *Salmonella*, *Escherichia coli*, and *Listeria monocytogenes* in Selected Pesticide Sprays for Use on Fresh Produce — KATRINA N. VLAHOVICH, Elizabeth A. Bihn, Robert B. Gravani, Randy W. Worobo, and John J. Churey, Cornell University, Ithaca, NY, USA

P213 Pre-harvest Survival of Viruses on the Surface of Produce — SCOTT W. STINE, Inhong Song, Jose Pimentel, Christopher Y. Choi, and Charles P. Gerba, University of Arizona, Tucson, AZ, USA

P214 Comparison of Cetylpyridinium Chloride-Ethanol and Lauryl Sulfate-Chlorine Disinfection of Ready-to-Eat Vegetables Artificially Contaminated with *Escherichia coli* and *Salmonella* — TONY TRAN, Yetunde Abegurin, Madeline Fanning, and Worku Biftu, FDA, College Park, MD, USA

P215 Efficacy of Acidified Sodium Chlorite Treatments in Reducing Pathogens on the Surface of Leafy Vegetable — YASUHIRO INATSU, Md. Latiful Bari, and Shinichi Kawamoto, National Food Research Institute, Tsukuba-Shi, Japan

P216 Growth of *Listeria monocytogenes* in Stored Red Delicious Apple Tissues — PASCAL DELAQUIS, Peter Toivonen, and Keith Walsh, Agriculture and Agri-Food Canada, Summerland, BC, Canada

P217 Inactivation of *Salmonella* during Drying and Storage of Nantes Carrot Slices Treated with Steam, Water or Acid Blanching before Dehydration — PATRICIA A. DIPERSIO, Patricia A. Kendall, Yohan Yoon, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P218 Fate of *Escherichia coli* O157:H7 and *Salmonella* during Osmotic Dehydration and Subsequent Storage of Apples — Thilahavathy Ramasamy, ROBERT C. WILLIAMS, Joseph D. Eifert, and Susan S. Sumner, Virginia Tech, Blacksburg, VA, USA

P219 DSC Inactivation of Foodborne Pathogens on Produce Surfaces with Atmospheric Plasma — FAITH M. JOHNSON, Suzanne South, Kimberly Kelly-Wintenberg, and David A. Golden, University of Tennessee, Knoxville, TN, USA

P220 DSC Effect of Electron Beam Irradiation on the Reduction of *Salmonella* Poona and Native Microbial Flora of Fresh-cut Cantaloupe — MANGESH PALEKAR and Alejandro Castillo, Texas A&M University, College Station, TX, USA

P221 Factors Affecting Survival, Growth, and Retrieval of *Salmonella* Poona on Intact and Wounded Cantaloupe Rind and Stem Scar Tissue — LARRY R. BEUCHAT and Alan J. Scouten, University of Georgia, Griffin, GA, USA

P222 Examination of Yeasts for Antagonistic Activity against *Salmonella* Poona in Cantaloupe Juice and Wounds in Rinds Co-infected with Phytopathogenic Molds — GLENNER M. RICHARDS and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P223 A Method for Detection of Enteric Viruses in Soft Fruit — A. RZEZUTKA, M. D'Agostino, and N. Cook, DEFRA Central Science Laboratory, Hutton, York, UK

P224 Irradiation and Modified Atmosphere Packaging of Endive Influences Survival and Regrowth of *Listeria monocytogenes* and Product Sensory Qualities — BRENDAN A. NIEMIRA, Xuetong Fan, and Kimberly J.B. Sokorai, USDA-ARS, Wyndmoor, PA, USA

P225 DSC Increased Resistance to Chemical Inactivation of *Salmonella* Montevideo during Biofilm Formation on Tomatoes — MONTSERRAT H. ITURRIAGA and Eduardo F. Escartin, Universidad Autonoma de Queretaro, Queretaro, Mexico

P226 DSC HPLC Method for Multiple *Fusarium graminearum* Mycotoxins — HUIMIN ZHANG, Charlene Wolf-Hall, Cliford Hall, and Mary Niehaus, North Dakota State University, Fargo, ND, USA

P227 Efficacy of Acidic Electrolyzed Water Ice for Pathogen Control on Lettuce — SHIGENOBU KOSEKI, Seiichiro Isobe, and Kazuhiko Itoh, National Food Research Institute, Tsukuba, Ibaraki, Japan

P228 Microbial Quality of Fresh-cut Cantaloupe and Honeydew Melon as Estimated by Bioluminescence ATP Assay — DIKE O. UKUKU, Gerald Sapers, and William Fett, ERRC-ARS-USDA, Wyndmoor, PA, USA

P229 Cantaloupe Surfaces Affect Bacterial Attachment and Detachment by Sanitizing Treatments — DIKE O. UKUKU, Gerald M. Sapers, William F. Fett, and Peter H. Cooke, ERRC-ARS-USDA, Wyndmoor, PA, USA

P230 Role of Irrigation and Microbial Survival in Wastewater Reuse — I. SONG, S. Stine, J. Pimentel, C. Choi, and C. Gerva, University of Arizona, Tucson, AZ, USA

P231 Comparing Survival of a Pathogenic and a Non-pathogenic *Salmonella* Strains in Manure Compost Applied to Soil to Grow Green Onions in an Environmentally Controlled Growth Chamber — MAHBUB ISLAM, Jennie Morgan, Michael P. Doyle, and Xuiping Jiang, FRIfoods, Athens, GA, USA

P232 Uptake and Translocation of *Escherichia coli* O157:H7 in Lettuce Grown in a Hydroponic System — AGNES KILONZO-NTHENGE, Melvin Carter, Jean Weese, Cheng-i Wei, and Tung-Shi Huang, Tennessee State University, Nashville, TN, USA

P233 DSC Effectiveness of Cleaners and Sanitizers in Killing *Salmonella* Newport in the Gut of a Free-living Nematode, *Caenorhabditis elegans* — STEPHEN J. KENNEY, Gary L. Anderson, Phillip L. Williams, Patricia D. Millner, and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P234 Bacterial Contamination Risk Associated with Application of Non-composted Bovine Manure to Soils in Low-chemical Input Vegetable Gardening — STEVEN INGHAM, Jill Losinski, Matthew Andrews, Jane Breuer, Jeff Breuer, Tim Wood, and Tom Wright, University of Wisconsin-Madison, Madison, WI, USA

P235 Comparison of Growth Kinetics and Dynamics of Adherence of *Escherichia coli* O157:H7 Isolates and *Salmonella* Serotypes on Greenhouse and Field-grown Romaine Lettuce — WENDY MADUFF and Trevor Suslow, University of California, Davis, CA, USA

P236 Evaluation of a Fiber-optic Biosensor for Detection of *Escherichia coli* O157:H7 in Fresh Produce — Yun-Yeh Lin and TONG-JEN FU, FDA, Summit-Argo, IL, USA

P237 Surface Area Measurement and Recovery of *Escherichia coli* O157:H7 from Raw Strawberries and Mushrooms — SOMPHAVANH PHETSOMPHOU and Joseph Eifert, Virginia Tech, Blacksburg, VA, USA

P238 Comparison of Inoculation Method and Drying Time for Their Effects on Survival and Recovery of *Escherichia coli* O157:H7, *Salmonella*, and *Listeria monocytogenes* Inoculated onto Apples and Strawberries — FRANK SCHLITT-DITTRICH, Larry R. Beuchat, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P239 Inactivation *Escherichia coli* O157:H7 and *Salmonella* spp. on Whole Tomatoes Following Immersion in Selected Chemical Sanitizers — THERESA SIKINYI and Aubrey Mendonca, Iowa State University, Ames, IA, USA

