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SCIENCE AND NEWS FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

JUNE 2007

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FOOD PROTECTION TRENDS

VOLUME 27, NO. 6

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

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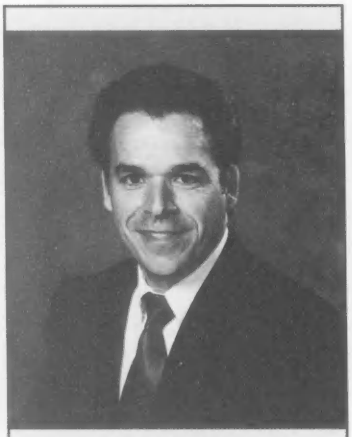


By FRANK YIANNAS
PRESIDENT

"Let me share with you what I believe are four critical success factors needed to make significant leaps in food safety"

Recent high profile outbreaks of foodborne disease in the United States (and elsewhere) have created political and professional pressure for additional food safety controls and management systems. Some say we need stricter food safety standards. Others claim we need more regulatory oversight. Yet others say we need a single food safety agency.

Regardless of what you think the answer could be, I believe we are at one of those defining moments for our profession. We stand on the brink of an opportunity to accelerate advances as a profession or continue with more traditional food safety approaches.

Although I don't think there is any question that in many parts of the food system and world we have made good progress in the battle against foodborne disease, for those of us with a passion for advancing food safety and protecting public health worldwide, we would like to see even more progress made. Despite the fact that thousands of employees have been trained in food safety around the world, millions have been spent globally on food safety research, and countless inspections and tests have been performed at home and abroad, food safety remains a significant public health challenge.

With this thought in mind, let me share with you what I believe are four critical success factors needed to make significant leaps in food safety.

One, to make significant leaps in food safety, we need creativity and innovation. The definition of an innovation is the act of introducing something new. From a food safety perspective, an innovation can be a new or enhanced food safety practice, a new food safety product, or a new food production technology. The bottom line is that creativity and innovation leads to change and change can lead to even greater reductions in the risk of foodborne disease. Simply put, it is impossible to advance food safety without change.

Two, to make significant leaps in food safety, we need leadership. As I have shared before, it's interesting to me that in the field of food safety today, we often talk about food safety management. We rarely talk about food safety leadership. But management and leadership are different. Food safety management focuses on the administration of set procedures within an established risk management system; food safety leadership focuses on the creation of new and enhanced risk reduction strategies, models, and processes. To advance food safety, some of us need to be courageous pioneers and help lead the way.

Three, to make significant leaps in food safety, we need to be continual learners and learn from other disciplines. There is no question about it, we need to be continual learners and more research is needed to answer some of the food safety questions of our day. We also need to get better at taking research out of the lab and putting it in contact with the problems in the real-world (in a manner that is effective, reliable, and efficient). We also need to learn from other disciplines such as the medical, information technology, and biotechnology fields to name just a few. I believe some of our greatest future food safety solutions may not even come from within the field of food safety.

Four, to make significant leaps in food safety, we need better collaboration. Remember, the way we get our food from farm to fork, the food system, has become increasingly complex

and interdependent on many businesses and individuals. Today more than ever, food safety is truly a shared responsibility. Regulators, academicians, consumers, and industry professionals must recognize that we can do more to advance food safety by working together than by working alone.

Over the past few years as an executive board member of IAFP, I have been very fortunate to meet many of our members and food safety professionals from all over the country and world. It is because of this experience that I remain convinced that the future of food safety looks very bright. Never before in history have we, as a profession, been so well suited to advance food safety through innovation, leadership, research, and collaboration.

I encourage you to become part of IAFP as we and our members help lead the way in advancing food safety worldwide.

Frank

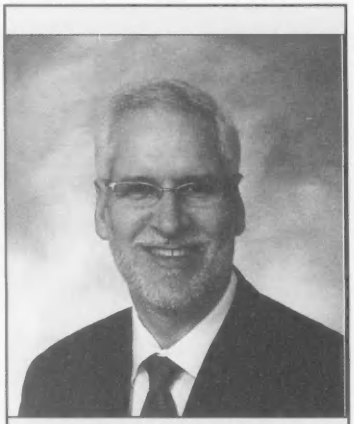
If you have any questions, comments, or suggestions, please let me know. You can E-mail me at frank.yiannas@disney.com. Until next month, thanks for reading.

"COMMENTARY"
FROM THE EXECUTIVE DIRECTOR

This issue of *Food Protection Trends* is our Annual Meeting issue and includes the full program for IAFP 2007. Our coverage of the 94th Annual Meeting begins on page 450. You will want to review the program to plan for **your** participation in the "leading food safety conference!"

Our meeting at *Walt Disney World®* Resort in Florida will have so much for everyone to do and see, it will be one experience you will not soon forget. If you have never been to *Walt Disney World®*, you will love the surroundings and the "Disney" experience. If ever you have considered bringing family members or friends to an IAFP Annual Meeting, this might just be the best time ever. IAFP 2007 presents the greatest opportunity to visit *Walt Disney World®* for those who have not yet been able to do this. In all, there are four theme parks and two water parks for your amusement and fun. Plus, there are great restaurants, many shopping and entertainment opportunities, along with golf, tennis, swimming, fishing and boating.

In addition to all that Disney has to offer, we have arranged a number of tours that your friends or family may choose to participate in. There are tours for you to consider on Saturday and Sunday prior to the start of our meeting and an additional day of field tours planned for Thursday after the meeting. Tour descriptions are on page 486, but let me tell you a little about our Saturday and Sunday line up. On Saturday, our tour travels east of Orlando to the Kennedy Space Center for observation of rockets and the space shuttle along with lunch with an astronaut. There are also two field tours on Saturday, one to the food operations of Disney, the second to learn about innovative technologies in food production. Lastly for Saturday, we have a golf tournament planned for the morning.



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"Our meeting at Walt Disney World® Resort in Florida will have so much for everyone to do and see"

On Saturday afternoon, IAFP will hold a welcome reception for those arriving early. This is an opportunity to meet new friends and renew old acquaintances. We hope you will be able to join us! Then, all day on Sunday, our Committees and Professional Development Groups (PDGs) will meet to discuss their interests and give guidance to the Association. Committee and PDG meetings are open to all attendees so plan now to attend those that interest you!

Our tour for Sunday will travel to Merritt Island National Wildlife Refuge. There, participants will learn about the endangered wildlife at the refuge. Later, the group will take an airboat ride through the Everglades with certified eco-guides. Committee and PDG meetings end late in the afternoon and the tour will return by 3 p.m., all in time for the Opening Session (6 p.m. until 7 p.m.) and the Opening Reception (from 7 p.m. until 9 p.m.). Don't be late to the Opening Session as there are a few surprises waiting for you at 6:00 p.m.!

Presentations begin on Monday and continue through Wednesday, but we have something planned for each evening, should you care to participate. Our Monday Evening Social will be held at *Disney's Epcot®* at the American Adventure Rotunda. After a reception-style dinner, we will enjoy a desert party while watching the *IllumniNations: Reflections of Earth* laser, fireworks and special lighting effects show.

Tuesday night presents an opportunity for some unique fun and entertainment. Offered as a fundraiser for the IAFP Foundation, our group will travel to the Adventurer's Club at Pleasure Island. Share stories with the many characters at this 1930's legendary

night club as you enjoy the evening. At the end of the evening, you may choose to extend your visit to Pleasure Island.

Of course on Wednesday evening, we will gather for the Annual Awards Banquet to share conversation with colleagues and recognize those selected leaders in food safety. Plan your IAFP Annual Meeting experience to include the Awards Banquet. It has become one of the largest gatherings of attendees over the past years!

To wrap up your trip to IAFP 2007, you may want to consider a Thursday morning field tour. In addition to the two tours mentioned earlier for Saturday (food operations and innovative food technologies), we have two additional tours to choose from. A trip is planned to Disney's Environmental Laboratory for a behind-the-scenes look at the environmental lab operations. Also, a tour to visit the first commercial food irradiation facility at Food Technology Service, Inc. will give you a first-hand look at this technology.

As you can see, there are so many things to experience at IAFP 2007; you will want to spend some extra time while there. We hope you have made your plans to attend IAFP 2007 and we look forward to seeing you at *Walt Disney World®* next month.

ARTICLES

Food Protection Trends, Vol. 27, No. 5, Pages 380–388

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

International Association for Food Protection

Factors That Contribute to the Microbial Safety of Commercial Yogurt

KATHLEEN A. GLASS[1]* and J. RUSSELL BISHOP[2]

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SUMMARY

Yogurt with active cultures, at pH of 4.6 or below, and processed in compliance with Good Manufacturing Practices prescribed by the United States Pasteurized Milk Ordinance, is inherently safe and does not support the growth of pathogenic organisms. More specifically, the safety of commercial yogurt is primarily dependent on the use of pasteurized milk to eliminate vegetative bacterial pathogens and spoilage microorganisms, good manufacturing practices and sanitary operating procedures to reduce the potential for recontamination, and a robust fermentation to produce sufficient acid and other antimicrobial metabolites to prevent growth of pathogens, should recontamination occur. High numbers of live and active starter culture organisms assure safety by generating acid and other antimicrobial metabolites during a short fermentation, preventing growth or causing death of pathogens. Chilling of the acid food to < 7°C within four hours after coagulating the milk (pH ~ 4.6) serves to reduce additional acid production and thus to prevent adverse flavor defects, control spoilage, and enhance quality. Data described in this review support the safety of current US industry practices for the production of commercial yogurt when pH values of the finished product is < 4.6 within 24 hours of filling.

A peer-reviewed article

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MANUFACTURING PRACTICES ENSURING THE SAFETY OF YOGURT

Standard commercial yogurt produced in the United States (defined in 21CFR 131.200, 131.203 and 131.206; *62)* is inherently safe because of a number of contributing factors. United States regulations require use of pasteurized milk in yogurt production. Current industry practices typically exceed minimum thermal requirements by pasteurizing to 91°C for 40 to 60 seconds (HTST) or to 85°C for 30 minutes (vat). Heating milk and milk mixes to a high temperature denatures the whey proteins, which improves body and ensures destruction of indigenous thermotolerant microflora that may interfere with the rapid growth and acid production of the starter bacteria *(31, 61, 64)*. Pasteurized homogenized milk or milk mix, and any stabilizers or sweeteners, are then cooled to 42 to 45°C in closed vats before concentrated starter culture is added to yield approximately 6 to 7-log CFU/ml or greater of each *Streptococcus thermophilus* (ST) and *Lactobacillus bulgaricus* (LB) culture. Product mixture may then be filled immediately for cup-set yogurt or vat-fermented before filling for blended-style. During the fermentation, regardless of product packaging, the population of yogurt starter culture increases 100- to 10,000 fold to a final concentration of approximately 9

log CFU/ml and generates lactic acid from the metabolism of lactose. The associated pH reduction causes a destabilization of the micellar casein at a pH of 5.1 – 5.2, with complete coagulation occurring around pH 4.6. At the desired final pH, the coagulated milk is cooled to 4–10°C to slow down the fermentation and retard further acid development. Cultures will continue to metabolize and produce acid after the yogurt is chilled to 7°C or less, although at a slower rate than in yogurt held at elevated temperatures *(35)*.

EFFECT OF SYNERGISTIC GROWTH OF ACTIVE STARTERS

Lactic acid bacteria starter cultures have long been used to ensure the safety of fermented foods because of their ability to compete with pathogens for nutrients, rapidly produce lactic and other acids to reduce pH, and generate other antimicrobial compounds such as acetaldehyde, diacetyl, hydrogen peroxide, and bacteriocins. If a food substrate is contaminated with high levels of pathogenic bacteria prior to fermentation, such as through cross contamination with raw ingredients, certain pathogens may initially be able to compete with the starter and grow. However, they will be inhibited or die when the level of lactic acid is sufficient to achieve a pH of 4.8 or less *(2, 8, 51)*.

On the other hand, certain factors such as bacteriophages, illegal antibiotic residues, or salt content of 1% or greater inhibit the starter culture activity essential for production of fermented or cultured foods. If starter culture metabolism and the rate of lactic acid production is eliminated or significantly reduced, the resulting environment could permit pathogen growth and toxin production in recontaminated, unfermented substrate stored at ambient temperatures (see reviews *40, 57, 66)*.

In the case of commercial yogurt, high numbers of live and active ST and LB cultures assure safety through generation of acid and other antimicrobial metabolites during a short (typically 3 to 6 hours) fermentation at 42 to 45°C, thereby preventing growth or causing death of numerous pathogens. Chilling of the acid food to < 7°C after coagulation of the milk (pH ~4.6) serves to diminish adverse flavor defects by reducing excessive acid production. However, rapid cooling (within 4 hours) does not appear to provide any safety advantage over the slow cooling (within 96 hours) currently practiced by US manufacturers because the higher levels of lactic acid production associated with extended fermentation provide an additional barrier to microbial growth.

Numerous studies have demonstrated that symbiotic growth of ST and LB results in greater acid production than when either strain is used individually *(29, 35)*. Both thermophilic bacteria generate lactic acid by fermenting lactose. LB specifically demonstrates mild proteolytic activity in milk and is primarily responsible for production of flavor and aroma components (acetaldehyde, acetone, acetoin, and diacetyl) *(6)*. During the early stages of fermentation, the amino acids released by the proteolysis of casein stimulate growth of ST. The coccus begins to grow faster than the rod and is responsible for the primary acid production. ST utilizes excess oxygen and produces carbon dioxide and formic acid, which in turn stimulates growth of LB. As the acid concentration increases and the pH decreases from 4.4 to 4.2, ST growth is inhibited, but the lactobacilli continue to grow and produce acid until the substrate reaches pH 3.5 to 3.8.

The synergistic growth of ST and LB is important not only to0 the physical, chemical, and sensory characteristics of yogurt, but also to its safety. Dineen et al. reported that *E. coli* O157:H7 was more sensitive to the inhibitory properties exerted by *L. bulgaricus* than to those of *S. thermophilus* but that co-culture of ST-LB reduced populations of *E. coli* O157:H7 more than either culture used alone *(15)*.

EFFECT OF ACIDITY

Although the use of Good Manufacturing Practices (GMPs) and proper processing are integral to food safety, the acidity of yogurt is a significant factor in inhibiting and inactivating bacterial pathogens should the product be inadvertently recontaminated and stored at non-refrigerator temperatures. Pathogens can survive in yogurt for extended periods if post-fermentation contamination occurs, regardless of storage temperature (see results from Challenge Studies section, following). However, as total acidity increases, survival time decreases *(38)*.

Low pH, by itself, decreases the activity of bacterial enzymes and transport systems. Other factors, such as type of acid and total acidity as well as buffering capacity of the substrate, are also pertinent to bacterial survival and growth capabilities *(10, 29)*. In addition, the lag phase for a microorganism increases if the pH of the substrate is outside the range of optimal growth pH *(29)*. For example, the minimum pH for growth in laboratory media under otherwise ideal conditions for *S. aureus* is 4.0 to 4.3 when inorganic acids are used; range is much higher (pH 4.9 to 5.1) with use of organic acids such as lactic or acetic acid *(27, 37, 39, 57)*. In acidified pasteurized milk stored at 37°C for 24 hours, populations of *S. aureus* decreased > 2 logs in milk acidified to pH 4.5 with lactic acid, but grew > 2.5 log in milk acidified with HCl to the same pH value *(58)*. The pH requirements are more stringent for toxin production than for growth, with the minimum pH for staphylococcal enterotoxin production reported to be 5.1 *(53)*. Enterotoxin production, like growth, is inhibited more effectively when the pH is reduced by lactic acid rather than by hydrochloric acid *(42)*.

Spores of pathogens such as *Bacillus cereus*, *Clostridium botulinum*, and *Clostridium perfringens* survive pasteurization. However, they are unlikely to grow at pH < 4.8 when stored at or below typical room temperatures. The USDA-ARS Pathogen Modeling Program 7.0 predicts probability <0.01 for growth of *C. botulinum* at 20°C through 29 days in laboratory media acidified to pH 4.8 *(60)*. Minimum pH for growth of common *B. cereus* strains is 4.8 in media acidified with HCl or 5.6 in media acidified with lactic acid; the organism is reported to die suddenly in yogurt when the pH reaches 4.5 *(27, 42)*. *C. perfringens* growth is limited at pH 5.5, and the organism is reported to be inactivated after several days at pH 5.0 *(27, 42)*.

EFFECT OF OTHER METABOLITES

In addition to generating lactic acid, the two primary starter cultures required by the Standard of Identity for yogurt (21 CFR 131.200, 131.203 and 131.206, *S. thermophilus* and *L. bulgaricus*) are known to generate other

antimicrobial metabolites *(62)*. Gilliland and Speck demonstrated that lactic streptococci reduced growth of *Salmonella* and *S. aureus* in milk, even when the pH was maintained at pH 6.6 during starter growth *(20)*. These researchers, as well as many others, have reported that metabolites such as hydrogen peroxide, bacteriocins, acetaldehyde, and diacetyl, are antagonistic to bacterial pathogens and spoilage microorganisms *(1, 4, 13, 14, 20, 28, 30)*.

Hydrogen peroxide is a toxic reduction product of molecular oxygen, which inhibits *S. aureus* and other pathogens *(2, 13, 14*; see review *19)*. Diacetyl inhibited growth of *E. coli* O157:H7 and *Salmonella* Typhimurium when added to laboratory media at a concentration of 50 ppm *(30)*. Acetaldehyde (at 500–1000 ppm) has been shown to be inhibitory to other lactic acid starter or probiotic bacteria *(66)*. Levels of these compounds produced by LB cultured alone are lower than those typically considered sufficient for antimicrobial activity individually *(32)*. However, studies have shown that when LB is co-cultured with ST in yogurt, 1400–1700 ppm acetaldehyde and 165–200 ppm diacetyl can be produced *(7)*.

Based on a study that neutralized hydrogen peroxide and acid produced by ST-LB cultures in yogurt, Attaie et al. suggested that bacteriocin or other antimicrobial production by ST and LB may also contribute to the inhibition of *S. aureus (2)*. Numerous bacteriocins that are effective against pathogenic and spoilage bacteria are produced by ST and LB, as well as by adjunct starters *(4)*. Most are active at the low pH values associated with yogurt *(10)*. Several strains of ST produce the bacteriocin thermophilin, which has activity against Gram-positive bacteria such as *L. monocytogenes* and *Clostridium tyrobutyricum (36, 65)*. Adjunct lactic acid bacteria, such as *L. acidophilus*, have been shown to produce the bacteriocin acidophilin, which inhibits *S. aureus*, *E. coli*, *Pseudomonas fluorescens*, and *P. fragi (2, 54, 55)*. Other research demonstrates greater kill of *S. aureus* and *L. monocytogenes* during yogurt fermentation and storage at 4 or 22°C when a bacteriocin-producing ST was used, rather than a starter that did not produce bacteriocins *(5*; N. Benkerroum, personal communication, April 4, 2005).

INTERNATIONAL OUTBREAKS ASSOCIATED WITH CONTAMINATED YOGURT

To date, no recognized foodborne disease outbreaks have been associated with yogurt in the United States. The enviable record of safety is due primarily to the consistent use of multiple safeguards, including proper GMPs (production in a sanitary environment, use of safe and suitable ingredients such as pasteurized milk) and use of active starter cultures for essential acid development. In contrast, each of the outbreaks associated with contaminated yogurt that have been reported in other countries in the past two decades were associated with improper processing, contamination with raw milk, and/or inadequate acid production *(9, 12, 41, 42, 44, 63)*.

In the United Kingdom, 27 cases of botulism, including 1 death, were associated with the consumption of yogurt that contained insufficient thermally-processed hazelnut puree. Although yogurt itself had been manufactured properly, the preformed botulinum toxin in the contaminated hazelnut puree was stable at the low pH of the product during refrigerated storage *(12, 44)*. Investigations into several outbreaks of *Salmonella* and *E. coli* O157:H7 in the UK, Scotland, and British Columbia similarly revealed violations of good manufacturing practices. Improper practices included using a single pump for transferring raw milk and distributing pasteurized milk for fermentation without intermediate disinfection, failure to record time/temperature for pasteurization, and overall poor hygienic practices *(9, 17, 41, 63)*. Two outbreaks of staphylococcal enterotoxin poisoning, resulting in a total of 47 cases, were reported to New Zealand authorities and linked to yogurt made in institutional kitchens *(42)*. Both outbreaks were attributed to contamination of food by handlers and to slow growth of yogurt starter culture due to fermentation at room temperature (approximately 25°C) rather than at the prescribed 42 to 45°C necessary for rapid acid development (R. Whyte, Institute of Environmental Science & Research Limited, New Zealand, personal communication, April 4, 2005).

VERIFICATION OF YOGURT SAFETY BY CHALLENGE STUDIES

Numerous studies have evaluated the survival of pathogens during production and storage of yogurt; however, all conditions have not been tested for each pathogen. Table 1 summarizes inactivation or survival rates for pathogens in yogurt at various temperatures from representative studies. In all reported studies, pathogens died in yogurt with pH ≤ 4.6, in contrast to the growth predicted at pH 4.6 with use of the USDA-ARS Pathogen Modeling Program 7.0 *(60)*. As described above, the enhanced inhibitory properties of yogurt compared with laboratory media are due to several factors: lactic acid as the predominant acid, generation of antimicrobial metabolites, and active competition of the starter cultures with pathogens for nutrients.

Few pathogenic bacteria are able to survive extended periods in the harsh, acidic environment of yogurt. Although the pH of commercial yogurt is generally less than 4.4, some unusual varieties may have pH values that exceed 4.6. Data from multiple challenge studies suggest that if the pH is < 4.6 within 24 hours of the beginning of fermentation, the probability of pathogen growth in yogurt at the nonstandard pH values is very low.

The enteric pathogen *E. coli* O157:H7 is noted to be particularly acid resistant *(16)* and therefore would pose the greatest risk of extended survival in yogurt. Factors that would control growth or survival of *E. coli* O157:H7 should be sufficient to ensure the overall safety of these products with regard to other pathogens. Any potential risks associated with *E. coli* O157:H7 can be mitigated by standard pasteurization of raw ingredients to eliminate the pathogens and good manufacturing practices to prevent any recontamination of the milk *(9, 41)*. However, numerous research studies have demonstrated that, should the product be inadvertently contaminated, fermentation by the ST-LB culture and prolonged exposure to the high-acid environment (pH ≤ 4.6) provide an additional hurdle to inactivate pathogens, especially when the product is stored at non-refrigeration temperatures. Research conducted using other acidic foods, such as apple cider and

TABLE 1. Pathogen inactivation in yogurt, minimum pH values for pathogen growth, and predicted growth potential in laboratory media adjusted with HCl to pH 4.6 and with no competitive microflora

	Modeled time to 1-log increase to pH 4.6 laboratory media at 20°C[a]	Yogurt storage temperature	Initial pH	Log reduction (time) in pH < 4.6[b] yogurt	Ref.
L. monocytogenes	2.85 days	4°C	4.54	4 (12 wk)	*52*
		4°C	4.44	4 (3 wk)	*52*
		4°C	4.19	3 (2 wk)	*52*
		4°C	4.02	2 (1 wk)	*52*
		8°C	4.35 to 4.52	2 to 3.5 (28 d)	*59*
		4°C	3.8 to 4.1	4 (13 to 27 d)	*11*
S. aureus	3.18 days	7°C	4.3	2 (10 d)	*5*
		7°C	3.7 to 4.1	2 to 3 (1 d)	*38*
		23°C	3.7 to 4.1	2 to 3 (1 d)	*38*
Salmonella	not modeled	42°C	4.54	3 (6 h)	*49*
		37°C	3.85	6 (1 h)	*49*
E. coli O157:H7	0.88 days	4°C	4.65	0.8 (7 d)	*25*
		4°C	4.65	>3 (35 d)	*25*
		12°C	4.65	1.0 (7 d)	*25*
		12°C	4.65	>3 (35 d)	*25*
		4°C	4.47	4 (16 d)	*26*
		10°C	4.47	4 (13 d)	*26*
		4°C	4.4 to 4.5	1 to 2 (7 d)	*34*
		4°C	4.39	6 (17 d)	*26*
		10°C	4.39	6 (15 d)	*26*
		4°C	4.2	1 (5 d)	*43*
		25°C	4.2	5 (48 h)	*43*
		4°C	4.17	6 (8 d)	*26*
		10°C	4.17	6 (5 d)	*26*
		4°C	4.1	0.8 (72 h)	*3*
		8°C	4.1	2.7 (72 h)	*3*
		17°C	4.1	3 (72 h)	*3*
		22°C	4.1	4 (74 h)	*3*

[a]Based on Pathogen Modeling Program 7.0 *(60)*

[b]Based on yogurt fermented at 42°C with standard ST-LB starter cultures

mayonnaise, further supports the contention that *E. coli* O157:H7 demonstrates lower tolerance of acid conditions when held at ambient temperatures than when refrigerated *(7, 67)*. Multiple challenge studies in yogurt confirm that acid content and temperature both have effects on pathogen survival.

Hudson et al. suggested that survival of *E. coli* O157:H7 in commercial yogurt with live cultures was dependent on both pH and storage temperature *(26)*. Shorter survival times were reported in yogurt with initial pH of 4.17 than yogurt at pH 4.39 or 4.47. Similarly, at any given pH, pathogen viability was lower in yogurt stored at 10°C than at 4°C. Populations of *E. coli* O157:H7 decreased 6 log units, to undetectable levels, within 5 and 8 days at 10 and 4°C respectively for yogurt with pH 4.17, within 7 and 15 days at 10 and 4°C respectively for yogurt with pH 4.39, and within 17 days at both 10 and 4°C for yogurt with pH 4.47. Similar trends were observed for strawberry-flavored full-fat and nonfat yogurt *(21)*. Populations of *E. coli* O157:H7 decreased by > 2.5 and 1 log CFU/g after two weeks in nonfat and full-fat yogurt, respectively, when cooled slowly from 27 to 7°C over 96 hours and then held at 7°C. The pathogen was more stable in products stored at a constant 7°C, with approximately 0.7 log decrease for both yogurt types at the end of the two-week testing interval. The pH values of the products decreased from an initial 4.4 to 4.2 when stored at a constant 7°C, whereas the products that were cooled slowly had final pH values of approximately 4.1 due to extended acid production.

Govaris et al. *(22)* inoculated milk with ST-LB starter culture and 4.8 log *E. coli* O157:H7 prior to preparation of set yogurt *(22)*. Products were fermented

at 42°C for 3 hours to coagulate the milk and then stored at 4 or 12°C. Populations of *E. coli* O157:H7 decreased approximately 1 log unit during the fermentation to pH 4.4 and to undetectable levels in yogurt after 5 and 7 days storage at 12 and 4°C, respectively.

Bachrouri et al. *(3)* similarly observed accelerated inactivation at higher storage temperatures. The researchers inoculated finished, retail, plain yogurt (with live ST-LB cultures; initial pH 4.1) with > 4 log CFU *E. coli* O157:H7 per g yogurt and stored the product at 4, 8, 17, and 22°C *(3)*. Populations of *E. coli* O157:H7 decreased 0.8 and 2.7 log in yogurt stored 72 hours at 4 and 8°C, respectively. Storage at ambient temperatures increased the death rate, yielding a 3 and 4 log decrease in yogurt stored at 17 and 22°C, respectively.

Ogwara et al. *(43)* compared the behavior of *E. coli* O157:H7 in African yogurt and in recontaminated milk fermented at 43, 37, 30, and 25°C, and then stored at 4 or 25°C *(43)*. Data revealed that in spite of the recontamination, *E. coli* O157:H7 did not grow in milk rapidly fermented at 43°C (final pH 4.0 at 24 h), but did increase in recontaminated milk during slow fermentation at the lower temperatures (final pH at 24 h was 5.1, 4.6, and 4.4, for 25, 30, and 37°C, respectively). In yogurt stored at 4°C, populations of pathogen decreased approximately 8 and 2 log CFU/g for product fermented at 43 and 25°C, respectively. In all fermented milk samples stored at 25°C, no viable *E. coli* O157:H7 were recovered after 5 days regardless of fermentation temperature.

Guyara and collaborators reported a > 3 log reduction of *E. coli* O157:H7 in inoculated retail yogurt (pH 4.2 or lower) stored at either 4 or 12°C for 7 days *(25)*. For pH 4.65 yogurt, populations of the pathogen declined 0.8 and 0.1 log when stored at 4 and 12°C, respectively, for 7 days. At day 35, a >3 log reduction was observed regardless of storage temperature.

The effect of the adjunct culture, *Bifidiobacterium bifidum*, used in addition to the standard ST-LB cultures was evaluated by co-inoculating high and low levels of *E. coli* O157:H7 with yogurt starters in pasteurized milk *(34)*. Product was fermented at 42°C for 5 hours until the pH was 5.1–5.2, and then stored at 4°C for 7 days. As seen with traditional yogurt, the pH continued to decrease during refrigerated storage to achieve a final pH 4.5–4.6; a concomitant decrease in viable *E. coli* O157:H7 was observed. No significant difference was observed between the traditional yogurt and the bifido yogurt, but continued acid production and pH decrease were deemed important in reducing pathogen populations.

Dineen et al. *(15)* demonstrated that populations of *E. coli* O157:H7 decreased from 2 log CFU/g to less than detectable levels in three brands of retail low-fat yogurt during storage for 6 to 14 days at 4°C. The acidity remained constant during the 2-week refrigerated storage with pH values of 4.0, 4.0, and 4.2 for the varieties made with ST-LB only, ST-LB with *L. acidophilus*, and ST-LB with *L. acidophilus* and *L. bifidus*, respectively. These data suggest that survival of this pathogen is diminished in an acidic environment, even at refrigeration temperatures.

Survival of *E. coli* O157:H7 in yogurt has been shown to be influenced by the presence of colanic acid (CA), which is polysaccharide slime on the surface of the bacterial cell that increases the pathogen's resistance to acid *(33)*. Wild-type cells with CA demonstrate the longer survival in yogurt (initial pH 4.7) stored at 15°C than at 4°C, whereas there was little difference in survival in mutant strains without CA. However, *E. coli* O157:H7 declined in all treatments during the 3-week storage period.

Salmonella Typhimurium grows in laboratory media acidified to pH 4.4 with lactic acid, but is inactivated in cultured skim milk with the same pH value *(45)*. In spite of the potential to tolerate extreme pH values, challenge studies reveal that *Salmonella* will not grow during early stages of yogurt production and will be inactivated during extended fermentation *(49)*. Populations of *Salmonella* Typhimurium remained constant during the first 4 hours of fermentation in the presence of ST-LB culture as the pH decreased from 6.25 to 4.54 in plain yogurt (0.34% lactic acid). *Salmonella* died rapidly thereafter, decreasing > 3 log CFU/g to undetectable levels during the next 3 hours at 42°C as the pH continued to decline to 4.15. Other research noted bactericidal activity when lactic acid reduced the pH of the environment to 4.5, causing the internal pH of the cell to be reduced to 5.3 and causing cell death *(48)*.

A study evaluating the survival of several serotypes of *Salmonella* in Egyptian yogurt demonstrated that *Salmonella* Typhimurium was the serotype most resistant to adverse pH conditions *(18)*. As reported for many of the *E. coli* O157:H7 studies, *Salmonella* survival was lower when yogurt was stored at elevated temperatures (30–32°C) than at refrigeration temperatures (4°C). The pathogen was inactivated to less than detectable levels at 16 and 23 days (final pH 4.5) or 11 and 19 days (final pH 4.0) when stored at 4°C and room temperature, respectively.

The behavior of Gram-positive bacteria, including spore-formers, which can survive pasteurization, is similar to that of the enteric pathogens in the presence of extreme acid conditions. While pathogens may be able to survive or grow in laboratory media with pH adjusted to < 4.8 under otherwise optimal conditions, few can grow or produce toxin in acidic foods such as yogurt.

No data for challenge studies evaluating the behavior of sporeforming pathogens have been published. However, the safety of yogurt related to these hazards can be predicted based on "worse-case scenarios" reported for growth in laboratory media. The addition of competitive microflora (starter cultures) will further inhibit growth or toxin production by these pathogens. *B. cereus* generally does not grow at pH 4.8 in media adjusted with HCl, or at pH 5.6 when lactic acid is used as the acidulant *(27)*. The pathogen has been reported to be inactivated by 0.1 M acetic, formic and lactic acids in nutrient broth and will die suddenly in yogurt when the pH reaches 4.5 *(42)*. The minimum pH for growth for Group I (proteolytic) *Clostridium botulinum* is considered to be 4.6; however, growth would be slow *(27)*. Outgrowth of Group II (nonproteolytic) spores, which are also able to grow at refrigeration temperatures, are prevented at pH 5.0 or lower. *C. perfringens* growth is slight at pH 5.5, and vegetative cells will die at pH 5.0.

More extensive research has been completed that studies the fate of *S. aureus* and *L. monocytogenes* in yogurt and acidified dairy products. The lag phase of *S. aureus* at 27°C is over 25 hours and generation time is 2 hours in laboratory

media adjusted to pH 4.5 with HCl *(60)*. If the pH of the substrate is less than 4.4, *S. aureus* will die at both refrigeration (7°C) and ambient temperatures (23°C) *(39)*. Neither growth nor toxin formation was detected in milk acidified to pH 4.5 with lactic acid *(58)*, but additional reports suggest that growth is slight in milk acidified to pH 5.1 to 5.2 *(37)*. The minimal pH for enterotoxin production is more stringent than that required for multiplication and is generally limited to values greater than 5.1 *(37, 53, 57, 58)*.

S. aureus is noted for being a poor competitor. However, staphylococcal food intoxications are possible if a food is recontaminated, if acid development by starters is inadequate, and if inhibitory pH is not reached quickly *(40)*. Although acid production is important in preventing staphylococcal growth, Reiter et al. *(47)* reported that even when lactic acid in milk was neutralized, lactic acid bacteria starter culture still retained inhibitory activity against *S. aureus*. If starter activity was poor because of bacteriophage infection, the pathogen was able to multiply. For this reason, hygienic manufacturing practices are essential to prevent recontamination, and starter activity should be monitored to verify proper fermentation.

Several published studies provide evidence demonstrating the control of *S. aureus* in properly fermented yogurt *(2, 5, 38)*. For example, when *S. aureus* was added as a post-fermentation contaminant in retail yogurt (pH 3.7 to 4.1), populations of *S. aureus* decreased by > 3 log within 1 day, regardless of whether it was stored at 7 or 23°C *(38)*. In another study, yogurt was produced in the laboratory by co-inoculating milk with *S. aureus*, *S. thermophilus*, *L. bulgaricus*, and *L. acidophilus (2)*. *S. aureus* grew approximately 1.5 log during the first 4 hours of fermentation until the pH reached 4.8. After the yogurt had reached pH 4.8, populations of *S. aureus* decreased > 3 log during an additional 4 hours at 42°C. To further demonstrate the effect of cultures, beyond acid production, acidified yogurt was produced by adding lactic acid to milk, mimicking the pH changes during fermentation of standard yogurt. Although the populations of *S. aureus* also decreased when the pH 4.8 was reached, the decline was much less dramatic. The greater bactericidal activity associated with standard yogurt and acidophilus yogurt was attributed to high levels of hydrogen peroxide (0.88 µg/ml) produced by the starters. Results for initial growth and subsequent kill of the pathogen during refrigerated storage were confirmed by Pazakova et al. *(46)*. Trends were comparable regardless of the concentration of *S. aureus* introduced at the onset of fermentation.

Similar results were observed when yogurt was produced with bacteriocin-producing ST and a non-producing strain of LB *(5)*. *S. aureus* grew 1.5 log during the early stages of fermentation at 40°C, but decreased > 3.5 log when the mixture reached pH 4.4 at the end of an 8-hour fermentation. Differences in storage temperature appeared to have little effect on viability after fermentation. Populations of *S. aureus* continued to decrease during storage at 7 and 22°C and were undetectable (additional 2 log decrease) at 10 days at both temperatures (N. Benkerroum, personal communication, e-mail April 4, 2005).

On the basis of the potential for *L. monocytogenes* as an environmental contaminant, comprehensive studies have also evaluated the behavior of *L. monocytogenes* in fermented milk products and yogurt *(5, 11, 23, 24, 50, 52, 56, 59)*. Two studies by Schaack and Marth demonstrated that the behavior of *L. monocytogenes* during the fermentation and storage of yogurt was similar to that of the other pathogens described in this review *(50, 52)*. Slow growth of *L. monocytogenes* (1 log increase) was observed during the initial 5-hour fermentation of yogurt with use of either ST alone or ST-LB cultures. After the pH reached 4.8, populations declined as the pH continued to decrease to 4.5 and to 4.0 during additional time at fermentation temperature and during storage at 4°C, respectively. Greater acid production and greater kill of *L. monocytogenes* were reported for yogurt fermented with ST-LB cultures than with ST alone. The pH decreased more rapidly when product was fermented at 42°C than at 37°C, which translated to decreased survival time of *L. monocytogenes* during refrigerated storage. *L. monocytogenes* survived 12 hours in refrigerated product previously fermented with 1.0% ST-LB culture at 42°C (final pH 3.8–3.9) but survived 1–2 weeks in similar product fermented at 37°C (final pH 4.0).

In addition, two research groups compared the differences in listerial survival in retail plain yogurt versus vanilla yogurt with sugar *(11, 59)*. In one study, the type of yogurt (plain vs. with vanilla with sugar) had no obvious effect on pathogen survival when yogurt was stored at 4°C *(11)*. *L. monocytogenes* decreased 2–3 logs during the first 8–12 days, while the pH values of 3.8–4.2 remained similar to 0-time samples. A second study evaluated the survival of *L. monocytogenes* that was inoculated into low-fat and nonfat plain or flavored yogurt (pH ranging from 4.35 to 4.52) and stored at 8°C *(59)*. In the latter study with higher-pH yogurt, listerial populations decreased more gradually, demonstrating a < 1 log decrease in 14 days at 8°C. The most significant decrease was observed at 28 days; populations of *L. monocytogenes* decreased 2.5 log in low-fat plain and vanilla yogurt and in fat-free plain yogurt, whereas a 3.5 log decrease was observed for the fat-free vanilla. Slight additional inhibitory effect by vanillin was observed.

Benkerroum et al. *(5)* reported that storage at either 7 or 22°C had no effect on survival of *L. monocytogenes* in pH 4.4 yogurt, but survival of *L. monocytogenes* was significantly decreased when yogurt was fermented with a bacteriocin-producing strain of ST (Bac$^+$ ST). Populations of *L. monocytogenes* decreased > 8 log after 8 to 24 hours fermentation with Bac$^+$ST, but only 1 log in the Bac$^-$ST yogurt.

CONCLUSIONS

Multiple factors contribute to the microbiological safety of commercial yogurt. Assuming that the milk used in yogurt production is pasteurized and adjunct ingredients are free of vegetative pathogens, good manufacturing practices and sanitation will minimize the risk of post-processing contamination. Rapid acid production to pH values ≤ 4.8 will prevent the outgrowth of any surviving spores of mesophilic and psychrotrophic strains of *Clostridium botulinum* and *Bacillus cereus* during refrigerated or ambient temperature storage. Similarly, *S. aureus* will not produce enterotoxin at these low pH values. While certain vegetative pathogens such as *E. coli* O157:H7 and *L. monocytogenes* are more acid tolerant than the sporeformers, research has demonstrated that as the pH

decreases to pH 4.6, the substrate will inhibit growth and can be bactericidal. Studies comparing the effect of fermentation and storage temperatures in yogurt further suggest that storage temperatures greater than 4°C will enhance the demise of vegetative pathogens by increasing acid production.

Acidity is one of the principal factors in controlling growth, but other metabolites produced during the ST-LB fermentation contribute to the overall safety of yogurt. Although strains may vary in their ability to produce bacteriocins or the level of hydrogen peroxide accumulated in the substrate during fermentation, utilization of nutrients by the high populations of added starter bacteria will compete with low levels of contaminants.

Scientific studies confirm that the current US practice of cooling yogurt to 7°C over 96 hours does not cause any additional safety risks, provided the pH is at or below 4.6 within 24 hours of filling. However, products should be cooled as rapidly as possible to decrease over-production of acid that may reduce quality of the product and to control spoilage. Environmental controls are essential to prevent recontamination with acid-tolerant microorganisms that may have long survival times.

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Home Food Safety Practices of Government Employees in Osceola County, Florida

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SUMMARY

The objectives of this study were to determine the in-home food-handling practices (e.g., personal hygiene, food preparation, food storage, sanitation) and behavior of consumers, and to determine their educational needs. Data were obtained by a mailed survey of a random sample of 600 Osceola County employees. This survey sample provided diversity with regard to age, gender, race, educational level, and income. In addition, some of the participants had previously participated in Osceola County Cooperative Extension Food Safety and Wellness Programs. The instrument included questions about food-handling behaviors and allowed the respondents to mark how often they performed each task. Analysis of survey data from the total of 376 respondents indicated that many participants may be using potentially risky food-handling techniques. Major food safety risk factors identified included cooling food at room temperature, improper use of dishtowels, lack of thermometer use in cooking and refrigerated storage, and many other actions that could lead to cross contamination in the kitchen. Information gained from the survey will facilitate the development of appropriate consumer education brochures and programs.

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INTRODUCTION

Enhanced food safety in home food preparation is possible only through enhancing consumer awareness through effective and appropriately targeted consumer education programs *(1, 3)*. President Clinton's national food safety initiative of 1996 has raised consumer food safety education to a high priority and has resulted in increased public awareness through news media and related sources, federally funded education programs (e.g., FightBAC! Campaign, Cooperative Extension Service), and privately presented education programs. For highest impact, it has been suggested that food safety education programs be targeted to younger consumers and to those in high-risk categories *(1, 4)*.

Although a variety of United States consumer surveys *(5, 6, 9–13)* have been conducted to assess the level of food safety knowledge of consumers and the potential risk for contracting foodborne illness in the home, these parameters are still not well quantified. Previous surveys varied in the number of respondents, ranging from 100 to over 2000, and were conducted in a variety of ways (e.g., mail, telephone, face-to-face interviews, videotaping of in-home practices). Although there is some variation in the survey data, it is generally accepted that contaminated food prepared in the home may cause a substantial portion of foodborne illness in the United States and that there is a general lack of food safety knowledge by many consumers.