Other Commodities

P240 DSC Reduction of Foodborne Pathogens on Almonds Using Gaseous Propylene Oxide — MICHELLE D. DANYLUK, Tracy L. Parnell, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P241 Survival, Growth, and Thermal Resistance of *Listeria monocytogenes* in Peanut and Chocolate Matrices — STEPHEN J. KENNEY and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P242 DSC Survival of *Salmonella* Enteritidis PT 30 on Almond Hulls and Kernels — AARON R. UESUGI, Tracy L Parnell, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P243 Evaluation of Dry-plant Sanitation Procedures Used in Almond Huller/Sheller Facilities for Reducing Microbial Loads on Almond-contact Surfaces — WEN-XIAN DU, Michelle D. Danyluk, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P244 Bacterial Populations Associated with Extended Storage of Commercially Manu-factured Yeast — S. S. O'BRIEN, D. Lindsay, and A. von Holy, University of the Witwatersrand, Wits, South Africa

P245 DSC Survey of a Yeast Manufacturing Process for Sources of Spoilage and Potentially Pathogenic Bacteria — S. S. O'BRIEN, D. Lindsay, and A. von Holy, University of the Witwatersrand, Wits, South Africa

P246 Survival of *Listeria monocytogenes* and *Escherichia coli* O157:H7 during Sauerkraut Fermentation — Miomir Niksic, JAMES S. DICKSON, Aubrey F. Mendonca, and Jay L. E. Ellingson, Iowa State University, Ames, IA, USA

P247 Microbiological Quality of Ready-to-Eat Foods — The Results of a Long-term Survey — RICHARD MELDRUM, Don Ribeiro, Robert Smith, Mark Walker, Will Lane, Mike Simmons, David Worthington, and Ceri Edwards, National Public Health Service for Wales, Penarth, UK

P248 The Effect of Structured Technical Audits on the Development of Traceability Systems in SMEs in the Further Processing Sector — DAVID LLOYD, University of Wales Institute-Cardiff, Cardiff, South Glamorgan, Wales, UK

P249 Recovery of *Salmonella* from Commercial Shell Eggs by Shell Rinse and Shell Crush Methodologies — MICHAEL T. MUSGROVE, Deana R. Jones, Julie K. Northcutt, Mark A. Harrison, Nelson A. Cox, Kimberly D. Ingram, and A. Hinton, Jr., USDA-ARS, Athens, GA, USA

P250 Thermal Resistance Parameters for Pathogens in Juice Concentrates — ELENA ENACHE, National Food Processors Association, Washington, D.C., USA

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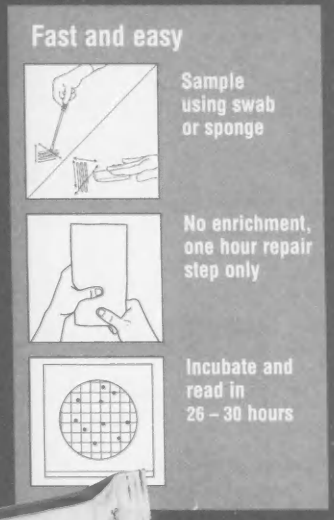


3M Microbiology

IAFP Exhibitor

IAFP Sustaining Member

Dr. Merle Pierson
Deputy Under Secretary for Food Safety
United States Department of Agriculture

Dr. Pierson will address
IAFP 2004 attendees during a presentation
on Tuesday, August 10, 12:15 p.m. – 1:00 p.m.

Please plan to join us in Phoenix for this special presentation.

Watch our web site at www.foodprotection.org
for additional details

Edmund A. Zottola has been appointed as the new Scientific Editor of Food Protection Trends

IAFP 2004 Networking Opportunities

IAFP FUNCTIONS

NEW MEMBER RECEPTION
Saturday, August 7, 2004 • 4:30 p.m. – 5:30 p.m.
Sponsored by Kluwer Academic Publishers

If you recently joined the Association or if this is your first time attending an IAFP Annual Meeting, welcome! Attend this informal reception to learn how to get the most out of attending the Meeting and meet some of today's leaders.

AFFILIATE RECEPTION
Saturday, August 7, 2004 ▪ 5:30 p.m. – 7:00 p.m.
Reception sponsored by Capitol Vial
Speakers sponsored by Weber Scientific

Affiliate Officers and Delegates plan to arrive in time to participate in this educational reception. This year's topic is "How to Add Fun Recreational Programs to Your Meeting/Event." See what ideas you can take back to spice up your next Affiliate Meeting.

COMMITTEE MEETINGS
Sunday, August 8, 2004 • 7:00 a.m. – 5:00 p.m.

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

STUDENT LUNCHEON
Sunday, August 8, 2004 • 12:00 p.m. – 1:30 p.m.
Sponsored by Nestlé USA, Inc.

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP. Sign up for the luncheon to help start building your professional network.

OPENING SESSION
Sunday, August 8, 2004 ▪ 7:00 p.m. – 8:00 p.m.

Join us to kick off IAFP 2004 at the Opening Session. Listen to the prestigous Ivan Parkin Lecture delivered by Martin B. Cole, Chief Research Scientist, Food Science Australia, North Ryde, Australia. He will deliver a presentation titled "Advancing Food Protection Technology."

CHEESE AND WINE RECEPTION
Sunday, August 8, 2004 • 8:00 p.m. – 10:00 p.m.
Sponsored by Kraft Foods, Inc.

An IAFP tradition for attendees and guests. The reception begins immediately following the Ivan Parkin Lecture on Sunday evening in the Exhibit Hall.

IAFP JOB FAIR
Sunday, August 8 through Wednesday, August 11, 2004

Employers, take advantage of recruiting the top food scientists in the world! Post your job announcements and interview candidates.

COMMITTEE AND PDG CHAIRPERSON BREAKFAST (By invitation)
Monday, August 9, 2004 • 7:00 a.m. – 9:00 a.m.

Chairpersons and Vice Chairpersons are invited to attend this breakfast to report on the activities of your committees.

EXHIBIT HALL RECEPTION
Monday, August 9, 2004 • 5:00 p.m. - 6:30 p.m.
Sponsored by DuPont Qualicon and Oxoid, Inc.

Join your colleagues in the exhibit hall to see the latest trends in food safety techniques and equipment. Discuss with exhibitors their latest products or use this time to view the poster presentations. Grab a drink and take advantage of this great networking reception.

JOHN H. SILLIKER LECTURE
Tuesday, August 10, 2004 • 3:45 p.m. – 4:30 p.m.

This plenary session will feature R. Bruce Tompkin, Retired Vice President — Product Safety, ConAgra Refrigerated Prepared Foods. He will deliver a presentation titled "Guess Who's Come to Stay — The Resident Pathogen Issue."

BUSINESS MEETING
Tuesday, August 10, 2004 • 4:45 p.m. – 5:30 p.m.

You are encouraged to attend the Business Meeting to keep informed of the actions of YOUR Association.

PRESIDENT'S RECEPTION (By invitation)
Tuesday, August 10, 2004 • 5:30 p.m. – 6:30 p.m.
Sponsored by Fisher Scientific

This by invitation event is held each year to honor those who have contributed to the Association during the year.

PAST PRESIDENTS' DINNER (By invitation)
Tuesday, August 10, 2004 • 6:30 p.m. – 10:00 p.m.

Past Presidents and their guests are invited to this dinner to socialize and reminisce.

AWARDS BANQUET
Wednesday, August 11, 2004 • 7:00 p.m. – 9:30 p.m.

Bring IAFP 2004 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Dr. Paul Hall to Incoming President Dr. Kathy Glass.

IAFP 2004 Event Information

EVENTS

MONDAY NIGHT SOCIAL AT RAWHIDE WESTERN TOWN

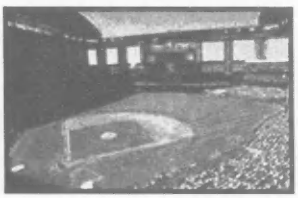
Monday, August 9, 2004 • 6:30 p.m. – 10:00 p.m.

Sponsored by Roche Applied Science and VWR International

Step back in time to the days when the West ran wild! This is the Wild West of good guys, bad guys, balladeers, shoot-outs, saloon girls, and delightfully crooked card dealers. Upon arrival at Rawhide, you will have the opportunity to stroll down Main Street, browse in the numerous shops and boutiques, witness a blacksmith at work and watch Rawhide's street entertainers. Satisfy your appetite by stopping in the Steakhouse and Saloon for a "Chuckwagon Feast". Grab your partners, jump on the bus and get ready for a rip-roarin good time — YEE HA!

DIAMONDBACKS BASEBALL GAME

Saturday, August 7, 2004 • 12:00 p.m. – 4:00 p.m.



Enjoy a afternoon at the ballpark as the Arizona Diamondbacks take on the Atlanta Braves at Bank One Ballpark. From its signature swimming pool to its retractable roof, Bank One Ballpark has become one of the game's most recognizable landmarks. Since the air-conditioned facility first opened its doors, fans have enjoyed the opportunity to watch the Arizona Diamondbacks without worrying about Phoenix's summer heat. Ticket price includes admission to the game and transportation to and from the JW Marriott Desert Ridge Resort.

GOLF TOURNAMENT

GOLF TOURNAMENT – Arnold Palmer Signature Course at Wildfire Golf Club

Saturday, August 7, 2004 • 6:00 a.m. – 11:00 a.m.

Everyone is invited to play in this best-ball golf tournament on the Arnold Palmer Signature Course at Wildfire Golf Club. A desert-style course of championship length, with generous fairways and large, bent-grass greens, the Palmer Course is challenging to all levels of golf skill. Begin IAFP 2004 with a round of golf playing before a backdrop of the Camelback Mountains!

DAYTIME TOURS

SEDONA AND VERDE VALLEY TOUR

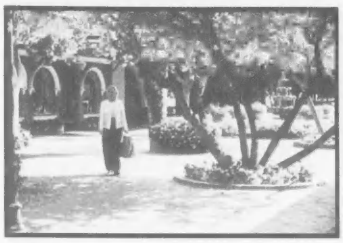
Saturday, August 7, 2004 • 8:00 a.m. – 4:00 p.m.

Known worldwide for its brilliant red rock mountains, breathtaking scenery and quaint artisan shops, Sedona is a "must see" destination for visitors to Arizona.

During the drive north, you will travel through the diverse terrain of the Sonoran Desert, Verde Valley and Camp Verde. Along the way, the guide will provide interesting narration about the area and answer questions.

Prior to reaching Sedona, we will stop at Montezuma's Castle, a twelfth century cliff dwelling built by the Sinagua Indians. This is considered one of the best-preserved cliff dwellings in the Southwest. Upon arrival in Sedona, your guide will point out the numerous red rock formations for which Sedona is famous — Snoopy Rock, Bell Rock, Chapel Rock, Submarine Rock and others. Lunch will be served at a quaint local eatery. Guests will have time to explore the galleries and shops of Main Street and Tlaquepaque.

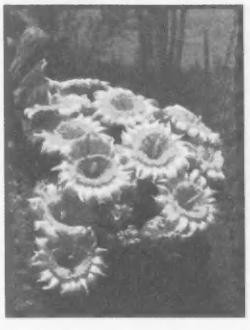
CITY TOUR AND OLD TOWN SCOTTSDALE
Sunday, August 8, 2004 • 10:00 a.m. – 3:00 p.m.



With amazing sunsets and spectacular mountain views, Arizona is a site to behold! The City Tour meanders through the amazing aspects of the valley. Each tour is unique in that the guide will stop along the way at several of the most beautiful sites and private homes in the valley.

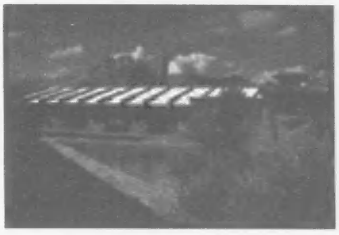
The Wrigley Mansion is well known for its unique architecture, the Biltmore Resort has had the pleasure of Frank Lloyd Wright's touch and the State Capitol is majestic against the blue sky backdrop of the city. This tour provides an opportunity to stop and enjoy the unique shopping experiences of Old Town Scottsdale as well as a delicious lunch. Old Town encompasses over a square mile of themed shopping streets. Walking the sidewalks of this section of Scottsdale, one can find everything from Native American jewelry and artwork to western clothing.

DESERT BOTANICAL GARDEN AND HEARD MUSEUM TOUR
Monday, August 9, 2004 • 8:00 a.m. – 1:00 p.m.



Two of the Southwest's most unique visitor attractions, The Desert Botanical Garden and Heard Museum, have teamed up to present an unbeatable tour designed to acquaint visitors with the diversity of the region and the resourcefulness of its Native American people. This tour includes visits to both attractions plus lunch at the Heard Museum Cafe. Your visit begins at the Desert Botanical Garden which displays more than 10,000 desert plants in a spectacular outdoor setting. Plants and People of the Sonoran Desert, a three-acre permanent exhibit with authentic historic and prehistoric structures, shows how Sonoran Desert dwellers have used native plants for thousands of years for food, construction, fiber, and medicines. Continuing on you will visit the amazing Heard Museum, a museum of Native American cultures and art. The Heard Museum is internationally recognized for its collections of Native American artifacts and contemporary fine art.

FRANK LLOYD WRIGHT – TALIESIN WEST TOUR
Tuesday, August 10, 2004 • 8:00 a.m. – 12:00 p.m.



Taliesin West in Scottsdale is considered one of Frank Lloyd Wright's greatest architectural masterpieces. From its inception, the buildings at Taliesin West astounded architectural critics with their beauty and unusual form. Taliesin West still serves as a living, working educational facility with an on-site architectural firm. By touring Taliesin West visitors are able to broaden their appreciation of architecture and Wright's continuing contribution to it through his theories of organic design.

If you're interested in an in-depth, intimate look at Taliesin West, this exclusive experience is a must! Visit the Cabaret Cinema, Music Pavilion, Seminar Theater and Wright's private office — all linked by dramatic terraces, gardens and walkways overlooking the rugged Sonoran Desert and Valley below. You'll have the chance to talk to a Wright associate, have leisurely mid-morning refreshments in the colorful Taliesin Fellowship dining room and explore the dramatic Taliesin West living room — called the "Garden Room" by Wright. You'll sit in Wright-designed furniture and experience firsthand the drama of being a guest in Wright's famous Garden Room.

SOUTHWESTERN COOKING CLASS
Wednesday, August 11, 2004 • 10:30 a.m. – 1:00 p.m.

This hands-on class explores the magic and mysteries of tamales, one of the great culinary traditions of the America's. While making tamales you will learn the secrets of choosing a filling and flavoring them with different types of wrappers, from cornhusks to banana leaves. You will also learn how to choose and make a complementary salsa to create a more satisfying and dynamic taste experience. This class is a total emersion into tamales and salsas that provides you with all the knowledge and skills to create your own tamales at home! Following the class you will enjoy lunch at Blue Sage.

HOSPITALITY ROOM

Register your spouse/companion and they will have access to the hospitality room where a continental breakfast and afternoon snacks are provided Sunday through Wednesday.

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

MEETING INFORMATION

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

Registration includes:

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

4 EASY WAYS TO REGISTER

Complete the Attendee Registration Form and submit it to the International Association for Food Protection by:

Online: www.foodprotection.org

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W,
Des Moines, IA 50322-2864, USA

Phone: 800.369.6337; 515.276.3344

The early registration deadline is July 7, 2004.
After this date, late registration fees are in effect.