In general, consumer attitude survey results have indicated that many consumers have little awareness of foodborne pathogens and do not associate specific pathogens with the diseases they cause or with the food sources of pathogens *(12)*, that a higher knowledge level does not necessarily result in implementation of appropriate food-handling practices *(12)*, that most consumers perceive a larger foodborne illness risk outside the home *(6)*, and that younger consumers with some college education are more likely than older, less educated consumers to recall previous experience with foodborne illness *(6)*.

Woodburn and Raab *(13)* compared the food safety knowledge of the general consumer population with that of groups at high risk for foodborne illness. In general, the high-risk group appeared to have more knowledge of foodborne illness factors than the general population. Most of the respondents in the high-risk group were able to identify potentially high-risk foods. However, they considered foods eaten at home to be of lower risk than food prepared in restaurants, especially fast food restaurants, and they lacked sufficient knowledge of food safety intervention and preventive methods in the home. These survey data also highlighted the importance of improper cooking as a risk factor in the home, with only 60% of the respondents recognizing the role of thorough cooking in food safety.

Similar observations have been made in surveys conducted in other countries. Jay et al. *(9, 10)* examined the preferred sources of food safety educational materials by consumers in Australia. The two most preferred sources were brochures and the news media (e.g., television, magazines, newspapers), followed by magazines, newspapers, refrigerator magnets, videotapes, kitchen posters, personal discussions, and audio tapes. According to Sammarco *(11)*, an estimated 80% of foodborne illness outbreaks in England/Wales and 48% of foodborne illness outbreaks in Spain were because of food prepared or eaten in the home. These researchers further suggested that consumers may be less likely than food service workers to participate in formal education programs and underscored the need for implementing innovative and interesting approaches to consumer education about food preparation techniques. The study by Angelillo et al. *(1)* also revealed food safety knowledge deficiencies in Italian consumers and emphasized the need for further food safety education.

Finally, the Audits International survey *(5)* evaluated food safety risk in the home in the United States by viewing the actual performance of home food handlers and by comparing these observations to the recommended practices in the 1999 Food Code *(7)*. Only 28 out of 115 participants met these Food Code recommended practices, with 76% of the participants committing at least one critical violation. When participants were asked why they committed the violation, 40% responded with lack of education, 40% with lack of awareness and 20% with lack of motivation or choosing to ignore their knowledge.

In summary, data from previous survey investigations suggest several important factors that cause foodborne illness, provide suggestions for in-home prevention and control, and highlight the importance of consumer knowledge, attitude and behavior; the effect of these factors on the rate of adoption of food safety guidelines in the home; and the areas where educational programs are most needed. However, further investigation is needed to determine where knowledge and behavior gaps exist, and how these issues can be further addressed through education or other means. Therefore, the purpose of this investigation was to determine consumer knowledge, attitude and behavior, as well as how these factors affect the rate of adoption of food safety guidelines in the home, and to determine the areas in which educational programs are most needed.

This investigation evaluated the food safety knowledge among Osceola County, Florida, employees who prepare food at home. Some of the participants had participated in previously offered cooperative extension programs in food safety (e.g., Osceola County Cooperative Extension Food Safety and Wellness Programs). Other independent variables studied were social class, gender and home environment. The inhome food-handling behavior of the respondents was assessed according to the following four categories: personal hygiene; food preparation; food cooling, storage and handling; and sanitation.

METHODS

The investigation and procedures were reviewed and approved by the University of Florida Institutional Review Board for rights and welfare of human subjects. Written consent was obtained from all participants.

Statistical design

The statistical research design was a randomized sample survey in which observations were made in the form of a mailed survey instrument. The survey was descriptive and basic in nature, using a combination of qualitative and quantitative methods *(2)*. A randomized sample of 600 government employees in Osceola County, Florida, was used. This popula-

TABLE 1. Age distribution of survey respondents[a]

Age Group	Number of Respondents	Indicated Frequency
30 and under	61	16.2
31 – 40	129	34.3
41 – 50	99	26.4
51 – 60	71	18.9
61 and over	16	4.3

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

tion included individuals ranging from those county employees who work outside (with no office time) to those who work inside (office workers, county officials), and it provided diversity with regard to age, gender, race, and level of education.

Survey instrument

The survey instrument was developed from examining previous studies and through personal experience in Cooperative Extension, with attention to content and face validity. Pre-testing was limited to review and critique by an expert panel. The survey instrument consisted of 37 questions that determined the participant's food safety knowledge and behavior. Demographic questions were asked to determine age, gender, race and level of education. In addition, those who had participated in Cooperative Extension Food Safety and Wellness Programs were identified. Questions included both multiple choice and short answer format and were asked in the form of a Likert scale that allowed participants to indicate the degree/level of knowledge that they may have and frequency of behavior *(2)*. The survey instrument was coded in order to identify the non-respondents.

Data collection

The instrument was administered as a mailed survey via inter-office mail. A total of two mailings were sent. The initial mailing consisted of a cover letter (which explained and defined the survey and its purpose), the survey instrument and a self-addressed coded return envelope for the return of the instrument. The second mailing, consisting of a modified cover letter, the survey instrument and a self-addressed coded return envelope, was mailed to the non-respondents two weeks after the initial mailing. Because of time constraints and based upon the adequacy of the response in the first and second mailings, it was determined by the graduate committee that a third and final mailing was not needed. Similar studies that have been conducted have had response rates of 49.7%, 59%, 87.1% and 95.9% *(1, 11–13)*.

Although the questions were asked in a random fashion, the response data were grouped into the four categories (personal hygiene; food preparation; food cooling, storage and handling; food sanitation). The data were analyzed by descriptive statistics, using SPSS and SAS *(8)*. All objectives were analyzed on a nominal scale in order to determine the frequency of correct answers. In addition, responses to questions that were asked more than once were compared to see if there was a statistical by significant difference between the responses.

RESULTS AND DISCUSSION

Survey demographics

A total of 376 survey instruments (an overall response rate of 62.7%) were completed and returned by the Osceola County employees. The wide range of job types of those surveyed could have caused the relatively large non-response rate. It is possible that some of those who were surveyed do not regularly check their mail or have the opportunity to complete the survey. Of the respondents, 43.3% were male and 56.5% were female. The overall response showed a diversity of ages (Table 1).

To evaluate whether households consist of individuals in potentially high-risk populations for foodborne illness because of age, respondents were asked to indicate the ages of those living in their household. The survey did not inquire about other food safety risk factors such as illnesses or pregnancies. Of the survey respondents, 23.9% reported having children aged 6 and under, which was broken down into less than 1 (4%), 1–3 years (9%), and 4–6 years (10.9%). In addition, 24.5% of the households had adults in the 51–60 year old category, and 8.2% had adults aged 61 years or older living in them.

Personal hygiene practices

As shown in Table 2, responses to personal hygiene questions were grouped into two general categories (handwashing and related practices; other personal hygiene practices).

Properly washing hands before and during the handling of food is an essential factor in preventing the spread of a foodborne illness in the home *(4)*. Pathogenic bacteria and viruses can easily be spread by hands that are not properly washed. It is important to use hot or warm running water and soap when washing hands, and to scrub hands (including the nails, and cuticles) and forearms for at least 20 seconds.

When asked in reference to "washing your hands before preparing food," the question was inadvertently asked twice. The second time it was phrased as "wash your hands prior to preparing food." The responses to these two questions are very similar, as shown in Table 2.

A high frequency (approximately 75% or higher) of respondents indicated that they wash their hands prior to and after preparing foods and that they use soap and water to wash their hands. Over 85% of those who had previously participated in Food Safety and Wellness Programs responded that they always "wash their hands before preparing food" compared to 73.9% of those who have not participated ($P < 0.05$). When male and female responses were compared, a significantly ($P < 0.001$) higher percentage of females (84.6%) than males (65.8%) answered that they always "wash hands before preparing food."

As shown in Table 2, the majority of the respondents use hot or warm water as well as soap to wash their hands. Data

TABLE 2. Personal hygiene related behavioral tasks[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Handwashing and Related Practices					
Wash your hands before preparing food	77.1	17.2	3.0	2.5	0.3
Wash your hands prior to preparing food	78.5	13.3	2.7	3.3	1.9
Use hot or warm water when washing your hands	67.3	22.1	5.4	3.5	1.6
Use soap to wash your hands when preparing food	76.8	16.2	3.0	2.7	1.3
Wash your hands after preparing food	74.5	15.7	4.1	5.4	0.3
Wash your hands after handling raw meat or poultry	86.8	8.1	0.8	1.9	2.4
Dry your hands with the same towel used to dry your dishes	4.6	10.7	9.4	31.4	44
Other Personal Hygiene Practices					
Wear rings and bracelets during meal preparation	24.7	16.3	6.0	11.9	40.7
Perform domestic chores during food preparation and cooking	2.4	4.6	11.9	43.5	37.6
Play with family pets while preparing food	0.3	0.5	1.3	6.5	91.4
Smoke during meal preparation	1.9	1.1	0.5	5.6	90.9
Prepare food while suffering from cold, diarrhea, cough or flu	6.5	7.0	5.4	50.3	30.9

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

indicate that 67.3% of the respondents "use hot or warm water when washing their hands" all of the time, 22.1% most of the time, 5.4% half of the time, 3.5% some of the time and 1.6% never. Similarly, 76.8% of the respondents indicated that they always "use soap" to wash hands. When males and females were compared, a significantly higher ($P < 0.01$) percentage of females (75%) than males (57.5%) said that they always "use hot or warm water when washing your hands."

When asked about "wash your hands after preparing food," 74.5% responded always. When this question was asked more specifically about whether they wash hands after handling raw meat or poultry, 86.8% of the respondents indicated that they always do this. When males were compared to females, however, a significantly ($P < 0.01$) higher percentage of females (91.1%) than males (80.4%) responded that they always "wash their hands after handling raw meat or poultry".

Many of the respondents did not follow recommended practices, with only 44.0% of the respondents indicating that they never "dry hands with the same towel used to dry dishes." Further, nearly one-fourth of the respondents answered this question as half the time to always.

Wearing of jewelry during food preparation can result in contamination from

TABLE 3. Responses to the survey question, how do you thaw your food?[a]

Thawing Method	Frequency of Response[b]
Proper or safe method	
In the refrigerator	70.2
In the microwave	42.0
In cold water	30.3
Improper or unsafe method	
On the counter	36.4
In hot water	8.0
Other	4.8

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

both physical hazards from the jewelry itself and from stones falling into food. Because of the difficulty of adequately cleaning jewelry, it can be a source of biological contamination through cross contamination. In this survey, approximately one-quarter (24.7%) of the respondents indicated that they always "wear rings and bracelets during food preparation." Further, only 40.7% indicated that they never "wear rings and bracelets." A significantly ($P < 0.01$) higher percentage of males (49.7%) than of females (33.5%), responded that they never wear jewelry.

In many households, those preparing food may get involved in a variety of tasks (e.g., cleaning, laundry, etc.), that could be sources of food contamination. In addition, household pets (e.g., cats and dogs) may be running through the kitchen or on countertops and may therefore be a source of contamination. When asked if they "perform domestic chores while preparing food," 2.4% of the respondents indicated always, 4.6% most of the time, 11.9% half of the time, 43.5% some of the time and 37.6% never. When males were compared to females, a significantly ($P < 0.001$) higher percentage of females (70.9%) than males (53.5%) "perform domestic chores during food preparation and cooking." When these two factors are examined, the respondents were seen to be more likely to perform other household domestic chores when preparing food than to play with their family pets, as more than 90% of the respondents indicated that they never "play with family pets while preparing food."

Smoking should be prohibited during food preparation, as it can be a source of droplet contamination, as well as hand-mouth cross contamination. More than 90% of the participants indicated that they never "smoke during food preparation."

Preparing food when you are sick can increase the risk of spreading the illness through the food. Respondents were asked how often they "prepare food while suffering from a cold, diarrhea, cough or flu," and 30.9% indicated never, while 50.3% indicated some of the time, 5.4% half of the time, 7% most of the time and 6.5% always. These data show that more than 60% of the respondents do prepare food at some point in time when they are ill. A significantly ($P < 0.001$) higher percentage of males (41.8%) than females (22.3%) indicated that they never "prepare food while suffering from a cold, diarrhea, cough or flu."

Food preparation

Responses in the food preparation category were grouped into: thawing practices, thermometer use in cooking, and prevention of cross contamination between raw and cooked or ready-to-eat foods.

Thawing practices

Thawing food properly is one of the many important food preparation steps that can be controlled in home food preparation. It is recommended that food be thawed by using one of the following four methods: in the refrigerator; in cold running water; in the microwave and cook immediately after; or as part of the cooking process *(7)*. The survey participants were asked specifically how they thawed food and told to mark all responses that apply. Survey response data are presented in Table 3.

The proportions of respondents who are following a recommended food thawing procedure were as follows: 70.2% in the refrigerator, 30.3% in cold water and 42% in the microwave. Responses indicating unsafe practices included 36.4% thawing food on the counter at room temperature, 8% in hot water, and 4.8% by use of other methods (e.g., in the kitchen sink).

When male and female respondents were compared statistically, the percentage of females who thawed food in the refrigerator (77.8%) was significantly ($P < 0.001$) higher than the percentage of males (61.0 %) who do so.

Data were also compared based on household income of the respondents. When asked "how do you thaw your food", 12.5% at income level < $30,000 thaw in hot water as compared to 10.56% of those earning between $30,000 and $59,999 and 3.57% of those making $60,000 or above. There was a significant ($P < 0.05$) difference between those in the highest income bracket and the lowest bracket.

Thermometer use in cooking

Survey data for questions related to the frequency of thermometer use in cooking and reheating food are presented in Table 4.

When asked how often a meat thermometer was used in preparing food, over half (57.4%) of the respondents indicated never, 29.2% some of the time, 5.4% half of the time, 5.6% most of the time and only 2.4% of the respondents used the thermometer all of the time. While a significant difference ($P < 0.01$) was observed between respondents who had previously participated in food safety programs and those who had not, use of meat thermometers was fairly low in both groups. Approximately 50% of those who had previous training, compared to more than 60% of those who had not had previous training, indicated that they never use a meat thermometer while cooking. More than 70% of the respondents at income levels < $30,000, and more than 63% of respondents at income levels of $30,000 and $59,999, never use a meat thermom-

TABLE 4. Thermometer use in cooking[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Use a meat thermometer	2.4	5.6	5.4	29.2	57.4
Reheat your food using a thermometer	1.4	0.6	1.7	8.0	88.4

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

TABLE 5. Prevention of cross contamination[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Place cooked meat on the same plate that it was on before cooking without washing the plate first	0.8	0.5	1.1	6.5	91.1
Use separate cutting boards for raw meat and vegetables	29.4	13.2	8.1	17.8	31.5

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

eter during preparation. However, 55% of those at income level of $60,000 or higher always use or have used a meat thermometer during preparation ($P < 0.001$).

When asked about using a thermometer when reheating food, 84.8% of the respondents indicated that they never "reheat food using a thermometer," 8% indicated some of the time and only 3.7% indicated they use a thermometer half the time, most of the time, or always when reheating food. When responses were compared based on level of education, a higher percentage (93.24%) of those who have a high school diploma never "reheat food using a thermometer" as compared to 83.39% of those with some college education or a degree ($P < 0.05$).

Prevention of cross contamination between raw and cooked or ready-to-eat food

Cross contamination between raw foods and cooked or ready to eat foods is a major potential source of contamination in home food handling. Such cross contamination can result from using the same plate for cooked and raw foods, from improper cleaning and sanitizing of utensils and cutting boards, and from not using separate cutting boards for raw meat and vegetables. Two questions were asked in this category: "place cooked meat on same plate that it was on before cooking without washing the plate first" and "use separate cutting boards for raw meat and vegetables." As shown in Table 5, more than 90% of the respondents indicated that they never "place cooked meat on the same plate that it was on before cooking" (Table 5). However, the frequency of responses for separate cutting board varied widely with 42.6% responding to the "use separate cutting boards for raw meat and vegetables" question as always and most of the time categories, compared to 49.5% that responded some of the time and never.

Food cooling, storage and handling practices

Survey responses for food storage and handling practices were grouped into two general categories: food cooling practices and food storage practices.

Bacteria grow most rapidly at temperatures of 70°F – 120°F. Therefore, foods should be cooled as quickly as possible for storage within two hours of preparation *(7)*. Because of increased risk of foodborne illness, food should not be allowed to cool at room temperature. When asked if they "cool food at room temperature," 18.9% of the respondents indicated always, 31.2% most of the time, 15.3% half of the time, 22.7% some of the time and 11.8% never (Table 6). These results indicate that a large majority of the respondents are putting themselves and their families at an increased risk of foodborne illness from food prepared in the home. Improperly cooled food can support the growth of pathogenic bacteria (especially sporeformers that have

TABLE 6. Food cooling practices[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Cool your food at room temperature	18.9	31.2	15.3	22.7	11.8
Refreeze thawed food	3.5	1.9	2.2	22.7	69.7
Refrigerate leftovers immediately	31.3	40.8	10.0	13.5	4.3
Place leftovers in the refrigerator immediately after a meal	28.8	37.8	10.6	17.4	5.4

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

TABLE 7. Food storage and handling practices[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Keep a thermometer in the refrigerator	16.3	3.8	1.9	7.9	70.0
Use food after the "use by" or "sell by" date	7.7	6.0	4.9	35.9	45.1

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

survived the cooking process) to sufficient levels to cause illness or the production of toxins that cause illness. Although proper reheating of the food might be sufficient to destroy many vegetative pathogens, normal heating does not destroy many toxins. Therefore, food allowed to cool at room temperature that allowed the growth and formation of bacterial toxins, could potentially cause foodborne illness, even if it has been reheated.

Food that has been thawed should not be refrozen unless it has first been cooked. Respondents indicated that 3.5% always refreeze thawed food, 1.9% most of the time, 2.2% half of the time, 22.7% some of the time and 69.7% never refreeze food that has been thawed, showing that the majority of the respondents may be aware that re-freezing thawed food can increase the risk of foodborne illness.

Two questions asked about refrigeration of leftovers (Table 6). The first asked if respondents "refrigerate leftovers immediately," while the second asked if they "place leftovers in the refrigerator immediately after a meal." Both of these questions are asking for the same information, yet they elicited somewhat different responses. For both questions, more than 65% of the respondents answered in the lower risk categories (always and most of the time). However, the response rate for the always and most of the time categories was slightly higher for the first question than for the second. Further, it should be noted that the responses to these questions are in contradiction to observations from the previous question (cooling food at room temperature).

Survey responses to general questions related to food storage practices are presented in Table 7.

Perishable food should be stored in a refrigerator that includes a thermometer so that the temperature of the refrigerator can be monitored to assure that food is kept at a temperature of 41°F or below *(7)*. Only 16.3% of the respondents always keep a thermometer in their refrigerator. Further, only 3.8% of the respondents have a thermometer in the refrigerator most of the time, 1.9% half of the time, 7.9% some of the time and 70% never. However, a significantly ($P < 0.05$) higher proportion (42.0%) of the respondents who have participated in previous food safety programs keep a thermometer in the refrigerator or have had one in the refrigerator, in contrast to over 72% of those who have not attended food safety programs who never keep a thermometer in the refrigerator.

For the most part, survey participants were conscious of the importance of "use by" or "sell by" dates on foods. As shown, 45.1% of the respondents never use food after the "use by" or "sell by" date, 35.9% use it some of the time, 4.9% half of the

TABLE 8. Comparison of responses between multiple choice and short answer questions in regard to how long leftovers are kept[a]

Multiple Choice Format		Short Answer Format	
Response	Indicated Frequency[b]	Response	Indicated Frequency[b]
Less than 1 day	5.4	Less than 1 day	8.1
1–2 days	47.6	1–2 days	40.9
3–4 days	34.9	2–3 days	15.7
		3–4 days	16.0
5–6 days	10.8	4–5 days	5.3
		5–6 days	3.4
7 days or more	1.3	7 days or less	7.6
		> 7 days	3.1

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

TABLE 9. Storage location within the refrigerator location where raw meat and poultry is stored[a]

Storage Location within Refrigerator	Indicated Frequency[b]
Anywhere	26.6
Above cooked, ready to eat foods	4.3
Below cooked, ready to eat foods	39.6
Other	31.1

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

time, 6.0% most of the time, and 7.9% always. This may be, in part, because of considerable media coverage on this topic over the past several years.

More specific questions were asked regarding the length of time leftovers are kept in the refrigerator (Table 8). These were asked in two different formats (multiple choice and short answer).

Leftovers that are considered to be potentially hazardous foods should be kept no longer than 3 to 4 days *(7)*. When asked about this topic in the multiple choice format, 87.9% of the respondents indicated that they kept leftovers 3 to 4 days or less. When asked in the short answer format, the percentage was slightly lower with only 76.6% responding that they keep their leftovers 3 to 4 days or less. Either way, the survey data show that the majority of the respondents claim not to keep their leftovers for extended periods of time.

To avoid the risk of cross contamination in the home refrigerator, it is recommended that raw meat and poultry products be stored separate from and below cooked, ready-to-eat foods. To examine compliance with these recommended procedures, participants were specifically asked, where do you store raw meat and poultry in the refrigerator, and were allowed to mark more than one response. As the data in Table 9 show, only 39.6% of the respondents are storing their raw meat and poultry correctly (below cooked, ready-to-eat foods). Another 30.9% are storing meat and poultry incorrectly, increasing their risk of foodborne illness because of cross contamination during storage, and yet another 31.1% are storing meat and poultry in other areas of the refrigerator, including meat bins, which may or may not be safe, depending on their location in the refrigerator.

When respondents were compared based on level of education, there was a significant difference between those who had some college education or a college degree and those with only a high school degree. When asked, "where do you store raw meat and poultry in the refrigerator?" 45.95% of those with only a high school or equivalent education responded anywhere, compared to only 22.84% of those with some college education or a degree ($P < 0.001$).

Leaving leftovers out of the refrigerator or freezer for extended periods of time can also increase the incidence of

TABLE 10. Comparative responses between multiple choice and short answer questions in regards to how long leftovers are left out of the refrigerator[a]

Multiple Choice Format		Short Answer Format	
Response	Indicated Frequency[b]	Response	Indicated Frequency[b]
< 1 hour	71%	< 1 hour	68.6%
1–2 hours	23%	1–2 hours	19.6%
3–4 hours	5.1%	3–4 hours	5.0%
> 4 hours	0.3%	> 4 hours	2.3%
		Long enough to cool	4.4%

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

TABLE 11. Performance of food safety behavioral tasks related to general sanitation as indicated by survey response[a]

Survey Question	Indicated Frequency[b]				
	Always	Most of the time	Half of the time	Some of the time	Never
Clean your kitchen counters with a detergent or sanitizer before cooking	23.4	21.8	11.0	30.9	12.6
Clean your kitchen counters with detergent or a sanitizer after preparing food	50.1	24.3	6.7	15.6	3.2
Use the same kitchenware without cleaning to prepare raw food and cooked food	1.3	1.1	0.8	11.0	85.8
Dry your dishes with a dish towel	16.5	15.7	9.2	33.6	24.7

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

foodborne illness occurring in the home. In general, food should not be left in the "danger zone" (41°F – 135°F) for more than two hours. Therefore, leftovers should be cooled and put away into the refrigerator or freezer within two hours of being prepared. In this survey, participants were asked specifically "how long do you leave your leftovers out of the refrigerator" in two different formats (multiple choice, one short answer), as shown in Table 10.

When asked in the multiple choice format, the majority, 94.0%, said that they stored their leftovers within the allotted two-hour time period; when asked in the short answer format, 88.2% of respondents answered that they store their leftovers within 2 hours. The data show that respondents may be aware of the increased risk of foodborne illness when leftovers are not put away within the 2-hour time frame. However, there are still 5.9% (multiple choice) or 11.7% (short answer) who are at increased risk of foodborne illness for allowing leftovers to remain at room temperature for more than 2 hours.

General food sanitation

Responses to the general food sanitation questions are shown in Table 11.

In response to the question on the topic of, "clean your kitchen counters with a detergent or sanitizer before cooking," 23.4% responded always, 21.8% most of the time, 11% half of the time, 30.9% some of the time and 12.6% never. These results indicate that a majority of the respondents may be preparing foods on a dirty or contaminated surface more than 50% of the time, again increasing the risk of foodborne illness occurring from food prepared in the home. When the respondents were asked if they "clean your kitchen counters with detergent or a sanitizer after preparing food," 50.1% indicated always, 24.3% said most of the

TABLE 12. Responses to the question, "how do you clean your cutting board in between uses"[a]

Cleaning Method	Indicated Frequency[b]
Hot water and soap	72.9
Dishwasher	26.1
Sanitizer	8.8
Water only	3.2
Other	7.4

[a]Mailed survey to 600 county employees, Osceola County, Florida.

[b]Percentage of total (376 respondents).

time, 6.7% half of the time, 15.6 some of the time, and 3.2% never. Again, it was shown that approximately half of the respondents might be putting themselves and their families at risk of foodborne illness, by leaving potential contaminants on the counters.

Another frequent source of cross contamination is the use, after cooking is finished, of the same plate or kitchenware that raw meat or poultry had been on, without properly washing and sanitizing the plate or kitchenware. A majority of respondents indicated that they never use the same plate or kitchenware without cleaning it first. In regard to using the same kitchenware, 14.2% do so some of the time, half of the time, most of the time or always. When specifically asked about placing cooked meat on a dirty plate, only 8.9% use the dirty plate some, half, most of the time or always. This leaves a relatively small percentage at an increased risk of foodborne illness because of this practice. A significantly higher ($P < 0.001$) number of females than of males responded that they never use the same kitchenware without cleaning to prepare raw food and cooked food or place cooked meat on the same plate that it was on before cooking without washing the plate first. For the first question, the female response rate in the never category was 90.2% compared to 78.6% for males, and for the second question it was 95.6% for females and 81.8% for males.

To decrease the risk of cross contamination, it is recommended that dishes be allowed to air-dry, not be towel dried. When asked about the topic "dry your dishes with a dish towel," 24.7% of respondents indicated never, 33.6% some of the time, 9.2% half of the time, 15.7% most of the time, and 16.5% always. Thus, the majority of the respondents either never or only some of the time use a dishtowel to dry dishes. However, approximately 40% of respondents are at risk of spreading bacteria and other microorganisms throughout the kitchen because they use dishtowels to dry dishes.

It is recommended that cutting boards be washed and then sanitized. To determine compliance with the recommended procedure, respondents were specifically asked "how do you clean your cutting board in between uses?" The question was in multiple choice format, allowing them to mark more than one response. The responses can be seen in Table 12.

The majority (72.9%) of the respondents indicated that they use hot water and soap, with 26.1% using a dishwasher to clean their cutting boards. Only 8.8% of the respondents use a sanitizer for their cutting boards.

We found significant ($P < 0.01$) differences between income groups. At income level $30,000 and $59,999, 81.37% use hot water and soap, compared to 66.67% and 65.71% at income levels of < $30,000 and > $60,000, respectively. Further, 35% of those at income level > $60,000 use a dishwasher, compared to only 21.74% and 16.67% at income levels of $30,000 and $59,999 and < $30,000, respectively. Responses were also compared between those who have participated in previous training under Cooperative Extension Food Safety and Wellness Programs and those who have not, with a significant difference ($P < 0.05$) between these groups. When asked "how do you clean your cutting board in between uses?" 100% of those who have participated in food safety programs use hot water and soap, while 4.3% of those in the untrained group use water only.

The data indicate that, while the majority are washing their cutting boards, sanitizer use was low. Thus, there is still potential for contamination from these boards, especially given that many of the respondents do not use separate cutting boards for raw meats and for vegetables (see Table 5).

SUMMARY AND CONCLUSIONS

The objectives of this study were to determine the degree of food safety knowledge and behavior of diverse group of government employees in Osceola County, Florida, and to determine if there is a high risk of foodborne illness from meals prepared in the home. The data indicate that problem areas exist in the degree of knowledge and thus the behaviors within each of the four categories (personal hygiene; food preparation; food cooling; storage and handling; food sanitation).

Upon analysis of the data, significant differences in food safety knowledge and behavior were found between male and female respondents. Females tended to thaw food more correctly, wash their hands prior to preparing food, wash their hands after handling raw food, and never

use the same kitchenware or plate for raw and cooked food without cleaning. However, males had less tendency to prepare food while they are sick, wear jewelry, or do domestic chores or play with pets while preparing food. When comparisons were made between income levels, significant differences in food handling practices were noted, including, thawing food in hot water, reheating food without the use of a thermometer, location of storing raw meat and poultry in the refrigerator, and method of cleaning cutting boards. Furthermore, the survey data show that respondents who had participated in previous food safety training programs were more likely to use a thermometer when cooking, as well as have to one in the refrigerator; to use appropriate procedures to clean cutting boards; and to wash their hands more often.

The most significant risky behavior observed in the preparation step is the lack of use of a thermometer when cooking and reheating, with nearly half the respondents indicating that they thaw foods improperly under unsafe conditions. Another significant risk observed is the number of respondents who prepare food while they are sick. Other, less significant risks include not cleaning and sanitizing counters prior to preparing food and using a dishtowel to dry the dishes instead of allowing them to air dry. Very few respondents smoked while preparing food, making this a minor risk of contamination.

High-risk behaviors were also indicated in cooling and storing of foods (e.g., cooling food at room temperature, not properly storing raw meat and poultry in the correct location in the refrigerator and not having a thermometer in the refrigerator to monitor the temperature). The majority of the respondents refrigerated their leftovers immediately most of the time and did not keep leftovers for extended periods of time, indicating a relatively small risk. Other proper behaviors pertaining to storage were indicated by respondents, because most did not leave leftovers out of the refrigerator for more than two hours, did not thaw and refreeze foods, and did not use products past their sell by or use by date.

In regard to sanitation, the most significant behaviors that indicate an increased risk include using the same dish towel to dry your hands and to dry clean dishes, wearing jewelry, and failing to use separate cutting boards for raw vegetables and raw meat and poultry. A small number of respondents did perform domestic chores while cooking and used the same plate or kitchenware that had been used with raw meat or poultry for a cooked product, without first cleaning. Others behaviors that were studied and found not to be a significant risk include hand washing at proper times with the proper water temperature, and after handling raw meat and poultry, as well as not playing with pets while preparing food.

In summary, based upon the survey response, there are some behavior practices that are putting consumers at risk for foodborne illness in their own home. These include improper cooling practices, improper use of dishtowels, improper food storage practices, and lack of thermometer use in cooking and in refrigerated storage. However, many consumers (especially those who had been previously trained) responded that they are also doing many activities correctly to prevent foodborne illness, such as proper handwashing, proper thawing of foods, and prevention of cross contamination. These results will aid in the development of consumer education programs to teach appropriate practices and behavior when preparing food in the home. These programs may result in an increased awareness and behavior change that will in turn decrease the overall risk of contracting foodborne illness from food prepared in the home.

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Needs Assessment Survey of Sanitation, Good Manufacturing and Hygienic Training Practices for Food Processors, Wholesalers and Warehouse Operators

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SUMMARY

The objective of this research project was to assess the need for sanitation training for food industry personnel. A survey was designed and distributed to food processors, wholesalers and distributors to determine current training practices and to ascertain their opinions on whether an Internet-based, interactive training course on sanitation, Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) could be utilized. Of 182 survey respondents, 75% categorized themselves as food processors of a variety of processed commodities: poultry (47%), meat (40%), dairy (34%), seafood (31%), fruits and/or vegetables (21%) and cereals, breads and/or baked goods (13%). Although respondents (95%) indicated that there was some food safety, sanitation and/or hygiene employee training in their facilities, 54% responded that they could use an Internet-based course, and 43% indicated that they would like to judge it prior to implementation. It was encouraging that 82% of those surveyed indicated that the Internet-based training could be integrated into the workday. The top four barriers to employee training were identified as time, cost, language and literacy. However, 61% still indicated that they would be willing to pay for an Internet course that would first target management level employees and would then provide supplementary educational materials that would be used for on-site training of production employees.

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INTRODUCTION

Basic sanitation training for workers is essential to ensure that employee practices consistently and effectively prevent, rather than contribute to, incidents of finished product contamination in the food handling and processing environment that could cause foodborne illness. Foodborne infections are estimated to cause approximately 76 million illnesses each year in the United States and have an annual cost burden of $23 billion. According to a May 11, 2004 Progress Review of Department of Health and Human Services' Food Safety focus area of the Healthy People 2010 initiative, about 81% of all cases of foodborne illness in the US cannot be ascribed to an identified pathogen, and small-scale producers account for only 10% of the food supply but 90% of the outbreaks of foodborne illness *(2)*.

A recent FDA report on the occurrence of foodborne illness risk factors in institutional foodservice, restaurant and retail food facility stores identified several food safety risk factors observed by Regional Retail Food Specialists during site visits of over 900 establishments. This data was collected in 2003 and compared to similar data collected in 1998. The risk factors that had the highest percent of out-of-compliance observations and needed priority attention were the same in both the 1998 and 2003 studies. These risk factors included improper holding time and temperature, poor personal hygiene, and contaminated equipment/inadequate prevention of contamination *(3)*. Although these observations were not made in food processing facilities, food processors have similar challenges in regards to personal hygiene and the prevention of contamination. In a study conducted by Sertkaya et al. *(8)*, food industry experts were asked to identify the top ten food safety problems in the United States food processing industry. Deficient employee training ranked number one by representatives of all food sectors, followed by contamination of raw materials, poor plant and equipment sanitation, poor plant design and construction, and lack of preventative maintenance. These studies demonstrate the continuing need for innovative training programs for the workforce in all types of food-handling facilities.

Comprehensive control strategies designed to prevent or reduce the frequency of finished product contamination by specific foodborne pathogens such as *Salmonella*, *Listeria monocytogenes*, and *Escherichia coli* O157:H7 must include effective employee training on personal hygiene, food handling, sanitation, and other aspects of good manufacturing practices. For example, the implementation of an effective employee-training program has been identified as one of five key elements in a comprehensive control strategy for *Listeria monocytogenes* in smoked fish and other ready-to-eat food items *(5, 6, 7)*. Conducting effective employee training is a continuing challenge for food processors, distributors, and/or warehouses that may have to recruit untrained workers and that also experience frequent employee turnover. Food safety is a "moving target" for processors as pathogens evolve, and food production and processing technologies continue to become more sophisticated and automated *(8)*. In addition, CFSAN/FDA has been considering revisions for modernization of the current Good Manufacturing Practices (GMP) regulation to better control food safety risks. A training requirement, among other recommendations, has been recommended for supervisors and workers, to ensure that they have the necessary knowledge and expertise in food hygiene, food protection, employee health and personal hygiene *(4)*. Training is an especially significant challenge for smaller businesses, since many lack the resources to purchase expensive training materials or the expertise to develop their own training programs.

A wide variety of food safety training materials have been developed in the United States and other countries around the world. These materials include written pamphlets and fact sheets, as well as training guides, videos, workshops, and distance education courses. The USDA/FDA Foodborne Illness Education Information Center *(9)* contains a comprehensive listing of food safety training materials. The majority of training materials and programs identified at this site are directed to foodservice workers, school foodservice workers, retail workers, and volunteers.

Internet-based training programs that are part of educational approaches that are more accessible, effective and relevant are needed for a variety of target audiences, as they provide a learning tool that can be self-paced and independent *(1)*. Inexpensive educational materials that target small food processors and that can be delivered via the Internet as part of an on-line distance-training program are needed. Current on-line programs consist of a series of courses, some of which cover topics such as Good Manufacturing Practices (GMP) Hazard Analysis Critical Control Points (HACCP). Costs, which can range from approximately $300 for a single course to $1,000 for a series of three or more courses that lead to a certificate of completion as a HACCP or food safety manager, are prohibitive for a small processor and may not be in a format that adequately addresses the needs and concerns of the smaller food processing establishments. The goal of this research project was to develop, distribute and evaluate an industry survey designed to obtain information from food processors, wholesalers and distributors on how they could best utilize an Internet-based, on-demand interactive training course on sanitation, GMP and Good Hygienic Practices (GHP).

METHODS

A survey tool was developed in which respondents were asked to answer questions regarding the need, usefulness and willingness to pay (WTP) for a two-tiered, Internet-based training program. The first "tier" would include an on-line portion that would first target management or supervisory level employees. After these employees have completed the program, the second tier would provide supplementary educational materials to be used in on-site training of production employees.

The survey questions can be divided into four categories: 1) Demographic information regarding business type, company size, location, current training programs/practices; 2) Usefulness of an Internet training program on GMP, GHP and sanitation; 3) Willingness to pay for and barriers to program implementation and 4) Topic choices for managers and production employees. Specific questions had, potentially, more than one answer, and respondents were asked to check all that applied.

The survey was administered by two methods: written and Internet-based, using Zoomerang,™ an online survey clearinghouse. The Web site, http://www.zoomerang.com, Zoomerang™ was created by MarketTools,® and is a leading Internet service for businesses and individuals to conduct professional surveys to

TABLE 1. Characteristics and current training practices of survey respondents (*N* = 182)

	Frequency	Percent
Description of business		
Food processor	137	75
Other[a]	25	14
Refrigerated/frozen food storage warehouse	13	7
Food wholesaler/distributor	8	4
Commodity processed, held or distributed (chose all that applied)		
Meat	73	40
Dairy	62	34
Seafood	56	31
Poultry	47	26
Other[b]	41	23
Fruits/vegetables	38	21
Cereals, breads and baked goods	24	13
Size of company – number of employees at location		
Less than 10	17	9
10–25	16	9
25–50	21	12
50–100	33	18
100–250	38	21
250–500	17	9
Greater than 500	40	22
Location (region) of facility[c]		
West	53	29
Midwest	46	21
Northeast	39	25
South	25	14
More then one region of operation[d]	11	6
Other (includes national, territory and international)	6	4
No response	2	1
Training currently conducted		
Yes	173	95
No	9	5
If no, capability to provide training ? (N = 9)		
Yes	7	78
No	2	22
Routine trainer in company (chose all that applied) (*N* = 173)		
Quality control manager	126	73
Safety supervisor	62	36
Shift supervisor	48	28
Line supervisor	41	24
Consultant	36	21
Other	29	17
Owner	24	14
University/extension professional	16	9

Continued on next page

TABLE 1. Characteristics and current training practices of survey respondents (*N* = 182) *continued*

	Frequency	Percent
Types of training programs conducted (chose all that applied) (*N* = 173)		
On-site, conducted by company employees	162	94
On-site, conducted by hired consultants or trainers	72	42
On-site, conducted by university personnel	16	9
Printed materials for employees to read	113	65
Videos, CDs or other training materials	110	64
Off-site workshops or training programs	96	55
Other	9	5

a. Includes those companies that considered themselves more than one kind of business: 9 as processors, wholesalers and/or warehouses operators; 1 as processor/retailer; and those as trade associations, consultants and academics

b. Other included: 10 as ingredient, flavor or sauce manufacturers; 5 as beverage or juice manufacturers; 5 as confectioner/dessert manufacturers; 3 as egg manufacturers

c. Regions determined by 2000 US Census

d. Category included 5 companies of more then 500 employees and 1 classified as 250–500 and reflected operations in all regions

get prompt responses to questions, with data analyzed in real time. Zoomerang™ is accessible from any Web browser. Paper and on-line surveys were the same, and paper responses were inputted into the on-line version by the project directors for assessment as one collective data pool.

Mailing lists were obtained from a variety of sources in an effort to get a diverse, commodity-based food processing, distributor and/or warehouse sector. A mailing list of small and very small meat and poultry processors in the United States was obtained from the USDA through the Freedom of Information Act. A random sampling of every tenth processor listed generated a mailing list of 589 potential respondents throughout the United States. The paper survey was mailed to this group. Trade associations were used to notify their members of the on-line survey, either by e-mail or newsletter, requesting the participation of the member. These included the Northwest Food Processors Association (80), Food Products Association (324), National Fisheries Institute (1,024), NY Seafood Council (150), International Dairy Foods Association (115) and the World Food Logistics Organization and International Association of Refrigerated Warehouses (50). In addition, another 25 written surveys were distributed through the warehouse association annual meeting.

The protocol and questionnaire were approved by the University of Rhode Island Institutional Subjects Review Board. The surveys were reviewed for content validity and clarity by the project collaborators and trade association members. All suggested changes were considered and the questionnaire was revised based on these recommendations.

Descriptive statistical analysis (frequencies, percentages) and cross tabulations were carried out using Zoomerang™ on-line statistical service.

RESULTS AND DISCUSSION

Table 1 shows the demographic characteristics and current training practices of the respondents. Survey respondents totaled 182, with 137 (75%) categorizing themselves as food processors. Industry responses were from a variety of processed commodity groups and were fairly uniform in distribution, with representation from the poultry (47%), meat (40%), dairy (34%), seafood (31%), fruits and/or vegetables (21%) and cereals, breads and/or baked goods (13%) sectors. In addition, small companies were well represented, with 48% of the respondents having fewer than 100 employees and 21% having between 100 and 250. Furthermore, all regions of the country (U.S. Census, 2000) were represented, with the South (14%) falling slightly below the West (29%), Midwest (21%) and Northeast (25%). Almost all of the respondents (95%) indicated that there was some kind of food safety, sanitation and/or personal hygiene training in their facilities for their employees, with quality control and/or safety supervisors conducting most of the on-site company training. Printed materials, videos and/or CDs were also being utilized for independent learning. While responses were not tabulated, most respondents indicated that they had equipment such as overhead projectors, LCD projectors, computers and/or copy machines to facilitate training. Finally, for those who were not currently providing training, 7 of the 9 wanted to have that capability. Therefore, 180 respondents filled out the remaining survey reflecting the other three categories of questions.