REFUND/CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by July 23, 2004. No refunds will be made after July 23, 2004; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 16, 2004. **Event and tour tickets purchased are nonrefundable.**

International Association for Food Protection®

EXHIBIT HOURS

Sunday, August 8, 2004	8:00 p.m. – 10:00 p.m.
Monday, August 9, 2004	9:30 a.m. – 1:30 p.m. 3:00 p.m. – 6:30 p.m.
Tuesday, August 10, 2004	9:30 a.m. – 1:30 p.m.

DAYTIME TOURS

Saturday, August 7, 2004	
Sedona and Verde Valley Tour (Lunch included)	8:00 a.m. – 4:00 p.m.
Sunday, August 8, 2004	
City Tour and Old Town Scottsdale (Lunch included)	10:00 a.m. – 3:00 p.m.
Monday, August 9, 2004	
Desert Botanical Garden and Heard Museum Tour (Lunch included)	8:00 a.m. – 1:00 p.m.
Tuesday, August 10, 2004	
Frank Lloyd Wright – Taliesin West Tour	8:00 a.m. – 12:00 p.m.
Wednesday, August 11, 2004	
Southwestern Cooking Class (Lunch included)	10:30 a.m. – 1:00 p.m.

EVENTS

Saturday, August 7, 2004	
Diamondbacks Baseball Game	12:00 p.m. – 4:00 p.m.
Sunday, August 8, 2004	
Opening Session	7:00 p.m. – 8:00 p.m.
Cheese and Wine Reception *Sponsored by Kraft Foods North America*	8:00 p.m. – 10:00 p.m.
Monday, August 9, 2004	
Exhibit Hall Reception *Sponsored by DuPont Qualicon and Oxoid, Inc.*	5:00 p.m. – 6:30 p.m.
Monday Night Social at Rawhide Western Town *Sponsored by Roche Applied Science*	6:30 p.m. – 10:00 p.m.
Wednesday, August 11, 2004	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

GOLF TOURNAMENT

Saturday, August 7, 2004	
Golf Tournament Arnold Palmer Signature Course at Wildfire Golf Club	6:00 a.m. – 11:00 a.m.

HOTEL INFORMATION

For reservations, contact the hotel directly and identify yourself as an IAFP 2004 attendee to receive a special rate of $139 per night, single/double or make your reservations online. This special rate is available only until July 7, 2004.

JW Marriott Desert Ridge Resort
5350 E. Marriott Dr.
Phoenix, Arizona 85054
Phone: 800.228.9290 • 480.609.3646 • Fax: 480.293.3738
Web site: www.marriott.com/phxdr
(Group Code INTINTA)

Visit our Web site at **www.foodprotection.org** for air travel and rental car information.

Attendee Registration Form

International Association for Food Protection®
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

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

Employer _____ Title _____

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

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

Telephone _____ Fax _____ E-mail _____

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

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

PAYMENT MUST BE RECEIVED BY JULY 7, 2004 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:	MEMBERS	NONMEMBERS	TOTAL
Registration (Awards Banquet included)	$ 365 ($415 late)	$ 555 ($605 late)	
Association Student Member (Awards Banquet included)	$ 75 ($ 85 late)	Not Available	
Retired Association Member (Awards Banquet included)	$ 75 ($ 85 late)	Not Available	
One Day Registration:* ❒ Mon. ❒ Tues. ❒ Wed.	$ 200 ($225 late)	$ 305 ($330 late)	
Spouse/Companion* (Name): _____	$ 55 ($ 55 late)	$ 55 ($ 55 late)	
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	
Children 14 & Under* (Names): _____	FREE	FREE	
*Awards Banquet not included			

EVENTS:		# OF TICKETS	
Golf Tournament – Arnold Palmer Signature Course (Saturday, 8/7)	$ 105 ($115 late)		
Diamondbacks Baseball Game (Saturday, 8/7 – 12:00 p.m.–4:00 p.m.)	$ 26 ($ 36 late)		
Student Luncheon (Sunday, 8/8)	$ 5 ($ 15 late)		
Monday Night Social at Rawhide Western Town (Monday, 8/9)	$ 42 ($ 52 late)		
Children 14 and under	$ 37 ($ 47 late)		
Awards Banquet (Wednesday, 8/11)	$ 50 ($ 60 late)		

DAYTIME TOURS: (Lunch included in daytime tours except on Tuesday)			
Sedona and Verde Valley Tour (Saturday, 8/7)	$ 90 ($100 late)		
City Tour and Old Town Scottsdale (Sunday, 8/8)	$ 55 ($ 65 late)		
Desert Botanical Garden and Heard Museum Tour (Monday, 8/9)	$ 78 ($ 88 late)		
Frank Lloyd Wright – Taliesin West Tour (Tuesday, 8/10)	$ 70 ($ 80 late)		
Southwestern Cooking Class (Wednesday, 8/11)	$ 65 ($ 75 late)		

PAYMENT OPTIONS: ❒ VISA ❒ MasterCard ❒

❒ Check Enclosed

Credit Card # _____

Name on Card _____

Signature _____

TOTAL AMOUNT ENCLOSED $ _____ US FUNDS on US BANK

Expiration Date _____

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

❒ Check box if you are a technical, poster, or symposium speaker.

EXHIBITORS DO NOT USE THIS FORM

IAFP 2004 Workshops

Sponsored by International Association for Food Protection®

Workshop I — August 6–7
Your Data, Your Job: Quality Systems for Microbial Food Analysis

This workshop will present principles for understanding and implementing microbial control in a food production environment by providing skills to address limitations in your current laboratory testing and documentation. You will learn, in an interactive environment, how to perform environmental and statistically sound food sampling for microbial testing that can be implemented into your standard operating procedures and will conform to today's QA and ISO requirements. Workshop participants will review and discuss material from practical case studies and present their findings to the group in an informal presentation that will facilitate open discussion. Workshop includes a binder of tools and reference materials to reinforce the practical experience gained from the workshop.

Workshop Topics

- Microbial control: where and how raw ingredient and finished product testing fit into the big picture
- Microbial control: where and how environmental/investigational sampling fit into the big picture
- Outsourcing/Auditing: What should you expect from an outside food-testing laboratory relative to quality systems and capabilities
- Using data management and trend analysis techniques to drive continuous improvement
- Practical approaches to incorporating rapid methods into the laboratory
- Food Safety Testing in the 21st Century by PCR
- Laboratory quality assurance and preparing your laboratory to address ISO 17025

Instructors

Robert Behling, Kornacki Food Safety Associates, LLC, Madison, WI

Jay Ellingson, Ph.D., Marshfield Clinic Laboratories, Madison, WI

W. Payton Pruett, Jr., Ph.D., ConAgra Foods, Inc., Omaha, NE

Cindy Ryan, Nestlé USA, Dublin, OH

Michael Sole, Canadian Food Inspection Agency, Ottawa, Ontario, Canada

Organizers and Instructors

Jeff Kornacki, Ph.D., Kornacki Food Safety Associates LLC, Madison, WI

Patricia Rule, bioMérieux, Inc., Hazelwood, MO

Who Should Attend?

Laboratory managers, supervisors, scientists and technicians responsible for product sampling, as well as performing and documenting microbial tests in a food production environment and quality control laboratories.