When the respondents were asked if they could use an Internet-based course for GMP (Table 2), sanitation and GHP training, 54% of the respondents said that they could and 43% indicated that they would like to judge it first before implementation in their facility. What was encouraging was that 82% of those surveyed indicated that the training could be integrated into the workday. Many of the facilities had the Internet connections and speed to accommodate the on-line training. Furthermore, 93% of the respondents who were interested in Internet-based GMP training also indicated that they could use supplemental

TABLE 2. Use/Access for Internet training (*N* = 180)

	Frequency	Percent
Internet-based training useful for GMP, sanitation and hygienic practices		
Yes	97	54
No	5	3
Maybe, would like to see it first	78	43
Internet training integrated into work day		
Yes	148	82
No, would have to be at another location	32	18
***If no, likelihood of computer access at another location* (*N* = 32)**		
Highly likely	4	13
Likely	12	38
Not likely	13	41
Not sure	3	9
***If yes, availability of computers for use at workplace* (*N* = 148)**		
Yes	144	97
No	3	2
Plan to install within a year	1	1
***If yes, type of Internet connection* (*N* = 148)**		
T1	60	41
Don't know	26	18
DSL	22	15
Cable, high speed	22	15
Phone line w/dial-up (56K or less)	7	5
High speed dial-up	7	5
Other	4	3
***If yes, type of computer available for use for course* (*N* = 148)**		
PC, desktop – IBM, Dell, Gateway, Hewlett Packard, etc.	130	88
PC, desktop – Macintosh (Apple)	0	0
PC, laptop – IBM, Dell, Gateway, Hewlett Packard, etc.	72	78
PC, laptop – Macintosh (Apple)	1	1
Don't know	1	1
Use of supplemental educational resources from Internet course for training production workers		
Yes	168	93
No	12	7

educational resources for training production employees.

Tables 3–5 show how the respondents felt regarding delivery and content of training. While 75% felt that in-house training classes would be the training format of choice, Internet-based training with audio and/or independent learning (42% and 32%, respectively) were identified as desirable alternatives. Of those who indicated that they would use supplemental resources, in-house training with Power Point and in-house training with CD or video were clearly the top choices (66% and 73%, respectively, data not shown). When content areas were identified, there appeared to be some confusion, in that some respondents chose the "all of the above" choice as well as specific content areas. However, topics of interest were diverse, and choices were slightly different for the on-line course for managerial personnel versus for supplemental materials for production employees. Those answering the questionnaire clearly wanted more information conveyed in the Internet course than for the supplemental, on-site training materials. It would make sense for the trainers or managers/supervisors to

TABLE 3. If worker training was made mandatory when the current GMP regulation is updated, what is the best way that you would like to see your workers trained? (*N* = 180; Respondents picked top two choices)

Category	No. of Responses	Percent
In-house training classes	135	75
Internet-based training program with audio	75	42
Internet-based training program for independent learning	58	32
Training course on CD for independent learning	34	19
Outside trainers or consultants	20	11
Off-site training classes or workshops	15	8
Booklets/brochures for at-home learning	10	6
Other	7	4

TABLE 4. Topics identified as those most important that should be covered in an Internet training course for employees. (*N* = 180: Respondents selected all that applied)

Category	No. of Responses	Percent
Employee health, hygiene, and hand washing	127	71
Proper cleaning and sanitation procedures	122	68
Preventing cross contamination	120	67
Food handling and process controls	115	64
Proper storage, labeling/use of chemicals	108	60
General pathogen controls	95	53
General housekeeping (sewage, drains, garbage disposal, etc.)	92	51
Allergen controls	84	47
Listeria controls	73	41
All of the above	70	39
Maintenance of equipment	67	37
Pest control	64	36
Maintenance of toilet and hand-washing facilities	63	35
Maintenance of grounds/work environment	52	29
Water safety	45	25
Other educational needs	13	7

have a higher level of training/knowledge. However, the general order of importance appeared to be the same.

Table 6 shows those willing to pay $50.00 for the Internet-based course. There may have been some confusion with this question, with respondents interpreting the cost issue for all employees, not just the supervisors that would take the course and then use supplemental materials to train the production employees at the facility. However, even with this confusion, 61% indicated that they would be willing to pay. Not surprising were the barriers to employee training that were identified (Table 7), with respondents indicating time, cost, language and literacy level as the four top obstacles. Respondents often indicated that Spanish would be the desired second language for training.

Finally, Tables 8 and 9 show the relationship among barriers, company size (by employee number), commodity produced and the willingness to pay for GMP, GHP and sanitation Internet-based training. All commodity producers, regardless of size, ranked barriers in the same order, with time constraints above cost issues. However, the top four barriers identified and their distribution remained the same for individual commodities compared to the entire respondent pool. As expected, those who were not willing to pay cited cost as the main difficulty to training, whereas those who were willing to pay cited time as the primary obstacle to worker training. Seafood, poultry, dairy and fruit/vegetable producers ranked their willingness to

TABLE 5. Topics identified as those most important that should be covered in an on-site training or supplemental educational materials for employees (N = 180; Respondents selected all that applied)

Category	No. of Responses	Percent
Employee health, hygiene, and hand washing	89	49
Proper cleaning and sanitation procedures	87	48
Food handling and process controls	82	46
Preventing cross contamination	77	43
All of the above	78	43
Proper storage, labeling/use of chemicals	70	39
General pathogen controls	62	34
General housekeeping (sewage, drains, garbage disposal, etc.)	54	30
Allergen controls	53	29
Listeria controls	43	24
Maintenance of equipment	40	22
Maintenance of toilet and hand washing facilities	38	21
Pest control	31	17
Maintenance of grounds/work environment	26	14
Water safety	19	11
Other educational needs	8	4

TABLE 6. Willingness to pay for an Internet course with educational resources for use by you or other trainers of employees for no more than $50.00 per person ($N$ = 180)

Category	No. of Responses	Percent
Yes	110	61
No	70	39

TABLE 7. Barriers to training employees, either by Internet or any in-house training that would be an extension of the Internet course? (N = 180; Respondents selected all that applied)

Category	No. of Responses	Percent
Time	120	67
Cost	95	53
Language	81	45
Literacy or reading level	54	30
Other, please specify	27	15
Lack of interest	21	12
Equipment	17	9
Lack of Internet connection	9	5

TABLE 8. Comparison of top four barriers to employee training with commodity, willingness to pay and size of company as percent of respondents in each category (total respondents: *N* = 180)

Barrier to Training	Commodity Produced							Willingness to Pay		Size of Company (Employees)			
	Dairy	Fruits and/or vegetables	Meat	Seafood	Poultry	Cereals, breads, baked goods	Other	Yes	No	0–50	50–100	100–250	Greater than 250
Total Responses	**62**	**38**	**72**	**56**	**47**	**24**	**40**	**110**	**70**	**54**	**33**	**38**	**57**
Time	66*	61	65	71	60	67	70	76	53	65	67	61	70
Cost	61	53	60	46	53	58	50	36	79	50	52	58	51
Language	29	45	44	54	51	46	50	47	41	37	61	45	42
Literacy/ reading level	23	26	29	36	36	33	25	33	26	22	39	24	35

* All values presented as % of respondents.

TABLE 9. Comparison of willingness to pay to commodity type produced and size of company as a percent of respondents in each category (total respondents, *N* = 180)

Willingness to Pay	Size of Company (employees)				Commodity Produced						
	0–50	50–100	100–250	Greater than 250	Dairy	Fruits and/or vegetables	Meat	Seafood	Poultry	Cereals, breads, baked goods	Other
Total Responses	**54**	**33**	**38**	**57**	**62**	**38**	**72**	**56**	**47**	**24**	**40**
Yes	61*	67	47	65	68	66	56	71	64	58	58
No	35	33	53	35	32	34	44	29	36	42	43

*All values presented as % of respondents.

pay higher than those producing meat, cereal/bread/baked goods and "other" commodities. Finally, small and large size companies appeared to be in agreement regarding willingness to pay, 61–65% indicating yes. However, in companies with 100–250 employees, a majority (53%) indicated that they were unwilling to pay for supervisor or employee education. The only other group that was unwilling to pay for training (56%) consisted of companies with less than 10 employees (data not shown). The 100–250 company size category had a slightly higher number of respondents that were producers of meat, cereal/bread/baked goods or "other" commodities. This may account for less willingness to pay.

Although many food industry facilities appear to have some on-site food safety training programs, the results of this survey would indicate that there is either a need or at least a willingness to consider and pay for an Internet-based educational program that can impact both supervisory and production employee personnel. The modules must be short, be cost effective, have an audio component, and be developed in other languages in addition to English. This two-tiered educational opportunity for GMP, GHP and sanitation training for managerial and food production employees will be developed and tested for content and reliability by those respondents that indicated their willingness to be part a pilot program.

ACKNOWLEDGMENTS

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95th Annual Meeting

IAFP 2008

Columbus, Ohio • August 3–6

CALL FOR SYMPOSIA

IAFP 2008

August 3–6
Hyatt Regency Columbus
Columbus, Ohio

The Program Committee invites International Association for Food Protection members and other interested individuals to submit a symposium proposal for presentation during IAFP 2008, August 3–6, 2008 in Columbus, Ohio.

WHAT IS A SYMPOSIUM?

A **symposium** is an organized, 3 1/2 hour session emphasizing a central theme relating to food safety and usually consists of six presenters each giving 30-minute presentations with a 30-minute break between the third and fourth presentation. A **short symposium** is three or four 30-minute presentations. A **roundtable** discussion forum is 90 minutes in length with 2–3 brief presentations (10–15 minutes), a formal question and answer session, followed by time for audience participation.

Symposia may include a discussion emphasizing a scientific aspect of a common food safety and quality topic, issues of general interest relating to food safety and microbiological quality, a report of recent developments, an update of state-of-the-art methodologies, or a discussion of basic and applied research in a given area. The material covered should include current work and the newest findings. Symposia will be evaluated by the Program Committee for relevance to current science and to Association members. Proposals may be prepared by individuals, groups of individuals, committees, or professional development groups (PDGs).

SUBMISSION INSTRUCTIONS

To submit a symposium proposal, read all the information, paying close attention to the "Symposia Selection Procedure" on the next page, then complete the "Symposium Proposal." Follow all instructions when making a submission. Your suggested presenters need not be confirmed at this stage, only identified.

SYMPOSIUM PROPOSAL DEADLINE

Symposium proposals may be sent to the Association office no later than June 29, 2007 or be submitted to the IAFP registration desk at IAFP 2007 by Tuesday, July 10, 2007 at 10:00 a.m. If preferred, ideas may be presented in person to the Program Committee on Wednesday, July 11, 2007 at 7:00 a.m. (proposals must first be submitted in writing by Tuesday, July 10, 2007 at 10:00 a.m.).

The Program Committee will review submitted symposia at the conclusion of the IAFP 2007 Annual Meeting to decide which symposia will be selected for further development. Organizers will be notified as to the status of their proposal by August 28, 2007. Applications for symposia that have been selected for further development should be completed and sent to the IAFP office by Tuesday, January 29, 2008. **FINAL DECISIONS ABOUT ACCEPTANCE AND CONTENT OF SYMPOSIA FOR PRESENTATION AT IAFP 2008 WILL BE MADE BY THE PROGRAM COMMITTEE DURING THEIR FEBRUARY 2008 MEETING.** Symposia organizers and potential moderators and speakers should understand that not all symposia selected for further development will be accepted as submitted. The IAFP Program Committee reserves the right to reject poorly organized symposia, and/or to review symposia, including proposed subjects and speakers, and make modifications based on providing the most comprehensive and balanced forum. The organizer will be notified of the final results by March 14, 2008.

PRESENTERS WHO ARE NOT MEMBERS

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

IAFP TRAVEL SUPPORT

The International Association for Food Protection Foundation has limited funds for travel support of presenters. After final acceptance of the symposium (March 2008), symposia organizers may make requests in writing to the Executive Director. Requests are reviewed on an individual and first-come-first-served basis. The maximum funding grant will be $750 per presenter ($1,250 if outside North America). Only one funding grant per symposium will be approved up to May 15, 2008. After that date, additional requests will be considered.

Organizers are welcome to seek funding from other sources and the Association will provide recognition for these groups in our program materials. Organizers are asked to inform the Association if they obtain outside funding.

SYMPOSIUM SELECTION PROCEDURE

The primary focus of the symposium selection procedure is to provide a balanced educational program for attendees of the IAFP Annual Meeting. To achieve this goal, symposia may be combined or modified by the Program Committee during their July 2007 or February 2008 review, as appropriate, to prevent overlap of topics among competing symposia. The Program Committee also reserves the right to suggest alternative speakers and/or topics in an effort to round out symposia or discussion forums. During the symposia selection process, only the most relevant and promising symposia proposed by groups and individuals will be selected for further development.

Guidelines for tentative acceptance:

1. Proposed symposia must be pertinent to IAFP members and PDGs. Priority will be given to symposia that address one or more of the following program areas:
   - Safety and Microbial Quality of Foods (dairy, meat and poultry, seafood, produce, water)
   - Viruses and Parasites, Retail Food Safety, Epidemiology and Public Health
   - Non-Microbiology Food Safety Issues (food toxicology; allergens; chemical contaminants)
   - General–Applied Food Safety Microbiology (for example, advances in sanitation, lab methods, quality assurance, food safety systems)
   - General–Food Protection for the Future (risk analysis; emerging pathogens; biotechnology; predictive models, etc.)
   - Developments in Food Safety Education
   - Other pertinent food protection topics may be considered if space is available
2. In addition to addressing pertinent program areas, symposia accepted for further development should:
   - Be new, emerging and/or address areas not covered in last 2 years
   - If covered in last 2 years, provide new information that warrants another symposium
3. Symposium submissions must include:
   - Titles that clearly convey the topics to be covered
   - Topics that are unique to prevent overlap of basic information among speakers
   - Names of suggested speakers from a variety of backgrounds, such as industry, regulatory, academic researchers, or consumer perspective (as appropriate)
   - Suggested speakers who are knowledgeable and good communicators
4. Special consideration will be given to symposium submissions that:
   - Are directly applicable or provide viable safety options for food manufacturers, including small- to medium-size manufacturers
   - Bring an international (outside of North America) focus or viewpoint to the meeting
   - Attract/involve students
   - Attract/involve local affiliate members who would not otherwise attend the Annual Meeting (e.g., regional specialties like shellfish issues for Gulf States)
   - Would attract members of a new PDG or program area that IAFP is trying to develop or encourage
5. Other considerations for selecting symposia for further development:
   - Proposals must be submitted to the Program Committee or the IAFP registration desk by 10:00 a.m. on Tuesday, July 10, 2007
   - The Program Committee reserves the right to limit the number of sessions devoted to a single program area to provide a balanced program
   - If relevant topics are proposed by more than one submission, the Program Committee will make the final decision to combine or modify symposia as appropriate to avoid overlap of topics among competing symposia. In this case, organizers may be asked to work with one another to combine symposia

- Due to space and time limitations, only the most relevant and promising proposals (as determined by the Program Committee) will be selected for further development as full sessions (consisting typically of six 30-minute presentations), short sessions (consisting typically of three or four 30-minute presentations), round table discussions (90 minutes in length with two or three brief presentations and question and answer session). Again, the Program Committee will make final decisions regarding symposia breadth and length
- Three sessions will be reserved for symposia sponsored by our partner, the International Life Science Institute North America (ILSI, N.A.). The ILSI N.A. symposia address topics that are of general interest to IAFP meeting attendees, focusing on emerging food safety issues and technologies, and provide a global perspective
- Additional sessions may be added at the discretion of the Program Committee to accommodate emerging issues

6. Final decisions on symposia selection will be made at the February 2008 Program Committee Meeting.

- Symposia recommended for further development should be submitted, in near finalized form, to the IAFP office by **January 29, 2008.** This includes symposium title, abstract, convenor and speaker information (name, contact information, and proposed title of presentation). Organizers are encouraged to contact and get preliminary confirmation from speakers in advance of submitting the final symposium application. **However, full confirmation of speakers, and acceptance of symposia, will be provided after the February 2008 Program Committee meeting. The IAFP Program Committee reserves the right to review symposia, including proposed subjects and speakers, and make modifications in order to provide the most comprehensive and balanced program. Invited symposium speakers need to be made aware of this when they are contacted.**

WHO TO CONTACT:

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95th Annual Meeting

IAFP 2008

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SYMPOSIUM PROPOSAL
IAFP 2008

August 3–6
Columbus, Ohio

Title: _____

Organizer's Name: _____

Committee or PDG Submitting Proposal: _____

Address: _____

Phone: _____ Fax: _____ E-mail: _____

❒ Full Symposium ❒ Short Symposium ❒ Roundtable

Topic – Suggested Presenter, Affiliation (Example: 1. HACCP Implementation – John Smith, University of Georgia)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Suggested Convenors: _____

Topic Area:

❒ Food Safety/Microbial Quality (list commodities) _____
❒ Foodborne Viruses and Parasites
❒ Retail Food Safety
❒ Epidemiology and Public Health
❒ Food Safety (Non-Microbiology Issues)
❒ General – Advances in Technology Applications
❒ General – Emerging Issues
❒ Education
❒ Other _____

Provide a short statement describing the relevance of the symposium to IAFP attendees and how this symposium is unique compared to topics previously presented at IAFP 2007 and IAFP 2006.

Signature of Organizer: _____

Submit by June 29, 2007 to:

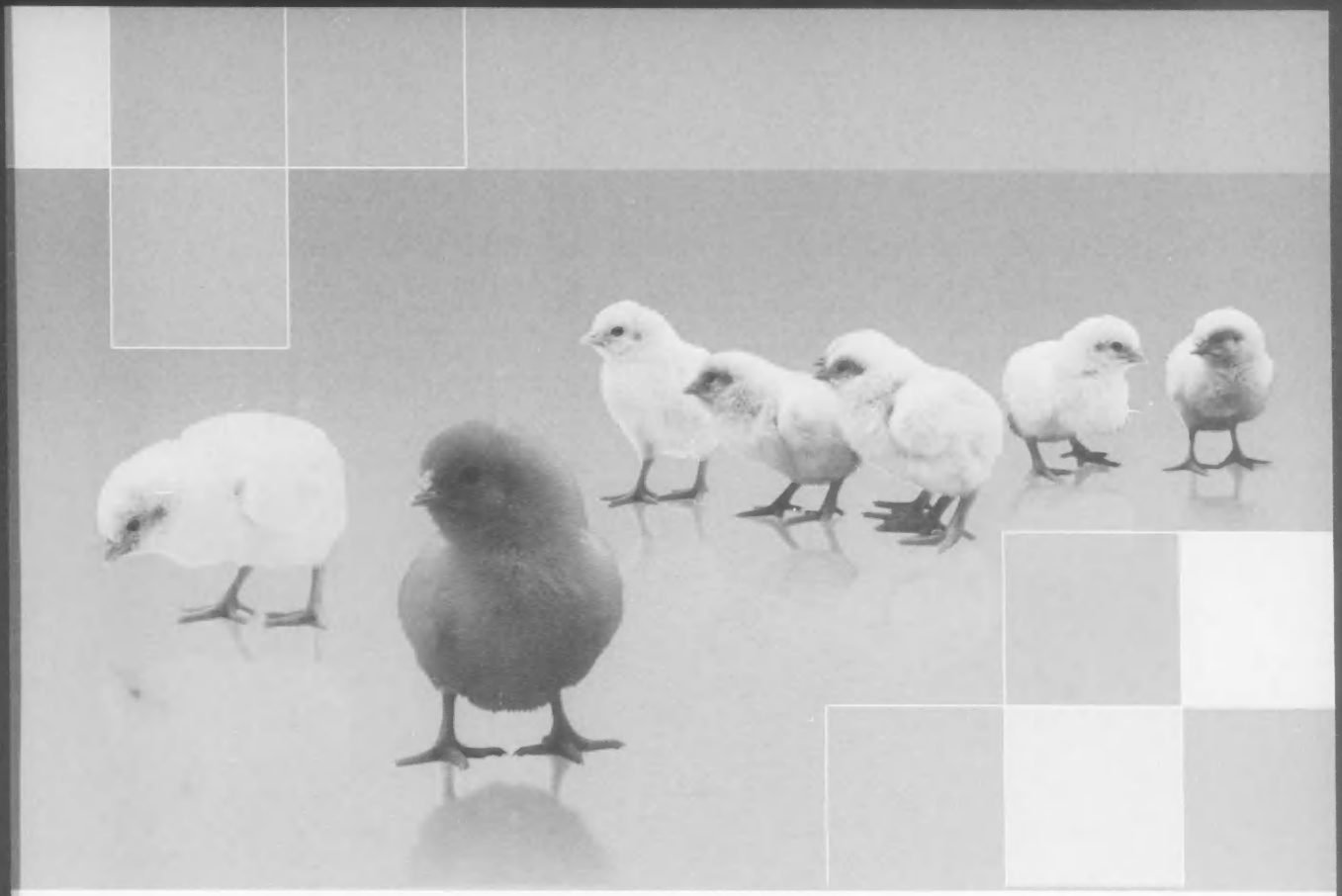
IAFP – Symposium Proposal
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2864, USA

or

Submit in person during IAFP 2007
to the IAFP Registration Desk by
10:00 a.m. on Tuesday, July 10, 2007.

or Contact:

Tamara Ford
International Association for Food Protection
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655
E-mail: tford@foodprotection.org



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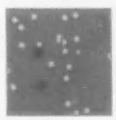
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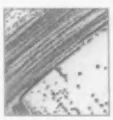
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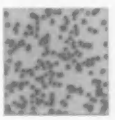
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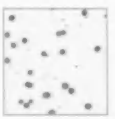
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BCN Research Laboratories, Inc. was founded in 1988 to provide the food manufacturing industry with high quality, affordable lab testing services. BCN Labs offers complete microbiological laboratory services including pathogen testing, bacterial identification, yeast and mold identification and is one of the leading food mycology specialists in the United States.

BCN Research Laboratories, Inc. is a full-service laboratory that is capable of testing a wide range of products. BCN Labs offers an extensive selection of microbiological tests. BCN Labs staff can perform bacterial identification as well as pathogen testing such as *Listeria monocytogenes*, *Salmonella* sp. and *E. coli* O157:H7. BCN Labs is certified by the USEPA for microbiological testing of drinking water.

BCN Labs specializes in food and beverage mycology with a strong background in preservative resistant yeasts and molds, heat-resistant molds, and osmophilic yeasts and molds. The staff at BCN Labs is proficient in yeast and mold identification. BCN Labs mycology department is one of the leading mycology departments in the United States. The labs mycology department is staffed with a member of the International Commission on Food Mycology (ICFM; www.foodmycology.org). This specialized group means that the customer receives the highest quality service and results. BCN Labs, in conjunction with the customer, can develop a test protocol that will help ensure that the customer is receiving ingredients that are within specification, that the products that are produced are safe and wholesome and that the customer's sanitation and environmental programs are working properly.

BCN Labs' extensive knowledge of the manufacturing industry allows BCN to develop and implement environmental programs that can improve productivity and increase food safety.

BCN Labs can perform shelf-life studies, preservative studies and sanitizer studies. These studies can help a customer choose an appropriate shelf life or preservative for their products as well as the most appropriate sanitizer.

BCN Labs staffs expert sanitarians and consultants that are familiar with food processing, HACCP, GMP, food spoilage, and sanitation programs. They not only solve problems related to your processing but also design the right sanitation program for your company's needs. These audits are performed during production and sanitation. They include environmental and product sampling, spoilage and food safety risk assessment and a review of sanitation procedures.

We also offer air quality assessment audits. Controlling and monitoring the number of molds in the air in the processing areas in industries such as the beverage industry where their products are spoiled mainly by molds is essential to prevent product spoilage. BCN Labs' mycologists can detect and identify target molds such as heat-resistant molds and determine the need for corrective action to prevent or reduce product spoilage.

BCN Labs offers customized training courses for the food industry's laboratory technicians or quality personnel in proper sampling techniques, microbiology and mycology testing and auditing. BCN Labs has state-of-the-art microbiology and mycology teaching facilities.

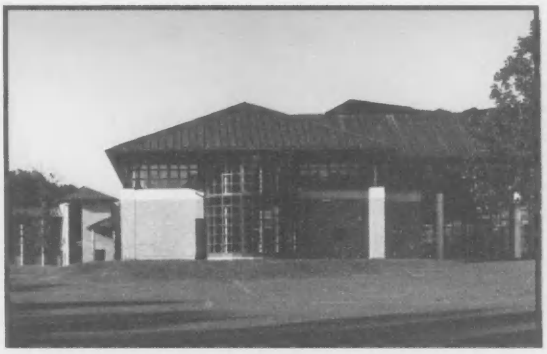
We are proud sponsors of the International Association for Food Protection (IAFP), the Mycological Society of America (MSA) and the International Commission on Food Mycology (ICFM). For additional information on BCN Labs, visit www.bcnlabs.com or call us at 800.236.0505 or 865.558.6819.

Gold Sustaining Member Profile

BD

Helping all people live healthy lives

BD, a leading global medical technology company that manufactures and sells medical devices, instrument systems and reagents, is dedicated to improving people's health throughout the world. BD is focused on improving drug therapy, enhancing the quality and speed of diagnosing infectious diseases, and advancing research and discovery of new drugs and vaccines. The Company's capabilities are instrumental in combating many of the world's most pressing diseases. Founded in 1897 and headquartered in Franklin Lakes, New Jersey, BD employs approximately 27,000 people in approximately 50 countries throughout the world. The Company serves healthcare institutions, life science researchers, clinical laboratories, industry and the general public.



The Company's original microbiology products division, Baltimore Biological Laboratories (founded in 1935 and acquired by BD in 1955), undertook the study of the preparation of peptones and development of culture media. The acronym "BBL" became the brand name for products offered by the company.

Difco Laboratories, founded in 1895, produced high quality enzymes, dehydrated tissues, and glandular products. In 1934, the focus was to develop new and improved bacteriological culture media, many of which were adopted as "standard" formulations in water, dairy, food, pharmaceutical and other microbiological laboratories.

In June 1997, the merge of Difco Laboratories with the Microbiology Systems division brought together the leading providers of microbiology products to industrial and clinical microbiology laboratories worldwide, with a combined total of over 180 years of experience. Today, both businesses comprise BD Diagnostics – Diagnostic Systems, headquartered in Sparks, MD, near the city of Baltimore.

Continuing this tradition of excellence, BD has developed an innovative line of media that incorporates carefully selected synthetic chromogenic and/or fluorogenic substrates. This novel technology has been shown to provide improved accuracy and faster detection than other traditional primary culture media. Depending on the media type and organism, identification may be accomplished without the need for confirmatory testing, subculturing, or supplemental biochemical or latex testing, leading to more efficient use of technologist time and earlier reporting of final results. In addition, four chromogenic media, all BBL™ CHROMagar™ formulations, have been developed and AOAC™-RI approved for rapid detection and identification of *E. coli* O157:H7, *Listeria monocytogenes*, *Salmonella* and *Staphylococcus aureus* from foods.

The business that now constitutes BD Diagnostics – Diagnostic Systems was founded by entrepreneurs whose ideas, diligence and foresight have contributed to making BD one of the world's leaders in the healthcare field. Through its products and services, BD is committed to "helping all people live healthy lives."

For more information, please visit www.bd.com/ds

Gold Sustaining Member Profile

BIOMÉRIEUX INDUSTRY

bioMérieux, a leading international diagnostics group specializing in the field of in vitro diagnostics, designs, develops, manufactures, and markets systems used in: clinical applications, for the diagnosis of infectious diseases such as sepsis, hepatitis, HIV, tuberculosis and respiratory illnesses, as well as pathologies such as cardiovascular diseases and cancer, based on the analysis of biological samples; and industrial applications, for the microbiological analysis of food, environments, surfaces, and pharmaceutical and cosmetic products, based on the analysis of product or environmental samples. Through 35 subsidiaries and a large network of distributors, the company is present in more than 150 countries.

bioMérieux's commitment to the public health sector is rooted in its unique history. Marcel Mérieux, a chemist, trained with the father of microbiology, Louis Pasteur. Combining strengths in chemistry and microbiology, Marcel Mérieux later founded the Institute of Mérieux, where various animal and human vaccines were developed. Marcel's son, Charles Mérieux, became a doctor of medicine who built on his father's foundations. In 1963, Alain Mérieux, grandson of Marcel, established the diagnostic company bioMérieux, which later encompassed joint ventures and acquisitions including api, Vitek Systems, and Organon Teknika, further strengthening bioMérieux's expertise in the diagnosis of infectious diseases. The partnership of engineering and microbiology, combined with service-oriented company philosophies, helped distinguish bioMérieux from other diagnostic companies.

Its launch from the field of infectious disease diagnostics soon led to bioMérieux's dedication of resources to the development of products that would improve food safety and quality, establishing its role in ensuring the safety of the public health. A separate division, bioMérieux INDUSTRY, was created to provide food processors with innovative testing solutions. Now in its twentieth year, the INDUSTRY division progresses under the direction of Alexandre Mérieux, the fourth generation of the Mérieux family.

bioMérieux's innovations encompass a full range of prepared culture media and microbiology testing solutions, including the VITEK® and VITEK® 2 Compact identification systems; api® manual identification system; VIDAS® Automated Pathogen Detection Systems; BacT/ALERT® 3D Microbial Detection System; and air IDEAL® environmental air sampling system. New additions include TEMPO®, bioMérieux's automated quality indicator solution; and DiversiLab®, a genotypic strain-typing method for bacteria, yeasts, and molds from Bacterial Barcodes, Inc., now a wholly owned subsidiary of bioMérieux. Rounding out the product portfolio are two recent distribution agreements: ELISA Systems Pty Ltd., adding a full range of allergen tests, and the PTS Gram ID System of Charles River Laboratories, Inc.

Innovations from bioMérieux INDUSTRY help control food producers' manufacturing costs, provide enhanced operational efficiency, and ensure the highest level of product safety. INDUSTRY'S goal is to achieve complete customer satisfaction.

bioMérieux remains competitive by consistently reinvesting 12–13% of annual revenues to support its ongoing commitment to advancing public health and safety. By working with the industry's top leaders to create partnerships with microbial experts, universities, and customers, bioMérieux ensures that its products and services meet the market's highest expectations. Such efforts have produced the NucliSENS® easyMAG™ and miniMAG,™ high quality automated and manual molecular extraction platforms used for research applications in universities and government laboratories to enhance nucleic acid purifications and sample preparation; and the development of new test parameters with the TEMPO.® bioMérieux's commitment to leading-edge research continues to broaden the realm of industrial microbiological control.

Over the years, bioMérieux has grown relationships with customers and leaders in the food safety community, including the IAFP Foundation. As an IAFP Gold Sustaining Member, bioMérieux proudly promotes the Foundation's endeavors to provide a forum for technical exchange between all sectors of the food safety industry. bioMérieux strives not only to supply food safety and quality solutions for the food industry, but to be partners and educators with the food community in ensuring the public health.

bioMérieux's food safety and quality solutions can be found at ww.foodsafetyandquality.com, by calling 1.800.634.7656.

Gold Sustaining Member Profile

bpi technology inc.

Expect a higher standard

Beef Products, Inc., the world's leading manufacturer of boneless lean beef, is headquartered in the heartland of America, Dakota Dunes, South Dakota. Since its inception in 1981, BPI has operated with one simple guideline, to be the best at what we do. This drive to be a leader within the beef industry has resulted in continuous development of new processing techniques, sanitation programs, and food safety innovations. BPI's dedication to quality and innovation spans over two decades of proven leadership in the lean meat manufacturing industry. At BPI and affiliated companies, we expect a higher standard of ourselves and, consequently, deliver a higher standard for our customers.

Producing 80,000 pounds of production a week in its beginnings, BPI's products are now found in over two-thirds of all ground beef produced in the United States each year. With current production of over 10 million pounds per week, BPI is clearly the leading manufacturer of boneless lean beef in the world. With continued process improvements, we anticipate production to reach 11 to 12 million pounds per week within the next year.

At BPI, food safety is more than an afterthought. Food safety is a critical element in the design and construction of each BPI facility. Food safety is so vital that nearly 20% of the total cost to construct BPI's South Sioux City facility went directly into sanitation and food safety related items. For example, outside air is washed, refrigerated, and sanitized before entering the processing room. The chilled air creates positive pressure within the processing room that, we believe, prevents contaminated air from entering the processing area. This eliminates the need for refrigeration coils, which can harbor bacteria.

That commitment to food safety carries through all aspects of production and beyond. BPI's finished product sampling and testing program is the most rigorous in the industry, assuring our customers of product quality and safety. The sampling and testing program was recently evaluated by Iowa State University Microbiology and Statistics departments in conjunction with BPI's reassessment of its HACCP plans. The reviewers commented that:

> *BPI's sampling and testing program is currently the most rigorous program in the industry I am aware of… The sampling and testing program managed by BPI is in fact statistically superior to other programs sometimes referred to by USDA as models for the industry, with higher probabilities of detection at all projected population levels for* E. coli O157:H7.

BPI is committed not only to the safety of BPI's own product, but to the safety of those produced by BPI's customers. That is why our customers are invited to take part in the BPI® Test and Hold Buy Back Guarantee.

If a US processor uses BPI® Boneless Lean Beef Trimmings in any of their formulations at a minimum of 15% inclusion, and

- all other raw materials meet industry expectations, and
- the processor conducts BPI audited facility environmental analysis, and
- uses our recommended grinding and blending methods, and
- is willing to test and hold for *E. coli* O157:H7 using our extensive sampling and testing methods, then

…if any evidence of *E. coli* O157:H7 is found in these tests, we will buy back that production.

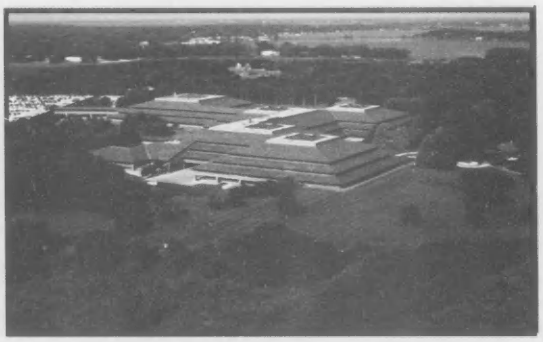
By maintaining our focus on BPI's core values of communication, cooperation, and innovation, BPI will continue to be the leading supplier of high-quality lean beef to the meat industry.

To learn more about BPI, please visit us at http://www.beefproducts.com.

Gold Sustaining Member Profile

collaborate > create > succeed™

Cargill is an international provider of food, agricultural, and risk management products and services. We are committed to using our knowledge and experience to meet customers' unique needs and help them succeed.



Cargill employs more than 153,000 people in 66 countries, and services five key customer segments: Crop and Livestock; Food; Health and Pharmaceutical; Financial and Risk Management; and Industrial. Cargill partners with farmers in growing crops, raising animals, and feeding people. We help our food and industrial customers reduce risk, expand markets, and streamline supply chains. We work to ensure that our people, products, and facilities are safe. We buy, trade, transport, blend, mill, crush, process, refine, season, distribute and deliver around the clock, around the globe. You can taste the results at your table each day – the meat made more flavorful, the bread made healthier or the beverage made more refreshing. Behind the scenes, Cargill employees are discovering new ways to improve the foods you eat. With our partners, we're working every day to nourish ideas and nourish people.

The history of Cargill dates back to 1865 when it was founded as a single grain elevator in Iowa. From its roots in the pioneer farming lands of America's Midwest, Cargill owes its long heritage to an early culture of business ethics, innovation, and leadership. Our world headquarters is based just outside Minneapolis, Minnesota. Cargill is a privately-held, professionally-managed company with more than $75 billion in revenue in 2006. Our customers and partners are some of the best known in the world: McDonald's, Kraft, Nestlé, Coca-Cola, Pepsi-Co., Wal-Mart, and Unilever. They choose Cargill because they know we're committed to doing what it takes to help them succeed. Providing solutions is what being a valued business partner is all about.

Cargill's four-fold Vision Statement is intended to unite, challenge, and inspire everything we do:

- Our purpose is to be the global leader in nourishing people.
- Our mission is to create distinctive value.
- Our approach is to be trustworthy, creative and enterprising.
- Our performance measures are engaged employees, satisfied customers, enriched communities, and profitable growth.

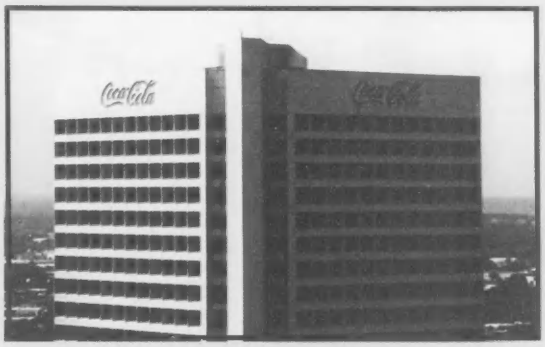
Success in each of these measures ensures success for Cargill and our customers. Through our breadth of knowledge across the agrifood chain and depth of experience in global markets, we help move food from the fields where it's grown to the homes where it's consumed. No matter where you look, you'll see Cargill working hand in hand with customers, suppliers, and communities to nourish ideas and nourish people.

To learn more about Cargill, please visit us at www.cargill.com.

Gold Sustaining Member Profile

The Coca-Cola Company®

More than a billion times a day, in 200 countries around the world, thirsty people reach for the beverages of The Coca-Cola Company. They expect great taste and the highest quality in every serving. Our promise at The Coca-Cola Company to deliver quality products is the most important commitment we make.



Founded in 1886, The Coca-Cola Company is the world's largest beverage company. While known for Coca-Cola, Diet Coke, Sprite, and other sparkling beverages, we now offer more than 400 brands. We are also the world's largest juice and juice-drinks company, and have the world's third largest bottled-water business.

We offer a wide variety of beverages to meet consumer needs, including low-calorie and regular sparkling beverages, energy drinks, ready-to-drink teas, coffee products, Minute Maid and Odwalla juice and juice drinks, Dasani bottled water, and PowerAde sports beverages. Assorted package sizes and flavors are created to meet every person's need for refreshment, hydration, energy, and nutrition. We are continuously introducing new products and packaging options to expand consumer choice.

Delivering the quality our consumers expect requires consistent and flawless execution. The Coca-Cola Quality System (TCCQS) is our branded quality management structure reflecting our integrated approach to managing quality, the environment, and health and safety. This worldwide initiative involves all of our business units and every aspect of our business. Everyone associated with our Company is expected to maintain the highest standards of quality in products, processes, and relationships. Developed by a global, cross-functional team, and endorsed by senior managers along with our top bottling partners, The Coca-Cola Quality System is the framework around which the Coca-Cola system coordinates and guides its activities, drives continuous improvement, and relentlessly strives for quality and safety in everything we do.

Our goal is to continuously keep pace with new regulations, and industry best practices, marketplace conditions, and ever-changing customer and consumer expectations. Today there is an increased awareness of the importance of food safety, not only in manufacturing, but also throughout the entire supply chain. By refining our requirements, we further ensure that we embody the most up-to-date, stringent processes and protocols.

The Coca-Cola Company exists to benefit and refresh everyone it touches. For us, quality is more than just something we taste, see, and measure. It shows in our actions every day. In addition to providing quality beverages, we have a long tradition of promoting and supporting the physical development of youth in the United States and around the globe through sponsorship of team sports, physical fitness and health programs, Boys & Girls Clubs, and national and world-class sporting events. In the last year, the Company and its Foundation invested nearly $76 million in community programs and initiatives worldwide.

For more information about The Coca-Cola Company, please visit www.thecoca-colacompany.com.

Gold Sustaining Member Profile

ConAgra Foods®

Since our first bag of flour was sold in 1867, ConAgra Foods has grown from a small Nebraska company into one of America's largest food companies. Today ConAgra Foods is one of North America's leading packaged food companies, with a strong presence in consumer grocery as well as restaurant and foodservice establishments. ConAgra nourishes the lives of its consumers, customers, and employees by providing trusted, brand-name food and quality ingredients, while fostering a workplace that grows talented people and values inclusion. We work every day to find a better way—to make meal time convenient, to help schools provide nutritious meals for students, to improve the communities in which we operate, and more.

ConAgra Foods had net sales of $11,579 billion in 2006, with over 100 manufacturing locations and 33,000 employees spanning the globe. The company is organized into three businesses:

- Consumer Foods, which manufactures and markets many respected, dynamic name-brand products sold at retail venues from supermarkets to convenience stores, and foodservice arenas from restaurants to stadiums. Among our popular consumer brands are Healthy Choice, Chef Boyardee, Hebrew National, PAM cooking spray, Egg Beaters, Orville Redenbacher's, and Slim Jim.
- Commercial Products, which provides food and ingredients to major foodservice establishments and commercial customers worldwide. We work carefully with our customers to develop solutions that meet their unique needs, with specialty potato products from Lamb Weston; Spicetec's spices and flavor blends; garlic, onions, capsicums and vegetables from Gilroy Foods; and grain and flour from ConAgra Mills, including Ultragrain, our proprietarywhole-wheat flour that has the taste and texture for refined white flour. Commercial Products also includes the ConAgra Foods Trade Group, which manages a portfolio of agricultural and energy commodities and services.
- International, which markets more than 40 brands in retail channels outside the United States. Our products are found in more than 100 countries, including Canada, Mexico, Puerto Rico, much of Latin America, Japan, China, and the United Kingdom.

ConAgra Foods is proud to be a Gold Sustaining Member of IAFP and we are dedicated to the safety, quality, and wholesomeness of our products. We are committed to the highest possible standards of food safety throughout our operations and are taking demonstrable measures to that end. This includes the consolidation of responsibility for existing and future companywide oversight of food safety initiatives and systems into a single leadership position and the formation of a Food Safety Advisory Committee of leading independent experts, uniquely positioned in the industry to help the company's efforts in this area. ConAgra's vision is simple—one company growing by nourishing lives and finding a better way today… one bite at a time!

Gold Sustaining Member Profile

Through its commitment to providing the best science available and its heritage of DuPont innovation, DuPont Qualicon delivers practical solutions that help food, pharmaceutical, and personal care companies around the world protect their products, productivity, and brands.

The DNA-based BAX® system is a fast, accurate way to detect bacteria and other microbes in food—from raw ingredients to finished products. The BAX® system is used around the world for food safety testing, receiving international approvals from third-party and government labs in Canada, South America, Europe, and Japan. The United States Department of Agriculture Food Safety and Inspection Service (USDA FSIS) has adopted the BAX® system as its testing method for *Salmonella*, *Listeria monocytogenes*, and *E. coli* O157:H7. AOAC has certified the BAX® system as an Official Method℠ for detecting *Salmonella* and *Listeria monocytogenes*, and a Performance Tested℠ method for detecting *E. coli* O157:H7 and *Listeria* species. Assays are also available for detecting *Enterobacter sakazakii*.

In addition to food safety, labs can also perform faster quality testing on the same platform. Instead of manually counting colonies on a plate, you can use the BAX® system PCR assay for yeast and mold to generate a 48-hour positive/negative result based on a detection threshold you specify.

The next-generation BAX® System Q7, introduced in alliance with Applied Biosystems, combines the ease-of-use and superior performance of the original BAX® system with new PCR technologies for an advanced system with tremendous technological flexibility. For example, the BAX® system real-time PCR assay for *Campylobacter* can differentiate three targeted species—*C. jejuni*, *C. coli* and *C. lari* —and give you quantitative results in about 90 minutes of processing time.

DuPont™ StatMedia™ soluble packets are pre-weighed unit-dose packets containing irradiated enrichment media wrapped in water-soluble film. You simply drop the packet into pre-warmed sterile water and mix to dissolve. No autoclaving required, no bulk powder mess to clean up.

DuPont Qualicon also markets the patented RiboPrinter® system, the world's only automated DNA fingerprinting instrument that can be used to rapidly pinpoint sources of bacteria in food and pharmaceuticals. Electronic linking provides microbial information and knowledge networking capabilities for public health agencies, industry, universities, and research centers. This enables the sharing of genetic RiboPrint™ patterns for organisms, making it faster and easier to help keep people safe in every corner of the world.

For more than 200 years, DuPont has been the leader in delivering science-based solutions that provide significant business value. DuPont Qualicon, a global leader in DNA-based diagnostic solutions, is part of that strong tradition. The BAX® and RiboPrinter® systems have proven to be a powerful part of the quality control and quality assurance processes for major food, pharmaceutical, and personal care product companies around the world, providing them with a competitive edge today and well into the future.

For more information, visit www.qualicon.com or call 1.800.863.6842.

Gold Sustaining Member Profile

ECOLAB®

A partner with its customers for over 80 years, Ecolab is the global leader in cleaning, sanitation, food safety, pest elimination, and health protection products and services for the hospitality, foodservice, healthcare, and industrial markets. Around the world, Ecolab operates directly in nearly 70 countries, employing more than 22,000 associates worldwide, and reaches 100 other countries through distributors, licensees, and export operations.

Ecolab uses an integrated systems approach to food safety and brand protection issues, providing customers with intervention at multiple sites throughout the "farm to fork" continuum. Ecolab associates' expertise in agricultural production, food processing and foodservice, as well as its premium cleaning and sanitation products and programs, help reduce the risk of contamination throughout an operation and provide reliable and efficient methods for maximizing food safety and quality.

At the start of the food chain, Ecolab Food & Beverage associates provide customers with premium cleaning and sanitation products, programs, and expertise in food production environments. For example, the Ecolab Livestock Disease Intervention™ (LDI) program is aimed at helping control cross contamination within animal production facilities, between such facilities, and between production facilities and processing plants. Ecolab also provides complete udder health, hoof management, and fly control programs for dairy production facilities.

Reducing pathogens and other microbial counts on food surfaces in the processing stage, meanwhile, improves the quality and shelf life of food products such as meat, poultry, seafood, fruits, and vegetables. These patented food surface treatments are effective solutions for minimizing microbial contamination during processing.

Contamination at any point in a food processing operation can shut down plant operations, costing customers time and money. The Ecolab Pest Elimination Division, therefore, provides custom-designed programs to meet the individual needs of food and beverage processing plants, as well as foodservice and food retail businesses. The emphasis is on sanitation, structural concerns within a facility, and preventative exclusion services in every aspect of the food production process.

Once the food supply reaches foodservice vendors, the Institutional and Kay divisions offer numerous high quality, patented product solutions to help prevent many of the leading causes of foodborne illnesses. These include products to improve employee hygiene practices, sanitize kitchen equipment used to prepare or serve food, as well as high-performance detergents and cleansers to sanitize every surface within a facility.

In fact, Ecolab personnel hygiene programs provide comprehensive, worker-focused hygiene systems including hand cleaners and sanitizers, doorway sanitizing systems for food processors, state-of-the-art, no-touch dispensers, and employee training.

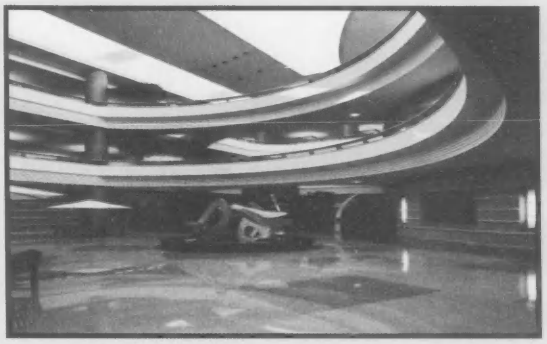
The last phase of food safety and brand protection deals with a comprehensive intervention program that focuses on compliance. EcoSure℠ Advanced QA Services, an Ecolab quality assurance food safety management program, helps customers establish a routine program of self-inspection, provide comprehensive employee training, and conduct periodic independent audits to help identify areas in need of improvement. It also brings Ecolab's commitment to its customers full circle.

For more information, visit www.ecolab.com or call 651.293.2233.

Gold Sustaining Member Profile

JohnsonDiversey

JohnsonDiversey is a global leader in commercial cleaning and hygiene solutions. Across the globe, JohnsonDiversey develops, manufactures, and provides cleaning and hygiene products and services, including safety and hygiene application training, consulting and auditing.



We recognize that businesses that manufacture, process, and serve food have a critical responsibility for protecting public health and safety, and that of their employees and brand. The task is a daunting one, because food protection touches every aspect of the operation: from sourcing to storage, from food preparation to presentation, and from process to consumption by customers.

Addressing Every Food Protection Need

Our ongoing commitment to food protection is supported by a continuously expanding portfolio of JohnsonDiversey products and services designed to address virtually every food safety need. To simplify the complicated business of ensuring that food is safe, JohnsonDiversey developed the SafeKey™ portfolio. Under SafeKey,™ we've organized the many elements of food protection, from sophisticated risk management consulting to essential cleaning chemicals, to provide seamless food protection from processing to consumption.

SafeKey™ makes food protection straightforward, with integrated solutions that are easy to implement and manage. Together with JohnsonDiversey Consulting, we deliver intellectual property and methodologies to thousands of customers around the world who know that partnering with a global food protection expert ensures a distinct competitive advantage.

Our consultants use the proprietary Hygieneomics™ Matrix to assess performance and quantitatively benchmark opportunities for improvements. Then, customized action plans map out an integrated risk management program.

JohnsonDiversey works with customers to develop a Food Safety Management System (FSMS) for the business and a Vendor Assurance Program, to ensure that food safety is managed, and traceable, all along the supply chain. The FSMS program includes HACCP (Hazard Analysis Critical Control Point) validation.

With strategy and management oversight established, the operational cornerstone of the process, HotSpots,™ is put to work. JohnsonDiversey's HotSpots™ program assembles all the elements of an effective food protection program into one customizable solution. It maps high-risk areas throughout individual facilities, and then provides data, guidelines, training, and online tools to drive "best practices" for efficiently matching internal and external resources for improved food safety management.

Our comprehensive approach to food and beverage protection includes plant-wide cleaning and sanitation solutions, a broad range of food surface antimicrobial treatments, and water quality and management expertise. Our CIP cleaning and disinfection agents, application expertise, and control systems ensure that the highest standards of hygiene are obtained for all production equipment, safeguarding even the most sensitive foods and beverages. The unique AquaCheck program measures, analyzes, and solves water usage problems to manage operating costs, improve operational efficiencies, save water and energy, and reduce waste.

JohnsonDiversey History

JohnsonDiversey has its roots in S.C. Johnson and Son, Inc., which was founded in 1886 in Racine, WI. Beginning as the Services Division of S.C. Johnson in the 1940s, the company gained independence from its parent in 1999 as Johnson Wax Professional.

JohnsonDiversey was formed in 2002 when Johnson Wax Professional acquired DiverseyLever from global food conglomerate Unilever PLC, making the new company a global leader in the institutional and industrial cleaning and hygiene business.

We offer our professional products directly or through third-party distributors and channel partners to end users in the following sectors: food service, lodging, food and beverage, building service contractors, retail, health care, industrial, government, and education.

Headquartered in Racine, WI, JohnsonDiversey maintains operations in 56 nations and provides products and services in more than 160 countries. To learn more, visit www.johnsondiversey.com.

Gold Sustaining Member Profile

Kraft Foods is a global leader in branded foods and beverages with net revenues of more than $34 billion. Built on more than 100 years of quality and innovation, Kraft has grown from modest beginnings to become the largest food and beverage company in North America and the second largest in the world, marketing many popular brands in more than 150 countries around the globe. The Kraft brand portfolio is one of the strongest of any packaged goods company with more than fifty $100 million brands and seven $1 billion brands (Kraft branded products, Jacobs and Maxwell House coffees, Oscar Mayer meats, Philadelphia cream cheese, and Post cereals). Our global brands include Kraft, the number one cheese brand in the world, as well as our best-known brand for salad and spoonable dressings, packaged dinners, barbecue sauce, and other products; Philadelphia, the world's number one brand of cream cheese, Jacobs and Maxwell House coffees, Milka and Toblerone chocolates, Oreo cookies, Ritz crackers, and Crystal Light/Clight and Tang beverages.

The history of Kraft dates back to 1903, when with $65 in capital, a rented wagon, and a horse named Paddy, J. L. Kraft started purchasing cheese at Chicago's Water Street wholesale market and reselling it to local merchants. From that first idea of selling wholesale cheese to stores, Kraft has been a company built on innovation. Through the years many people have contributed to the success of Kraft – and its numerous predecessor companies, some of which trace their heritage back to the 1700s.

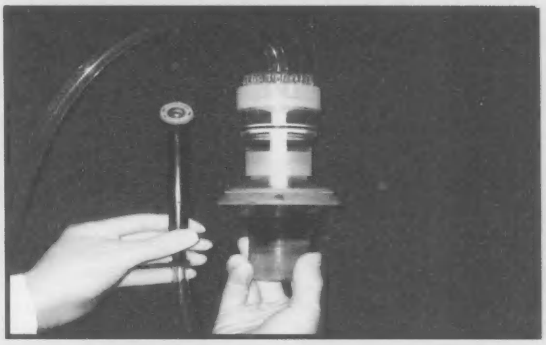
These contributions have resulted in numerous breakthrough ideas, such as the 1898 introduction of the Uneeda biscuit, which featured the first "inner-seal" packaging; the 1906 launch of Kaffee Hag, the first decaffeinated coffee; the 1927 introduction of Kool Aid, the first successful powdered soft drink; the 1950 introduction of Kraft Deluxe, the first commercially packaged process-cheese slices; the 1995 launch of DiGiorno Rising Crust pizza, revolutionizing the frozen pizza category, and the 2004 introduction of the Tassimo hot beverage system, and the 2005 introduction of the South Beach Diet line of foods.

To learn more about Kraft please visit us at www.kraft.com.

Gold Sustaining Member Profile

Safeguard Our Precious Resources

Microbial-Vac Systems,® Inc. is an innovator in surface pathogen sample collection and processing. Our advanced technology improves the response capabilities of our military and civilian first responders and food safety experts to locate and identify biothreat agents, food pathogens and pandemic disease agents.



Microbial-Vac Systems,® Inc. (MSI) was founded in 2002 to improve food and environmental safety through more accurate surface sample collection and more convenient, rapid, and cost effective sample processing for detection than most rapid or conventional methods. The old adage that the "lab analysis results are no better than the sample submitted" was the driving force that started this company.

Similarly, one version of the law of equivalent progression states that "To maximize the accuracy and confidence levels of laboratory results from rapid, ultra-sensitive bio-detection technology, an equivalent or higher level of sample acquisition technology is required." The Microbial-Vac (M-Vac™) wet-vacuum collection system is based on the theory that higher efficiency of collection of field samples over larger surface areas will yield more representative samples. Typically, if each collected sample represents a larger surface area, fewer samples will be initially required at the lab for analysis. If fewer but more representative samples can also be processed more quickly and efficiently, total testing costs and response time by field personnel would be expected to decrease. Directly or indirectly, these benefits will save human and animal lives.

The new M-Vac sample collection technology system utilizes Liquid and Air-assisted Microbial Detachment and Capture (LAMDAC™) principles to collect food or environmental surface samples; typically from one-to-two square feet of surface area per sample in 100–150 ml of safely contained liquid. The M-Vac's sister technology allows these liquid samples to be rapidly processed at the lab in the original M-Vac liquid-collection chamber using a unique, low speed centrifuge process referred to as the Rotary Activated Concentration System (RACS). With this new, "second-stage technology," liquid-suspended pathogens can be rapidly concentrated 10–15 fold in 2–3 mls for more accurate analysis without transfer to additional labware.

Although this technology was originally developed for collecting and processing surface bacteria, initial testing by a prominent laboratory in Europe indicates the M-Vac system may also have significant potential for surface virus contamination retrieval. These new systems will be commercially available throughout the US in 2007, and globally in 2008, and will be marketed initially for surface bacterial and similar-sized particle collection. Several Technology Centers are currently being set up across the US by MSI to investigate additional applications possibilities for the technology and to provide interested scientists and other end users a more convenient opportunity to view the technology in action.

MSI is projected to raise the bar in the world of sampling with its innovative technology by setting a new standard of comparison and creating higher confidence in accuracy of collecting and processing surface pathogen samples.

www.m-vac.com

Gold Sustaining Member Profile

PepsiCo is a world leader in convenient foods and beverages, with 2006 revenues of more than $35 billion and more than 168,000 employees worldwide. The company consists of Frito-Lay North America, PepsiCo Beverages North America, PepsiCo International, and Quaker Foods North America. PepsiCo brands are available in nearly 200 countries and territories and generate sales at the retail level of about $92 billion. Many of PepsiCo's brand names are more than 100 years old, but the corporation is relatively young. PepsiCo was founded in 1965 through the merger of Pepsi-Cola and Frito-Lay. Tropicana was acquired in 1998, and PepsiCo merged with The Quaker Oats Company, including Gatorade, in 2001.

The safety and integrity of our products is our single highest priority. It's our duty as a responsible company. People buy our brands because they know they can count on consistent quality—every time. We follow very rigorous standards of safety and quality. Our policies ensure strict adherence to all applicable regulations and legislation. Our policies cover food safety, sanitation, recalls, and allergens, and require that our products are coded, labeled, identifiable, and traceable.

At every level of PepsiCo, we take great care to ensure that the highest standards are met in our manufacturing processes. We strive for excellence, because our consumers expect and deserve nothing less. The PepsiCo Product Integrity Task Force provides strategic and technical guidance on product integrity. Our compliance systems include web site training, monitoring, preventative measures, and readiness for corrective action. We have regular management review of our procedures and activities regarding our products. Our standards are equally rigorous in New York, London, Beijing, and wherever else we operate. We stand behind each and every product we sell.

PepsiCo is committed to providing safe, wholesome products and protecting equity in our brands, trademarks, and goodwill. Our divisions have implemented policies related to food safety, labeling product integrity and quality. PepsiCo products meet a broad variety of needs and preference—from fun-for-you items to product choices that contribute to healthier lifestyles. In 2004, PepsiCo introduced the Smart Spot symbol in the United States, a first-of-its-kind designation that helps consumers identify PepsiCo products that can contribute to healthier lifestyles. Products with the Smart Spot symbol meet nutrition criteria based on authoritative statements from the US Food and Drug Administration and the National Academy of Sciences, or provide other functional benefits. Today, more than 250 PepsiCo products carry the Smart Spot symbol.

Gold Sustaining Member Profile

SILLIKER®
Food Safety & Quality Solutions

When John H. Silliker, Ph.D., founded the Silliker Corporation in 1967, the field of food testing was in its relative infancy. With a small staff of four professionals and a highly temperamental sterilizer, Dr. Silliker, a renowned microbiologist known for his groundbreaking work with *Salmonella*, sought to take the practice of food testing to a new level. He had a practical philosophy: "Give the clients more than just analytical results; give them practical solutions to their problems."

This forthright and enduring philosophy has guided and sustained the Silliker organization for 40 years. Led today by Chief Executive Officer and President Philippe Sans, Silliker Group Corp. is the preeminent food testing organization in the world. It is comprised of 41 locations in 13 countries, including Australia, Belgium, Canada, China, France, Italy, Mexico, the Netherlands, Poland, Spain, Switzerland, and the United States.

Serving leading processors, retailers, distributors, and manufacturers worldwide, Silliker meets and exceeds international standards for technical competency. As the leading international network of ISO 17025 accredited food testing and consulting labs, the company consistently outperforms participants in industry-wide laboratory proficiency programs.

Silliker "operating excellence" is the primary reason why 20 of the top 25 food producers in the US contract Silliker to support their food safety and quality programs. Silliker services include:

Testing: Using state-of-the art technologies and the latest validated methods, Silliker microbiologists and chemists are equipped to handle routine and complex analytical tasks with accuracy and unrivaled responsiveness.

Auditing: With years of experience in almost every food industry environment and segment of the food chain, Silliker auditors can help retailers and distributors identify potential risks in their food safety programs and pass the strictest industry and regulatory standards.

Consulting: Highly knowledgeable and skilled Silliker consultants provide companies with professional, expert services to improve quality assurance programs, reduce the risk of product recalls, and find practical, workable solutions to science-based problems.

Education and Training: Silliker public short courses, training videos, on-line learning programs, and customized training programs provide upper management and line workers with multi-level tools to put recognized food safety principles into immediate action.

Research: From shelf life and challenge studies to market surveys, the Silliker Food Science Center provides a broad spectrum of studies to help companies assure product safety and quality.

For its numerous contributions to food science, Silliker has been the recipient of numerous industry honors including the International Association for Food Protection's "Black Pearl Award" and the American Meat Institute's "Supplier-of-the-Year Award."

For more information on the Silliker international network, please log on to www.silliker.com.

Gold Sustaining Member Profile

Our mission is the optimization of sanitation procedures to reduce or eliminate spoilage due to sanitation practices and to maximize food safety through innovative sanitation procedures. Besides an extensive line of cleaners and EPA-registered sanitizers, USS offers sanitation equipment, customized sanitation programs, contract cleaning, equipment passivation, plant fogging, and microbiological testing.

Universal Sanitizers and Supplies, Inc. (USS) was founded in 1994 to provide the food manufacturing industry with unparalleled service that leading sanitation companies cannot provide.

USS has developed a full line of sanitation chemicals such as cleaners and sanitizers as well as conveyor lubricants, sanitation equipment, water treatment products, and janitorial products. Our products are made from the highest quality ingredients and meet the strictest standards. USS matches these cleaners to the needs of the customer based on the soils encountered. USS then chooses one of its EPA-registered sanitizers that will be best suited to eliminate the microorganisms that could affect the product or consumer safety.

What sets USS apart from the rest of the food sanitation companies are our specialized services. We provide in-depth plant cleaning, silo and tank cleaning, new equipment passivation, and fogging, among other services. We offer training for employees, supervisors, and managers, and consultation in the areas of sanitation, spoilage prevention, and food safety. Food manufacturers can use these services to prepare for audits, clean equipment that can be hazardous or difficult for their employees to clean, or help with their product shelf life or product safety.

USS is one of the few sanitation companies that offer fogging services. This fogging uses micro-droplets of sanitizer to fog the air and equipment. USS also provides passivation services. This service is done to clean and prepare new and old stainless steel for operational service.

USS prepares sanitation programs for its customers that include sanitation standard operating procedures, daily check sheets, and employee training. The programs are customized for each facility and each piece of equipment. The check sheets provide written documentation that the equipment has been cleaned and sanitized according to the SSOP. Once a sanitation program is in place, USS can provide microbiological testing services through the company's in-house food testing laboratory. The laboratory can verify that the sanitation program is working, identify unknown soils, perform shelf-life studies, test ingredients and finished products, and perform sanitizer-studies to confirm that the proper sanitizer is being used.

USS can also provide sanitation consulting to companies that currently use other vendors for their sanitation. This provides an unbiased opinion and can help improve the customer's current sanitation program. This auditing service includes an in-depth plant audit, microbiological verification, written recommendations and, if the customer desires, a meeting with the current supplier to implement these changes.

USS employs professional, knowledgeable staff that can help with sanitation issues and product quality issues. The company offers many products and services to meet the many needs of the food manufacturing industry.

USS is a certified women-owned business (WBE) by the Women Business Enterprises National Council (WBENC).

We are proud sponsors of the International Association for Food Protection (IAFP) and the International Commission on Food Mycology (ICFM). For additional information on USS, visit www.universalsanitizers.com or call us at 888.634.6196 or 865.584.1936.

Certified
WBENC
Women's Business Enterprise

Highlights of the Executive Board Meeting
April 12–13, 2007
Des Moines, Iowa

The following is an unofficial summary of actions from the Executive Board Meeting held in Des Moines, Iowa on April 12–13, 2007.

Approved the following:

- Minutes of January 28–29, 2007 Executive Board Meeting
- Minutes of January 28, 2007 Executive Session Board Meeting
- Approved Archie Holliday for an Honorary Life Membership
- New staff position for administrative assistance
- Budget for fiscal year ending August 31, 2008
- Five complementary registrations for ILSI speakers

Discussed the following:

- E-mail votes taken since the last meeting
- Status of IAFP Foundation fundraising efforts
- Recognition system for IAFP Foundation contributors
- Completion of the revision to the *Procedures to Investigate Foodborne Illness*
- Papers on food worker hygiene
- Committee appointments for IAFP 2007
- IAFP 2007 program planning review
- IAFP's future plan document
- Tentative program for IAFP's Third European Symposium, October 2007
- Participation in China International Food Safety and Quality, September 2007
- Member comments on international issues
- European symposium projected growth curve
- IAFP 2010 site selection
- Suggestion to name the International Award
- Succession planning
- *FPT* cover redesign
- Scientific Editor terms for John Sofos and Ed Zottola
- Joining BIFSCo (Beef Industry Food Safety Council)
- Allergy Icons
- Webcasts & short courses
- WHO-NGO Update
- 3-A Sanitary Standards, Inc.
- Non O157 *E. coli* white paper
- International Leadership Award sponsorship by Cargill
- Update on Member dues restructure
- Review of February 2007 financial statements

Reports received:

- *Food Protection Trends*
- *Journal of Food Protection*
- IAFP Web site
- Membership
- Advertising update
- Board Members attending Affiliate meetings
- *Affiliate View* newsletter
- Future Annual Meeting schedule
- Exhibiting (IAFP On the Road)

Next Executive Board meeting – July 6–12, 2007.

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Hobart, Tasmania

Brent A. Story
Story Fresh
Cambooya, Queensland

BELGIUM

Michel B. Diop
Faculte Universitaire Sciences Agronomiques
Gembloux

BRAZIL

Marceia Faria
Jacarei, São Paulo

Hans Froder
Federal Institute for Risk Assessment
São Paulo

Patricia Silva Jacob
Sorocaba, São Paulo

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Cargill Meat Solutions
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Gary H. Graumann
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Jacci Holowath
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Calgary, Alberta

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Ansung, Gyunggi-Do

Ki-Eun Lee
Kyungnam University
Masam, Kyungsangsam-do

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Chung-Ang University
Ansung, Gyunggi-Do

Cho Yong Sun
Korea Food Research Institute
Songnam-Si, Kyunggi-Do

Hyun Sun Yun
Korea University
Sungbuk-gu, Seoul

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Linkoping, Ostergotland

TAIWAN

May-June Tsou
Chung Chou Institue of Technology
Yuanlin, Changhua

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Auburn

Vanija Kallur
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Huntsville

Lin Liu
Auburn University
Auburn

Robert S. Miller
Auburn University
Auburn

Naga Prasad Muppala
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Auburn

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Auburn

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Clyde's Restaurant Group
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Resources for the Future
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Lake Alfred

Kamil G. Gajewski
Florida State University
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Safe Food Systems
Lutz

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Florida State University
Tallahassee

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Matthew L. Ranieri
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Ithaca

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North Carolina State University
Raleigh

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Raleigh

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The Steritech Group Inc.
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Mary K. Muth
RTI International
Research Triangle Park

Youwen Pan
USDA-ARS
Raleigh

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Wooster

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Ohio State University
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Knoxville

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Knoxville

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Loree Branham
Texas Tech University
Lubbock

Melissa K. Hughes
Texas Tech University
Lubbock

Jennifer L. Johnson
Texas Tech University
Lubbock

Grihalakshmi Kakani
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College Station

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Kennewick

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NEW GOLD SUSTAINING MEMBERS

This membership was previously a Sustaining Membership

Paul Hall
ConAgra Foods, Inc.
Omaha, Nebraska

UPDATES

Bettcher Industries Appoints Byrley and Stump to Product Development and Product Management Positions

As part of its ongoing R&D and product marketing efforts, Bettcher Industries announces two new appointments in its product development and product management areas.

David H. Byrley has been named director of product development. In this position, Mr. Byrley is responsible for directing the investigation of opportunities to introduce new equipment to the food processing and foodservice industries. Mr. Byrley has 25+ years of experience leading large-scale new product development, new process development and business development projects. Prior to joining Bettcher Industries, he held managerial positions in product development with MK Morse Company, Bosch (Emerson Electric), and BF Goodrich. Mr. Byrley holds a BS degree in mechanical engineering from Cleveland State University.

Also joining Bettcher Industries is Kevin Stump, product manager. He will be responsible for formulating and implementing strategies to enhance the company's current product offerings. Prior to joining Bettcher Industries, Mr. Stump was a product manager at Nordson Corporation's Automotive Systems Group. While at Nordson, he also held positions as product development engineer and applications engineer. Mr. Stump holds a BS degree in mechanical engineering from the University of Toledo, and an MBA degree from Cleveland State University.

Larry Bettcher, president, noted that the appointments of Mr. Byrley and Mr. Stump tie into the company's strategic plans to develop and grow markets through organic product development. "We are delighted to welcome David and Kevin aboard. Their strong background and superior qualifications will add breadth and depth to our product development program," Bettcher said.

Company Veteran Steve McElweenie to Head up FKI Logistex Canada

FKI Logistex® announces the expansion of its Canadian operations. Company management veteran Steve McElweenie will serve as vice president and general manager of FKI Logistex Canada Ltd.

FKI Logistex Canada brings together three existing FKI Logistex Canadian divisions — Airport, Post & Parcel, Warehouse & Distribution, and Manufacturing Systems — to create a single, go-to-market entity in Canada offering enhanced, integrated service to the company's Canadian customer base.

FKI Logistex Canada customers include retailer Canadian Tire Corporation and third-party logistics provider ATS, as well as several major Canadian airports. McElweenie, who is a native Canadian, will lead FKI Logistex Canada from the greater Toronto area.

Mr. McElweenie, who leaves his post as vice president, sortation, and general manager of FKI Logistex North America's Frederick, Maryland operation, reports directly to Steve Ackerman, president, FKI Logistex North America. Mark Sibley assumes Mr. McElweenie's former responsibilities as interim general manager of the Frederick operation.

In Canada, Geoff Bainton assumes the role of director of operations, and Glen Chambers moves into the position of director of business development. Both report to Mr. McElweenie.

Mr. McElweenie joined FKI Logistex in 2000. Prior to joining FKI Logistex, he held positions at Motion Systems, Siemens ElectroCom & AEG Sorting Systems, and G.N. Johnston Equipment.

Mettler–Toledo Hi–Speed Appoints Gerald Lisowski General Manager

Mettler–Toledo Hi–Speed, Inc. is pleased to announce that Gerald Lisowski has joined the firm as general manager. At Mettler–Toledo Hi–Speed, Mr. Lisowski is responsible for providing strategic and operational leadership for the company's business, which is focused primarily in North America and Latin America.

Mr. Lisowski will oversee the development and execution of plans that support the company's strategy to deliver superior packaging equipment and services to customers manufacturing foods, beverages, pharmaceuticals, chemicals, durable and non-durable goods.

Mr. Lisowski brings more than 20 years of business leadership experience to Mettler–Toledo Hi–Speed. Most recently, he served as vice president and general manager of Taiyo Birdair Corporation. Previously, he was managing director at Kistler Instrument Corporation, and previous to that Mr. Lisowski spent 14 years at Moog Inc. in a variety of management positions. He holds a BS degree in electrical engineering technology and an MBA, both from the State University of New York at Buffalo.

NEWS

NSF International Announces Recipients of the 2007 Food Safety Leadership Awards

NSF International (NSF) has announced the 2007 recipients of its Fourth Annual Food Safety Leadership Awards. NSF's Food Safety Leadership Awards Program recognizes groundbreaking food safety achievements throughout the foodservice industry. The awards were presented on May 19, 2007 at McCormick Place Convention Center during the National Restaurant Association Restaurant, Hotel–Motel Show in Chicago.

Mr. Frank Yiannas, from Walt Disney World is one of the 2007 NSF Food Safety Leadership Award Recipients for Lifetime Achievement in Food Safety Leadership.

Mr. Yiannas is the president of the International Association for Food Protection. He has been a leader in food safety for eighteen years. His many contributions include progressive microbial detection methods, developing hand-held computer audit technology and vendor food safety monitoring systems. He led the creation of food safety icons which represent important food safety tasks that can be recognized in multiple languages.

Other receipents of the NSF Food Safety Leadership Award included:

- Jeannie Sneed, Ph.D., R.D., SNS,CFSP, Iowa State University – 2007 NSF Food Safety Leadership Award – Lifetime Achievement for Education & Research;
- Susan D. Conley, USDA/Food Safety and Inspection Service – 2007 NSF Food Safety Leadership Award for Education;
- Shelley Feist, Partnership for Food Safety Education – 2007 NSF Food Safety Leadership Award for Education;
- Rasheed Ahmed, M.Ed., CPHI(C), DAAS, FRSH, Royal Commission Jubail – 2007 NSF Food Safety Leadership Award for System Improvement;
- Nelson Taylor, Sonic Industries, Inc. – 2007 NSF Food Safety Leadership Award for System Improvement; and
- Carol P. Wallace, Cooper-Atkins – 2007 NSF Food Safety Leadership Award for Product Development.

"NSF International is very pleased to once again present the food safety leadership awards. I look forward to congratulating this year's winners for their outstanding achievement and advancement in areas directly impacting food safety," said William Fisher, NSF International chief marketing officer and vice president.

OmniLytics Announces USDA/FSIS Allowance of Bacteriophage Treatment of *Salmonella* on Livestock

The USDA's Food Safety and Inspection Service (FSIS) has issued a no-objection letter for use of *Salmonella*-targeted bacteriophage manufactured by OmniLytics, Inc. applied as a mist, spray or wash on live animals prior to slaughter.

The BacWash™ branded bacteriophage products will be utilized to reduce the level of *Salmonella* contamination on the hides of livestock prior to further processing. Research has demonstrated the need to reduce the presence of *Salmonella* on the hide as it has been shown that during peak season, animal hides harbor more bacteria than feces. It is also envisioned that bacteriophage produced by OmniLytics will be used to treat holding areas, transportation vehicles, containers and living quarters.

"The USDA's allowance of the extended use of our BacWash product to treat *Salmonella* inserts for the first time a truly effective *Salmonella* control that can be applied prior to the organism being introduced into the processing facility," stated Justin Reber, president and CEO of OmniLytics. "We're confident that reducing the level of *Salmonella* going into the plant will reduce the contamination of final product being shipped to the consumer."

Bacteriophage target individual strains and species of bacteria. Unlike indiscriminant broad-spectrum antibiotics, the specificity of bacteriophage allows targeting of harmful bacteria without compromising the viability of other beneficial microflora or fauna. Identified in 1917, bacteriophage or "bacteria eaters" are bacterial viruses that are environmentally friendly, biodegradable, and one of many families of viruses that have no effect on non-target organisms, plants, animals or humans. Bacteriophage are ubiquitous and exist in numbers rivaling even the most prevalent organisms on earth.

OmniLytics has been working with US regulatory agencies since 1994 and in addition to this most

recent allowance by the USDA, OmniLytics received the first US registration for a bacteriophage product with its AgriPhage™ product line in December of 2005 and allowance from the USDA/FSIS for bacteriophage treatment of *E. coli* O157:H7 on livestock hides in December of 2006.

"*Salmonella* has followed the same path as other bacteria which have been treated for long periods of time with traditional antibiotics and chemicals, and now several Multidrug-Resistant (MDR) 'super bug' serotypes of *Salmonella* have been identified. We believe BacWash can succeed as a long-term solution for controlling MDR *Salmonella* where these old methods have failed," added Mr. Reber. "Another benefit of bacteriophage specificity is the opportunity to treat many types of contaminant-susceptible foods, on a continuous basis as a preventive measure, since there are no side effects."

The USDA allowance and immediate availability of these products means that livestock processors may now begin to treat both *Salmonella* and *E. coli* O157:H7 using the OmniLytics products.

State Government Backs NSW Oyster Industry NSW Food Authority (Australia)

The State Government has reaffirmed its long-standing commitment to the NSW oyster industry with funding of $685,000 for the NSW Shellfish Program this year, Primary Industries Minister Ian Macdonald recently said. The Minister said a state government review of the NSW Shellfish Program recommended funding be increased from $400,000 in 2005–06 to $685,000 in 2006–07. "This funding is in addition to the $2.7 million the state government had already spent on classifying shellfish harvest areas," he said.

"The Iemma Government has put its money where its mouth is and showed it's committed to the long-term viability of our oyster industry. For example, the NSW Shellfish Program checks water quality in oyster-growing areas to protect food safety and ensure our oyster industry remains competitive and NSW consumers are protected. Since 2000, the Shellfish Program has conducted 45,000 water quality tests across NSW. The Program ensures our oysters are as safe as they can be, and also helps open the industry up to invaluable export opportunities."

Minister Macdonald said the funding boost was the latest in a raft of Iemma Government initiatives to support the oyster industry.

"The state government to date has also spent $2.4 million fighting QX disease in estuaries across NSW," Minister Macdonald said.

"It's no secret many farmers have had a tough time with QX and the Iemma Government will continue to do everything possible to eradicate this threat from our waterways. All this is good news for our local oyster industry, and good news for consumers who can continue to enjoy our excellent NSW oysters."

Secretary Kawamura Commends the Launch of the New Center for Produce Safety at WIFSS–UC Davis

Secretary A. G. Kawamura joined representatives from the country's leading produce trade associations to announce the creation of the new Center for Produce Safety at the University of California, Davis. The new Center will be housed at the Western Institute for Food Safety and Security (WIFSS). WIFSS was founded as a partnership between private industry, government, and academia to provide comprehensive solutions to the various threats to food safety and security.

Secretary Kawamura lauded the vision and commitment by the Produce Marketing Association (PMA) to contribute $2 million to establish the Center for Produce Safety and the individual commitment of $2 million cash by Taylor Farms of Salinas, California. Taylor Farms also has pledged to contribute $1 million in research already planned by the company. These donations will be augmented by $200,000 in in-kind and cash contributions from the Western Growers Association, $500,000 from the California Department of Food and Agriculture and $150,000 from the Division of Agriculture and Natural Resources, the outreach arm of the University of California.

"I commend PMA, Taylor Farms, Western Growers and other leaders in the produce sector for partnering with WIFSS to launch the new Center for Produce Safety at UC Davis," said Secretary Kawamura. The Center for Produce Safety will lose no time putting together an aggressive research, training and outreach agenda into how and when foodborne illnesses arise in produce, and actions that can be taken to reduce these risks. The industry's actions will help restore consumer confidence and demonstrate that the health and safety of consumers is their ultimate priority.

"We hope that this lead funding from the Produce Marketing Association encourages other government and industry partners to support the full build-out of this comprehen-

sive program," said Bennie Osburn, dean of the UC Davis School of Veterinary Medicine. "It is critical that the solutions to food-safety issues include all the players."

For more information, please visit the following Web sites: www.cdfa.ca.gov, and www.pma.com.

Enhanced Food Safety Practices

In collaboration with government and university specialists, organizations representing fresh-produce farmers and handlers have written enhanced food safety practices for the growing of leafy greens. Organizations cooperating in the project include California Farm Bureau Federation, Western Growers, Grower-Shipper Vegetable Association of Central California, Produce Marketing Association and United Fresh Produce Association.

The practices affect production of iceberg lettuce, romaine lettuce, green leaf lettuce, red leaf lettuce, butter lettuce, baby leaf lettuce (i.e., immature lettuce or leafy greens), escarole, endive, spring mix, spinach, cabbage, kale, arugula and chard. The practices have been accepted by the Leafy Greens Handler Marketing Agreement Advisory Board. The board will oversee inspections conducted by the California Department of Food and Agriculture, that verify compliance with the food safety practices.

Best Ways to Clean Kitchen Sponges

Every kitchen has at some time or another been home to a sponge, that oh-so-versatile cleaning tool. It wipes up messes on countertops and absorbs liquid droplets quickly. Best of all, it's reusable.

However, that handy kitchen sponge can harbor more than moisture – things like foodborne pathogens, yeasts and molds. So Agricultural Research Service (ARS) scientists in Beltsville, MD, have tested several methods for reducing risks from harmful microbes hiding in reused sponges.

At the ARS Food Technology and Safety Laboratory in Beltsville, microbiologists Manan Sharma and Cheryl Mudd and two student interns did the testing. First, they soaked sponges at room temperature for 48 hours in a solution made from ground beef and lab growth medium to attain a high level of microbes (20 million per sponge) to simulate a very dirty sponge.

Then, they treated each sponge in one of five ways: soaked for three minutes in a 10-percent chlorine bleach solution, soaked in lemon juice or deionized water for one minute, heated in a microwave for one minute, placed in a dishwasher operating with a drying cycle–or left untreated.

The scientists chose these methods because they're commonly used in most household kitchens. They found that between 37 and 87 percent of bacteria were killed on sponges soaked in the 10-percent bleach solution, lemon juice or deionized water–and those left untreated. That still left enough bacteria to potentially cause disease.

Microwaving sponges killed 99.99999 percent of bacteria present on them, while dishwashing killed 99.9998 percent of bacteria.

As for yeasts and molds, the sponges treated in the microwave oven or dishwasher were found to harbor less than 1 percent (0.00001 percent). Between 6.7 and 63 percent of yeasts and molds survived on sponges soaked in bleach, lemon juice, deionized water or left untreated.

Thus microwave heating and dishwashing with a drying cycle proved to be the most effective methods for inactivating bacteria, yeasts and molds on sponges. These simple and convenient treatments can help ensure that contaminated sponges don't spread foodborne pathogens around household kitchens of today's busy families.

Federal Oversight of Food Safety: High-risk Designation Can Bring Attention to Limitations in the Government's Food Recall Programs

Each year, about 76 million people contract a foodborne illness in the United States; about 325,000 require hospitalization; and about 5,000 die. The outbreaks of *E. coli* in spinach and *Salmonella* in peanut butter, along with contamination in pet food, have highlighted the risks posed by accidental food contamination. The attacks of September 11, 2001, heightened awareness that the food supply could also be vulnerable to deliberate contamination. This testimony focuses on the (1) role that GAO's high-risk series can play in raising the priority and visibility of the need to transform federal oversight of food safety, (2) fragmented nature of federal oversight of food safety, and (3) limitations in federal food recall programs.

While many of GAO's recommendations to promote the safety of the nation's food supply have been acted upon, others have not yet been addressed. For example, GAO recommended that the executive branch reconvene the President's Council on Food Safety to facilitate interagency coordination. GAO also proposed that Congress enact comprehensive, uniform, and risk-based food safety legislation; analyze alternative organizational food safety structures; and consider legislation giving agencies authority to order food recalls.

GAO's High-Risk Series is intended to raise the priority and visibility of government programs that are in need of broad-based transformation to achieve greater economy, efficiency, effectiveness, accountability, and sustainability. These reports also help Congress and the executive branch carry out their responsibilities while improving the government's performance and enhancing its accountability for the benefit of the American people. In January 2007, as part of our regular update of this series for each new Congress, GAO designated the federal oversight of food safety as a high-risk area for the first time.

EFSA Survey Supports UK *Salmonella* Control Measures

The European Food Safety Authority has published the results of its EU wide survey into levels of *Salmonella* detected in chicken reared for meat (broilers).

In the UK, the survey found no *Salmonella* Enteritidis and 0.1% *Salmonella* Typhimurium. These types are the ones most often responsible for cases of *Salmonella* food poisoning in people.

Dr. Judith Hilton, head of Microbiological Safety at the FSA, said: "These findings are very encouraging and show how effective control measures taken by industry in the UK have been. However, *Salmonella* has not been entirely eliminated from broiler flocks and we need to continue to work hard to minimize *Salmonella* and *Campylobacter* levels in UK poultry. It remains very important that people continue to follow good hygiene practices – and take care to handle raw poultry meat carefully and cook it properly. Cooking poultry properly kills any *Salmonella* and *Camplyobacter* organisms in the meat."

"The UK supports European Commission efforts in setting EU-wide reduction targets for *Salmonella* in broiler flocks, as well as encouraging action at national level, to ensure that Member States reduce contamination levels down to the very low levels found in the UK," Dr. Hilton said.

Food Incidents Guidance Published

The Food Standard Agency (UK) has published guidance to help businesses and enforcement authorities prevent and respond better to food incidents. An incident is an event where there are concerns about actual or suspected threats to the safety of quality of food that could require intervention to protect consumers' interests.

The guidance has been developed by the Food Incidents Task Force, set up by the Agency in the wake of the 2005 Sudan I industrial dye incident, to help strengthen controls in the food chain and prevent major food incidents.

The task force brought together experts from the food industry, consumer groups and enforcement authorities to identify good practice from previous food incidents and develop guidance for other organizations.

"The food chain is complex and food incidents are difficult to eliminate altogether but we hope that providing clear, easy-to-follow information will help food businesses to reduce the likelihood of them happening."

The guidance gives step-by-step advice about preventing food incidents, including how to identify potential hazards. It also gives practical advice about effective incident response from notification through to post-incident actions.

It's designed to help anyone who is responsible for handling incidents in the food industry as well as those in local authorities. A summary version has been developed particularly for small businesses.

Nick Tomlinson, head of the FSA's Chemical Safety Division, said, "The Incidents Task Force provided a unique opportunity for a range of experts to come together and share their expertise about preventing and handling food incidents. The food chain is complex and food incidents are difficult to eliminate altogether but we hope that providing clear, easy-to-follow information will help food businesses to reduce the likelihood of them happening. The guidance also aims to improve the handling of incidents by providing easy-to-follow advice on the steps to follow if an incident does occur."