Hours for Workshop

Friday August 6, 2004	Saturday August 7, 2004
Registration – 7:30 a.m. Continental Breakfast	7:30 a.m. Continental Breakfast
Workshop – 8:00 a.m. – 5:00 p.m. (Lunch Provided)	**Workshop –** 8:00 a.m. – 4:00 p.m. (Lunch Provided)

Workshop II — August 7
Best Practices for Safe and High Quality Aquaculture Products

Aquacultured seafoods are an increasingly important component of global trade in seafoods. Overexploitation of natural harvests

has created a growing interest in aquaculture to provide seafoods to a demanding public. Because aquaculture is a controlled enterprise, inventory control, quality, and safety issues are very different than wild catch products. This workshop is designed to give attendees an overview of practices necessary to deliver high quality and safe aquacultured products to today's discriminating consumer. The afternoon session will include an interactive field trip to Desert Sweet Shrimp Farm in Gila Bend, AZ.

Workshop Topics

- Shellfish (Crustacean and Mollusks)
- Finfish warm water
- Finfish cold water
- What works for the industry
- Interactive field trip

Instructors

Linda Andrews, Mississippi State University, Biloxi, MS

Andrew Kaelin, ASI Aqua Fods, Inc., Arroyo Seco, NM

Lisbeth Truelstrup Hansen, Canadian Institute of Fisheries Technology, Dalhousie University, Halifax, Nova Scotia, Canada

Organizer and Instructor

Douglas L. Marshall, Mississippi State University, Mississippi State, MS

Who Should Attend?

Seafood processors, seafood retailers, and food service.

Hours for Workshop

Saturday, August 7, 2004

Registration –
7:30 a.m. Continental Breakfast

Workshop –
8:00 a.m. – 5:30 p.m.
(Lunch Provided)

Workshop III — August 7

Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection

Take advantage of the new Grade A HACCP program for dairy plants that was adopted by the 2003 National Conference on Interstate Milk Shipments (NCIMS) and became effective on January 1, 2004. The guidelines for this new Grade A HACCP program are outlined in Appendix K of the Pasteurized Milk Ordinance (PMO). NCIMS HACCP is an alternative to the traditional inspection/rating program for Grade A Dairy Processors that allows dairy plants to develop their own "PMO".

This workshop will give an overview of the NCIMS Voluntary HACCP Program with emphasis on the differences with the traditional PMO-based regulatory inspection system. Participants will hear perspectives of industry and regulatory participants involved in the 4 year pilot studies used to develop the program. Hands-on exercises will be provided to give participants a better understanding of what is required to document Prerequisite Programs, conduct a Hazard Analysis, develop a HACCP Plan and build a HACCP records system. An FDA presentation on state and FDA HACCP audits with comparisons to traditional inspections will conclude the program.

Workshop Topics

- Transition to the NCIMS Voluntary HACCP Program
- NCIMS HACCP implementation perspectives
- Hands-on HACCP program development for dairy plants
- Prerequisite Program, Hazard Analysis and HACCP Plan
- Practical recommendations for State and Federal NCIMS oversight of dairy plant HACCP
- Auditing of dairy plant HACCP Systems
- Hands-on HACCP dairy plant auditing

Instructors

Kristin Phillips, Publix Super Markets, Lakeland, FL

Greg Lockwood, Vermont Department of Agriculture, Montpelier, VT

Bill Sveum, Kraft Foods NA, Madison, WI

Lloyd Kinzel, FDA, North Wales, PA

Steve Sims, FDA, College Park, MD

Stephanie Olmsted, Safeway Foods, Bellevue, WA

Doug Pearson, Utah Department of Agriculture, Salt Lake City, UT

Organizers and Instructors

Steven Murphy, Cornell University, Ithaca, NY

Allen Sayler, International Dairy Foods Association, Washington, D.C.

Who Should Attend?

Grade "A" Dairy Processors, State and Federal Regulatory Personnel, Dairy Plant Suppliers, and Academicians.

Hours for Workshop

Saturday, August 7, 2004

Registration –
7:30 a.m. Continental Breakfast

Workshop Registration Form

Friday–Saturday, August 6–7, 2004

Workshop 1: Your Data, Your Job: Quality Systems for Microbial Food Analysis

Saturday, August 7, 2004

Workshop 2: Best Practices for Safe and High Quality Aquaculture Products

Workshop 3: Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection

First Name (will appear on badge)

Last Name

Company | Job Title

Address | City

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

Area Code & Telephone | Fax

E-mail | Member #

❒ Check Enclosed ❒ VISA ❒ ❒ MasterCard

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

Account Number _____

Signature _____ **Expiration date** _____

Register by July 16, 2004 to avoid late registration fees

• Registration •

WORKSHOP I: Your Data, Your Job: Quality Systems for Microbial Food Analysis	Early Rate	Late Rate
IAFP Member	$450.00	$525.00
NonMember	$550.00	$625.00

WORKSHOP II: Best Practices for Safe and High Quality Aquaculture Products	Early Rate	Late Rate
IAFP Member	$375.00	$450.00
NonMember	$475.00	$550.00

WORKSHOP III: Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection	Early Rate	Late Rate
IAFP Member	$320.00	$395.00
NonMember	$420.00	$495.00

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

Refund/Cancellation Policy

Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by July 23, 2004. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 16, 2004. The workshop may be cancelled if sufficient enrollment is not received by July 16, 2004.

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

• 4 Easy Ways to Register •

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

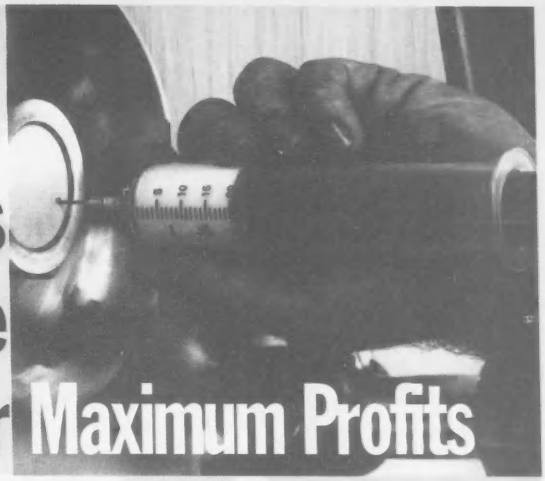
Online: www.foodprotection.org

Phone: 800.369.6337; 515.276.3344

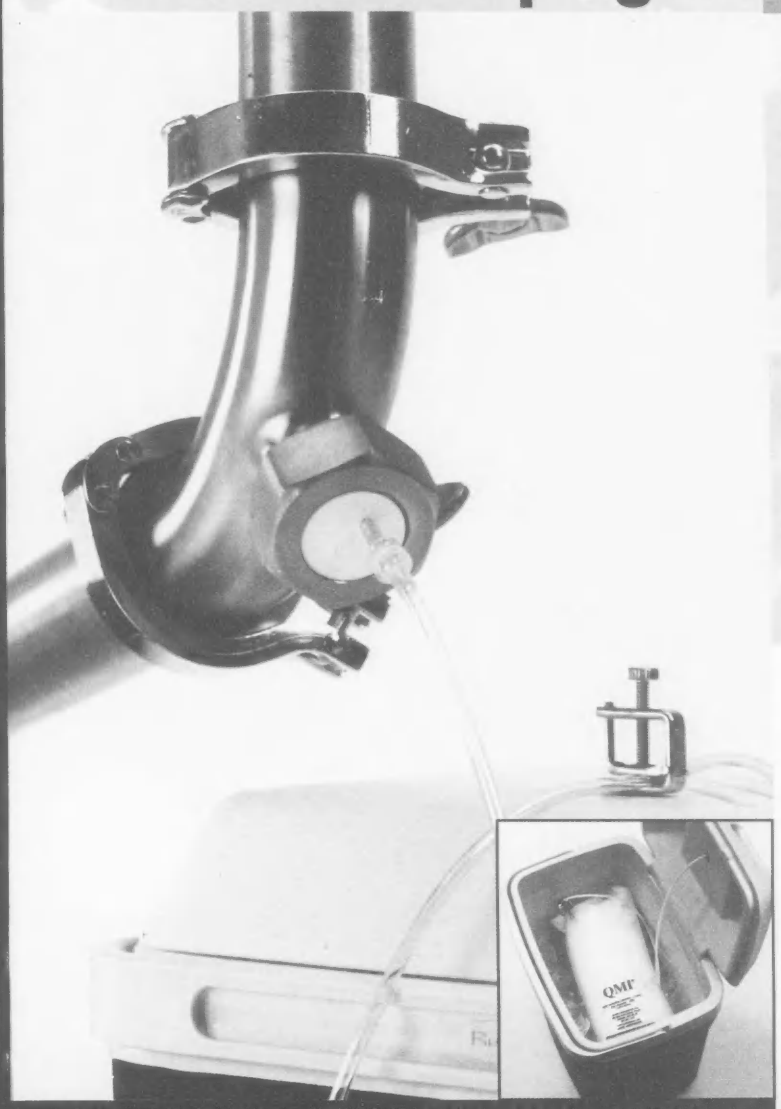
Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2864