FDA Re-emphasizes Warnings to Consumers on Risks of Pet Turtles

The Food and Drug Administration (FDA) is urgently reminding the public that contact with baby turtles can pose a serious health risk to infants, small children, and adults with impaired immune systems as they can be natural hosts to *Salmonella*, a group of bacteria that can cause severe illness and death. Recently, a four-week old infant in Florida died of infection traced to *Salmonella pomona*, a bacteria that was also found in a pet turtle in the home.

Salmonella is the genus name of a number of bacteria commonly associated with food poisoning from contaminated or undercooked foods, and salmonellosis is the disease the bacteria can cause. *Salmonella* can be found on the outer skin and shell surfaces of the turtles causing salmonellosis for those handling turtles without properly washing their hands after handling the animals.

FDA is reminding parents and others who care for children of the following:

The sale of turtles with a shell less than four inches long is illegal. Exceptions to FDA's regulation include sales of these turtles intended for export only or for bona fide scientific, educational, or exhibitional purpose; *Salmonella* infection can be caused by contact with turtles in petting zoos, parks, child daycare facilities and other locations; and it is important to wash hands thoroughly with soap and water after handling or touching turtles and their housing.

In the early 1970s, it was determined that pet turtles, particularly red-eared sliders, were responsible for an estimated 280,000 cases of salmonellosis each year in the United States. In 1975, FDA banned the sale of turtles with a shell less than four inches long as a necessary public health measure. FDA has repeatedly emphasized the risks of turtle-associated salmonellosis because of a resurgence in the sales of such turtles in the last four years. The public health impact of turtle-associated salmonellosis in humans is an estimated 74,000 cases in the United States per year.

Salmonella infection can be transmitted either directly from contact with the turtle or its feces, or indirectly through the animal's water. Turtles with *Salmonella* usually do not appear to be sick. Their feces do not always contain the bacteria, therefore a single negative test does not prove they are *Salmonella*-free.

Although anyone can acquire a salmonellosis infection, the risk is highest in infants, young children, the elderly, and others with lowered natural resistance to disease. Pregnancy, cancer, chemotherapy, organ transplant, diabetes, and liver problems pose particular risks. Gastrointestinal symptoms following *Salmonella* exposure begin in 6 to 72 hours (usually 12 to 36 hours) and generally last for two to seven days.

For more information on FDA's regulation of turtles, please see the following: http://www.fda.gov/cvm/turtleregs.htm.

INDUSTRY PRODUCTS

Bettcher Industries, Inc.

AirShirz® Air-powered Scissors Improve Speed and Efficiency of Poultry Paw Upgrading from Bettcher Industries, Inc.

Lightweight yet powerful AirShirz® pneumatic scissors from Bettcher Industries increase worker productivity while reducing muscle fatigue in poultry paw upgrade operations – an increasingly popular application due to growing export market demand. With its air-powered operation and fixed bottom blade design, AirShirz® scissors provide clean, accurate cutting without the stress on hands caused by using manual scissors.

Fully controllable blades allow operators to use AirShirz® units in the paw upgrade application just as they would manual scissors. AirShirz® requires approximately 90% less muscle activity to operate, and achieves up to 127% greater worker productivity over conventional scissors.

AirShirz® scissors are now available in two grip designs: a two-finger grip for smaller hands, and a larger finger-loop style that works well for all other operators. All models feature an automatic spring-return action, so no effort is required to open the blades.

Moreover, the scissors' pneumatic design gives users complete control over the cutting action, thereby guarding against accidents or an inadvertent cut. A safety latch secures blades in a locked position to enhance safety and prevent damage when not in use. All units use standard 80 to 120 psi plant air.

AirShirz® scissors deliver major benefits in reducing muscle fatigue and exposure to a variety of risk factors associated with musculoskeletal disorders. There are clear benefits for poultry processing managers who seek improved employee welfare and lower turnover – along with increased productivity.

AirShirz® pneumatic scissors utilize stainless steel blades. Blades can be removed in seconds and sharpened using conventional sharpening equipment. Based on 80 hours of use weekly, blade life extends to six months with daily buffing and weekly blade sharpening.

Paw upgrading is just one of many productivity-enhancing operations that can be performed using AirShirz® air-powered scissors. Among other popular poultry processing applications are breast tenders, wing-trim for buffalo wings, gizzard harvesting, as well as turkey neck breaking and tail trimming.

Bettcher Industries, Inc.
440.965.4422
Birmingham, OH
www.bettcher.com

Nilfisk–Advance America Announces the Availability of Its New GWD 255 Drum Vacuum

When plant managers and operators asked Nilfisk–Advance for a cost efficient, easy-to-use drum vacuum, engineers immediately went to work. The end result is the Nilfisk GWD 255 Drum Vac, showcased at the 2007 Food Safety and Security Summit in Washington, D.C.

Designed to meet the general plant cleaning and maintenance needs of food manufacturers, the GWD 255 is powered by 2 independent bypass motors and can fit both 30 and 55 gallon drums, allowing users to recycle drums that are abundant in nearly every production plant. An optional float chamber and washable cartridge filter allows the GWD 255 to pick up both wet and dry materials, and the machine can also be fitted with an upstream HEPA filter for pick-up of hazardous materials, ensuring 99.97% of particles are retained, down to and including 0.3 microns in size.

"Finally, Nilfisk–Advance is able to offer our customers a drum top vacuum," said Corry Luckenbach, product manager. "Though this product is not new to the industry, the GWD 255 Drum Vac is a powerful offering because it combines versatility, ease-of-use and good performance in a cost effective package."

Additional features of the GWD 255 Drum Vac include a fifty-foot yellow cord for assured safety and washable main filter sack. The unit can also be combined with Nilfisk's comprehensive line of accessories, including those for

overhead cleaning, in order to create the ultimate cleaning solution for the food industry.

Nilfisk-Advance America, Inc.
Malvern, PA
610.232.5469
www.pa.nilfisk-advance.com

bioMérieux Expands Food Safety Testing Capabilities with the Addition of Food Allergen Detection Kits

bioMérieux, Inc., announces an exclusive distribution agreement with Elisa Systems Pty Ltd. bioMérieux will market a full line of tests for the detection of allergenic protein residues to customers in the United States and Canada. Food allergen tests will help food companies evaluate products for allergens to ensure consumer safety from allergic reactions, which can be life-threatening.

"This partnership provides an opportunity for bioMérieux to enter the food allergen market and we are very pleased to work with Elisa Systems, the leader in development of new allergen tests," said Herb Steward, executive vice president and general manager, bioMérieux, North America. "With the addition of food allergen test kits, bioMérieux can now offer our customers a more comprehensive line of food safety solutions."

An effective screening program for the presence of food allergens will help food manufacturers and suppliers prevent costly product recalls, often due to the presence of undeclared food allergens. The food allergen screening kits are ideal for testing raw materials, material-in-production, finished product and environmental surfaces. Each kit is simple to use and will provide an efficient and cost-effective method of screening for the presence of food allergens and residues.

"We are extremely excited about the opportunities created as a result of the signing of this agreement with bioMérieux, Inc.," said Michael Ryan, managing director of Elisa Systems Pty Ltd. "Elisa Systems has developed the broadest range of food allergen test kits currently available based on immunoassay technology. Partnering with bioMérieux represents a significant step in developing new market channels and offering the highest level of service and support to customers in the United States and Canada. Customers will have resource to one of the world's leading food safety companies."

The food allergen residue kits provide both qualitative and quantitative detection of almond, buckwheat, crustacean, egg, hazelnut, milk (casein), milk (beta lacto globulin), peanut, sesame and soy. These kits utilize an enzyme-linked immunosorbant assay (ELISA) platform that provides the flexibility to be easily interpreted either visually or with an automated microplate/strip reader.

The incidence of food allergens in the United States and Canada continues to grow. Food allergies account for an estimated 30,000 emergency room visits and 150 deaths per year. Consumers must rely on avoidance to prevent reactions. Therefore, it is critical that foods be tested for the presence of allergens and labeled accordingly. In January 2006 the Food Allergen Labeling and Consumer Protection Act of 2004 took effect to mandate that all food product labels declare in plain English the presence of any of the "big eight" (milk, eggs, fish, crustacean, tree nuts, peanuts, wheat and soybeans) specific foods/food groups or protein derived from one of these foods or food groups.

bioMérieux, Inc.
800.638.4835
Hazelwood, MO
www.biomerieux-usa.com

DuPont Qualicon Releases New BAX® System Assay for Detecting *Staphylococcus aureus*

DuPont Qualicon has released a new test for detecting *Staphylococcus aureus* in powdered infant formula and ground beef. This real-time PCR assay, developed in alliance with Applied Biosystems, is the latest addition to the award-winning BAX® system line of genetic-based diagnostic solutions for the food industry.

Staphylococcus aureus (*S. aureus*) are common bacteria often found on human skin, in nasal passages and in the environment. Some strains of *S. aureus* produce toxins that can cause illness when ingested through contaminated food, such as cream-filled bakery products, sandwich fillings and meat and dairy products. Traditional testing methods for *S. aureus* in food require 3–5 days or more for cultural growth and manual enumeration. The BAX® system provides accurate and reliable automated detection with next-day results.

"With this new assay, food companies get the information they need

in just 24 hours," said Kevin Huttman, president of DuPont Qualicon. "When you're looking at shelf life, time is money and the BAX® system helps the food industry save on both."

DuPont Qualicon provides innovative, science-based diagnostic products. The BAX® system offers advanced DNA-based detection of microbes in food, from raw ingredients to finished products. Proprietary enrichment media are available in bulk powder or as unit-sized DuPont™ StatMedia™ soluble packets. DuPont Qualicon also markets the patented RiboPrinter® System, the world's only automated DNA fingerprinting instrument that rapidly pinpoints sources of bacteria in food and pharmaceuticals.

DuPont Qualicon
302.695.5300
Wilmington, DE
www.qualicon.com

NEW "DynaVac®" System Combines Liquid Removal with UVC Surface Decontamination

A new "DynaVac®" system from REYCO Systems® provides dual functions of liquid removal and surface decontamination using high output ultraviolet-C (UVC) energy. The DynaVac system may be used to remove water, syrups and other liquids while simultaneously decontaminating food product and conveyor surfaces of mold, bacterial and viral contaminants using "UVC Emitters®" from Steril-Aire, Inc. The unit is designed primarily for use with fresh-cut foods and may also be used to dewater and decontaminate

REYCO Systems Inc.

processed foods such as diced potatoes immediately prior to freezing or cooling.

Dual-suction plenums below a precision-driven stainless steel belt are used to remove fluids. In addition, two decontamination hoods equipped with UVC lights effectively kill or inactivate viruses, bacteria, mold and yeast. The DynaVac unit also incorporates a product turnover section between the two decontamination hoods: Agitation shafts gently distribute and turn the products across the belt, allowing optimal liquid removal and maximum surface exposure to the UVC germicidal energy.

The UVC Emitters are housed in watertight hubs and sheathed with a proprietary material to provide a food-grade, shatter-resistant design. The decontamination hoods are hinged for easy cleaning with high-pressure water or chemical foam. Each hood is provided with its own safety switch to shut down the UVC lights when lifted. Units may be customized with different hood and turnover configurations depending on the application.

Steril-Aire's multi-patented UVC technology destroys coliform, *Salmonella*, *E. coli*, *Staphylococcus*, *Listeria*, and other bacteria through disruption of the DNA or RNA structure at the cellular level. UVC treatment is approved by the USDA and FDA for surface decontamination, does not require irradiation-labeling, and will not alter the look or taste of most food products. The Steril-Aire lights produce no ozone and generate very little heat, utilizing minimal energy and maintaining effective output at temperatures near freezing.

In addition to the DynaVac system, REYCO offers a range of other equipment utilizing Steril-Aire UVC Emitter® technology for various applications in food plants. Offerings include patented UVC tumbling drums and standard and custom-designed UVC conveyor hoods.

REYCO Systems Inc.
208.888.2449
Meridian, ID
www.reycosys.com

Kimberly–Clark Professional Introduces New Line of Protective Eyewear under Its Well-known KleenGuard* Brand

Kimberly–Clark Professional has announced a major extension of its well-known KleenGuard* brand with the launch of a new line of protective eyewear. The introduction includes 20 new KleenGuard* Brand eye protection products, further expanding the brand's broad selection of head-to-toe, comfortable, high-quality protective gear.

The new KleenGuard* protective eyewear offerings are impact-resistant, ANSI Z87.1+ compliant, provide 99.9 percent protection from harmful UVA and UVB rays, and are both comfortable and stylish.

"Research has shown that comfort and style both drive compliance with PPE-wearing protocols," said Randy Kates, general manager of the Kimberly-Clark Professional Safety Business. "Safety glasses won't protect workers if they don't wear them. That's why our protective eyewear product line includes such advanced comfort features as cushioned brows, comfortable gel nose pieces, flexible temples, dual wraparound designs, and even mirrored lenses – all designed to make the eyewear more comfortable, more attractive, and more likely to be worn."

The new products range from standard visitors' glasses to stylish frames with enhanced comfort and design features. Uses include: general maintenance, manufacturing, warehousing, construction, materials handling, masonry, clean manufacturing industries and food processing. Like other KleenGuard* Brand products, the eye protection offerings feature a simple "Alpha Numeric" product selection formula, with the alphabet letter identifying the type of product and the number indicating the type and level of features.

This launch of 20 new eyewear products is the first such offering of an eye protection line under the KleenGuard* Brand. This introduction is one of several new KleenGuard* Brand products launched in the past year. These include KleenGuard* G40 Latex Coated Gloves and KleenGuard* G60 PURPLE NITRILE* Cut Resistant Gloves. In October 2006, Kimberly-Clark Professional launched the Chemical Resistance Bundle, which includes KleenGuard* A70 Chemical Spray Protection Apparel, KleenGuard* G80 PURPLE NITRILE* Chemical Resistant Gloves and KleenGuard* G80 Neoprene/Latex Chemical Resistant Gloves.

As part of the KleenGuard* Brand eye protection introduction, Kimberly-Clark Professional is offering end users tools and information including user guides and articles. To download these materials, visit www.kc-safety.com/kn.

Kimberly-Clark Professional
800.255.6401
Roswell, GA
www.kc-safety.com/kn

IAFP 2007 Exhibitor

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None presented this year

AFFILIATE AWARDS:

C.B. SHOGREN MEMORIAL

Brazil Association for Food Protection

BEST AFFILIATE OVERALL MEETING

Washington Association for Food Protection

BEST AFFILIATE EDUCATIONAL

New York State Association for Food Protection

BEST AFFILIATE COMMUNICATION MATERIALS

British Columbia Food Protection Association

AFFILIATE MEMBERSHIP ACHIEVEMENT

Ontario Food Protection Association

Committee Meetings

TIMES	COMMITTEE MEETING	ROOM
Saturday, July 7		
3:00 p.m. – 4:00 p.m.	Past Presidents'	Boardroom
3:00 p.m. – 4:30 p.m.	Membership	Pastoral 2
Sunday, July 8		
7:00 a.m. – 10:00 a.m.	Affiliate Council	Grand Republic B
8:00 a.m. – 5:00 p.m.	Committee on Control of Foodborne Illness	Pastoral 3
9:00 a.m. – 11:00 a.m.	Applied Laboratory Methods PDG	Nutcracker 2
9:00 a.m. – 11:00 a.m.	Water Safety and Quality PDG	Atlantic A
9:00 a.m. – 11:00 a.m.	Food Safety Education PDG	Boardroom
9:00 a.m. – 11:00 a.m.	Food Chemical Hazards and Food Allergy PDG	Grand Republic D
9:00 a.m. – 11:00 a.m.	Viral and Parasitic Foodborne Disease PDG	Grand Republic C
10:00 a.m. – 12:00 p.m.	3-A Committee on Sanitary Procedures	Pastoral 2
10:00 a.m. – 12:00 p.m.	*JFP* Management	Nutcracker 1
10:00 a.m. – 12:00 p.m.	Microbial Risk Analysis PDG	Grand Republic A
10:00 a.m. – 12:00 p.m.	Retail Food Safety and Quality PDG	Nutcracker 3
11:00 a.m. – 12:00 p.m.	Awards	Grand Republic C
11:00 a.m. – 12:00 p.m.	Constitution and Bylaws	Grand Republic D
12:00 p.m. – 1:30 p.m.	Student PDG	Grand Republic B
1:00 p.m. – 3:00 p.m.	Audiovisual Library	Pastoral 2
1:00 p.m. – 3:00 p.m.	Food Hygiene and Sanitation PDG	Boardroom
1:00 p.m. – 3:00 p.m.	Food Law PDG	Atlantic A
1:00 p.m. – 3:00 p.m.	Fruit and Vegetable Safety and Quality PDG	Nutcracker 2
1:00 p.m. – 3:00 p.m.	Seafood Safety and Quality PDG	Grand Republic C
2:00 p.m. – 4:00 p.m.	Dairy Quality and Safety PDG	Grand Republic A
2:00 p.m. – 4:00 p.m.	*FPT* Management	Nutcracker 1
2:00 p.m. – 4:00 p.m.	Meat and Poultry Safety and Quality PDG	Nutcracker 3
2:00 p.m. – 4:00 p.m.	Beverage PDG	Grand Republic D
3:00 p.m. – 4:30 p.m.	Foundation	Boardroom
3:30 p.m. – 4:30 p.m.	Nominating	Pastoral 2
4:30 p.m. – 5:30 p.m.	Editorial Board Reception	Grand Republic B
Wednesday, July 11		
7:00 a.m. – 8:30 a.m.	Program	Grand Republic C

IAFP Members are welcome to attend Committee Meetings;
Nonmembers are welcome to attend PDG meetings and participate.

Ivan Parkin Lecture

Sunday, July 8

6:00 p.m.

Reflections on 41 Years as a Food Microbiologist

Mr. Carl S. Custer
Food Microbiologist
Bethesda, Maryland

Mr. Carl Custer started his food microbiology career in 1966 as a tech, then as a graduate student for Dr. Carl Vanderzant at Texas A&M. In 1972, he joined the APHIS microbiology laboratory in Maryland rising to run the special projects laboratory where his primary projects were on *Clostridium botulinum*.

In 1980, promotion led Mr. Custer to Washington, D.C., working on the microbiological aspects of regulatory development. This exposed him to the interactions of politics and science in food safety regulatory promulgation. His primary contributions, with the aid of ARS, were in policies and standards for stabilization and inactivation.

Inheriting trichina projects exposed Mr. Custer to ninetieth century regulatory policy and hazard analysis. Trichina also opened up the world of uncooked ready-to-eat ethnic and traditional meat products. His primary contributions, with the support of ARS and academics, were in fermented sausages, dry-cured hams, jerky, and basturma.

Mr. Custer's experience with traditional food processes led AFDO in recruiting him to assist in developing their retail processing manual and its subsequent versions. He also helped present the AFDO retail processing workshops. Mr. Custer has also trained FSIS inspectors on sampling listeriae and the FSIS hotline staff on microbiology.

Mr. Custer has served on various IAFP Committees and Professional Development Groups (PDGs) and is a past chair of the Meat and Poultry Safety and Quality PDG. He is currently chair of the Nominating Committee and serves as Affiliate Council Secretary.

After 34 years of federal service, Mr. Custer retired in March 2007. In addition to part-time consulting, he will be pursuing his other interests including motorcycle restoration and touring, gardening, woodworking, cooking, and fine alcoholic beverages.

John H. Silliker Lecture

Wednesday, July 11

4:00 p.m.

Trends in Food Safety Management

Dr. Terry A. Roberts
Food Safety and Hygiene Consultant
Reading, England

A Fellow of the Institute of Food Science and Technology (FIFST), and Officer of the British Empire (OBE), Dr. Terry Roberts earned his B.A. (1957) and Ph.D. (1961) in Pharmacy from the University of London, and later his M.A. (1967) from the University of Cambridge. Retired since 1994, his growing list of contributions to food safety began during his tenure with the Institute of Food Research (IFR) now centralized in Norwich, England. Initially appointed to IFR's former Low Temperature Research Station in Cambridge, Dr. Roberts moved with the station to the Meat Research Institute in Langford (Bristol), where he became head of microbiology and spent the remainder of his IFR career at the Reading Laboratory.

Dr. Roberts was a member of the International Commission on Microbiological Specifications for Foods (ICMSF) for more than two decades, serving as Chairman his last nine years while co-editing five books in the ICMSF series "Microorganisms in Foods." He was a two-term consultant for both the World Health Organization and the International Atomic Energy Agency. In 1995, Dr. Roberts' committee involvement expanded to the UK Advisory Committee on Microbiological Safety of Foods and the EU Scientific Committee for Veterinary Measures Related to Public Health. His work with the European Food Safety Authority Panel on Biological Hazards continues today.

Published research by Dr. Roberts encompasses the topics of food irradiation; slaughterhouse hygiene; death and survival in relation to food safety; food preservation and spoilage; botulism in animals; microbiological safety of foods with emphasis on *C. botulinum*; the role of sodium nitrite in controlling *C. botulinum*; molecular and genetic inter-relationships of the *C. botulinum* group; and developing predictive modeling of microbial pathogens.

IAFP 2007 PRELIMINARY PROGRAM

DSC – Developing Scientist Competitor

SUNDAY, JULY 8

7:00 p.m. – 8:00 p.m.

OPENING SESSION – *Ballroom of the Americas*

Ivan Parkin Lecture – Reflections on 41 Years as a Food Microbiologist

Mr. Carl S. Custer, Food Microbiologist, Bethesda, Maryland

Cheese and Wine Reception will follow in the Exhibit Hall.

MONDAY MORNING JULY 9

SYMPOSIA • 8:30 a.m. – 12:00 p.m.

S1 Foodborne Disease Update

Ballroom of the Americas A

Organizer: Jack Guzewich
Convenors: Jack Guzewich and Jeff Farrar

8:30 National *E. coli* O157:H7 in Spinach Outbreak US 2006 — THAI-AN NGUYEN, CDC, Epidemiology Branch, Div. of Foodborne, Bacterial and Mycotic Diseases, National Center for Zoonotic, Vectorborne, and Enteric Diseases, Atlanta, GA, USA

9:00 Environmental Investigation of the Spinach Outbreak: What Was Learned? — BENSON J. YEE, California Department of Health Services, Emergency Response Unit, Food and Drug Branch, Sacramento, CA, USA

9:30 Botulism Outbreaks Linked to Bottled Carrot Juice — ANANDI SHETH, CDC, Enteric Diseases Epidemiology Branch, Div. of Foodborne, Bacterial and Mycotic Diseases, National Center for Zoonotic, Vectorborne, and Enteric Diseases, Atlanta, GA, USA

10:00 Break

10:30 Environmental Investigation of Carrot Juice Processor and Regulatory Response — DONALD ZINK, FDA-CFSAN, College Park, MD, USA

11:00 Taco Bell and Taco Johns *E. coli* in Lettuce Outbreaks 2006 — MARTHA IWAMOTO, CDC, Outbreak Response and Surveillance Team, Enteric Diseases Epidemiology Branch, Div. of Foodborne, Bacterial and Mycotic Diseases, Atlanta, GA, USA

11:30 Environmental Investigation of Implicated Farms and Lessons Learned — MAHA HAJMEER, California Dept. of Health Services, Emergency Response Unit, Food and Drug Branch, Sacramento, CA, USA

S2 Vaccination Strategies to Control Foodborne Pathogens from Farm-to-Table

Ballroom of the Americas B

Sponsored by ILSI North America Technical Committee on Food Microbiology

Organizers: Marie E. Latulippe and Pauline Rosen
Convenors: Joseph D. Meyer and Martin Wiedmann

8:30 Vaccines against Diarrheal and Foodborne Diseases – An Overview — KAREN L. KOTLOFF, University of Maryland School of Medicine, Center for Vaccine Development, Baltimore, MD, USA

9:00 Efficacy of a Vaccine Product Containing Type III Secreted Proteins for Reduction of *Escherichia coli* O157:H7 in Cattle — RODNEY A. MOXLEY, University of Nebraska-Lincoln, Dept. of Veterinary and Biomedical Sciences, Lincoln, NE, USA

9:30 Controlling *Salmonella* through Vaccination in Chickens — JOHN J. MAURER, University of Georgia, Population Health, Athens, GA, USA

10:00 Break

10:30 Vaccination of Food Service Workers as an Intervention Strategy against Foodborne Diseases: The Hepatitis A Example — RYAN NOVAK, CDC, Division of Viral Hepatitis, Atlanta, GA, USA

11:00 Vaccinating Humans against *Campylobacter* — ANTHONY P. MORAN, National University of Ireland, Galway, Ireland

11:30 Current Status of Norovirus Vaccine Development — ROBERT L. ATMAR, Baylor College of Medicine, Dept. of Molecular Virology and Microbiology, Houston, TX, USA

S3 Food Defense Research and Application

Grand Republic B

Organizer: Lynda Collins Kelley
Convenors: Lynda Collins Kelley and Margaret D. Hardin

8:30 Food Defense Research Activities at FDA-CFSAN — DAVID ACHESON, FDA-CFSAN, Office of Food Safety, Defense, and Outreach, College Park, MD, USA

9:00 An Overview of the National Center for Food Protection and Defense Research Programs — SHAUN KENNEDY, University of Minnesota, National Center for Food Protection and Defense, St. Paul, USA

9:30 Biological Threat Agent Detection in Food Matrices — ROBERT PHILLIPS, USDA-FSIS-OPHS-FERN, Athens, GA, USA

10:00 Break

10:30 Pathogen Risk Modeling for Food Defense — MARK TAMPLIN, University of Tasmania, Australian Food Safety Centre of Excellence, Tasmanian Institute of Agricultural Research, School of Agricultural Science, Hobart, Tasmania, Australia

11:00 Use of Research Findings to Develop Food Defense Initiatives and Update Guidance Documents — ISABEL WALLS, USDA-FSIS, Office of Food Defense and Emergency Response, Washington, D.C., USA

11:30 Countermeasures for Threats to Food Processing Facilities — SKIP SEWARD, American Meat Institute, Washington, D.C., USA

S4 Outreach Programs to Promote Dairy Products and Their Safety around the World

Nutcracker 1

Organizers: Catherine W. Donnelly, Ron Schmidt, John Bruhn, and John Rushing
Convenors: John Bruhn and Ron Schmidt

8:30 Challenges of Dairy Production in Developing Nations: Global Trade and Public Health — To be determined

9:00 Collaborative Pasteurized Milk Ordinance (PMO) Training and Regulatory Programs in Latin America and the Caribbean — GABRIEL E. PASCUAL, Agency for Development of Export Markets, Washington, D.C., USA

9:30 Providing Milk Production and Quality and Safety Assistance in Afghanistan — LOCHRANE GARY, University of Florida Cooperative Extension, Wauchula, FL, USA

10:00 Break

10:30 The iPOW Project: Enhancing Cheese Safety in African Nations through Information Technology — GUISEPPE LICITRA, CORFILAC, Ragusa, Sicily, Italy

11:00 Promoting the Quality and Safety of Traditional Dairy Foods Produced in India — ALOK JHA, Institute of Agricultural Sciences, Barnaras Hindu University, Varanasi, India

11:30 Global Trade and Traditional Foods: Promoting Trade through Enhanced Safety — TIM TAYLOR, University of Florida, Gainesville, FL, USA

ROUNDTABLES • 8:30 a.m. – 12:00 p.m.

RT1 Using HACCP to Innovate New Processes in Retail Food Operations

Nutcracker 3

Organizer: O. Peter Snyder
Convenors: O. Peter Snyder and Vijay Juneja

8:30 Retail Cold Holding: What are the Significant Hazards, the Control Temperatures, and How to Use Temperature Control for Safety Criteria to Innovate New Processes? — DONALD W. SCHAFFNER, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA

8:45 Applying HACCP to Develop a Pasteurization Value Hot Holding Limits for a New Process in Retail — HARSHAVARDAN THIPPAREDDI, University of Nebraska-Lincoln, Lincoln, NE, USA

9:00 HACCP to Develop Safe Food Cooling, the Shelf-life Limits of the Chilled Food for a New Process in a Retail Operation — VIJAY K. JUNEJA, USDA-ARS-NAA-ERRC, Food Safety Intervention and Technology Research Unit, Wyndmoor, PA, USA

9:15 Applying HACCP to Develop and Validate Food Process Controls and Monitoring in Grocery Operations — CRAIG WILSON, Costco Wholesale, Issaquah, WA, USA

9:30 Roundtable Discussion – O. PETER SNYDER, Hospitality Institute of Technology and Management, St. Paul, MN, USA-Moderator

Questioners: DONALD W. SCHAFFNER, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA; HARSHAVARDAN THIPPAREDDI, University of Nebraska-Lincoln, Lincoln, NE, USA; VIJAY K. JUNEJA, USDA-ARS-NAA-ERRC, Food Safety Intervention and Technology Research Unit, Wyndmoor, PA, USA; CRAIG WILSON, Costco Wholesale, Issaquah, WA, USA

10:00 Break

RT2 The Management and Control of Chemical Hazards in Food

Nutcracker 3

Organizers: Tong-Jen Fu, Kathleen A. Lawlor, and Peter Slade
Convenor: Jon DeVries

10:30 Heavy Metals — P. MICHAEL BOLGER, FDA-CFSAN, College Park, MD, USA

10:40 Mycotoxins — DAVID F. KENDRA, USDA-ARS-NCAUR, Peoria, IL, USA

10:50 Pesticide Residues — LARRY KEENER, International Product Safety Consultants, Seattle, WA, USA

11:00 Allergens — MARK MOORMAN, Kellogg Company, Battle Creek, MI, USA

11:10 Packaging Residues — JEFFREY A. KEITHLINE, Keller and Heckamn, LLP, Washington, D.C., USA

11:20 HACCP Controls — PETER J. SLADE, National Center for Food Safety and Technology, Summit-Argo, IL, USA

11:30 Roundtable Discussion – JON DEVRIES – Moderator

Questioners: JON DEVRIES, Medallion Labs/General Mills, Minneapolis, MN, USA; TONG-JEN FU, FDA-National Center for Food Safety and Technology, Summit-Argo, IL, USA; KATHLEEN A. LAWLOR, PepsiCo, R & D, Vallhalla, NY, USA

TECHNICALS • 8:30 a.m. – 12:00 p.m.

T1 Laboratory Methods Technical Session

Nutcracker 2

Convenors: Julie Jean and Leslie Thompson

T1-01 8:30 Ten-minute Assay for Detecting *Escherichia coli* O157:H7 in Ground Beef Samples Using Piezoelectric-excited Millimeter-sized Cantilever Sensors — David Maraldo and RAJ MUTHARASAN, Drexel University, Philadelphia, PA, USA

T1-02 8:45 Rapid Detection of *Listeria monocytogenes* Using Quantum Dots and Nanobeads-based Optical Biosensor — HONG WANG, Y. Li, and M. Slavik, University of Arkansas, Fayetteville, AR, USA

T1-03 9:00 Methods for the Detection of Foodborne Viruses: Approach to Quantification — FABIENNE LOISY-HAMON, Soizick Le Guyader, and Benoit Lebeau, CEERAM SAS, Saint Herblain, France

T1-04 9:15 Development and Application of Real-time NASBA for the Detection of Norovirus in Lettuce Samples — Safaa Lamhoujeb, Solange E. Ngazoa, Ismaïl Fliss, and JULIE JEAN, Universite Laval, Quebec, QC, Canada

T1-05 9:30 Detection of Avian Influenza Virus H5N1 Using an Impedance Biosensor-based on Immuno-Nanobeads and Microfluidic Biochips — YANBIN LI, Ronghui Wang, Billy Hargis, Steve Tung, and Luc Berghman, University of Arkansas, Fayetteville, AR, USA

T1-06 9:45 DSC Enumeration of Viable Cells of *Listeria monocytogenes* in Biofilms by Use of Propidium Monoazide and Real time PCR — YOUWEN PAN and F. Breidt, Jr., USDA-ARS and North Carolina Agricultural Research Service, North Carolina State University, Raleigh, NC, USA

10:00 Break

T1-07 10:30 DSC Evaluation of Loop-mediated Isothermal Amplification to Detect *Vibrio vulnificus* — FEIFEI HAN and Beilei Ge, Louisiana State University, Baton Rouge, LA, USA

T1-08 10:45 Comparison of Methods for Detecting Live, Stressed, and Dead Cells of *Campylobacter jejuni* — CHIN-YI CHEN and Yiping He, USDA-ARS-ERRC, Wyndmoor, PA, USA

T1-09 11:00 Evaluation of the VIDAS® *Listeria* Species Xpress with Ottaviani Agosti Agar Method for the Detection of *Listeria* Species in Poultry, Seafood, and Vegetable Products: AOAC Food Matrix Extension Study — LESLIE K. THOMPSON, Brian Kupski, and Ronald L. Johnson, Silliker Inc., Food Science Center, South Holland, IL, USA

T1-10 11:15 DSC Rapid Enrichment and Detection of *Salmonella* in Composite Raw Beef Samples: A Comparison between Cultural Method, PCR and Lateral Flow Immunoassay — JINGKUN LI and Jim Stave, Strategic Diagnostics, Inc., Newark, DE, USA

T1-11 11:30 Design of a Novel Multiplex Real-time PCR Assay for *Vibrio* Pathogen Detection, Quantification and Speciation — ROBERT S. TEBBS, Somaya L. Bit, Pius M. Brzoska, Manohar R. Furtado, and Olga V. Petrauskene, Applied Biosystems, Foster City, CA USA

T1-12 11:45 Five-hour Real-time PCR-based Method for Rapid and Simultaneous Detection of Five Foodborne Pathogenic Bacteria in Food — JEONGSOON KIM, Kyounghwa Um, Kyoungmo Koo, and Ganggweon Lee, Samsung Everland, Inc., Yongin, Gyeonggi, South Korea

POSTERS • 9:30 a.m. – 1:30 p.m.

P1 Dairy, Seafood, Produce and Education Poster Session

Exhibit Hall
Authors present 10:00 a.m.–12:00 p.m.
Convenors: Melissa Evans

P1-01 Antibacterial Activity of the Lactoperoxidase System against Foodborne Pathogens in Saanen and South African Indigenous Goat Milk — Eyassu Seifu, Ned. F. Donkin, and ELNA M. BUYS, University of Pretoria, Pretoria, Gauteng, South Africa

P1-02 Control of *E. coli* and Spoilage Microorganisms in Soft Cheese Production Brines Using a Synergistic Antimicrobial Formula — ROBERT S. KOEFOD and T. A. Freier, Cargill, Inc., Wayzata, MN, USA

P1-03 Microbial Evaluation of Commercial Ricotta Cheeses in the City of Campinas — R. J. G. Turri, SILVANA M. SREBERNICH, M. M. S. R. Soares, C. S. R. Soares, and P. S. Jacob, Nutrition College, Pontificia Univerisdade Católica de Campinas, São Paulo, Brazil

P1-04 *Salmonella* Multidrug-resistance Isolated from Fresh Cheese — ANGÉLICA VILLARRUEL-LÓPEZ, N. Velazquez-Suarez, L. E. Garay-Martínez, M. R. Torres-Vitela, and F. Ascencio, Universadad de Guadalajara, Guadalajara, Jalisco, México

P1-05 Katiki – A Traditional Greek Soft Cheese: Survival of *L. monocytogenes* and Determination of Biodiversity at Different Temperatures Using Microbiological and Molecular Techniques — V. Stergiou, A. Lazaridou, D. M. Kagkli, and GEORGE-JOHN E. NYCHAS, Agricultural University Athens, Athens, Attiki, Greece

P1-06 Incidence of *Listeria monocytogenes* in Milk and Cheese in Macedonia — PAVLE SEKULOVSKI, S. Mrenoski, V. Katic, and O. Buncic, Faculty of Veterinary Medicine, Skopje, Macedonia

P1-07 Microbiological Quality and *Salmonella* and *S. aureus* Frequency in Requesón Expended in Cremerías from Guadalajara City, México — LUZ E. GARAY-MARTÍNEZ, Sergio A. Vázquez, M. Concepción Chávez, Torres V. Ma. R., Villarruel López Angélica, and F. Ascencio, Universidad de Guadalajara, Guadalajara, Jalisco, México

P1-08 Comparison Study between 3M™ Petrifilm™ Rapid Coliform Count Plates Methods and Desoxycholate Agar Methods for Pasteurized and Processed Milk — Takatoshi Moriyam and AKIO KITAHARA, 3M Health Care Limited, Kanagawa, Japan

P1-09 Evaluation of 3M™ Petrifilm™ Plates for the Detection of Coliforms and *E. coli* in Individual Cow Milk Samples — M. M. O. P. Cerqueira, N. E. Martins, J. Pacheco, M. R. Souza, C. F. A. M. Penna, L. M. Fonseca, R. Rodrigues, M. O. Leite, F. F. Caldas, and ADRIANA DOS REIS TASSINARI, 3M do Brasil Ltd., São Paulo, Brazil

P1-10 DSC Diversity of *Listeria monocytogenes* Ribotypes Isolated from Farmstead Cheese Processing Facilities — DENNIS J. D'AMICO and Catherine W. Donnelly, University of Vermont, Burlington, VT, USA

P1-11 Detection of *Listeria monocytogenes* in Unpasteurized Liquid Egg Commercially Broken in Japan — MIHO OHKOCHI, Miyuki Nakazawa, and Nobuhiro Sashihara, Q. P. Corporation, Tokyo, Japan

P1-12 *Enterobacteriaceae* and Related Organisms Recovered from Retail Shell Eggs — MICHAEL T. MUSGROVE and Deana Jones, USDA-ARS, Athens, GA, USA

P1-13 DSC Development of Ozone-based Technology to Eradicate *Salmonella* Enteritidis within Shell Eggs — Luis A. Rodriguez-Romo, MUSTAFA VURMA, and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P1-14 Microbiological Safety of Sandwiches from Hospitals and Residential Care Homes for *Listeria monocytogenes* and Other *Listeria* spp. — CHRISTINE L. LITTLE, Satnam Sagoo, Kathie Grant, and Jim McLauchlin, Health Protection Agency Centre for Infections, London, UK

P1-15 Viability of *Enterobacter sakazakii* in Reconstituted Infant Formula Containing the Lactoperoxidase System — JOSHUA B. GURTLER and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

P1-16 DSC Inactivation of Human Enteric Viruses and Viral Surrogates in Fresh Salsa Using High Hydrostatic Pressure — JENNIFER L. CASCARINO, Dallas G. Hoover, Doris T. Hicks, Lori F. Pivarnik, and Kali E. Kniel, University of Delaware, Newark, DE, USA

P1-17 Comparison and Validation of ISO9000-sequence and Putative Sequence as a Diagnostic Tool to *Mycobacterium avium* subsp. *paratuberculosis* — TESHOME YEHUALAESHET, Marica Montgomery, Mica Vapner, and Tsegaye Habtemariam, Tuskegee University, Tuskegee, AL, USA

P1-18 Comparison of a Multiplex PCR with Convention Method for Monitoring of *Vibrio parahaemolyticus* in Seafoods of South Korea — SEUNG-HWAN KIM, Young-Mi Park, Hyun-Suk Oh, Dal-Hwan Kim, Young-Min Shin, Jong-Mi Lim, Chang-Yong Yoon, In-Sun Joo, and Soon-Han Kim, Daegu Regional KFDA, Daegu, Republic of Korea

P1-19 DSC Detection of *Listeria monocytogenes* in Blue Crab Meat (*Callinectus sapidus*) and Blue Crab Processing Plants Using Automated BAX Polymerase Chain Reaction and Standard Culture Method — SIVARANJANI PAGADALA, Thomas Rippen, Martin Weidmann, Jurgen Schwarz, Jeannie Harter-Dennis, and Salina Parveen, University of Maryland Eastern Shore, Princess Anne, MD, USA

P1-20 DSC Comparison of the Direct Colony Immunoblot to DNA Hybridization for Enumeration of *Vibrio vulnificus* in Oysters — RESHANI N. SENEVIRATHNE, Marlene E. Janes, Janet G. Simonson, Jon Bell, and Amrish Chawla, Louisiana State University, Baton Rouge, LA, USA

P1-21 Validation of Post-harvest Processing Using Ultra-low Freezing of Oysters — Anita C. Wright, Victor Garrido, MELISSA FARRELL-EVANS, Archana A. Mudbidri, Georgia Debuex, and W. Steven Otwell, The University of Florida, Gainesville, FL, USA

P1-22 DSC A Novel Technology for Senegalese Fish Preservation by Combined Treatment with Salt and Fermentation Products of Bacteriocin-producing Lactic Acid Bacteria during Storage at 10°C — MICHEL B. DIOP, Emmanuel Tine, Jacqueline Detain, El H. A. Ngom, and Philippe Thonart, Faculte Universitaire Sciences Agronomiques Gembloux (Belgium) and University C. A. DIOP (Senegal), Gembloux, Belgium

P1-23 Genetic Diversity of *Salmonella* Enterica Serovar Weltevreden Isolates from Imported Seafood — Elizabeth Ponce, ASHAF KHAN, Chorng-Ming Cheng, Christine Summage, and Carl E. Cerniglia, FDA, Jefferson, AR, USA

P1-24 Eat Puffer and You Will Suffer — GEORGE R. JACKOW, SR., Dean Bodager, and Joy Hill, Brevard County Health Dept., Merritt Island, FL, USA

P1-25 Bacteriological Quality of Shellfishes Culture Waters Located at the South Bay in Santa Catarina's Island, Brazil — Roberta Juliano Ramos, Renata D'Aquino Faria, Murilo Anderson Pereira, Nelson Silveira Junior, Gisele Volpato de Souza, Mirelle Micheletto Carradore, and CLEIDE ROSANA V. BATISTA, Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina, Brazil

P1-26 Depuration in Cold and Ambient Water Changes the Microbiological Profile of Gulf Coast Oysters — OLEKSANDR TOKARSKYY, L.S. Andrews, and D. L. Marshall, Mississippi State University, Starkville, MS, USA

P1-27 Monitoring of *Vibrio parahaemolyticus* Contaminated Level in Seafood, the Southern Area of South Korea, 2006 — Y.M. Sin, JONG-MI LIM, H.S. Lee, H.J. You, K.H. Kim, S.M. Kim, H.K. Oh, I.S. Joo, O.S. Huh, S.H. Kim. S.H. Kim, C.Y. Yoon, K.J. Kang, K.S. Park, D.B. Kim, and O.H. Kim, Busan Regional Korea Food & Drug Administration, Busan, Korea

P1-28 Incidence and Enterotoxiginicity of *Clostridium perfringens* and *Bacillus cereus* from Retail Seafood — Talat Rahmati and RONALD LABBE, University of Massachusetts, Amherst, MA, USA

P1-29 Rapid Protocol for the Detection of *Salmonella* and *E. coli* O157:H7 in Salad Greens from a Single Eight-hour Enrichment — ANDREW D. FARNUM, Morgan Wallace, Angeline Stoltzfus, and Jack Janes, DuPont Qualicon, Wilmington, DE, USA

P1-30 A Microbiological Survey of Fresh Leafy Greens — MARISSA LOPES, Jarret Stopforth, Bala Kottapalli, and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P1-31 Effect of Irrigation Water on the Bacteriological Quality of Lettuce during the Growth Period and at Harvest in Norway — GRO S. JOHANNESSEN, Elin Reitehaug, Indira Secic, Marianne Økland, Helga R. Høgasen, Ingvild Portaas, Liv Marit Rørvik, and Kofitsyo S. Cudjoe, National Veterinary Institute, Oslo, Norway

P1-32 The Proliferation of *Escherichia coli* O157 on Washed and Unwashed Spinach Leaves — DANIEL ARUSCAVAGE, Ken Lee, and Jeffrey LeJeune, The Ohio State University, FAHP, Wooster, PA, USA

P1-33 Efficacy of Aerosolized Peroxyacetic Acid as a Sanitizer for Raw Spinach — PEI-CHUN CHEN, Se-Wook Oh, and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

P1-34 Inactivation Kinetics of Inoculated *E. coli* O157:H7 and *Salmonella* Species on Iceberg Lettuce by Chlorine Dioxide Gas (ClO_2) — S. M. MAHMOUD BARAKAT, and Richard Linton, Purdue University, West Lafayette, IN, USA

P1-35 DSC Non-thermal Pasteurization of Spinach Leaves Using Dense Phase Carbon Dioxide — DARRYL G. BLACK, T. Matthew Taylor, David A. Golden, P. Michael Davidson, and Qixin Zhong, University of Tennessee-Knoxville, Knoxville, TN, USA

P1-36 Effect of Antimicrobial Interventions on *Escherichia coli* O157:H7, *Salmonella*, and *Listeria monocytogenes* on Leafy Greens — JARRET STOPFORTH, Tam Mai, Marissa Lopes, Bala Kottapalli, and Mansour Samadpour, IEH Laboratories & Consulting G, Lake Forest Park, WA, USA

P1-37 Effects of the Competing Microflora of Fresh-cut Lettuce on Survival and Growth of *Listeria* — GILLIAN A. FRANCIS and David O'Beirne, Univeristy of Limerick, Food Science Research Centre, Dept. of Life Sciences, Limerick, Ireland

P1-38 Effect of Modified Atmosphere Packaging following Treatment of Chemical Sanitizer for Inactivating *Escherichia coli* O157:H7 in Spinach — Hyun-Ho Jin and SUN-YOUNG LEE, Chung-Ang University, Dept. of Food and Nutrition, Anseong-si, Gyeonggi-do, Korea

P1-39 Recovery of *E. coli* from Lettuce One Week after Irrigation with Different Types of Water — MARIANNE ØKLAND, E. Reitehaug, I. Secic, G. S. Johannessen, Ø. Østensvik, A-M. Bomo, and C. Vogelsang, National Veterinary Institute, Oslo, Norway

P1-40 DSC Observing *Salmonella* Internalization from Contaminated Seeds and Irrigation Water in Greenhouse Tomatoes — JACQUELYN M. MILES, S. S. Sumner, R. C. Williams, J. G. Latimer, and R. R. Boyer, Virginia Tech, Gibsonia, PA, USA

P1-41 DSC Effect of Electron Beam Irradiation on Acid-resistant *Salmonella* Enterica subsp. Enterica Serotype Montevideo in Tomato — DEBORAH L. JAMES, J. Jaczynski, and K. E. Matak, West Virginia University, Morgantown, WV, USA

P1-42 Differences in Physical Characteristics and Survival of *Salmonella* between Round and Roma Tomato Varieties — HYUN-GYUN YUK, Benjamin R. Warren, Rebecca A. Burnworth, and Keith R. Schneider, University of Florida, Gainesville, FL, USA

P1-43 Effects of Heat Treatment on Survival of *Salmonella* spp. and *E. coli* O157:H7 on Alfalfa Seeds — GUOPING FENG, John J. Churey, and Randy W. Worobo, Cornell University, Geneva, NY, USA

P1-44 Comparison of the Efficacy of 1% and 3% Tsunami 100 to 20,000 ppm Calcium Hypochlorite Treatment for Reduction of *Salmonella* on Alfalfa Seed — Annemarie Buchholz and KARL R. MATTHEWS, Rutgers University, The State University of New Jersey, New Brunswick, NJ, USA

P1-45 Evaluation of the Effect of Lactic Acid Bacterial Isolates on the Growth of *Escherichia coli* O157:H7 and *Salmonella* Enterica subsp. Enterica on Alfalfa Sprouts — MARSHA R. WILDERDYKE, D.A. Smith, and M. M. Brashears, University of Nebraska-Lincoln, Gretna, NE, USA

P1-46 DSC Shelf-life Extension of Strawberries by Use of Ozone based Combination Treatments — MUSTAFA VURMA, Luis Rodriguez-Romo, and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P1-47 Effect of Hot Water Dips on Quality of Highbush Blueberries — LIHUA FAN, Charles Forney, Jun Song, Craig Doucette, Michael Jordan, Ken McRae, and Brad Walker, Agriculture and Agri-Food Canada, Atlantic Food and Horticulture Research Centre, Kentville, NS, Canada

P1-48 Interventions for Ensuring Food Safety in Mangoes during Phytosanitary Treatments — GRIHALAKSHMI KAKANI, Nanci Martínez-Gonzáles, Ofelia Rodríguez-García, Cristina Martínez-Cárdenas, and Alejandro Castillo and Hector B. Escalona-Buendía, Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco, Texas A&M University, College Station, TX, USA

P1-49 Survival of *Salmonella* Enteritidis in Black Olive Fermentation — E.Z. Panagou, CHYSOULA C. TASSOU, N.G. Chorianopoulos, and G.J.E. Nychas, National Agricultural Research Foundation, Institute of Technology of Agricultural Products, Athens, Greece

P1-50 Use of Probiotic Starter Culture in Spanish-type Green Olive Fermentation and the Fate of Inoculated *Bacillus cereus* — CHRYSOULA C. TASSOU, E.A. Saravanos, G. Zoumpopoulou, E. Tsakalidou, and E. Z. Panagou, National Agricultural Research Foundation-Institute of Technology of Agricultural Products, Athens, Greece

P1-51 Evaluation of Chemical Disinfection Treatments for Inactivation of *Salmonella* Enterica on Cilantro (*Coriandrum sativum L.*) during Different Storage Conditions — Naaxielii Serna Villagomez, Erika A. Neri Herrera, Leopoldo Orozco R., and MONTSERRAT H. ITURRIAGA, Universidad Autonoma de Queretaro, Queretaro, Mexico

P1-52 Control of *Clostridium botulinum* in Cooked and Packed Rice — Jun Hoshino, YUKIFUMI KONAGAYA, Sachi Shimana, Hiroshi Urakami, Akihiko Sasagawa, Akira Yamazaki, and Nobumasa Tanaka, Niigata University of Pharmacy and Applied Life Sciences (NUPALS), Higashijima, Niigata, Japan

P1-53 DSC Effect of Storage Time and Temperature on the Heat Resistance of *Salmonella* Enteritidis PT 30 on Almonds Exposed to Hot Oil — SHIRIN J. ABD, Wen-Xian Du, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P1-54 Monitoring Microbial Quality of Organic Watercress in the Productive Chain — Cecília Geraldes Martins, Tatiana Pacheco Nunes, Lina Casale Aragon-Alegro, Katia Leani Oliveira de Souza, Christiane Ribeiro, Maria Teresa Destro, Bernadette Dora Gombossy de Melo Franco, and MARIZA LANDGRAF, University of São Paulo, São Paulo, Brazil

P1-55 DSC Implementing a Dynamic Interdisciplinary Food Safety Curriculum Targeted at Middle School Students — JENNIFER K. RICHARDS, Ashley Pedigo, Harry Richards, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P1-56 Food Safety Investigation: Applying Food Safety Practices from Farm to Table —ELIZABETH A. BIHN, Karin A.K. Rosberg, and Robert B. Gravani, Cornell University, Ithaca, NY, USA

P1-57 Consumers' Use and Understanding of Dates on Ready-to-Eat Food Products — S. L. Godwin, SHERYL C. CATES, D. Chambers, E. Chambers IV, C. Thompson, L. Pearson, and K.M. Kosa, RTI International, Research Triangle Park, NC, USA

P1-58 DSC Development and Evaluation of an Educational Bulletin for Consumers Facing Life-threatening Food Allergies — BRADLEY F. OLSON, S. S. Teuber, and Christine M. Bruhn, University of California-Davis, Davis, CA, USA

P1-59 A Nationwide Study of UK Consumer Attitudes towards Food Safety in the Domestic Kitchen — ELIZABETH C. REDMOND, Christopher J. Griffith, Susanna King, and Mark Dyball, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P1-60 Meals-on-Wheels Food Safety Project — JULIE A. ALBRECHT and Carol Larvick, University of Nebraska-Lincoln, Lincoln, NE, USA

P1-61 Improving the Effectiveness of ServSafe® Courses in Spanish — CLAUDIA R. BUZO de DIEZ, Glenyce L. Peterson-Vangsness, William Kass, Joellen M. Feirtag, and Francisco Diez-Gonzalez, University of Minnesota Extension, Shoreview, MN, USA

P1-62 Comparison of Microbiological Quality and Safety of Products Available to Populations of Different Socioeconomic Status — Marlen E. Koro, Shivanthi Anandan, and JENNIFER J. QUINLAN, Drexel University, Philadelphia, PA, USA

P1-63 DSC Attitudes and Educational Needs Regarding New Alternative Technologies — CLAUDIA DELGADO-GUTIERREZ and Christine M. Bruhn, University of California-Davis, Davis, CA, USA

P1-64 What are the Economic Costs of Recordkeeping for Food Processors? — Aylin Sertkaya, AYESHA BERLIND, Christina R. McLaughlin, and Andrew J. Estrin, Eastern Research Group, Inc., Lexington, MA, USA

P1-65 Does Recordkeeping Improve Food Safety? — AYLIN SERTKAYA, Ayesha Berlind, Andrew J. Estrin, and Christina R. McLaughlin, Eastern Research Group, Inc., Lexington, MA, USA

P1-66 Health Code Violations: Is There Consistency in Types of Violations by State/County, a Case Study — MARGARET BINKLEY, Douglas Nelson, Barbara Almanza, and Richard Ghiselli, Texas Tech University, Lubbock, TX, USA

P1-67 A Model for Assessing the Training Needs of Retail Food Safety Inspection Officers — ALAN M. TART, FDA, Atlanta, GA, USA

P1-68 Development of Canadian Standards for Working with Foodborne Viruses: The Microbiological Methods Committee's (MMC) Technical Group on Virology — FRANCO J. PAGOTTO, Kirsten Mattison, Julie Brassard, Alain Houde, Tineke Jones, Carole Simard and Yvon-Louis Trottier, Health Canada, Ottawa, ON, Canada

P1-69 DSC Development of a "Type of Counterfeiters" Hierarchy to Review the Business Case of Anti-counterfeit Food Actions — JOHN SPINK, Anthony Phillips, and Robyn Mace, Michigan State University, Okemos, MI USA

P1-70 Neurotoxic Shellfish Poisoning from Recreationally Harvested Clams in Florida, 2006 — ROBIN TERZAGIAN and Roberta Hammond, Florida Dept. of Health, Ft. Myers, FL, USA

MONDAY AFTERNOON
JULY 9

SYMPOSIA • 1:30 p.m. – 5:00 p.m.

S5 Measuring and Motivating Safe Food-handling Practices at Home, Retail and Food Service

Ballroom of the Americas A

Organizer: Ben Chapman
Convenors: Mickey Parish, Christine Bruhn, and Ewen Todd

1:30 What Surveys Say about Food Handling in the Home and at Retail — SHERYL C. CATES, RTI International, Research Triangle Park, NC, USA

2:00 What Consumers Really Do with Their Food — CHRIS GRIFFITH, University of Wales Institute-Cardiff, Cardiff, Wales, UK

2:30 Development of Risk Communication Messages for Food Handlers — LYDIA MEDEIROS, The Ohio State University, Columbus, OH, USA

3:00 Break

3:30 Tools to Enhance Compliance with Best Food Safety Practices — BEN CHAPMAN, University of Guelph, Dept. of Plant Ag., Food Safety Network, Guelph, ON, Canada

4:00 Effective Programs in the Food Service Setting — FRANK YIANNAS, Walt Disney World, Lake Buena Vista, FL, USA

4:30 Evaluation of Food Safety Risk Communication Efficacy — TOBY A. TEN EYCK, Michigan State University, Dept. of Sociology and National Food Safety and Toxicology Center, East Lansing, MI, USA

S6 Long-term Sequelae of Pathogens Transmitted by Food

Ballroom of the Americas B
Sponsored by ILSI North America Technical Committee on Food Microbiology

Organizers: Marie E. Latulippe and Pauline Rosen
Convenors: Indaue Mello-Hall and Maguerite A. Neill

1:30 The Gift That Keeps on Giving: Postinfectious Sequelae of Foodborne Pathogens — MARGUERITE A. NEILL, Memorial Hospital of Rhode Island, Div. of Infectious Diseases, Pawtucket, RI, USA

1:45 Guillain-Barre Syndrome Associated with *Campylobacter jejuni* Infection— BAN MISHU ALLOS, Vanderbilt School of Medicine, Nashville, TN, USA

2:15 Incidence and Clinical Spectrum of Reactive Arthritis following Foodborne Illness — JOHN M. TOWNES, Oregon Health & Science University, Portland, OR, USA

2:45 Break

3:15 Late Sequelae and Long-term Outcomes in Children with Shigatoxin-associated Hemolytic Syndrome — JOHN R. BRANDT, University of New Mexico, Albuquerque, NM, USA

3:45 The Economic Costs of Long-term Sequelae of Selected Foodborne Pathogens — TANYA ROBERTS, USDA-ERS, Washington, D.C., USA

4:15 Roundtable Discussion

S7 The DaVinci Code of Auditing: Reaching the Holy Grail of One Global Standard

Nutcracker 1
Organizer: Loralyn Ledenbach
Convenors: Loralyn Ledenbach and Mark Carter

1:30 The Differences in Audit Standards: One Auditor's Perspective — DUANE BURAU, Grayslake, IL, USA

2:00 FPA Safe Audits: One Standard? — BRUCE BECKER, Food Products Association, Washington, D.C., USA

2:30 Harmonizing Retail/Foodservice Audits to One Standard — CINDY JIANG, McDonald's Corporation, Oak Brook, IL, USA and JAIME LASTRA, Wal-Mart Stores, Inc., Bentonville, AR, USA

3:00 Break

3:30 Harmonizing GAPs and Audits at the Farm Level: Food Safety Leadership Council — TOM CHESTNUT, NSF, Ann Arbor, MI, USA

4:00 Harmonization/Certification of Audits: The SQF Perspective — PAUL RYAN, FMI, Arlington, VA, USA

4:30 A Global Perspective on Harmonizing Audits: British Retail Consortium — LOUISE FIELDING, University of Wales Institute–Cardiff, Cardiff, Wales, UK

S8 Recent Pivotal Decisions of the National Conference on Interstate Milk Shipments

Grand Republic B
Organizer: Steven Sims
Convenor: Ron Schmidt

1:30 The Safest Milk Supply for All the People — JOHN MILLER, Florida Dept. of Agriculture and Consumer Services, Tallahassee, FL, USA

2:00 International Grade A?... — CLAUDIA COLES, Washington Dept. of Agriculture, Food Safety Program, Olympia, WA, USA and JOHN MILLER, Florida Dept. of Agriculture and Consumer Services, Tallahassee, FL, USA

2:30 Big Changes for Aseptic Grade A Milk — SUSAN ESSER, Michigan Dept. of Agriculture, Lansing, MI, USA

3:00 Break

3:30 Dairy HACCP Innovations (the "Pop Up" Audit Form and a New Hazard Guide) — KATHY GOMBAS, Dean Foods East, Franklin, MA, USA

4:00 Paperless Monitoring, Critical Pasteurization, or Other Critical Processes Public Health Control — CRAIG NELSON, Vigilistics, Inc., Mission Viejo, CA, USA

4:30 Other May 2007 Critical Decisions — STEVEN SIMS, FDA, College Park, MD, USA

ROUNDTABLE • 1:30 p.m. – 3:00 p.m.

RT3 Water Emergencies: Too Much, Too Little, Too Late and What is the Plan?

Grand Republic B
Organizers: Larry Cohen and Susan McKnight
Convenors: Larry Cohen and Susan McKnight

1:30 Impact of Water Shortages on Irrigation Water — CHUCK GERBA, University of Arizona, Tucson, AZ, USA

1:45 Hurricane Katrina: Flooded Water Supplies Impact on Foodservice Operation Recovery — RICHARD GELTING, CDC, National Center for Environmental Health, Atlanta, GA, USA

2:00 Walkerton, Ontario – A Watershed Event — MICHAEL BRODSKY, Brodsky Consultants, Thornhill, ON, Canada

2:15 A Utilities Perspective on the Economic Issues and Recovery Plan following a Boil Water Notice — J. ALAN ROBERSON, American Water Works Association (AWWA), Washington, D.C., USA

2:30 Roundtable Discussion – SUSAN MCKNIGHT, Quality Flow Inc., Northbrook, IL, USA-Moderator

Questioners: PETER KENNEDY, Quality Flow Inc., Northbrook, IL; DEAN DAVIDSON, FDA-CFSAN, College Park, MD, USA

TECHNICALS • 1:30 p.m. – 5:00 p.m.

T2 Produce and Seafood Technical Session

Nutcracker 2
Convenors: Bassam Annous and Rachel McEgan

T2-01 1:30 Survival and Transport of *Escherichia coli* O157:H7 in Agricultural Environments — MICHAEL COOLEY, Diana Chao, and Robert Mandrell, USDA, Albany, CA, USA

T2-02 1:45 Efficacy of Hot Water Surface Pasteurization vs. Chlorine and Experimental Sanitizing Wash Treatments for Reducing Populations of *Salmonella* Poona on Inoculated Whole Cantaloupe Melons —BASSAM A. ANNOUS, USDA-ARS-ERRC, Wyndmoor, PA, USA

T2-03 2:00 Reduction of *Escherichia coli* O157:H7 and *Salmonella* Species on Baby Spinach by Use of Electron Beam Irradiation — JAY NEAL, Joe Maxim, and Alejandro Castillo, Texas A&M, College Station, TX, USA

T2-04 2:15 DSC Decontamination of Fresh Cut Produce by Using a Combination of Ultraviolet Light and Hydrogen Peroxide — CHRISTINA HAJDOCK and Keith Warriner, University of Guelph, Guelph, ON, Canada

T2-05 2:30 Inactivation of *Escherichia coli* O157:H7 Internalized in Leaves of Romaine Lettuce and Baby Spinach: Sodium Hypochlorite Wash vs. Irradiation — BRENDAN A. NIEMIRA, USDA-ARS-ERRC, Wyndmoor, PA, USA

T2-06 2.45 Concentration and Detection of *Salmonella* in Sprouted Seed Spent Irrigation Water Using Microfiltration Coupled with Flow through ELISA — RACHEL MCEGAN and Keith Warriner, University of Guelph, Guelph, ON, Canada

3:00 Break

T2-07 3:30 DSC Use of Multiplexed Real-time PCR for the Detection of Pathogenic *V. parahaemolyticus* in Oyster Homogenate — BROOKE M. WHITNEY, Stephenie Drake, and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

T2-08 3:45 Incidence of *Listeria* spp. and *Listeria monocytogenes* in Blue Crab Meat (*Callinectus sapidus*) and Blue Crab Processing Plants — SIVARANJANI PAGADALA, Thomas Rippen, Martin Wiedmann, Mark L. Tamplin, Michael Jahncke, Matthew Whittiker, and Salina Parveen, University of Maryland Eastern Shore, Princess Anne, MD, USA

T2-09 4:00 DSC Changes in the Levels of *V. parahaemolyticus* and *V. vulnificus* during Commercial Harvesting of Gulf Coast Oysters — STEPHENIE L. DRAKE, B. Whitney, A. Chawla, R. Beverly, M. Janes, J. Bell, J. Supan and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

T2-10 4:15 The Effect of Salt, Smoke Compound and Storage Temperature on the Growth of *Listeria monocytogenes* in Simulated Smoked Salmon — CHENG-AN HWANG, USDA-ARS-ERRC, Wyndmoor, PA, USA

T2-11 4:30 DSC Use of Antimicrobial Packaging Films and Edible Coatings to Control the Growth of *Listeria monocytogenes* on Cold Smoked Salmon — HUDAA NEETOO, Mu Ye, and Haiqiang Chen, University of Delaware, Newark, DE, USA

T2-12 4:45 DSC Spoilage and Shelf Life of Refrigerated Reduced Oxygen Packaged Atlantic Croaker (*Micropogonias undulatus*) — COURTNEY RHEINHART, Joseph Eifert, Michael Jahncke, and Susan Sumner, Virginia Tech, Blacksburg, VA, USA

POSTERS • 2:00 p.m. – 6:00 p.m.

P2 Meat and Poultry Poster Session

Exhibit Hall
Authors present 3:00 p.m.–5:00 p.m.
Convenor: Denise Eblen

P2-01 DSC Changes in Indicator Populations Due to Therapeutic Use of Injectable Antibiotics in Feedlot Cattle — ANGELA M. LAURY, G. H. Loneragan, T. Platt, L.A. Branham, S.E. Ives, M. J. Engler, D. U. Thompson, and M. Brashears, Texas Tech University, Animal and Food Science, Lubbock, TX, USA

P2-02 DSC Pre-harvest Control Factors Affecting Prevalence of Shiga Toxin-producing *Escherichia coli* in Cattle Grazing Irrigated Pastures — LAURIE M. BOLLINGER, Hussein S. Hussein, and Edward R. Atwill, University of Nevada-Reno, Reno, NV, USA

P2-03 *Salmonella* Contamination of Cattle between Feedlot and Abattoir — NARELLE FEGAN, Glen Higgs, and Patricia Desmarchelier, Food Science Australia, Brisbane, Queensland, Australia

P2-04 Survival and Growth of Different Strains of *Escherichia coli* O157:H7 in Cattle Water Troughs — SAJIDA PLAUCHE and Marlene Janes, Louisiana State University, Baton Rouge, LA, USA

P2-05 Feedlot Dust as a Source of Cross Contamination of *E. coli* O157 on Beef Feedlot Cattle Hides Prior to Shipping — MINDY BRASHEARS, Guy Loneragan, and Mark Miller, Texas Tech University, Lubbock, TX, USA

P2-06 Fate of Zoonotic Pathogens in Static Composting Piles of Chicken Litter and Peanut Hulls — MARILYN C. ERICKSON, George E. Boyhan, Chis B. Smith, Jean Liao, Michael P. Doyle, Li Ma, and Xiuping Jiang, University of Georgia, Griffin, GA, USA

P2-07 DSC Inactivation of *Salmonella* and *Listeria* in Dairy Manure-based Compost — MARION W. SHEPHERD, JR., P. Liang, X. Jiang, M.P. Doyle, and M. Erickson, Clemson University, Central, SC, USA

P2-08 Virulence Genes and Enterohemolysin Production by *E. coli* Isolates Derived from Feedlot Beef Cattle, Environment and Carcasses — Ana Eucares von Laer, Kátia L. O. de Souza, Ricardo I. Sakate, Edio Moscardi Júnior, José P. A. N. Pinto, Kinue Irino, MARIZA LANDGRAF, and Maria Teresa Destro, University of São Paulo, São Paulo, Brazil

P2-09 Dynamics of *Campylobacter* Spread Investigated in Fourteen Broiler Flocks in Switzerland — Marianne Ring, CLAUDIO ZWEIFEL, and Roger Stephan, Institute for Food Safety and Hygiene, Vetsuisse Faculty University of Zurich, Zurich, Switzerland

P2-10 *Salmonella* on Harvest-ready Cattle of the Texas High Plains — TYLER STEPHENS, David J. Kunze II, Guy H. Loneragan, Tammy M. Platt, Mark F. Miller, Thomas E. Besser, Mohammad Koohmaraie, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-11 DSC Reduction of *Escherichia coli* O157 and *Salmonella* in Feces and on Hides of Feedlot Cattle Using Various Doses of a Direct-fed Microbial — TYLER STEPHENS, G.H. Loneragan, E. Karunasena, and M. M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-12 DSC Prevalence and Enumeration of *Escherichia coli* O157 in Steers Receiving Various Strains of *Lactobacillus*-based Direct-fed Microbials; and Validation of Naturally Infected Bovine Feces with a Most-probable Number/Immunomagnetic Separation Technique — TYLER STEPHENS, G. H. Loneragan, L. M. Chichester, and M. M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-13 DSC Impact of In-feed Antimicrobial Drug Use on Antimicrobial Susceptibility Patterns of Generic *Escherichia coli* — LOREE A. BRANHAM, Tammy M. Platt, Guy H. Loneragan, Michael J. Engler, Daniel U. Thomson, Randall S. Singer, and Mindy M. Brashears, Texas Tech Univeristy, Lubbock, TX, USA

P2-14 *Listeria monocytogenes* Growth in Delicatessen Meats Based on Product Formulation and Age — LEI ZHANG, Ewen C.D. Todd, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

P2-15 Validation of Hot Water Interventions on Beef Carcasses Using Fluorescent Protein-marked Nonpathogenic *Escherichia coli* Strains as Surrogates for *E. coli* O157:H7 and *Salmonella* — ELISA CABRERA-DIAZ, Lisa M. Lucia, Alejandro Castillo, and Gary R. Acuff, Texas A&M University, College Station, TX, USA

P2-16 Investigation of a Multi-step Intervention Suitable for Very Small Meat Establishments to Reduce Pathogens from Inoculated Beef Surfaces — CATHERINE N. CUTTER, Sally F. Yoder, William R. Henning, Edward W. Mills, Nancy Ostiguy, and Stephanie Doores, Pennsylvania State University, University Park, PA, USA

P2-17 Investigation of Antimicrobial Rinses Suitable for Very Small Meat Establishments to Reduce Pathogens from Inoculated Beef Surfaces — Sally F. Yoder, William R. Henning, Edward W. Mills, Nancy Ostiguy, Stephanie Doores, and CATHERINE N. CUTTER, Pennsylvania State University, University Park, PA, USA

P2-18 Control of *Listeria monocytogenes* and Other Microorganisms in Brine Chill Systems Using a Novel Antimicrobial Formulation — R. S. Koefod and TIMOTHY A. FREIER, Cargill Inc., Wayzata, MN, USA

P2-19 DSC Reduction of *E. coli* O157:H7 in Whole Muscle Beef Cuts Using Lactic Acid Bacteria Cultures — J. C. Brooks, MELISSA K. HUGHES, E. Karunasena, and M. M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-20 Survival of *Listeria monocytogenes* Inoculated Post-processing on Frankfurters Formulated with Low Concentrations of Malic Acid, Sodium Citrate, and Sodium Acetate, and Exposed to a Heat Treatment after Packaging — IFIGENIA GEORNARAS, Patricia A. Kendall, John A. Scanga, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P2-21 DSC Acetate, Lactate Levels in Ready-to-Eat Processed Meat and Poultry Products Collected at Retail and Correlation with Occurrence of *Listeria monocytogenes* — OMAIMA AHMED, Philipus Pangloli, Svetlana Zivanovic, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P2-22 Use of Buffered Sodium Citrate and Sodium Diacetate to Control *Listeria monocytogenes* on Hams — MARY SHEESLEY, Lalit Boha, Padmanabha Reddy Velugoti, and Harshavardhan Thippareddi, University of Nebraska-Lincoln, Lincoln, NE, USA

P2-23 Fate of *Listeria monocytogenes* in a Processed Meat with Sodium Lactate and Diacetate and a Biopreservative — DENISE CARLSON, Mike Stiles, David Smith, and Lynn McMullen, CanBiocin Inc., Edmonton, AB, Canada

P2-24 Viability of *Listeria monocytogenes* on Commercially-prepared Roast Beef Log, Turkey Breast Log, and Frankfurters Surface Treated with Lauric Arginate and Stored at 4°C for 24 Hours — John B. Luchansky, JEFFREY E. CALL, James L. Smith, Jean Smith, and Alan Oser, USDA-ARS-ERRC, Wyndmoor, PA , USA

P2-25 Antimicrobial Effects of A&B Ingredients CytoGuard® on the Survival of *Listeria monocytogenes* Surface-inoculated onto Bar-S® Foods Co. Hot Dogs, Vacuum-packed and Stored at 4°C — Elizabeth Martin, Yale Lary, Carl Griffis, KATHERINE VAUGHN, Carol Boger, and John Marcy, University of Arkansas, Fayetteville, AR, USA

P2-26 Effect of Combining Nisin and/or Lysozyme with In-package Pasteurization for Control of *Listeria monocytogenes* in Ready-to-Eat Turkey Bologna during Refrigerated Storage — SUNIL MANGALASSARY, Inyee Han, James Rieck, James Acton, Xiuping Jiang, and Paul Dawson, Clemson University, Clemson, SC, USA

P2-27 Efficacy of SANOVA RTE in Reducing *Listeria monocytogenes* Populations in Ready-to-Eat Products — WILLIAM CENTRELLA II, Nahed Kotrola, Wendy Warren-Serna, and Jordan Woodbury, Food Safety Net Services Laboratory, San Antonio, TX, USA

P2-28 Inhibition of *Listeria monocytogenes* by Meat-borne Spoilage Lactic Acid Bacteria and *Bacillus* Species — WILLETTE M. CRAWFORD and Maribeth A. Cousin, Purdue University, West Lafayette, IN, USA

P2-29 Thermal Inactivation of High Pathogenicity Avian Influenza Viruses in Chicken Meat — COLLEEN THOMAS and David E. Swayne, USDA-ARS-SAA-SPRL, Athens, GA, USA

P2-30 Antimicrobial Effects of Mastertaste Zesti-smoke (Two-stage Application) on the Survival of *Listeria monocytogenes*, Surface-inoculated onto Bar-S Hot Dogs, Vacuum-packed and Stored at 4°C — ELIZABETH MARTIN, Yale Lary, Carl Griffis, Bob Riley, Darren Toczko, Katherine Vaughn, Courtney Botkin, Rick Grat, Mark van der Bleek, and John Marcy, University of Arkansas, Fayetteville, AR, USA

P2-31 DSC Ceftiofur Crystalline-free Acid Administration Reduces Susceptibility of Generic *E. coli* in Cattle — ALEJANDRO ECHEVERRY, Courtney Lowrance, Guy H. Loneragan, Mindy M. Brashears, M.S. Brown, David J. Kunze, Tammy M. Platt, Sam Ives, H. Morgan Scott, and Bo Norby, Texas Tech University, Lubbock, TX, USA

P2-32 Combined Effect of Formulation and High-pressure Pasteurization on the Control of *Listeria monocytogenes* on Ham — KATHLEEN GLASS, Lindsey McDonnell, Kristine Zierke, Rob Rassel, Lucas Schuette, Wafa Birbari, Paul Bernthal, Paul Zubinski, and Tracie Sheehan, University of Wisconsin-Madison, Madison, WI, USA

P2-33 DSC Ultraviolet Light Dose Required to Inactivate *Listeria monocytogenes* in Water and Brine — JULIE MCKINNEY, Robert Williams, Greg Boardman, Joseph Eifert, and Susan Sumner, Virginia Tech, Blacksburg, VA, USA

P2-34 Control of Foodborne Pathogens in Ground Beef Using Controlled Phase Carbon Dioxide — CARLOS TANUS, Curtis Kastner, Daniel Fung, and Beth Ann Crozier-Dodson, Kansas State University, Manhattan, KS, USA

P2-35 Improved Shelf Life and Microbial Safety of Hams by the Application of Vaporous Biocides — TOM ROSS, Craig Miller, Roger Latham, Cathy Fryirs, Alister Morison, and David Lark, University of Tasmania, Tasmania Hobart, Australia

P2-36 Control of *Clostridium perfringens* Spores by Green Tea Leaf Extracts during Cooling of Cooked Ground Beef, Chicken and Pork — VIJAY K. JUNEJA and Mendel Friedman, USDA-ARS-ERRC, Wyndmoor, PA, USA

P2-37 Combined Efficacy of Lactic Acid, Lauric Arginate and High Hydrostatic Pressure for Inactivating *Listeria monocytogenes* in Vacuum-packaged Cooked Ham— AUBREY MENDONCA, Stephanie Jung, and Joseph Sebranek, Iowa State University, Ames, IA, USA

P2-38 Viability of *Salmonella*, *Escherichia coli* O157:H7, *Listeria monocytogenes*, and *Staphylococcus aureus* in Jamaican Jerk Seasoning Paste at 25°C — AUBREY MENDONCA, Chido Viaji, Stephanie Volk, Uford Madden, and Michelle Copeland, Iowa State University, Ames, IA, USA

P2-39 Recovery of *Listeria monocytogenes* from Various Aqueous Chilling Solutions (Brine) — MARK PRATT, Lorenza Rozier Jr., Mary Niemann, John Jarosh, Leslie Manis, James Collins, John Rivera, Kay Williams, Brad Webb, Kristi Barlow, and Peter Evans, USDA-FSIS-OPHS, St. Louis, MO, USA

P2-40 Identification of Microbiological Hazards in the Environment and Processes of Traditional Fermented Sausages — A. S. Gounadaki, P. N. Skandamis, E. Drosinos, and GEORGE-JOHN E. NYCHAS, Agricultural University Athens, Lab of Microbiology & Biotechnology of Foods, Athens, Attiki, Greece

P2-41 DSC Survival of *Clostridium perfringens*, *Enterobacteriaceae*, Coliforms and *Escherichia coli* in Tajik Sambusa — SHAKHLO N.YARBAEVA, Padmanabha R.Velugoti, Harshavardhan Thippareddi, and Julie A. Albrecht, University of Nebraska-Lincoln, Lincoln, NE, USA

P2-42 DSC Fate of *Listeria monocytogenes* on Vacuum-packaged Pepperoni Stored at 4, 12, or 25°C — OLEKSANDR A. BYELASHOV, Brandon A. Carlson, Gianna Duran, Ifigenia Geornaras, Patricia A. Kendall, John A. Scanga, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P2-43 DSC Survival of *Escherichia coli* O157:H7 on the Surface and Inside Westphalian Ham during Ripening following Needle Tenderization — GARY H. GRAUMANN and Richard Holley, University of Manitoba, Winnipeg, MB, Canada

P2-44 Inactivation of *Listeria monocytogenes* on the Surface of Cooked Turkey Breast and Roast Beef Using High-pressure Processing and Food Grade Chemicals — RENATA JACOB, Anna C.S. Porto-Fett, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P2-45 Fate of *Listeria monocytogenes* Inoculated onto the Surface of Soudjouk and Kippered Beef and Stored at Different Temperatures — RENATA JACOB, Anna C.S. Porto-Fett, Jeffrey E. Call, C. Andy Hwang, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P2-46 Fate of *Salmonella* Typhimurium, *Escherichia coli* O157:H7, or *Listeria monocytogenes* on the Surface of Whole Muscle Turkey Jerky — ANNA C.S. PORTO-FETT, Jeffrey E. Call, C. Andy Hwang, Vijay Juneja, Steve Ingham, Barbara Ingham, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P2-47 Prevalence of *Salmonella*, *Campylobacter* and *Listeria* on Retail Organic and Kosher Poultry Products — XIANGWU NOU, Jessica Delgado, Jitu Patel, Manan Sharma, and Morse Solomon, USDA-ARS-FTSL, Beltsville, MD, USA

P2-48 Microbiological Evaluation of Beef Carcasses during Process at Two Slaughter Establishments in Jalisco State, Mexico — NANCI E. MARTíNEZ-GONZÁLES, Luz E. Garay-Martínez, Alejandro Castillo-Ayala, Cristina Martínez-Cárdenas, Liliana Martínez-Chávez, and Ofelia Rodríguez-García, Laboratorio de Microbiología e Inocuidad de Alimentos, Guadalajara, Jalisco, Mexico

P2-49 DSC Isolation and Characterization of Thermal Resistance of *Salmonella* spp. from Raw, Frozen Chicken Nuggets, Strips and Pelleted Broiler Feeds — OLIVER BUCHER, Richard Alan Holley, Rafiq Ahmed, Helen Tabor, Celine Nadon, and Lai King Ng, University of Manitoba, Winnipeg, MB, Canada

P2-50 Prevalence of *Campylobacter*, *Enterobacteriaceae*, and Antimicrobial Resistance in Chickens and Guinea Fowls — AGNES KILONZO-NTHENGE, Samuel Nahashon, and Fur-Chi Chen, Tennessee State University, Nashville, TN, USA

P2-51 Antimicrobial Resistance in *Campylobacter jejuni* and *Campylobacter coli* Isolated from Chicken Carcass Rinsates: Update from the Animal Arm of NARMS — PAULA J. FEDORKA-CRAY, J. Plumblee, N. Anandaraman, M. Englen, and R. Meinersmann, USDA-ARS-BEAR, Athens, GA, USA

P2-52 Characterization of *Staphylococcus aureus* Strains Isolated from Pig Carcasses — SABINE NITZSCHE, Claudio Zweifel, and Roger Stephan, Institute for Food Safety and Hygiene, Vetsuisse Faculty University of Zurich, Zurich, Switzerland

P2-53 DSC Meat Packaging Technologies and the Safety of Ground Beef — MANUEL V. ALVARADO, J. C. Brooks, M. F. Miller, T. Jackson, and M. M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-54 Mechanisms of *Salmonella* Persistence during Chicken Slaughter — W. L. Tan, N. Fegan, and GARY A. DYKES, Food Science Australia, Brisbane, Queensland, Australia

P2-55 Effect of Acid Adaptation on Thermal Tolerance of *Escherichia coli* O157:H7 and *Samonella* Enterica in Meat Serum — MANPREET SINGH and J. S. Dickson, Auburn University, Auburn, AL, USA

P2-56 DSC Effect of Freezing, Thawing Method, and Aerobic Storage on the Fate of *Listeria monocytogenes* during Home Storage of Frankfurters — CATHERINE A. SIMPSON, O. Byelashov, I. Geornaras, P.A. Kendall, J. A. Scanga, K. E. Belk, G. C. Smith, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P2-57 DSC Characterization of Multi-resistant *Salmonella* spp. Isolates Recovered from Commercially Processed Whole Rabbit Carcasses — RAMARAO KASULA and Leonard L. Williams, Alabama A&M University, Normal, AL, USA

P2-58 Comparison of the TEMPO® System, Petrifilm®, and Cultural MPN Procedure for Enumeration of *E. coli*, Coliforms and Total Aerobic Plate Counts from Poultry Samples — DOUGLAS E. COSBY and J. Stan Bailey, USDA-ARS-BEAR, Athens, GA, USA

P2-59 Presence of *Campylobacter jejuni* in Poultry Samples of Different Colombian Regions Using Traditional Microbiology and BAX® System — MARIA CONSUELO VANEGAS, Aida Juliana Martínez, and Mayra Viviana Medrano, Universidad de los Andes, Bogotá, Colombia

P2-60 An Automated Immunomagnetic Separation Enzyme-linked Immunoassay for the Detection of *Salmonella* in Poultry Environmental Samples — CARLOS G. LEON-VELARDE, Carlos G. Leon-Velarde, Leila Zosherafatein, and Joseph A. Odumeru, Laboratory Services Division, University of Guelph, Guelph, ON, Canada

P2-61 DSC Evaluation of Detection Methods for the Identification of *Listeria* spp. Recovered from Meat Processing Facilities — JOVANA KOVACEVIC, Valerie Bohaychuk, Pablo Romero Barrios, Gary Gensler, Deana Rolheiser, and Lynn McMullen, University of Alberta, Edmonton, AB, Canada

P2-62 Evaluation of Sponge-sampling Methods for Fleece and Carcasses of Sheep in a Commercial Abattoir — Alison Small, Lucia Rivas, and NARELLE FEGAN, Food Science Australia, Brisbane, Queensland, Australia

P2-63 The Effect of Incubation Temperature on Total Viable Counts of Beef and Sheep Carcasses — MARK TAMPLIN, Jacinta Simmons, Ian Jenson, and John Sumner, University of Tasmania, Tasmania, Australia

P2-64 F-RNA Coliphages as a Potential Model Organism for Enteric Viruses of Animal Origin — TINEKE H. JONES and Michael W. Johns, Agriculture and Agri-Food Canada, Lacombe, AB, Canada

P2-65 DSC Multiplex Polymerase Chain Reaction Assays for Screening Virulence Genes of *Campylobacter jejuni* Strains Isolated from Processed Broilers — SYEDA K. HUSSAIN and Omar A. Oyarzabal, Auburn University, Auburn, AL, USA

P2-66 Enrichment Media and Protocol Comparison for the Rapid Detection of *Salmonella* in Poultry Carcass Rinses — JINGKUN LI, Mark Muldoon, and Jim Stave, Strategic Diagnostics, Inc., Newark, DE, USA

P2-67 Incidence of *Campylobacter* from Post-chill Poultry Carcass Rinse Samples by Improved Enrichment Methodologies from a Processing Plant Over a Three-day Sampling Period — L. JASON RICHARDSON, J. Stan Bailey, Nelson Cox, Mark Harrison, and Julian Cox, USDA-ARS-PMSRU, Athens, GA, USA

P2-68 Efficacy of Several Enrichment Procedures Utilizing TECRA and Bolton's Broth for Recovery of *Campylobacter* from Commercial Poultry Carcass Rinse Samples — L. JASON RICHARDSON, J. Stan Bailey, Nelson Cox, Mark Harrison, and Julian Cox, USDA-ARS-PMSRU, Athens, GA, USA

P2-69 An Enumeration Method and Sampling Plan for Mapping the Number and Distribution of *Salmonella* on the Chicken Carcass — THOMAS OSCAR, USDA-ARS, Princess Anne, MD, USA

P2-70 Carcass Mapping Study That Investigates Microbial Contamination throughout the Slaughter and Fabrication Process — CORRI L. REKOW, M.F. Miller, J.C. Brooks, and M.M. Brashears, Texas Tech University, Lubbock, TX, USA

P2-71 Analysis of Pathogen Control Performance in United States Broiler Slaughter Plants — MARY K. MUTH, Mansour Fahimi, and Shawn A. Karns, RTI International, Research Triangle Park, NC, USA

P2-72 The Effects of Non-intervention HACCP on Microbial Levels on Bovine and Porcine Carcasses at Abattoir — IVAN NASTASIJEVIC, Radmila Mitrovic, and Sava Buncic, Institute of Meat Hygiene and Technology, Belgrade, Serbia

P2-73 Regulatory Monitoring for *Campylobacter* in Chickens and on Poultry Meat in New Zealand — ROGER COOK, Peter van der Logt, Sharon Wagener, Gail Mustor, and Steve Hathaway, New Zealand Food Safety Authority, Wellington, New Zealand

P2-74 Assessment of Cooking Instructions on Labels of Retail, Frozen Ground Beef Patties — SANDRA M. MCCURDY and Katrina Finley, University of Idaho, Moscow, ID, USA

P2-75 Food Safety and Inspection Service Strategy to Reduce *Salmonella* Contamination of Broilers — DENISE EBLEN, Patricia Bennett, Amy Chanlongbutra, Robert Umholtz, and Sean Altekruse, USDA-FSIS, Washington, D.C., USA

P2-76 Pathogen Control Strategies Used by United States Meat and Poultry Processing Plants — CATHERINE L. VIATOR, Sheryl C. Cates, Shawn A. Karns, and Mary K. Muth, RTI International, Research Triange Park, NC, USA

P2-77 Educational Needs of United States Cattle Producers Regarding Pre-harvest Food Safety Interventions — LAURA LEMONS, Michel Todd Brashears, Moriah Jennings, Guy Loneragan, and Mindy Brashears, Texas Tech University, Lubbock, TX, USA

P2-78 DSC Effects of Acid and Cold Stresses on Cell Structure and Growth Kinetics of *Salmonella* Typhimurium in Broth during Storage at 10 and 24°C — YANG JIN JUNG, Kyung J. Min, and Ki. S. Yoon, Kyung Hee University, Seoul, South Korea

P2-79 Impact of Product Temperature on Quantitative Transfer of *Listeria monocytogenes* during Commercial Slicing of Deli Ham — ZHINONG YAN, Ewen C.D. Todd, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

P2-80 Inactivated Autogenous Trivalent *Salmonella* Vaccine Used in Commercial Poultry Breeders for the Control of *Salmonella* Colonization — ANTHONY PAVIC, Peter Groves, and Julian Cox, Birling Avian Laboratories, Bringelly, NSW, Australia

TUESDAY MORNING

JULY 10

SYMPOSIA • 8:30 a.m. – 12:00 p.m.