Today's Dairy Farmers Require Accurate Milk Sampling For Maximum Profits



Staphylococcus aureus



You work hard to run a clean and healthy dairy operation. Get maximum profits for all that effort by using the QMI Line and Tank Sampling System. The benefits are:

- Precise composite sampling to aid in mastitis control
- Contamination-free sampling resulting in accurate bacterial counts
- Reliable sampling to measure milk fat and protein

As you know, your testing is only as good as your sampling.

Escherichia coli

For more information, contact:

QMI
426 Hayward Avenue North
Oakdale, MN 55128
Phone: 651.501.2337
Fax: 651.501.5797
E-mail address: qmi2@aol.com

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Quality Management, Inc.

Promotional Opportunities

We invite you to participate as a sponsor for IAFP 2004. Sponsorship participation provides an excellent opportunity to position your company or organization as a supporter of the Association.

Please review the event listing to select the one that will best position your organization. Reservations will be taken in order received for any open sponsorship events.

Sponsorship Event List

Amount	Event
$17,000	Monday Evening Social Roche Applied Science (1/2 sponsor)
$16,000 Sponsored	Opening Reception Kraft Foods North America
$15,000 Sponsored	Exhibit Hall Reception DuPont Qualicon, Oxoid, Inc.
$12,000 Sponsored	Conference Program Bag bioMérieux, Inc.
$10,000 Sponsored	President's Reception Fisher Scientific
$8,000 Sponsored	Badge Holders w/Lanyards Strategic Diagnostics, Inc.
$6,000 Sponsored	Exhibit Hall Pastries and Coffee Deibel Laboratories, Inc. *(Monday Morning)*
$6,000 Sponsored	Exhibit Hall Pastries and Coffee Nice-Pak Products, Inc. *(Tuesday Morning)*
$3,500 Sponsored	Exhibit Hall Coffee Break NSF International *(Monday Afternoon)*
$3,500 Sponsored	Coffee Break BD Diagnostic Systems *(Tuesday Afternoon)*
$3,500 Sponsored	Coffee Break 3M Microbiology *(Wednesday Morning)*
$3,000	Coffee Break *(Wednesday Afternoon)*
$3,750 Sponsored	Notepads with Sponsor's Logo Bio-Rad Laboratories
$3,500	Spouse/Companion Hospitality Room
$3,500 Sponsored	Student PDG Luncheon Nestlé USA, Inc.
$3,000 Sponsored	Affiliate Educational Reception Capitol Vial, Weber Scientific
$2,500 Sponsored	IAFP New Member Orientation Kluwer Academic Publishers
$2,000 Sponsored	Awards Banquet Flowers PepsiCo
$1,750	Committee Day Refreshments
$1,500	Exhibitor Move-in Refreshments
$1,000	Speaker Travel Support (Multiple opportunities available) Warren Analytical Laboratory

General Conference Sponsorship $_____

Partial sponsorship for the above events is available.

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

Sponsorship Participant

Name _____

Company _____

Address _____

City _____ State or Province _____

Country _____ Postal Code/Zip + 4 _____

Phone _____ Fax _____

E-mail _____

Desired Event to Sponsor _____

Amount Paid $ _____
U.S. Funds on U.S. Bank

Return form to:
IAFP
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2864
Phone: 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org

Payment: ❑ Check ❑ Mastercard ❑ VISA ❑ American Express

Account Number _____

Expiration Date _____

Cardholder Signature _____

Contribute to the Seventh Annual Foundation Fund Silent Auction Today!

The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2004, the Association's 91st Annual Meeting in Phoenix, Arizona, August 8–11, 2004. The Foundation Fund supports:

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

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

- Waterford Crystal Bowl
- Food Safety Handbook
- Walt Disney World Theme Park Tickets
- United States Flag
- Lionel Electric Train
- Oscar Mayer Remote Controlled Wiener Mobile
- Freshwater Stick Pearl Necklace
- Wine
- "Taste of Chicago" Gift Certificates
- Ultimate Garden State Gift Basket

Complete the form and send it in today.

Description of Auction Items _____

Estimated Value _____

Name of Donor _____

Company (if relevant) _____

Mailing Address _____

(Please specify: ❒ Home ❒ Work)

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-mail _____

Return to:

Donna Gronstal
International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
800.369.6337; 515.276.3344
Fax: 515.276.8655
E-mail: dgronstal@foodprotection.org

International Association for Food Protection®

Exhibitors

Companies scheduled to exhibit as of May 25, 2004

3-A Sanitary Standards, Inc.
www.3-a.org Phone: 703.790.0295

3M Microbiology
www.3m.com/microbiology Phone: 800.328.1671

ABC Research Corporation
www.abcr.com Phone: 352.372.0436

Advanced Instruments, Inc.
www.aicompanies.com Phone: 800.225.4034

Aerotech P&K
www.aerotechlabs.com Phone: 800.651.4802

AES – Chemunex, Inc.
www.aeschemunex.com Phone: 609.497.0166

AIHA Food Laboratory Accreditation Program
www.aiha.org Phone: 703.849.8888

Alaska Food Diagnostics plc
www.alaskafooddiagnostics.com Phone: 44.1980.590030

Alex C. Fergusson, Inc.
www.afcocare.com Phone: 800.345.1329

aLF Ventures, LLC
www.activinlf.com Phone: 801.961.1030

Alpha Biosciences, Inc.
www.alphabiosciences.com Phone: 410.467.9983

American Proficiency Institute
www.foodpt.com Phone: 800.333.0958

AOAC International
www.aoac.org Phone: 800.379.2622

Applied Biosystems
www.appliedbiosystems.com Phone: 650.638.5715

ASI Food Safety Consultants, Inc.
www.asifood.com Phone: 800.477.0778

ASM Press
www.asm.org Phone: 202.942.9316

BD Diagnostics
www.bd.com Phone: 410.316.4000

BioControl Systems, Inc.
www.biocontrolsys.com Phone: 800.245.0113

bioMérieux, Inc.
www.biomerieux-usa.com Phone: 800.634.7656

Bio-Rad Laboratories
www.foodscience.bio-rad.com Phone: 800.4BIORAD

Bioscience International
www.biosci-intl.com Phone: 301.230.0072

BioSys, Inc.
www.biosystesting.com Phone: 866-3Biosys

Biotrace International BioProducts
www.intlbioproducts.com Phone: 800.729.7611

Blackwell Publishing
www.blackwellprofessional.com Phone: 800.862.6657

Center for Food Safety and Applied Nutrition, US FDA
www.cfsan.fda.gov Phone: 301.436.2127