S9 What's the Future of Foodborne Pathogen Detection?

Ballroom of the Americas A

Organizers: Laura Bauermeister, Omar Oyarzabal, and Pamela Wilger

Convenors: Laura Bauermeister, Brooke Whitney, Omar Oyarzabal, and Pamela Wilger

8:30 Foodborne Pathogens: The Future in Detection — LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

9:00 Detection and Quanitfication of Foodborne Pathogens Using RT-PCR — NIGEL COOK, Central Science Laboratory, Sand Hutton, York, UK

9:30 A Microarray Chip for the Detection of Noroviruses— SABAH BIDAWID, Health Canada, Ottawa, ON, Canada

10:00 Break

10:30 Biosensors, Basic Definitions — OMAR A. OYARZABAL, Auburn University, Auburn, AL, USA

11:00 Multiple Pathogen Detection Using Biosensors: Advancement and Challenges — SHU-I TU AND GEORGE PAOLI, USDA-ARS-NAA-ERRC, Wyndmoor, PA, USA

11:30 Nanoliter Fluidic Arrays for Single Bacterial Cell Detection — JONG WOOK HONG, Auburn University, Auburn, AL, USA

S10 The Impact of Emerging Food Trends on Food Safety

Ballroom of the Americas B

Sponsored by ILSI North America Technical Committee on Food Microbiology

Organizers: Marie E. Latulippe and Pauline Rosen

Convenors: Jean Anderson, J. Stan Bailey, and Theodora Morille-Hinds

8:30 Emerging Consumer Trends: Challenges for Food Safety — CHRISTINE M. BRUHN, University of California-Davis, Davis, CA, USA

9:00 Safety of Probiotics — PIETER BREEUWER, Nestle Product Techology Center- Konolfingen, Konolfingen, Switzerland

9:30 Natural Ingredients and Food Trends — JOSEPH D. MEYER, Kraft Foods-Oscar Mayer, Madison, WI, USA

10:00 Break

10:30 Organic Foods and Food Safety: Separate, Antagonistic, or Symbiotic? — DOUGLAS A. POWELL, Kansas State University, Manhattan, KS, USA

11:00 Food Safety Challenges Posed by Minimal/Opinion-traditional Food Processing Technologies — MARTIN COLE, Illinois Institute of Technology, National Center for Food Safety and Technology, Summit-Argo, IL, USA

11:30 Food Safety Challenges and Strategies Allowing for Unique, Year-round Globally-sourced Ingredients, Commodities, and New Products — SARA E. MORTIMORE, General Mills, Inc., Minneapolis, MN, USA

S11 Food Allergies: A Growing Food Safety Concern

Grand Republic B

Organizer: Anne Munoz-Furlong

Convenors: Anne Munoz-Furlong and Kathleen O'Donnell

8:30 Food Allergy Research Update — ANNE MUNOZ-FURLONG, The Food Allergy & Anaphylaxis Network, Fairfax, VA, USA

9:00 Food Allergy Regulatory Update — ELIZABETH L. HARDEN, FDA-CFSAN, College Park, MD, USA

9:30 Impact of Food Allergies on the Retail Food Industry — To be determined

10:00 Break

10:30 Impact of Food Allergies in Packaged Processed Foods — DAN SKRYPEC, Kraft Foods, Inc., Glenview, IL, USA and — TRACIE G. SHEEHAN, Sara Lee Corporation, Downers Grove, IL, USA

11:00 Food Allergy Management Best Practices — LARRY KOHL, Walt Disney World Company, Lake Buena Vista, FL, USA and — PAUL MARRA, Wegmans Food Markets, Inc., Rochester, NY, USA — and TOM TRAUTMAN, General Mills, Minneapolis, MN, USA

11:30 Liability Issues for Food Allergens Affecting the Food Industry — MARTIN J. HAHN, Hogan & Hartson, L.L.P., Washington, D.C., USA

S12 The Wrath of Vibrio's "Past, Present and Future"

Nutcracker 1

Organizers: Kathleen Rajkowski, Peter Hibbard, and Marlene Janes

Convenors: Kathleen Rajkowski and Marlene Janes

8:30 Historical and Ecological Perspective for *Vibrio parahaemolyticus* and *Vibrio vulnificus* Disease — ANITA WRIGHT, University of Florida, Gainesville, FL, USA

9:00 Historical Perspective for Handling *Vibrio parahaemolyticus* Outbreaks "Case Study of Chile" — FELIPE CABELLO, University of Chile, Santiago, Chile

9:30 Overview of Canadian Regulations for Vibrios in Shellfish — LILIANA RODRIGUEZ-MAYNES, Burnaby, BC, Canada

10:00 Break

10:30 International Prospective of *Vibrio parahaemolyticus*, Burden of Disease, and Control Measures — HAJIME TOYOFUKU, National Institute of Health Sciences, Tokyo, Japan

11:00 A Safety Strategic Plan to Open Estuary — ANGELO DEPAOLA, FDA Gulf Coast Seafood Laboratory, Dauphin Island, AL, USA

11:30 Where Do We Go from Here "Mitigating Strategies" — JOHN SUPAN, Louisiana State University, Baton Rouge, LA, USA

Special Interest Session: *Salmonella* Growth, Persistence and Survival in Low-moisture Foods and Their Environments—Strategies for Control

Nutcracker 3

Organizers: John Hanlin and Mark Moorman

Convenors: John Hanlin and Mark Moorman

8:30 Water, Water, Everywhere Nor Any Drop to Drink — The Problem of *Salmonella* in Low Moisture Foods — ROY BETTS, Campden & Chorleywood Food Research Association, Gloucestershire, UK

9:00 To be determined — ANN MARIE MCNAMARA, Silliker Inc., South Holland, IL, USA

9:30 To be determined — PAUL HALL, ConAgra Foods, Inc., Omaha, NE, USA

10:00 Break

10:30 The Production Floor — The Good, the Bad and the Ugly — BILL PURSLEY, AIB, Manhattan, KS, USA

11:00 To Be Determined — DON ZINK, FDA-CFSAN, College Park, MD, USA

11:30 Panel Discussion

Interactive Session: A Mystery Outbreak — What to Do When It Happens to You!
Grand Republic A
Organizers: Thilde Peterson, Michael Roberson, Maria Nazarowec-White, Judy D. Greig, and EwenTodd
Convenors: Ewen Todd and Chris Griffith

8:30 a.m. – 10:00 a.m. – Session One
10:30 a.m. – 12:00 p.m. – Session Two
1:30 p.m. – 3:00 p.m. – Session Three
3:30 p.m. – 5:00 p.m. – Session Four
6:30 p.m. – 8:00 p.m. – Session Five

TECHNICALS • 8:30 a.m. – 12:00 p.m.

T3 Antimicrobials, Sanitation and Non-microbial Food Safety

Nutcracker 2
Convenors: John Holah and Lynne McLandsborough

T3-01 8:30 Adhesion Forces of *Listeria monocytogenes* Scott A Biofilms Exposed to Surfactant Micellar-encapsulated Eugenol and Carvacrol Solutions as Measured by Atomic Force Microscopy — Dario Pérez-Conesa, Andrés Rodríguez, Jochen Weiss, and LYNNE A. MCLANDSBOROUGH, University of Massachusetts, Amherst, MA, USA

T3-02 8:45 Oregano Essential Oil: A Potential Food Industry Disinfectant — A. S. Gounadaki, P. N. Skandamis, E. Drosinos, and GEORGE-JOHN E. NYCHAS, Agricultural University Athens, Athens, Attiki, Greece

T3-03 9:00 Fate of *Escherichia coli* O157:H7 when Exposed to Sub-lethal and Lethal Concentrations of Common Industrial Sanitizers — KRISTEN A. HUNT, S. J. Goodfellow, and R. L. West, Deibel Laboratories, Inc., Gainesville, FL, USA

T3-04 9:15 Chlorine Sensitivity of Feline Calicivirus, a Surrogate of Norovirus — HIROSHI URAKAMI, Kumiko Ikarashi, Ko Okamoto, Yukari Abe, Tamami Ikarashi, Takeshi Kono, Yukifumi Konagaya, and Nobumasa Tanaka, Niigata University of Pharmacy and Applied Life Sciences (NUPALS), Niigata, Japan

T3-05 9:30 Sensitivity of *Escherichia albertii* to Food Preservation Treatments — MANAN SHARMA, Kalmia E. Kniel, Alexandra Derevianko, Jason Ling, and Arvind A. Bhagwat, USDA-ARS-BARC-EAST, Beltsville, MD, USA

T3-06 9:45 DSC On the Role of Colicin E1 against Gram-positive Bacteria — BRENDA S. PATTON, Sara Cutler, Steven M. Lonergan, James S. Dickson, and Chad H. Stahl, Iowa State University, Ames, IA, USA

10:00 Break

T3-07 10:30 DSC Incidence of Contaminating Microbial Species throughout Manufacture and Ripening of São Jorge – A Portuguese Traditional Cheese from Raw Milk — J. MARCELINO KONGO and F. Xavier Malcata, University of Azores, Azores, Portugal

T3-08 10:45 Cleaning Validation for Allergen Removal: Food Factory Case Studies — Helen E. Arrowsmith, D. L. Smith, J. T. HOLAH, and H. M. Brown, Campden and Chorleywood Food Research Association Group, Chipping Campden, Gloucestershire, UK

T3-09 11:00 Effect of Cleaning Fluids on Detection of Allergens — Helen E. Arrowsmith, D. L. Smith, J. T. HOLAH, and H. M. Brown, Campden and Chorleywood Food Research Association Group, Chipping Campden, Gloucestershire, UK

T3-10 11:15 Sandwich ELISA for the Detection of Bovine Blood in Animal Feedstuffs — YUN-HWA P. HSIEH and Jack A. Ofori, Florida State University, Talahassee, FL, USA

T3-11 11:30 Pesticides Determination in Three Fruit-based Baby Foods Using Different Extraction Methods and Gas Chromatography — Alexandros Theos, PANAGIOTIS GEORGAKOPOULOS, Eleftherios H. Drosinos, and Panagiotis N. Skandamis, Agricultural University of Athens, Athens, Votanikos, Greece

T3-12 11:45 DSC Quantification of Mycotoxins Deoxynivalenol, Masked Deoxynivalenol and *Fusarium graminearum* Pigment in Wheat and Rice Samples Using a New LC-UV/ MS Method — JAMES J. SASANYA, C. Hall, and C. Wolf-Hall, Great Plains Institute of Food Safety, North Dakota State University, Fargo, ND, USA

POSTERS • 9:30 a.m. – 1:00 p.m.

P3 Epidemiology and Risk Assessment, Novel Laboratory Methods, and Applied Laboratory Methods Poster Session

Exhibit Hall
Authors present 10:00 a.m.–12:00 p.m.
Convenor: Mark Carter

P3-01 A Decline in the Proportion of Foodborne Outbreaks with Undetermined Etiology following Increased Specimen Collection and More Rapid Investigation: FoodNet 2001–2005 — IDA E. ROSENBLUM, Duc J. Vugia, Alicia Cronquist, Quyen Phan, Cindy Burnett, Kristin Larson, Ellen Swanson, David Nicholas, William E. Keene, Michael Lynch, Timothy F. Jones, and Patrick McCarthy, Atlanta Reseach Education Foundation and Center for Disease Control and Prevention, Atlanta, GA, USA

P3-02 Outbreaks by the Numbers: Viruses — Caroline Smith Dewaal and FARIDA BHUIYA, Center for Science in the Public Interest, Washington, D.C., USA

P3-03 Outbreaks by the Numbers: Fruits and Vegetables — Caroline Smith Dewaal and FARIDA BHUIYA, Center for Science in the Public Interest, Washington, D.C., USA

P3-04 FDA's Use of Epidemiologic Data, Traceback Investigations and Farm Investigations as Regulatory Tools during Outbreaks of *Cyclospora cayetanensis* Associated with Produce, 1995–2005 — BABGALEH B. TIMBO, Marianne P. Ross, Debra A. Street, and Jack J. Guzewich, Center for Food Safety and Applied Nutrition, FDA, College Park, MD, USA

P3-05 Outbreaks Where Food Workers Have Been Implicated in the Spread of Foodborne Disease — JUDY D. GREIG, Ewen C. D. Todd, Charles A. Bartleson, and Barry S. Michaels, Public Health Agency of Canada, Guelph, ON, Canada

P3-06 Prevalence of Foodborne Pathogens in Stools from Mexican Hospitals — NORMA HEREDIA, Santos García, Luisa Solís, Rocio Amador, Sagrario García, and Rodolfo Puente, Facultad de Ciencias Biologicas, Universidad Autonoma de Nuevo Leon, San Nicolas, NL, Mexico

P3-07 A Novel Approach for Conducting Environmental Investigations of Foodborne Outbreaks — MAHA HAJMEER, Benson Yee, Davina Watson, Richelle Richter, Mary Palumbo, Patrick Kennelly, Jeff Farrar, Barbara Cassens, and Alonza Cruse, California Dept. of Health Services, Food and Drug Branch, Sacramento, CA, USA

P3-08 Withdrawn

P3-09 *Vibrio parahaemolyticus* Illnesses in Florida, 1994–2006 — KATHLEEN W. VAN ZILE, MSEH, Florida Dept. of Health, Jacksonville, FL, USA

P3-10 Foodborne Sources of Uropathogenic *Escherichia coli* — Mark Stinson, Robert Barlow, PATRICIA DESMARCHELIER, Mark O'Brien, and Kari Gobius, Food Science Australia, Queensland, Australia

P3-11 Characterization and Virulence of *Enterobacter sakazakii* from Neonatal Intensive Care Unit Outbreak — Stacy Townsend, Edward Hurrell, Juncal Caubilla Barron, and STEPHEN FORSYTHE, Nottingham Trent University, Nottingham, UK

P3-12 DSC Food Poisoning Outbreaks Caused by *Bacillus* spp. in British Columbia, Canada — LORRAINE F. MCINTYRE, Kathy Bernard, Judy Isaac-Renton, and David Naseby, BC Centre for Disease Control, Vancouver, BC, Canada

P3-13 Estimation of the Burden of Gastroenteric Diseases Study in Miyagi Prefecture, Japan, Using Physician Consultation Rates from a Retrospective Cross-sectional Telephone Survey — Hajimee Toyofuku, KUNIHIRO KUBOTA, Fumiko Kasuga, Emiko Iwasaki, Tomomi Nokubo, Shun-ichi Inagaki, Hei-ichiro Kusakari, Mayumi Komatsu, Frederic J. Angulo, and Kaoru Morikawa, National Institute of Health Sciences, Tokoyo, Japan

P3-14 Molecular Characterization, Serotyping and Antimicrobial Resistance Profiles of *Salmonella* Isolates Obtained from Wastewater, Food and Human Sources in Guadalajara, Mexico — Corina Hernández-Mireles, Alejandro Sanchez, Cristina Martínez-Cárdenas, Jesús Silva-Sanchez, Alejandro Castillo-Ayala, and OFELIA RODRIGUEZ-GARCIA, Universidad de Guadalajara, Guadalajara, Jalisco, México

P3-15 Trends in Foodborne Outbreaks Caused by School Lunches and Evaluation of Activities to Improve School Lunch Sanitation in Japan — FUMIKO KASUGA, Masayo Kaneda, Nobuko Tanaka, and Akiko Nakamura, National Institute of Health Sciences, Setagaya-ku, Tokyo, Japan

P3-16 Pulsed Field Gel Electrophoresis (PFGE) of Human and Meat Isolates of *Escherichia coli* O157:H7 for Source Atribution in International Trade — ROGER L. COOK, Angela Cornelius, Brent Gilpin, and Carolyn Nicol, New Zealand Food Safety Authority, Wellington, New Zealand

P3-17 DSC Validation of Models for Proteolytic *Clostridium botulinum* Growth during Cooling of Cooked Ground Beef — KARLA M. MENDOZA and Donald W. Schaffner, Rutgers, The State University of New Jersey, New Brunswick, NJ, USA

P3-18 Yeast Growth-decay Modeling Using Logistic Function and Fermi Equation — Rodrigo Mandujano, Luis G. Rios-Casas, Aurelio López-Malo, and ENRIQUE PALOU, Universidad de las Americas Puebla, Cholula, Puebla, Mexico

P3-19 Dose Response Survival Modeling of *Escherichia coli* Exposed to Simultaneous Application of High Frequency Ultrasound and Laurel and Coriander Essential Oils — Arlette Santacruz, Fernanda San Martin, ENRIQUE PALOU, Alejandro Castillo, and Aurelio López-Malo, Universidad de las Americas Puebla, Cholula, Puebla, Mexico

P3-20 Protocol for Pasteurization Inactivation Kinetics of Milkborne Pathogens — LINDSAY PEARCE, Lisa Oakley, and Joanna Shepherd, Fonterra Research Centre, Palmerston North, New Zealand

P3-21 Predictive Models for the Growth and Survival of Total *Vibrio parahaemolyticus* in Gulf Coast Shellstock Oysters — SALINA PARVEEN, Mark L. Tamplin, Ligia V.A. da Silva, Chanelle White, John Bowers, Geoffrey Rutto, and Angelo DePaola, University of Maryland Eastern Shore, Princess Anne, MD, USA

P3-22 DSC Development of Predictive Mathematical Model for the Growth Kinetics of *Staphylococcus aureus* by Response Surface Model Based on Absorbance Data — KYO-YOUNG SEO and Sang-Do Ha, Chung-Ang University, Daeduk-myun, Ansung, Gyunggi-Do, South Korea

P3-23 Probabilistic Modeling of *Enterobacter sakazakii* Survival to Desiccation after Grown at Selected Water Activities — Rosa Elena Delgado-Portales, Enrique Palou, and AURELIO LÓPEZ-MALO, Universidad de las Americas Puebla, Cholula, Puebla, Mexico

P3-24 Modeling the Bacterial Survival/Death Interface Induced by High Pressure Processing — SHIGENOBU KOSEKI and Kazutaka Yamamoto, National Food Research Institute, Tsukuba, Ibaraki, Japan

P3-25 Kinetic Model of Tropomyosin Denaturation for Predicting Inactivation of *Salmonella* in Cooked Beef — FUR-CHI CHEN and Roger C. Bridgman, Tennessee State University, Institute of Agricultural and Environmental Research, Nashville, TN, USA

P3-26 Uncertainty Assessment of Broth-based Microbial Growth Models — KARINA G. MARTINO and Bradley P. Marks, North Wales, PA, USA

P3-27 DSC Modeling the Risk of *Salmonella* in Raw Poultry as Influenced by Different Further Processing and Packaging Practices — SILVIA DOMINGUEZ and Donald W. Schaffner, Rutgers University, The State University of New Jersey, New Brunswick, NJ, USA

P3-28 Development of a Kinetic Model for Mold/Yeast Growth on Seasoned Lotus Root Cuts for Online Shelf-life Control — IL SEO, Jin Pyo Park, Duck Soon An, Hyuk Jae Lee, and Dong Sun Lee, Kyungnam University, Gyeongnam, South Korea

P3-29 The International Risk Governance Framework as Applied to *Listeria monocytogenes* in Raw Milk Soft Cheese in the United States — Andrew Knight, Michelle Worosz, Craig Harris, Les Bourquin, and EWEN TODD, Michigan State University, East Lansing, MI, USA

P3-30 Monte-Carlo Simulation to Predict the Effect of Multiple-sequential Interventions on Bacterial Populations during Poultry Processing — BALA KOTTAPALLI, Jarret Stopforth, Marissa Lopes, and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P3-31 Quantitative Risk Assessment in HACCP for Safe Menu in Korean Restaurants: Focus on Vegetable Dishes (Sangchae) — KWANG-GEUN LEE, Seung Ju Lee, Yujin Choi, Ari Park, Juhyun Song, Seung Won Jung, and Yun-Hae Kim, Dongguk University, Jung-gu, Seoul, Korea

P3-32 Fuzzy Math Calculation for Quantitative Risk Assessment on Korean Vegetable Dishes (Sangchae) — Seung Ju Lee, Yun-Hae Kim, Yujin Choi, Ari Park, Juhyun Song and KWANG-GEUN LEE, Dongguk University, Jung-gu, Seoul, Korea

P3-33 DSC Quantification of *Salmonella* from Pig Feces by Real time PCR — HANS FRÖDER, Reinier Helmuth, Istaván Szabó, Karsten Nöckler, Maria Teresa Destro, Cornelia Bunge, and Burkhard Malorny, Federal Institute for Risk Assessment, Berlin, Germany

P3-34 DSC Comparison of Quantitative, Real-time PCR to Most Probable Number Method for *Salmonella* Typhimurium DT104 from Swine Feces — REBECCA C. ROBBINS, Lee-Ann Jaykus, and Wondwossen A. Gebreyes, North Carolina State University, Raleigh, NC, USA

P3-35 Reverse-Transcriptase-PCR for the Rapid Detection of *Salmonella* Using invA Primers — DORIS H. D'SOUZA, Faith J. Critzer, and David A. Golden, The University of Tennessee, Knoxville, TN, USA

P3-36 Immuno-magnetic Chemiluminescence (IMC) Rapid Detection of *Listeria* spp. — H. CEM YURTAS, H.Cem Yurtas, William R. Dantzer, Jessica Saylor, Leena Griffith, Mary Brown, Alan Olstein, and Joellen M. Feirtag, University of Minnesota, St. Paul, MN, USA

P3-37 Affinity Magnetic Separation, a Novel Sensitive and Specific Method Drastically Reducing the Time of Enrichment for *Listeria* — Michael Schuetz, Karolina Heed, Ingrid Wanninger, and JAN KRETZER, Profos AG, Regensburg, Bavaria, Germany

P3-38 Characterization of an Affinity-purified Antibody Specific for *Listeria* spp. — Katelin Mao, Sundeep Malhi, and JOSHUA D. LEVIN, KPL, Inc., Gaithersburg, MD, USA

P3-39 Evaluation of Cationic Magnetic Separation Beads for the Capture of *Escherichia coli* O157:H7 — ALEXANDER GILL, Health Canada, Sir F. G. Banting Research Centre, Ottawa, ON, Canada

P3-40 Rapid Detection of *Eshcerichia coli* O157:H7 in Minced Beef Meat Using Nucleic Acid Sequenced-based Amplication Technology — CHRISTINE VERNOZY-ROZAND, Delphine Sergentet-Thevenot, Marie-Pierre Montet, and Marion Bouvier, Ecole Nationale Vétérinaire de LYON, Marcy L'Etoile, France

P3-41 Detection of Enterohemorrhagic *Escherichia coli* O157 and O26 and Food by Plating Methods and LAMP Assay: A Collaborative Study — YUKIKO HARA-KUDO, N. Konishi, K. Ohtsuka, R. Hiramatsu, H. Tanaka, H. Konuma, and K. Takatori, National Institute of Health Sciences, Tokyo, Japan

P3-42 A Novel Most-Probable-Number Plate Developed for Use with the 5-tube MPN Table — HIDEMASA KODAKA and Hideaki Matsuoka, Nissui Pharmaceutical Co., Ltd., Yuki, Ibaraki, Japan

P3-43 Detection of *Shigella* spp. Using a Selective and Differential Chromogenic Plating Medium — LAWRENCE RESTAINO, Elon W. Frampton, William C. Lionberg, and Anthony L. Restaino, R and F Laboratories, Downers Grove, IL, USA

P3-44 DSC Isolation and Infection of Potential Foodborne Viral Pathogens — KIRSTEN A. HIRNEISEN, Dallas G. Hoover, and Kalmia E. Kniel, University of Delaware, Newark, DE, USA

P3-45 Withdrawn

P3-46 Universal M13 Tailed Primers for Use in Sequencing PCR Products with Degenerative Primers or Short Amplicons — JACQUELINA W. WOODS, Narjol González-Escalona, and William Burkhardt III, FDA, Dauphin Island, AL, USA

P3-47 *Enterobacter sakazakii* Can be Detected Simultaneously with *Salmonella* Using a Chromogenic Agar Plating Medium — Jeremy Chenu and JULIAN COX, The University of New South Wales, Sydney, NSW, Australia

P3-48 DSC A Comparison of RNA Versus DNA-based Amplification Methods for the Discrimination of Viable from Non-viable Bacterial Cells — JAMES E. BINGHAM, Blanca I. Escudero-Abarca, Helen Rawsthorne, and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

P3-49 Novel Method for Concentrating Bacteria from Biological Liquid Samples for Direct Real-time PCR Detection (No Pre-enrichment) — MAXIM G. BREVNOV, Robert S. Tebbs, Olga V. Petrauskene, and Manohar R. Furtado, Applied Biosystems, Foster City, CA, USA

P3-50 Isolation of *Vibrio vulnificus* by Immunomagnetic Separation Using Anti-H Monoclonal Antibodies — RAVIRAJSINH P. JADEJA, Janet G. Simonson, and Marlene E. Janes, Louisiana State University, Baton Rouge, LA, USA

P3-51 Comparison of Real-time PCR with Conventional Culture for Detection of *Yersinia enterocolitica* in Environmental Swabs — DIANA STEWART, David Laird, Karl Reineke, and Mary Lou Tortorello, FDA, Summit-Argo, IL, USA

P3-52 Evaluation of Commercial Rapid Assay Kits and a Conventional Culture Method for Detection of *Salmonella*, *Listeria*, and *E. coli* O157 in Traditional Korean Foods — Jung-Yoeun Park, KUN-HO SEO, Hee-Yun Kim, and Jong-Seok Park, Konkuk University, Seoul, Korea

P3-53 Exclusion of a False Positive Strain, *Escherichia vulneris*, from a Chromogenic Agar Plate for Specific Detection of *Enterobacter sakazakii* by Supplementing with Glucose — Kwang-Young Song, KUN-HO SEO, and Robert E. Brackett, Konkuk University, Seoul, Korea

P3-54 DSC Ten-minute Assay for Detecting Staphylococcal Enterotoxin B in Apple Juice Using Piezoelectrically-excited Millimeter-sized Cantilever Sensors — DAVID MARALDO and Raj Mutharasan, Drexel University, Philadelphia, PA, USA

P3-55 Isolation and Characterization of *Salmonella* Bacteriophages for Produce Biocontrol Applications — LYNN MCINTYRE, Hany Anany, Danielle Gray, and Mansel W. Griffiths, Institute of Environmental Science and Research (ESR) Ltd., Christchurch, New Zealand

P3-56 Development of a Rapid Method for the Isolation and Detection of *Enterobacter sakazakii* and *Salmonella* spp. in Xanthan Gum — ADRIAN PARTON, John S. Murray, Nicole Prentice, Michael F. Scott, Paul A. Hall, and Adrian Parton, Matrix MicroScience, Newmarket, Cambridgeshire, UK

P3-57 Development of a Rapid Assay for the Detection of *Listeria* spp. in Environmental Swabs Using Re-circulating Immunomagnetic Separation Linked to Real-time PCR (RT-PCR) — John S. Murray, Nicole Prentice, Michael F. Scott, Paul A. Hall, and ADRIAN PARTON, Matrix MicroScience, Newmarket, Cambridgeshire, UK

P3-58 Rapid Isolation and Detection of *Salmonella* spp. from Chocolate Crumb, Cocoa Liquor and Cocoa Butter Using Re-circulating Immunomagnetic Separation Linked to Real-time PCR — John S. Murray, Nicole Prentice, Michael F. Scott, Paul A. Hall, and ADRIAN PARTON, Matrix MicroScience, Newmarket, Cambridgeshire, UK

P3-59 A Simple Enrichment and Lateral Flow Assay for the Rapid Detection of *Salmonella* in Poultry Environmental Samples — JINGKUN LI, Doug Waltman, Joe Schultz, and Kenton Kreager, Strategic Diagnostics, Inc., Newark, DE, USA

P3-60 A Comparative Study of Four Alternative Methods and the ISO 6579 Method for the Detection of *Salmonella* spp. in Food Products — BÉRENGÈRE GENEST, Joel Crociani, and Bérengère Genest, Silliker Cergy and bioMérieux R&D Microbiologie Industrielle, Marcy l'Etoile, Lyon, France

P3-61 Cutting Sample Preparation Time in *Salmonella* Testing with Enhanced Enrichment and Immunomagnetic Capture — Tytti Miettinen, Assia Jabeur, Vanessa Oliach, Marie-Laure Sorin, Hervé Laisis, and MIKA TUOMOLA, Raisio Diagnostics, Turku, Finland

P3-62 New 24-hour Immunoassay Method for the Detection of *Salmonella* in Food — Assia Jabeur, Vanessa Oliach, Marie-Laure Sorin, Hervé Laisis, and MIKA TUOMOLA, Raisio Diagnostics, Turku, Finland

P3-63 An Enrichment Method for Detection and Isolation of Shiga Toxin-producing *Escherichia coli* in Cattle Feces — HUSSEIN S. HUSSEIN and Laurie M. Bollinger, University of Nevada-Reno, Reno, NV, USA

P3-64 DSC Optimization of the Enrichment Protocal for Detection of *Escherichia coli* O157:H7 in Ground Beef by the Vidas *E. coli* O157H7 (ECO) Screening Test — ANTOINE VIMONT, Christine Vernozy-Rozand, Benoît Mallen, Christine Bavai, Mathieu Dothal, Nina Nguon, and Marie-Laure Delignette-Muller, Ecole Nationale Veterinaire de Lyon – UMAP-QSA, Marcy l'Etoile, France

P3-65 New Method for Simultaneous Detection of *Listeria* Species and *Listeria monocytogenes* — DENISE HUGHES, Rachel Keefe, and Selina Begum, DH Micro Consulting, Peelwood, NSW, Australia

P3-66 Evaluation of the Effect of Various pH Levels on 3M™ Petrifilm™ Aerobic Count Plates, 3M™ Petrifilm™ *E. coli* Coliform Count Plates, and 3M™ Petrifilm™ *Enterobacteriaceae* Count Plates on Microbial Growth when Compared to the Reference Method — LESLIE K. THOMPSON and Brian Kupski Silliker, Inc., South Holland, IL USA, Karen Hesselroth and Robert Young, 3M Microbiology, St. Paul, MN, USA

P3-67 Preliminary Evaluation of Reduced Enrichment Media Volumes for the Detection of *Escherichia coli* O157:H7 from Beef Trimmings in Conjunction with a Rapid Immunological Screen — LESLIE K. THOMPSON and Mark Carter, Silliker Inc., South Holland, IL, USA

P3-68 Detection of *E. coli* O157:H7 in Artificially Contaminated Spinach by Pathatrix™ Immunomagnetic-capture, Real-time PCR and Cultural Methods — Steve D. Weagant, Ken J. Yoshitomi, CHRISTINA CARRILLO, Ruben Zapata, Chitra Wendakoon, Paul Browning, Karen C. Jinneman, and Willis M. Fedio, New Mexico State University, Las Cruces, NM, USA

P3-69 Detection of *Escherichia coli* O157:H7 in Food Using Real-time Multiplex PCR Assays — PINA M. FRATAMICO and Chitrita DebRoy, USDA-ARS-ERRC, Wyndmoor, PA, USA

P3-70 Evaluation of Pathatrix (Immunomagnetic Concentration) and BAX (PCR) Using Two Nonselective Enrichment Broth for the 24-hour Recovery of Stressed *Listeria* Species from Artificially Contaminated Sponges — MARK W. CARTER, Paul A. Hall, Brian Kupski, and Leslie Thompson, Silliker Inc., Holland, IL, USA

P3-71 Efficiency of Transport Media for Recovery of *Listeria* from Milk Biofilm and Meat Processing Plant Environmental Swabs — KARL REINEKE, Diana Stewart, and Mary Lou Tortorello, FDA, Summit-Argo, IL, USA

P3-72 Evaluation of 3M™ Petrifilm™ Staph Express Count System for *Staphylococcus* spp. Detection in Individual Cow Milk Samples — M.M.O.P. Cerqueira, N.E. Martens, J. Pacheco, M.R. Souza, C.F.A.M. Penna, L.M. Fonseca, R. Rodrigues, M.O. Leite, D.L. Clinquart, and ADRIANA DOS REIS TASSINARI, 3M do Brasil Ltd., São Paulo, Brazil

P3-73 ValidCheck™ – A Rapid and Accurate Detection System for *Staphylococcus aureus* in a Variety of Foods — Elena Dzhaman, Phoebe Crippin, and IKRO JOE, Kim Laboratories, Inc., Champaign, IL, USA

P3-74 Highly Specific and Sensitive Detection and Quantification of *Staphylococcus aureus* Using Real-time PCR — LILY WONG, Pius Brzoska, Timothy Dambaugh, Dawn Fallon, George Tice, Manohar Furtado, and Olga Petrauskene, Applied Biosystems, Foster City, CA, USA

P3-75 TEMPO® EC (*E. coli*) Method for the Enumeration of *Escherichia coli* in a Variety of Foods: AOAC Research Institute Independent Laboratory Study — ROBERT P. JECHOREK, Amy C. Remes, and Amanda L. Wessinger, rtech laboratories, St. Paul, MN, USA

P3-76 Evaluation of the VIDAS Staph Enterotoxin II (SET 2) Immunoassay Method for the Detection of Staphylococcal Enterotoxins in Foods: Collaborative Study — ROBERT P. JECHOREK, St. Paul, MN and Ronald L. Johnson, bioMérieux, Inc., Hazelwood, MO, USA

P3-77 Evaluation of the TEMPO EC Test for Quantification of *Escherichia coli* from the Korean High-salt Seasoning — MIN SOO KIM, Kyung Hee You, Kang Pyo Lee, and Hye Won Shin, CJ Corp., Seoul, Korea

P3-78 A Study to Evaluate Direct Plating onto Chromocult® Coliform Agar for the Enumeration of Fecal Coliforms and *Escherichia coli* in Raw Shellfish — GRACE L. MAXWELL, M.L. Dorey, B-A. Lightfoot, J.R. Steeves, and P.A. Wilson, Canadian Food Inspection Agency, Dartmouth, NS, Canada

P3-79 Comparison of Compact Dry Yeast and Mold, Petrifilm Yeast and Mold, and Conventional Agar Media for Enumerating Yeasts and Molds in Foods — LARRY R. BEUCHAT, David A. Mann, and Joshua B. Gurtler, University of Georgia, Griffin, GA, USA

P3-80 Application and Evaluation of the TEMPO® System as a Fast Method for the Quantification of Microorganisms in Food — SABINE NITZSCHE, Claudio Zweifel, and Roger Stephan, Institute for Food Safety and Hygiene, Vetsuisse Faculty University of Zurich, Zurich, Switzerland

P3-81 Results of a MicroVal EN ISO 16140 Validation of the Compact Dry Total Count Plate Method for the Enumeration of Total Viable Microorganisms in Foods C. L. Baylis, R. A. Green, R. Limburn, K. Jewell, and ROY BETTS, Campden & Chorleywood Food Research Association, Chipping Campden, Gloucestershire, UK

P3-82 A Comparative Evaluation of the TEMPO® TVC Method for the Enumeration of Viable Aerobic Mesophilic Flora in Foods — JOHN MILLS, Judith Colon-Reveles, Joseph Mayer, Linette Beiner, Ron Johnson, and Gregory Devulder, bioMérieux, Inc., Hazelwood, MO, USA

P3-83 A New Approach for Workflow Evaluation in Food Microbiology Laboratories: Automated MPN Method Versus Plate Count Method — Federica Cattapan, PHILIPPE VILLARD, and Nelly Dumont, bioMérieux Inc., Hazelwood, MO, USA

P3-84 Anti-counterfeit Systems Food Research, Modeling and Applications: Perception, Risk Assessment, and Mitigation — JOHN SPINK, Anthony Phillips, and Robyn Mace, National Food Safety & Toxicology Center, Michigan State University, Okemos, MI, USA

TUESDAY AFTERNOON
JULY 10

IAFP Business Meeting • 12:15 p.m. – 1:00 p.m.

Nutcracker 2

- Welcome and Introduction
  Gary R. Acuff, President-Elect
- Moment of Silence
  Frank Yiannas, President
- Call to Order
  Frank Yiannas, President
- Minutes of the 2006 Business Meeting
  Frank Yiannas, President
- President's Report
  Frank Yiannas, President
- Report of Committees
  Tellers, *Amarat Simonne*
  JFP Management, *Maria Teresa Destro*
  FPT Management, *Jinru Chen*
  Foundation, *Gale Prince*
- Report of the Affiliate Council
  Maria Teresa Destro, Affiliate Council Chairperson
- Report of the Executive Director
  David Tharp, Executive Director
- Unfinished Business
- New Business
- Adjournment

SYMPOSIA • 1:30 p.m. – 5:00 p.m.

Interactive Session: A Mystery Outbreak — What to Do When It Happens to You!