Certified Laboratories, Inc.
www.800certlab.com Phone: 800.cert-lab

Charm Sciences, Inc.
www.charm.com Phone: 800.343.2170

Copan Diagnostics, Inc.
www.copanusa.com Phone: 800.216.4016

Daikin Environmental Laboratory, Ltd.
www.daikin.com Phone: 81.29.858.5010

Decagon Devices, Inc.
www.decagon.com Phone: 800.755.2751

Deibel Laboratories
www.deibellabs.com Phone: 847.329.9900

Diffchamb, Inc.
www.diffchamb.com Phone: 866.DIFFCHAMB

DonLevy Laboratories
www.donlevylab.com Phone: 219.736.0472

DQCI Services, Inc.
www.dqci.com Phone: 763.785.0484

DSM Food Specialties USA, Inc.
www.dsm-foodspecialities.com Phone: 800.423.7906

DuPont™ Food Risk Assessment™
www.dupont.ca Phone: 800.387.2122

DuPont Qualicon
www.qualicon.com Phone: 800.863.6842

Dynal Biotech, LLC
www.dynalbiotech.com Phone: 800.558.4511

EMD Chemicals Inc.
www.emdchemicals.com Phone: 800.222.0342

eMerge Interactive
www.verifeye.net Phone: 877.578.2333

Eurofins Scientific
www.eurofinsus.com Phone: 800.880.1038

Fisher Scientific
www.fishersci.com Phone: 800.494.6913

Food Processors Institute
www.fpi-food.org Phone: 800.355.0983

Food Quality Magazine
www.foodquality.com Phone: 215.860.7800 x11

Food Safety Magazine
www.foodsafetymagazine.com Phone: 818.842.4777

Food Safety Net Services, Ltd.
www.food-safetynet.com Phone: 888.525.9788

Food Safety Summit
www.foodsafetysummit.com Phone: 800.746.9646

FoodHandler
www.foodhandler.com Phone: 800.338.4433

FOODSAFE Systems, Inc.
www.foodsafesystems.com Phone: 800.809.8586

FOSS
www.foss.dk Phone: 800.547.6275

Handgards
www.handgards.com Phone: 915.779.6606

Hardy Diagnostics
www.hardydiagnostics.com Phone: 800.266.2222

Hygiena LLC
www.hygienausa.com Phone: 805.388.8007

International Association for Food Protection
www.foodprotection.org Phone: 800.369.6337

International Association for Food Protection – Student PDG
www.foodprotection.org Phone: 800.369.6337

International Food Hygiene
www.positiveaction.co.uk Phone: 44.13.7724.1724

International Food Information Council Foundation
www.ific.org Phone: 202.296.6540

Interscience Laboratories Inc.
www.intersciencelab.com Phone: 617.548.6416

IQ Scientific Instruments, Inc.
www.iqscientific.com Phone: 800.276.0723

Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
www.jifsan.umd.edu Phone: 301.405.8382

Marshfield Clinic Food Safety Services
www.my.marshfieldclinic.org/foodsafety Phone: 888.780.9897

Matrix MicroScience, Inc.
www.matrixmsci.com Phone: 303.277.9613

Medallion Laboratories
www.medallionlabs.com Phone: 800.245.5615

Medical Wire & Equipment
www.advantagebundlingsp.com Phone: 866.286.3546

Michigan State University National Food Safety and Toxicology Center
www.foodsafe.msu.edu Phone: 517.432.3100 x101

MicroBioLogics, Inc.
www.MicroBioLogics.com Phone: 800.599.2847

Microbiology International
www.800ezmicro.com Phone: 800.396.4276

Milliken Chemical
www.milliken.com Phone: 864.503.6505

MVTL Laboratories, Inc.
www.mvtl.com Phone: 800.782.3557

Nasco
www.enasco.com Phone: 209.545.1600

National Center for Food Safety & Technology
www.ncfst.iit.edu Phone: 708.563.8160

The National Food Laboratory, Inc.
www.thenfl.com Phone: 925.551.4205

Nelson-Jameson, Inc.
www.nelsonjameson.com Phone: 800.826.8302

Neogen Corporation
www.neogen.com Phone: 800.234.5333

NEOS Industrial Overshoe
www.overshoe.com Phone: 802.846.8880

Neu-tec Group, Inc.
www.neutecgroup.com Phone: 516.870.0877

Nice-Pak Products, Inc.
www.nicepak.com Phone: 800.999.6423

Northeast Laboratory Services
www.nelabservices.com Phone: 207.873.7711

NSF-Cook & Thurber
www.nsf.org Phone: 800.NSF.MARK

Orkin Commercial Services
www.orkin.com Phone: 800.ORKIN.NOW

Oxoid Inc.
www.oxoid.com Phone: 800.567.8378

PML Microbiologicals, Inc.
www.pmlmicro.com Phone: 800.628.7014

Procter & Gamble
www.pgbrands.com Phone: 513.983.1100

Q Laboratories, Inc.
www.qlaboratories.com Phone: 513.471.1300

R&F Laboratories
www.rf-labs.com Phone: 630.293.4000

Remel Inc.
www.remel.com Phone: 800.255.6730

Roche Applied Science
www.roche-applied-science.com Phone: 800.428.5433

rtech™ laboratories
www.rtechlabs.com Phone: 800.328.9687

Serim Research Corporation
www.serim.com Phone: 800.542.4690

Silliker, Inc.
www.silliker.com Phone: 888.957.LABS

Springer
www.wkap.nl Phone: 866.269.9527

Strategic Diagnostics Inc.
www.sdix.com Phone: 800.544.8881

Steritech
www.steritech.com Phone: 800.868.0089

Synbiosis
www.synbiosis.com Phone: 800.686.4451

USDA – Food Safety and Inspection Service
www.fsis.usda.gov Phone: 202.720.9113

VWR International
www.vwr.com Phone: 800.932.5000

Warnex Diagnostics Inc.
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Sunday, August 8, 2004	Monday, August 9, 2004	Tuesday, August 10, 2004
8:00 p.m. – 10:00 p.m. Cheese and Wine Reception	9:30 a.m. – 10:30 a.m. Pastries and Coffee 3:00 p.m. – 4:00 p.m. Coffee Break 5:00 p.m. – 6:30 p.m. Exhibit Hall Reception	9:30 a.m. – 10:30 a.m. Pastries and Coffee

EXHIBIT HOURS

Sunday, August 8, 2004	Monday, August 9, 2004	Tuesday, August 10, 2004
8:00 p.m. – 10:00 p.m.	9:30 a.m. – 1:30 p.m. 3:00 p.m. – 6:30 p.m.	9:30 a.m. – 1:30 p.m.

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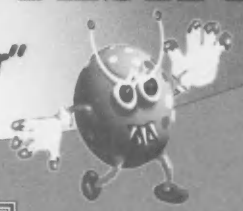

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COMING EVENTS

AUGUST

IAFP 2004 Workshops, JW Marriott Desert Ridge Resort, Phoenix, AZ.

- **6–7,** Workshop 1 – Your Data, Your Job: Quality Systems for Microbial Food Analysis
- **7,** Workshop 2 – Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection
- **7,** Workshop 3 – Best Practices for Quality Aquacultural Products

See page 558 of this issue for additional information.

- **8–11, IAFP 2004, the Association's 91st Annual Meeting,** JW Marriott Desert Ridge Resort, Phoenix, AZ. For more information, see page 556 of this issue for additional information or contact Julie Cattanach at 800.369.6337; E-mail: jcattanach@foodprotection.org.
- **16–20, Advanced Food Microbiology Short Course,** Boise State University, Boise, ID. For more information, call 877.426.3797 or go to www.techhelp.org.
- **17–18, National Pork Board's Pork Quality and Safety Summit,** Holiday Inn, Des Moines, IA. For more information, call 515.223.3532 or go to www.porkboard.org.
- **19–20, Principles of HACCP,** ASI Food Safety Consultants, Baltimore, MD. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **20–21, Baking 101 Seminar,** Chicago, IL. For more information, contact AIB at 785.537.4750 or go to www.aibonline.org.
- **26–27, Lead Auditor,** ASI Food Safety Consultants, Chicago, IL. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **30–31, Forensic Food Microscopy,** GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.

SEPTEMBER

- **1–3, Food Safety and HACCP in the 21st Century: From Theory to Practice,** Conrad Hotel, Bangkok, Thailand. Co-sponsored by IAFP. For more information, contact Chris Jones at 44.161.736.9172; E-mail: www.who.int/en.
- **12–15, International Symposium on Problem of Listeriosis (ISOPOL),** Uppsala, Sweden. For more information, go to www.conference.slu.se/isopol.
- **19–22, American Association of Cereal Chemists (AACC) and the Tortilla Industry Association (TIA) Meeting,** San Diego Convention Center, San Diego, CA. For more information, contact AACC at 651.454.7250; E-mail: aacc@scisoc.org.
- **20–24, International Conference on Food Safety,** Adelaide, South Australia. For more information, contact the conference convenor at 61.2.9684.1975; E-mail: conference@haccptown.com.
- **21–22, Upper Midwest Dairy Industry Association Annual Meeting,** Holiday Inn, St. Cloud, MN. For more information, contact Gene Watnaas at 218.769.4334; E-mail: saantaw@prtel.com.
- **21–23, New York State Food Protection Association Annual Meeting,** Sheraton Four Points Hotel, Buffalo, NY. For more information, contact Janine Lucia at 607.255.2892; E-mail: jgg3@cornell.edu.
- **22–23, Fifth Annual Illinois Food Safety Symposium,** Hotel Pere Marquette, Peoria, Il. For more information, contact Jayne Nosari at 217.785.2439; E-mail: jnosari@idph.state.il.us.
- **28, Washington Association for Food Protection Annual Conference,** Campbell's Resort, Chelan, WA. For more information, contact Bill Brewer at 206.363.5411; E-mail: billbrewer1@juno.com.
- **28–29, Wisconsin Association for Food Protection Annual Meeting,** Ho-Chunk Casino & Hotel Convention Center, Wisconsin Dells, WI. For more information, contact Randy Daggs at 608.837.2087; E-mail: rdaggs@juno.com.
- **28–Oct. 2, World Dairy Expo 2004,** Madison, WI. For more information, go to www.worlddairyexpo.com.
- **29, Sanitary Facility Design Workshop,** Nashville, TN. For more information, contact American Meat Institute Foundation at 703.841.2400 or go to www.meatami.com.
- **29–Oct. 1, Wyoming Environmental Health Association Annual Educational Conference,** Great Divide Lodge, Breckenridge, CO. For more information, contact Roy Kroeger at 307.633.4090; E-mail: roykehs@laramiecounty.com.
- **29–Oct. 1, Bev Expo 2004,** Tampa Convention Center, Tampa, FL. For more information, go to www.bevexpo.com.

OCTOBER

- **5–7, ASTM Committee E27 on Hazard Potential of Chemicals,** Omni Shoreham, Washington, D.C. For more information, contact Scott Orthey at 610.832.9730; E-mail: sorthey@astm.org.
- **6–8, Kansas Environmental Health Association Annual Fall Meeting,** Best Western Inn, McPherson, KS. For more information, contact Cynthia Kastens at 620.842.6000; E-mail: ckastens@sedgwick.gov.
- **7–8, Advanced HACCP,** St. Louis, MO. For more information, contact ASI Food Safety Consultants at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **12–13, Associated Illinois Milk, Food and Environmental Sanitarians Annual Fall Meeting,** Stoney Creek Inn, East Peoria, IL. For more information, contact Terry Fairfield at 815.490.5570; E-mail: terry_fairfield@deanfoods.com.
- **12–14, Applied Extrusion Workshop,** University of Nebraska Food Processing Center, Lincoln, NE. For more information, contact Pauline Galloway at 402.472.9751; E-mail: pgalloway2@unl.edu.

IAFP UPCOMING MEETINGS

AUGUST 8-11, 2004
Phoenix, Arizona

AUGUST 14-17, 2005
Baltimore, Maryland

AUGUST 13-16, 2006
Calgary, Alberta, Canada

COMING EVENTS

- **17–20, UW-River Falls 24th Food Microbiology Symposium,** "Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology," University of Wisconsin-River Falls, WI. For more information, call 715.425.3704; E-mail: foodmicro@uwrf.edu.
- **19, Metropolitan Association for Food Protection Annual Meeting,** Rutgers, Cook College, New Brunswick, NJ. For more information, contact Carol Schwar at 908.689.6693; E-mail: cschwar@entermail.net.
- **19–20, 9th Annual Dairy Cleaning and Sanitation Short Course,** Cal Poly Dairy Products Technology Center, San Luis Obispo, CA. For more information, contact Laurie Jacobson at 805.756.6097; E-mail: ljacobso@calpoly.edu.
- **19–20, Sensory Techniques,** CCFRA Technology Ltd., Chipping Campden, Glos, UK. For more information, contact Chantal Gilbert at 44.1386.842256; E-mail: training@campden.co.uk.
- **19–21, 2nd International Symposium on Spray Drying of Milk Products,** Maryborough House Hotel, Maryborough Hill, Douglas, Cork, Ireland. For more information, call 353.25.42237; E-mail: spraydrying2004@moorepark.teagasc.ie.
- **20–22, Florida Association for Food Protection Annual Educational Conference,** Adam's Mark Hotel, Clearwater Beach, FL. For more information, contact Marjorie Jones at 561.871.7405; E-mail: marjorie.jones@avendra.com.
- **25–26, Brazil Association for Food Protection Annual Fall Meeting,** Conselho Regional de Quimica, São Pāulo, Brazil. For more information, contact Maria Teresa Destro at 55.113.091.2199; E-mail: mtdestro@usp.br.
- **25–29, Dairy Technology Workshop,** Birmingham, AL. For more information, call 205.595.6455; E-mail: us@randolphconsulting.com.
- **28–30, North Dakota Environmental Health Association Annual Fall Meeting,** Seven Seas Conference Center, Mandan, ND. For more information, contact Debra Larson at 701.328.1291; E-mail: djlarson@state.nd.us.

NOVEMBER

- **3–4, Implementing *Listeria* Intervention and Control Workshop,** Chicago, IL. For more information, contact American Meat Institute Foundation at 703.841.2400 or go to www.meatami.com.
- **4–5, Lead Auditor,** Atlanta, GA. For more information, contact ASI Food Safety Consultants at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **9–10, Principles of Food Safety Auditing/Inspection,** Four Points Sheraton Hotel Chicago O'Hare, Chicago, IL. For more information, contact AIB at 785.537.4750; or go to www.aibonline.org.
- **9–10, Principles of Food Safety Auditing/Inspection,** Atlanta, GA. For more information, contact AIB at 785.537.4750 or go to www.aibonline.org.
- **18, Ontario Food Protection Association Annual Fall Meeting,** Stage West, Mississauga, Ontario. For more information, contact Gail Evans Seed at 519.463.6320; E-mail: ofpa_info@worldchat.com.

DECEMBER

- **1–2, Food Plant Sanitation,** GFTC, Guelph, Ontario, Canada. For more information, contact GFTC at 519.821.1246; E-mail: gftc@gftc.ca.
- **6–10, Diploma in Food Hygiene and Safety,** GFTC, Guelph, Ontario, Canada. For more information, contact GFTC at 519.821.1246; E-mail: gftc@gftc.ca.

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Review

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	*Developing HACCP Plans–A Five-Part Series (as published in *DFES*)	15.00	15.00	
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