Grand Republic A

Organizers: Thilde Peterson, Michael Roberson, Maria Nazarowec-White, Judy D. Greig, and Ewen Todd

Convenors: Ewen Todd and Chris Griffith

1:30 p.m. – 3:00 p.m. – Session Three

3:30 p.m. – 5:00 p.m. – Session Four

6:30 p.m. – 8:00 p.m. – Session Five

S13 Pre-harvest Food Safety: Another Critical Consideration for Assuring the Safety of the Food Supply

Ballroom of the Americas A

Organizer: Lee-Ann Jaykus

Convenors: Lee-Ann Jaykus and Mary E. Torrence

1:30 An Introduction to Pre-harvest Food Safety — MARY E. TORRENCE, USDA-CSREES, Washington, D.C., USA

2:00 Tracking Foodborne Pathogens in the Pre-harvest Environment: *Salmonella*, Dairy Production, and Produce — WILLIAM M. SISCHO, Washington State University, Pullman, WA, USA

2:30 The Impact of Pre-harvest Practices on Antimicrobial Resistance of Pathogens: *Salmonella* in Poutry — JOHN J. MAURER, University of Georgia, Athens, GA, USA

3:00 Break

3:30 Understanding Microbial Contamination of Produce: What Happens on the Farm? — ROBERT MANDRELL, USDA-ARS-WRRC, Albany, CA, USA

4:00 Understanding Prevalence and Risk Associated with Naturally-occurring Pre-harvest Pathogens: Vibrios and Molluscan Shellfish — LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

4:30 Elucidating the Relationship between Pre-harvest Pathogens and Human Disease — H. MORGAN SCOTT, Texas A&M Univesity, College Station, TX, USA

S14 Critical Issues in the Investigation of Outbreaks of Foodborne Illness Involving Food Workers

Ballroom of the Americas B

Organizers: Charles Bartleson, Chris Griffith, and Ewen Todd

Convenors: Judy Greig and Chris Griffith

1:30 Outbreaks Attributed to Infected Workers: Characteristics and Control — EWEN TODD, Michigan State University, East Lansing, MI, USA and BARRY MICHAELS, The Michaels Group, Palatka, FL, USA

2:00 How Outbreaks Where Foodworkers are Responsible are Investigated — DAVID GIFFORD, Washington State Dept. of Health, Olympia, WA, USA

2:30 Outbreak Investigation: Accreditation, Microbiological Sampling and the Role of the Microbiological Laboratory — AGNES TAN, Melbourne University, Melbourne, Victoria, Australia

3:00 Break

3:30 Outbreak Investigation: Different Agencies and Compelling Priorities — SHIRLEY B. BOHM, FDA-CFSAN, College Park, MD, USA

4:00 Outbreak Consequences and Legal Challenges: Use of a Novel Audit-based Approach in Outbreak Investigation: A Case Study — CHRIS GRIFFITH, University of Wales Institute-Cardiff, Cardiff, Wales, UK

4:30 Managing an Outbreak Investigation: The Role of an Enforcement Officer: Two Perspectives — SHIRLEY B. BOHM, FDA-CFSAN, College Park, MD, USA and RICHARD SPRENGER, Highfield.co.uk, Doncaster, S. Yorkshire, UK

S15 Balancing Cultural and Religious Norms and Food Safety

Grand Republic B

Organizers: Ken Anderson and Allen R. Sayler

Convenors: Ken Anderson and Allen R. Sayler

1:30 Kosher Food Requirements and Their Origins — JOE REGENSTEIN, Cornell University, Ithaca, NY, USA

2:00 Halal Food Preparation/Consumption Requirements and Origins — SYED RASHEEDUDDIN AHMED, Muslim Consumer Group, Rolling Meadows, IL, USA

2:30 Hindu Food Preparation/Consumption Requirements and Origins — GIHAN ELGINDY, Transcultural Education Center, McLean, VA, USA

3:00 Break

3:30 Asian Traditional Food Safety Case Study – Georgia — KIMBERLY LIVSEY, FDA-ORA-Southeast Region, Atlanta, GA, USA

4:00 Traditional vs. Store-bought Foods in Northern Canada – First Nation Perspective — CINDY JARDINE, University of Alberta, Edmonton, AB, USA

4:30 Traditional Hispanic Food Preparation and Food Safety Issues — GIHAN ELGINDY, Transcultural Education Center, McLean, VA, USA

S16 Microbial Biofilms and Biofilm Control

Nutcracker 1

Organizers: Bassam A. Annous, Dale Grinstead, and O. Peter Snyder

Convenors: Bassam A. Annous and O. Peter Snyder

1:30 Physiology and Genetics of Biofilm — ETHAN B. SOLOMON, DuPont Chemical Solutions Enterprise, Wilmington, DE, USA

2:00 Biofilms in the Food Handling/Processing Environment — AMY C. LEE WONG, University of Wisconsin-Madison, Madison, WI, USA

2:30 Biofilms on Produce — BASSAM A. ANNOUS, USDA-ARS-ERRC, Wyndmoor, PA, USA

3:00 Break

3:30 Measuring and Managing Biofilm Removal in Food-handling Environments — DON SCHAFFNER, Rutgers University, The State University of New Jersey, New Brunswick, NJ, USA

4:00 Biologic Control of Biofilms (Competitive Exclusion, Phage, Etc.) — MICHAEL P. DOYLE, University of Georgia, Griffin, GA, USA

4:30 Biofilm Removal from Food Processing Environment — DALE A. GRINSTEAD, JohnsonDiversey, Sturtevant, WI, USA

TECHNICALS • 1:30 p.m. – 5:00 p.m.

T4 Dairy Technical Session

Nutcracker 2

Convenors: Margaret Patterson and Brian Sauders

T4-01 1:30 DSC A Comparative Analysis of the Effects of Pasteurization and High Pressure Processing on the Stability and Infectivity of Bovine Rotavirus — DAYNA L. SWIATEK, Alvin Lee, Enzo Palombo, John Coventry, and Carl Kirkwood, University of Melbourne, Kensington, Australia

T4-02 1:45 DSC High Temperature Short Time (HTST) Processing Temperatures Have Surprising Effects on Fluid Milk Aerobic Plate Counts — MATTHEW RANIERI, Jason Huck, David Barbano, and Kathryn Boor, Cornell University, Ithaca, NY, USA

T4-03 2:00 Use of 3M™ Petrifilm™ Aerobic Count Plates for the Detection of *Geobacillus stearothermophilus* in UHT Milk — ROSA CASILLAS, Norma Heredia, Santos García, and Rafael Martínez, Universidad Autónoma de Nuevo León, San Nicolas, NL, Mexico

T4-04 2:15 Efficiency of Milk Culture, Direct PCR, and Nested PCR and Comparison with Fecal Culture Based on Samples from Dairy Herds Containing Cows with Johne's Disease — ANLI GAO, Joseph Odumeru, Melinda Raymond, Steven Hendrick, Todd Duffield, and Lucy Mutharia, University of Guelph, Guelph, ON, Canada

T4-05 2:30 Effect of Milk Concentration and pH on Pressure Inactivation of *Listeria monocytogenes* — MARGARET PATTERSON, Malachy Connolly, Alan Kelly, and Margaret Patterson, Agri-Food and Biosciences Institute, Belfast, Northern Ireland, UK

T4-06 2:45 DSC Prevalence of Target Pathogens in Farmstead Raw Milk Destined for Cheesemaking — DENNIS J. D'AMICO and Catherine W. Donnelly, University of Vermont, Burlington, VT, USA

3:00 Break

T4-07 3:30 DSC Elimination of *Listeria monocytogenes* in a Soft Cheese, Fromage Blanc, Using Natural Processing Methods and Formulation Changes — EMILY MATHUSA, Susan Sumner, Robert Williams, and Joe Marcy, Virginia Polytechnic Institute & State University, Blacksburg, VA, USA

T4-08 3:45 Prevalence and Molecular Ecology of *Listeria monocytogenes* in Retail Food Establishments — BRIAN D. SAUDERS, Claudette Farchione, Maria D. Sanchez, Kurt Mangione, Joe Corby, Stephen Stich, Daniel Rice, Esther Fortes, and Martin Wiedmann, New York State Dept. of Agriculture and Markets, Selkirk, NY, USA

T4-09 4:00 Penetration of *Salmonella* Enteritidis and *S.* Heidelberg Strains into Egg Yolks during 36-hour Ambient Temperature Storage — RICHARD K. GAST, Rupa Guraya, Jean Guard-Bouldin, and Peter S. Holt, USDA-ARS, Athens, GA, USA

T4-10 4:15 Microbial Levels and Pathogen Prevalence Associated with Restricted Shell Eggs — DEANA R. JONES and Michael T. Musgrove, USDA-ARS, Egg Safety and Quality Research Unit, Athens, GA, USA

T4-11 4:30 Egg Monitoring Program: Sampling Procedures and *Salmonella* Results — PRIYA KADAM, Bonnie Rose, Parmesh Saini, Victor Cook, Moshe Dreyfuss, Priscilla Levine, Nisha Antoine, Suzanne Hasiak, and Uday Dessai, USDA-FSIS, Washington, D.C., USA

T5 Pathogens Technical Session

Nutcracker 3

Convenors: Kendra K. Nightingale and Jie Zheng

T5-01 1:30 *Listeria monocytogenes* Strains Commonly Isolated from Foods Contain Virulence-attenuating Mutations in *inlA* — KENDRA K. NIGHTINGALE, Reid A. Ivy, Alphina J. Ho, Esther D. Fortes, Brad L. Njaa, and Martin Wiedmann, Colorado State University, Fort Collins, CO, USA

T5-02 1:45 The Use of Hybridization Techniques as a Tool to Uncover Genomic Factors Associated with the Tropism of *Listeria monocytogenes* for Food, Environmental and Host Niches — SARAH MCILWHAM, Franco Pagotto, and Jeffrey Farber, Health Canada and University of Ottawa, Ottawa, ON, Canada

T5-03 2:00 Contributions of Transcriptional Regulators to *Listeria monocytogenes* Growth at Refrigeration Temperature — YVONNE C. CHAN, Barbara M. Bowen, Soraya Chaturongakul, Yuewei Hu, Sarita Raengpradub, Kathryn J. Boor, and Martin Wiedmann, Cornell University, Ithaca, NY, USA

T5-04 2:15 Microarray Characterization of *Listeria monocytogenes* Genes Regulated by HrcA and CtsR — YUEWEI HU, S. Raengpradub, U. Schwab, K. J. Boor, and M. Wiedmann, Cornell University, Ithaca, NY, USA

T5-05 2:30 Sigma B Contributions to Stress Response and Virulence in Select *Listeria monocytogenes* Strains Representing Lineages I, II, IIIA, and IIIB — HALEY F. OLIVER, Jessica L. Corron, Martin Wiedmann, and Kathryn J. Boor, Cornell University, Ithaca, NY, USA

T5-06 2:45 Survival and Subsequent Acid Resistance of Acid Adapted or Osmotically Shocked *Salmonella* Enterica Serovar Enteritidis PT 4 and *Listeria monocytogenes* in Traditional Greek Appetizers Stored at 5 and 15°C — PANAGIOTIS N. SKANDAMIS, Stavros Manios, Argyris Skiadaresis, and Eleutherios H. Drosinos, Agricultural University of Athens, Athens, Votanikos, Greece

3:00 Break

T5-07 3:30 An Enhanced Discriminatory Scheme for PFGE-based Subtyping of *Salmonella* Enteritidis — JIE ZHENG, Christine E. Keys, Shaohua Zhao, Jianghong Meng, and Eric W. Brown, University of Maryland, College Park, MD, USA

T5-08 3:45 Characterization of Integrons, Antimicrobial Resistance Genes and Virulence Genes of *Salmonella* Enterica Isolated from Foodstuff and Related Sources — Vinicius Buccelli Ribeiro, Nilton Lincopan, Norma S. Lázaro, Luciano S. Bersot, José P. A. N. Pinto, Mariza Landgraf, and MARIA TERESA DESTRO, University of São Paulo, São Paulo, Brazil

T5-09 DSC 4:00 Transcription Analysis of *stx*1 and marA Genes in *Escherichia coli* O157:H7 Treated with Sodium Benzoate — FAITH J. CRITZER, Doris H. D'Souza, and David A. Golden, The University of Tennessee, Knoxville, TN, USA

T5-10 4:15 Studies on Biofilm Formation in Enteropathogenic *E. coli* — SHLOMO SELA, M. Wiess-Mushkat, D. Shakh, and R. Pinto, Agricultural Research Organization (ARO), Beth-Dagan, Israel

T5-11 4:30 Comparison of Virulence Plasmid (pYV/pCD) associated Phenotypes in *Yersinia* Species — SAUMYA BHADURI, Microbial Food Safety Research Unit, USDA-ARS-ERRC, Wyndmoor, PA, USA

T5-12 DSC 4:45 Elongation Factor EF-G as an Indicator of Cell Viability — DONGLAI L. ZHANG, S. A. McCammon, L. Mellefont, J. P. Bowman, and T. Ross, University of Tasmania, Tasmania, Australia

POSTERS • 2:00 p.m. – 6:00 p.m.

P4 Beverages and Water, Antimicrobials, Sanitation and Non-microbial Food Safety Poster Session

Exhibit Hall

Authors present 3:00 p.m.–5:00 p.m.

Convenor: Mindy Brashears

P4-01 An Evaluation of Ozonated Water as an Alternative to Chemical Cleaning and Sanitization of Beer Lines — LOUISE FIELDING, Andrew Hall, and Adrian Peters, University of Wales Institute-Cardiff, Cardiff, UK

P4-02 Withdrawn

P4-03 DSC Development of Novel Isolation Media for Guaiacol producing *Alicyclobacillus* spp. — SU-SEN CHANG and Dong-Hyun Kang, Washington State University, Pullman, WA, USA

P4-04 DSC An Assessment of Airborne Contaminants in Beverage Processing Environments — KARABO SHALE, Central University of Technology, Free State, South Africa

P4-05 DSC Ozonating Apple Cider to Reduce *E. coli* O157:H7 and *Cryptosporidium parvum* — ALEXANDRA DEREVIANKO, Lynsey Schoonover, Andrea Laycock, and Kali Kniel, University of Delaware, Newark, DE, USA

P4-06 Survival of *Bacillus anthracis* Vegetative Cells in Beverages — YUN-YUN D. HAO, and Richard C. Whiting, FDA-CFSAN, HFS-517, College Park, MD, USA

P4-07 Inhibitory Effects of Short Chain Fatty Acids against *Enterobacter sakazakii* in Laboratory Media and Liquid Foods — Hyun-Ho Jin and SUN-YOUNG LEE, Chung-Ang University, Gyeonggi-do, Korea

P4-08 Inhibition of *Enterobacter sakazakii* by Some Naturally Occurring Organic Compounds in Combination with Nisin — Hyun-Ho Jin and SUN-YOUNG LEE, Chung-Ang University, Gyeonggi-do, Korea

P4-09 Inhibitory Effect of Green Tea and Rosemary Leaves against Foodborne Pathogens in Laboratory Media and Rice Cake — SUN-YOUNG LEE, Gwon, Hyun-Ho Jin, and Bo-Kyoung Moon, Chung-Ang University, Gyeonggi-do, Korea

P4-10 Comparative Efficacy of Alcohol-based Hand Sanitizers and Antibacterial Foam against Norovirus Virus Using Fingerpad Method — PENGBO LIU, Hui-Mien Hsiao, David Macinga, Jim Arbogast, Marcia Snyder, and Christine Moe, Rollins School of Public Health, Emory University, Atlanta, GA, USA

P4-11 Inactivation of Viruses Using a Synergistically Formulated Alcohol-based Hand Sanitizer — David R. Macinga, MARCIA SNYDER, Helen Rawthorne, Alexia Taylor, Lee-Ann Jaykus, Karen M. Ramm, and James W. Arbogast, GOJO Industries, Inc., Akron, OH, USA

P4-12 DSC Comparative Susceptibilities of Hepatitis A, Feline Calicivirus, Coliphage MS-2, and Coliphage X-174 to Inactivation by Quaternary Ammonium and Potassium Peroxymonosulfate Disinfectants — VIVIANA FINO, Ethan B. Solomon, and Kalmia E. Kniel, University of Delaware, Newark, DE, USA

P4-13 Antimicrobial Efficacy of Peroxy Foam against Foodborne Pathogens, Yeasts and Molds — ERDOGAN CEYLAN, Sam Saltzman, and Mark Carter, Silliker Inc., South Holland, IL, USA

P4-14 Evaluation of the Antimicrobial Action of Physical and Chemical Sanitizer Agents in Commercial Sponges Used for Cleaning in Kitchens — SILVANA M. SREBERNICH, M. M. S. R. Soares, C. Fey, and M. S. Loiola, Pontifícia Universidade Católica de Campinas, São Paulo, Brazil

P4-15 DSC Degradation of Cellulose Produced by Shiga-toxin Producing *Escherichia coli* — YOEN JU PARK, Michelle Rossman, and Jinru Chen, University of Georgia, Griffin, GA, USA

P4-16 Efficacy of First, Third, and Fifth Generation Quaternary Ammonium Compounds against *Escherichia coli* O157:H7 and *Listeria innocua* — SALLY C. FOONG-CUNNINGHAM and Peter W. Bodnaruk, Ecolab Research Center, Eagan, MN, USA

P4-17 Inactivation of *Bacillus* Spores Using a Peroxyacetic Acid-based Sanitizer — SOOYEON OH, Claudia Rodriguez, and Peter J. Slade, National Center for Food Safety & Technology, Illinois Institute of Technology, Summit-Argo, IL, USA

P4-18 Mitigation of *Alicyclobacillus* spp. Spores on Food Contact Surfaces — R. Goodrich Schneider, LORETTA M. FRIEDRICH, M.E. Parish, University of Florida, Lake Alfred, FL, USA

P4-19 Field Assessment of Sanitation Management for Food Suppliers of School Foodservice in Korea — K. M. Lee, S. H. Kim, E. H. Choi, J. Y. Cha, H. S. Park, S. H. Choi, S. H. Kwon, J. K. Kim, K. H. Park, Y. K. Lee, and KYUNG RYU, Dongnam Health College, Gyeonggi, South Korea

P4-20 Effects of Cetylpyridinium Chloride against *Escherichia coli* O157:H7 Biofilms on Stainless Steel — SAJIDA PLAUCHE and Marlene Janes, Louisiana State University, Baton Rouge, LA, USA

P4-21 DSC Application of Sanitizers, Disinfectants and Detergents to Reduce *Bacillus cereus* Biofilm on Stainless Steel Surfaces — IL-JIN KIM, Min-Jeong Lee, Yong-Soo Kim, and Sang-Do Ha, Chung-Ang University, Gyunggi-do, South Korea

P4-22 Novel Approach for Assessing the Efficacy of In-place Cleaning Methods for Food Equipment — ROBERT S. DONOFRIO, Lisa Davis, Julie Vantine, and Lori L. Bestervelt, NSF International, Ann Arbor, MI, USA

P4-23 Evaluation of Infrared Spectroscopic Methods for Analysis of Organic Soils on Stainless Steel Surfaces — NURDAN A. KOCAOGLU-VURMA, M. Thomson, L. E. Rodriguez-Saona, and W. J. Harper, The Ohio State University, Columbus, OH, USA

P4-24 Reduced Attachment and Biofilm Development of *E. coli* on Nickel-silver Alloy and Copper Surfaces — DENISE LINDSAY, T. Pato, J. Tshukutswane, A. Koursaris, and A. von Holy, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

P4-25 Prevalence of *E. coli* O157:H7 on and Potential Biotransfer of *Staphylococcus* and *Enterococcus* between Cleaning and Handling Tools and Ready-to-Eat Food Products in Retail Delicatessens — DENISE LINDSAY, C. A. Chistison, and A. von Holy, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

P4-26 Comparison of Sanitary Designs of Delicatessen Meat Slicers — GUODONG ZHANG, Li Ma, and Michael P. Doyle, University of Georgia Center for Food Safety, Griffin, GA, USA

P4-27 DSC The Role of Biofilm Formation in the Protection of *Enterobacter sakazakii* from Chlorination — DIANA CAROLINA NAAR and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P4-28 Production of Bacterial Biofilms by *Enterobacter sakazakii* and Other *Enterobacteriaceae* on Neonatal Enteral Feeding Tubes — EDWARD HURRELL and Stephen Forsythe, Nottingham Trent University, Nottingham, Nottinghamshire, UK

P4-29 Comparison of Effectiveness of Various Sanitizing Agents by Different Validity Test Methods — AE-YEONG KIM, Yong-Su Kim, In-Sook Park, Sang-Do Ha, and Myung-Sub Chung, Korea Health Industry Development Institute, Seoul, South Korea

P4-30 A Comparative Analysis of Proficiency Testing Results from Food Laboratories — WALT HILL and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P4-31 Efficacy of Sanitizing Program to Control *Listeria* in a Poultry Facilities — FLÁVIA REGIANINI MONTIBELLER, Ademir Quintana Cabral, Eb Chiarini, Kátia Leani de Sousa, Maria Teresa Destro, University of São Paulo and JohnsonDiversey Brazil, São Paulo, Brazil

P4-32 Microbial Risk Factors Associated with Condensation in Ready-to-Eat Processing Facilities — MINDY BRASHEARS, Mark Miller, Chance Brooks, Deidrea Harris, Guy Loneragan, Alejandro Echeverry, Tanya E. Jackson, and John Michael Mehaffey, Texas Tech University, Lubbock, TX, USA

P4-33 DSC A Vertically Integrated Colorimetric Rapid Detection Test for *Listeria monocytogenes* — JEFFREY R. CALLAWAY and Lawrence Goodridge, Colorado State University, Fort Collins, CO, USA

P4-34 Sterility Testing of a Dispensing Valve for Aseptic Function in Foodservice Applications — JARRET STOPFORTH, Bala Kottapalli, Marissa Lopes, and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P4-35 Decontamination Application Using Bacteriophage for *Listeria monocytogenes* — SONYA E. NARODNY, Natasha Belcher, William Drummond, and Richard Obiso, Jr., Luna Innovations, Blacksburg, VA, USA

P4-36 DSC Sensitizing Processing-resistant Foodborne Spoilage and Pathogenic Bacteria to Ultra-high Pressure by Food Colorants — JOY G. WAITE and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P4-37 Mechanism of Action of Antilisterial Peptides Produced by *Lactobacillus sakei* 2a, a Bacteriocinogenic Strain Isolated from a Brazilian Meat Product — BERNADETTE D.G.M. FRANCO, Kátia G. C. Lima, Monika F. Kruger, Matheus Barbosa, Emiliano Salvucci, Fernando J. Sesma, and Bernadette D. G. M. Franco, University of São Paulo, São Paulo, Brazil

P4-38 Isolation and Purification of a Novel Bacteriocin from *Enterococcus* spp. with Broad Spectrum Inhibitory Activity — JOHN E. LINE, N. J. Stern, E. A. Svetoch, B.V. Eruslanov, V. V. Perelygin, E. V. Mitsevich, I. P. Mitsevich, V. D. Pokhilenko, V. P. Levchuk, O. E. Svetoch, and B. Seal, USDA-ARS-PMSRU, Athens, GA, USA

P4-39 DSC Bacteriocin Structural Genes and Virulence Determinants among Bacteriocin-producing Enterococci Isolated from Different Food Samples — XUEYING ZHANG and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P4-40 DSC Extraction of Nisin from a 2.5% Commercial Nisin Product Using Methanol and Ethanol — T. MATTHEW TAYLOR, P. Michael Davidson, and Qixin Zhong, University of Tennessee, Knoxville, TN, USA

P4-41 In Vitro Assessment of Novel Edible Coats with Antimicrobial Features: Applications to Cheese — OSCAR RAMOS, Manuela Pintado, and Xavier Malcata, Escola Superior de Biotecnologia, Rua, Porto, Sandim, Portugal

P4-42 Role of Crude Canola Extracts on *Listeria monocytogenes* Cell Invasion to CaCo-2 Cell Line — LEONARD L. WILLIAMS, Ernest Cebert, and Juliet Durant, Alabama A&M University, Normal, AL, USA

P4-43 DSC Response of *Salmonella* Strains to All Natural Citrus Antimicrobials — ERIK FRIEDLY, Corliss A. O'Bryan, Vesela I. Chalova, Philip G. Crandall, and Steven C. Ricke, University of Arkansas, Fayetteville, AR, USA

P4-44 Antimicrobial Activity of Citrus-based Natural Extracts against *Escherichia coli* O157:H7 — RAMAKRISHNA NANNAPANENI, Philip G. Crandall, Steven C. Ricke, and Michael G. Johnson, Center for Food Safety & Microbiology – IFSE, Fayetteville, AR, USA

P4-45 Ciprofloxacin-sensitive and Ciprofloxacin-resistant *Campylobacter jejuni* Inhibition by Citrus-based Natural Extracts — RAMAKRISHNA NANNAPANENI, Philip G. Crandall, Steven C. Ricke, and Michael G. Johnson, Center for Food Safety & Microbiology – IFSE, Fayetteville, AR, USA

P4-46 Antibacterial Efficacy of Thyme and Oregano Vapors — Tania F. Perez-Alvarado, Fernanda San Martin, Enrique Palou, and AURELIO LÓPEZ-MALO, Universidad de las Americas Puebla, Cholula, Puebla, Mexico

P4-47 Antimicrobial Agents Combining Thymol, Carvacrol, and Eugenol — Rebeca García-García, Rosa Elena Delgado-Portales, N. Angélica Santiesteban, P. Michael Davidson, Enrique Palou, and AURELIO LÓPEZ-MALO, Universidad de las Americas Puebla, Cholula, Puebla, Mexico

P4-48 Antimicrobial Properties of Plant Extracts against *Clostridium perfringens* and *Vibrio cholerae* — EDUARDO SANCHEZ, Santos García, and Norma Heredia, F. Apdo. San Nicolas, NL, Mexico

P4-49 Identification of Plant Compounds That Inactivate Shiga Toxin — BEATRIZ QUIÑONES, C. S. Massey, R. D. Alfonso, M. Friedman, and K. Teter, USDA-ARS-WRRC, Albany, CA, USA

P4-50 Inhibitory Effect of Fermented Kimchi on *Vibrio parahaemolyticus* ATCC 17802 Strain — JONG-KYUNG LEE, Da-Wa Jung, Myung-Ki Lee, Se-Wook Oh, Yunji Kim, and Young-Ho Kim, Korea Food Research Institute, Gyeonggi-do, Republic of Korea

P4-51 Antimutagenic Capabilities of Selected *Lactobacillus* spp. and *Bifidobacterium bifidum* ATCC 11863 Supernatants at Different Growth Phases — VESELA I. CHALOVA, Y. M. Kwon, J. M. Lingbeck, and S. C. Ricke, University of Arkansas, Fayetteville, AR, USA

P4-52 Management of Food Additives in Functional Health Foods in Korea — A. E. SON O. M., J. H. Moon, S.Y. Park, I. H. Kim, J.Y. Shim, H.A. Shin, M.K. Jang, K. H. Hong, J. D. Choi, K. I. Moon, and J. H. Hong, Hanyang University, Seoul, South Korea

P4-53 Determination of Arsenic, Lead and Manganese in Water Samples from Hidalgo and Tlaxcala, Mexico — Jaime García Germán Monsalvo, Ana Retama, MIROSLAVA SÁNCHEZ-MENDOZA, Elizabeth Castelazo, Armida Zúñiga and Alberto Jonguitud, and Luis A. Muños, State Laboratory of Public Health at Tlaxcala and State Laboratory of Public Health at Hidalgo, Pachuca, Hidalgo, Mexico

P4-54 Monitoring of Ochratoxin A in Imported Foodstuffs — JOONGOO LEE, J. H. Joung, E. S. Ann, M. J. Noh, S. Heo, J. S. Park, and H.Y. Kim, Korea Food & Drug Administration, Incheon, Korea

P4-55 Safety Evaluation of *Elsholtzia splendens* Extracts: Assessment of Acute Toxicity and Mutagenicity — Hae-Jin Um, SOON-MI SHIM, Ki-Hwan Park, Gun-Hee Kim, Seoul National University, Seoul, South Korea

P4-56 Acrylamide Content in Food Products Manufactured in Korea — MI KYO KIM, Mi-Kyo Kim, Se-Hee Paek, Cheong-Tae Kim, and Sangsuk Oh, Ewha Womans University, Seoul, Korea

P4-57 A Limited Survey of Zearalenone, an Estrogenic Mycotoxin, in Cereal Crops and Their Products Consumed in Korea — HYUN JUNG KIM, Hyang Sook Chun, Hyun Ee Ok, Hyun-Joo Chang, and Sung Wook Choi, Korea Food Research Institute, Gyeonggi-do, South Korea

P4-58 Fluorescence Polarization-based Homogeneous Assay for Zearalenone Determination in Grains — HYANG SOOK CHUN, Hyun Joo Chang, Hyun Jung Kim, Hyun Ee Ok, and Sung-Wook Choi, Korea Food Research Institute, Kyonggi, Republic of Korea

P4-59 Development of Immunoassay for the Detection of Zearalenone — JUNG-HYUN JE, Tiraporn Thongrussamee, Jin-Gil Choi, Thanayut Jiratpong, and Duck-Hwa chung, Gyeongsang National University, Jinju, Gyeongnam, Korea

P4-60 Construction and Expression of a Synthetic Single-chain Variable Domain Fragment Antibody against Mycotoxin Zearalenone in *Pichia pastoris* — HYUN-JOO CHANG, Hyun-Joo Chang, Sung-Wook Choi, Nari Lee, and Hyang Sook Chun, Korea Food Research Institute, Kyonggi, Republic of Korea

P4-61 DSC Thermo-stable Antigenic Proteins in Fish — KAMIL G. GAJEWSKI and Y-H. Peggy Hsieh, Florida State University, Tallahassee, FL, USA

P4-62 Effect of Heat Treatment on the Quantitation of Peanut Allergens by ELISA Test Kits — TONG-JEN FU and Nicole Maks, FDA-National Center for Food Safety and Tech., Summit-Argo, IL, USA

P4-63 Development of Real-time PCR Method to Monitor the Presence of Egg Allergens in Pasta Declared as Egg-free Products — EVA RENCOVA and Pavel Krcmar, Veterinary Research Institute, Brno, Czech Republic

P4-64 Screening Procedures for Clenbuterol Residue Determination in Raw Swine Livers Using Lateral-flow Assay and Enzyme-linked Immunosorbent Assay — WEIHUA LAI, Daniel Y. C. Fung, Yang Xu, and Yonghua Xiong, Kansas State University, Manhattan, KS, USA

P4-65 DSC Characterization of a Monoclonal Antibody Specific to Ruminant Blood — QINCHUN RAO and Yun-Hwa Peggy Hsieh, Florida State University, Tallahassee, FL, USA

P4-66 Simultaneous Determination of Three Macrolide Antibiotics in Foodstuffs by High-performance Liquid Chromatography — KIM SU-OK, S. O. Kim, K. N. Bhan, S. H. Lee, S.Y. Won, H. J. Lee, S.W. Park, H. M. Ok, H. I. Kang, S. H. Kim, and D. B. Kim, Busan Regional Korea Food and Drug Administration, Busan, Korea

P4-67 Comparison of Visual Inspection, an Allergen-specific Method (ELISA) and a Nonspecific Method (Sensitive ATP) to Detect the Presence of Allergenic Food Residues on Food-contact Surfaces — FADWA M. AL-TAHER and Lauren Jackson, Illinois Institute of Tech., National Center for Food Safety and Tech., Summit-Argo, IL, USA

P4-68 A High-sensitivity Immunoassay for the Detection of Ruminant Muscle Protein in Meat and Bone Meal and Feeds — BRUCE W. RITTER, Eun J. Park, and Laura K. Allred, ELISA Technologies, Inc., Gainesville, FL, USA

P4-69 Withdrawn

P4-70 Rapid Detection of Potential Food Allergen Residues on Processing Equipment – a Tool for Confirming Effective Cleaning — IAN GARTHWAITE, Rani Chowdhury, Victoria Stitt, Josie Quindere and Victoria Hutchison, TECRA International Pty Ltd., Frenchs Forest, NSW, Australia

P4-71 Recovery of Staphylococcal Enterotoxin in Multiple Phase Foods — REGINALD W. BENNETT, FDA, College Park, MD, USA

P4-72 DSC Ethylene Production by *Penicillium expansum* and Its Endogenous and Exogenous Effects on Patulin Production in Inoculated Solid Media — KERRI L. HARRIS, L.V. Roze, R. Beaudry, J. E. Linz, and L. D. Bourquin, Michigan State University, East Lansing, MI, USA

P4-73 Reduction of the Allergenicty of Hypoallergenic Formula by Gamma Irradiation — JU WOON LEE, J. H. Seo, J. H. Kim, H. J. Kim, S.Y. Lee, and M.W. Byun, Korea Atomic Energy Research Institute, Jeongeup, Republic of Korea

P4-74 Thermal Stability of Ricin in Apple Juice — LAUREN S. JACKSON, P. Truong, and W. H. Tolleson, FDA-NCFST, Summit-Argo, IL, USA

P4-75 Reduction of Aflatoxin in Rice and Corn by Different Cooking Methods — JONG-GYU KIM, Keimyung University, Daegu, Korea

WEDNESDAY MORNING
JULY 11

SYMPOSIA • 8:30 a.m. – 12:00 p.m.

S17 Lettuce and Leafy Greens: Issues, Actions, and Opportunities

Ballroom of the Americas A

Organizers: Linda Harris and James Gorny
Convenors: Linda Harris and James Gorny

8:30 Lettuce and Leafy Greens: Connecting the Dots on Epi Investigations — THAI-AN NGUYEN, CDC, Epidemiology Branch, Div. of Foodborne, Bacterial and Mycotic Diseases, National Center for Zoonotic, Vectorborne, and Enteric Diseases, Atlanta, GA, USA

9:00 Lessons Learned from Recent Lettuce and Leafy Greens Foodborne Illness Outbreak Investigations — MAHA HAJMEER, California Dept. of Health Services, Emergency Response Unit, Food and Drug Branch, Sacramento, CA, USA

9:30 Gaps in the GAPs (Data Metrics Needs) — DAVID E. GOMBAS, United Fresh Produce Association, Washington, D.C., USA

10:00 Break

10:30 Microbiological Testing in the Production Environment — How is It Being Used? What are the Limitations and Data Gaps? — CHUCK GERBA, University of Arizona, Tucson, AZ, USA

11:00 Raw and Endproduct Testing — How is It Being Used? What are the Limitations and Data Gaps? — RUTH L. PETRAN, Ecolab Inc., Eagan, MN, USA

11:30 Produce Time Temperature Control for Safety — Where Do Lettuce and Leafy Greens Fits? — SHIRLEY B. BOHM, FDA-CFSAN, College Park, MD, USA

S18 Preparing Scientists for the Legal Aspects of a Crisis: Step into an Interactive Mock Trial and Learn How to become an Expert Witness

Ballroom of the Americas B

Organizers: LeAnn Chuboff and Donna Garren
Convenors: LeAnn Chuboff and Donna Garren

8:30 DONNA GARREN, National Restaurant Association, Washington, D.C., USA

9:00 THOMAS S. THRONTON, III, Carr, Allison, Pugh, Howard, Oliver and Sisson, Birmingham, AL, USA

9:30 DAVID ERNST, Portland, OR, USA

10:00 Break

10:30 GALE PRINCE, The Kroger Company, Cincinnati, OH, USA

11:00 To be determined

S19 Applications of "omics" Technologies for Food Safety and Security

Nutcracker I

Organizers: Pina Fratamico and John B. Luchansky
Convenors: Pina Fratamico and John B. Luchansky

8:30 Impact of Functional Genomics in Food Safety and Security – An Overview of the "-omics" Tools and Their Application — BART WEIMER, Utah State University, Logan, UT, USA

9:00 Genomotyping of Foodborne Pathogens — ANDREW K. BENSON, University of Nebraska-Lincoln, Lincoln, NE, USA

9:30 Microarrays for Analysis and Detection of Microbial Pathogens and Their Toxins— AVRAHAM RASOOLY, NIH-NCI and FDA-CDRH, Rockville, MD, USA

10:00 Break

10:30 Analysis of Foodborne Pathogens Using "omics" Technologies — SOPHIA KATHARIOU, North Carolina State University, Raleigh, NC, USA

11:00 Whole Genome Expression Profiling of Pathogens in Food Environments — F. CHRIS MINION, Iowa State University, Ames, IA, USA

11:30 Bioinformatics: Data Mining and Applications — DARRELL O. BAYLES, USDA-ARS, National Animal Disease Center, Ames, IA, USA

S20 Food Safety @ the Speed of Thought – Creating Virtual Networks

Nutcracker 3

Organizers: Gary Acuff and Frank Yiannas
Convenors: Gary Acuff and Frank Yiannas

To be determined

ROUNDTABLES • 8:30 a.m. – 12:00 p.m.

RT4 With Over 100 Years of Experience in Food Safety, We Think...

Grand Republic B

Organizers: Renee Boyer and Manan Sharma
Convenors: Renee Boyer, Ben Chapman, Michelle Danyluk, and Manan Sharma

8:30 What is the Best, and Conversely, the Worst Thing That Has Happened to Food Safety? — ELSA A. MURANO, Texas Agricultural Experiment College Station, TX, USA

9:00 What is the Best, and Conversely, the Worst Thing That Has Happened to Food Safety? — JAMES JAY, Stone Mountain, GA, USA

9:15 What is the Best, and Conversely, the Worst Thing That Has Happened to Food Safety? — KATHERINE M.J. SWANSON, Ecolab, St. Paul, MN, USA

9:30 What is the Best, and Conversely, the Worst Thing That Has Happened to Food Safety? — ROBERT TAUXE, CDC-NCID-CCID, Division of Bacterial and Mycotic Diseases, Atlanta GA, USA

9:45 Roundtable Discussion – MANAN SHARMA – Moderator

Questioners: PAT KENDALL, Colorado State University, Fort Collins, CO, USA; JOHN BASSETT, Unilever, Bedford, Bedfordshire, UK

RT5 Panel on the Science Behind Temperature Control of Potentially Hazardous and High Risk Food

Grand Republic B

Organizer: Ewen C.D. Todd
Convenors: Judy Greig and Patricia Desmarchelier

10:30 Viewpoint: The Science Behind the Definitions of Potentially Hazardous Food in the Food Code — RICHARD LINTON, Purdue University, West Lafayette, IN, USA

10:45 How Industry Fulfills the Code Requirements for the Food Code and in Particular, Those Affecting Potentially Hazardous Food — GALE PRINCE, The Kroger Company, Cincinnati, OH, USA

11:00 Viewpoint: The EU Perspective on Potentially Hazardous Foods and Their Control – Is There a Unified Approach in Member Countries? — CANICE NOLAN, Delegation of the European Commission, Washington, D.C., USA

11:30 Roundtable Discussion – EWEN TODD — Moderator

Questioners: DEON MAHONEY, Food Standards Australia New Zealand, Canberra, Australia; JEFF FARBER, Health Canada, Health Products and Food Branch, Ottawa, ON, Canada; RICHARD SPRENGER, Highfield.co.uk, Doncaster, South Yorkshire, UK

TECHNICALS • 8:30 a.m. – 12:00 p.m.

T6 Meat and Poultry

Nutcracker 2

Convenors: Steven Goodfellow and Avik Mukherjee

T6-01 8:30 *Listeria monocytogenes* in Fermented Sausages; Effect of Stress Factors — A. S. Gounadaki, P. N. Skandamis, and GEORGE-JOHN E. NYCHAS, Agricultural University Athens, Athens, Attiki, Greece

T6-02 8:45 Inhibitory Effects of Nitrite and Lactate/Diacetate on Survival, Growth and Germination of *Clostridium perfringens* in Cooked Meat and Poultry Products under Abusive Chilling Conditions — STEVEN J. GOODFELLOW and K.A. Hunt, Deibel Laboratories, Inc., Gainesville, FL, USA

T6-03 9:00 DSC Ultraviolet Light and Dimethyl Dicarbonate to Reduce *Listeria monocytogenes* in Chill Brine — PRITI PARIKH, Robert Williams, Joseph Marcy, Joseph Eifert, and Kumar Mallikarjunan, Virginia Tech, Blacksburg, VA, USA

T6-04 9:15 Effect of Marination and Tenderization Ingredients on Thermal Inactivation of *Escherichia coli* O157:H7 in Beef — AVIK MUKHERJEE, Yohan Yoon, Keith E. Belk, John A. Scanga, Gary C. Smith, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

T6-05 9:30 Efficacy of Surface Spray Application of Lauric Arginate, Octanoic Acid, and Colicin E1 Prior to Packaging to Control Growth of *Listeria innocua* on Ready-to-Eat Meat Products — LILIA M. SANTIAGO, Gene Bartholomew, and Warren Dorsa, John Morrell & Company, Cincinnati, OH, USA

T6-06 9:45 DSC Pre-Harvest Carriage and Diversity of *Escherichia coli* O157:H7 in Feedlot Cattle — BRANDON A. CARLSON, Kendra K. Nightingale, John N. Sofos, John A. Scanga, Gary C. Smith, and Keith E. Belk, Colorado State University, Fort Collins, CO, USA

10:00 Break

T6-07 10:30 Prevalence and Antimicrobial Resistance of *Salmonella* Isolated from Retail Meat: National Antimicrobial Resistance Monitoring System (NARMS): 2002–2005 — SHAOHUA ZHAO, D. G. White, E. Hall-Robinson, L. Ayers, A. Glenn, S. L. Friedman, J. W. Abbott, H. Harbottle, and P. F. McDermott, FDA, Laurel, MD, USA

T6-08 10:45 DSC Characterization of *Campylobacter jejuni* Strains Isolated from Commercial Broilers in Puerto Rico by Pulsed-field Gel Electrophoresis, Multi-locus Sequence Typing and Cytotoxicity Assays — Steffen Backert, Leonard Williams, Robert S. Miller, SARAH J. PIERCE, Ami Sumners, Fernando Rebollo-Carrato, and Omar A. Oyarzabal, Auburn University, Auburn, AL, USA

T6-09 11:00 DSC Logistic Processing of Commercial Broiler Flocks to Reduce Cross Contamination by *Campylobacter* — ROBERT S. MILLER, Potturi, Lakshmi-Prasanna V., Steffen Backert, Robert A. Norton, Leslie Speegle, and Omar A. Oyarzabal, Auburn University, Auburn, AL, USA

T6-10 11:15 DSC Fate of *Listeria monocytogenes* on Frankfurters at Different Stages from Manufacturing to Consumption — OLEKSANDR A. BYELASHOV, Catherine A. Simpson, Ifigenia Geornaras, Patricia A. Kendall, John A. Scanga, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

T6-11 11:30 Effect of Rinse Volume and Sample Time on Recovery of *Salmonella*, *Campylobacter*, *E. coli*, and *Enterobacteriaceae* from Post-chill Chicken Carcasses — J. STAN BAILEY and Mark Berrang, USDA-ARS-BEAR, Athens, GA, USA

T6-12 11:45 DSC An Exploratory Study of Food-handling Practices at Church Dinners in Canada — BENJAMIN CHAPMAN, Tanya MacLaurin, and Douglas Powell, Food Safety Network, Dept. of Plant Agriculture, University of Guelph, Guelph, ON, Canada

POSTERS • 9:30 a.m. – 1:30 p.m.

P5 Risk Assessment and Antimicrobials Poster Session

Exhibit Hall

Authors present 10:00 a.m.–12:00 p.m.

Convenor: Yohan Yoon

P5-01 DSC Extraction of *Bacillus anthracis* Spores from Milk — ORIANA N. RAABE, Theodore P. Labuza, and Francisco Diez-Gonzalez, University of Minnesota, St. Paul, MN, USA

P5-02 DSC Addressing Biosecurity Issues of the Dairy Industry: The Survival of Raccoonpox Virus in Milk — JENNIFER L. CASCARINO and Kali E. Kniel, University of Delaware, Newark, DE, US

P5-03 Molecular Approaches for the Identification of a Toxin in Foods — XIAOHUA HE, John Mark Carter, David L. Brandon, Luisa W. Cheng, and Thomas A. McKeon, USDA-ARS-WRRC, Albany, CA, USA

P5-04 Effect of the Combination of pH, Water Activity and Temperature on the Growth of *Bacillus anthracis* — YUN-YUN D. HAO, Y.-Y. Diana Hao, and Richard C. Whiting, FDA-CFSAN, College Park, MD, USA

P5-05 Inactivation of *Bacillus anthracis* Spores by a Combination of Biocides and Heat in Milk at Pasteurization Temperatures — SA XU, Theodore P. Labuza, and Francisco Diez-Gonzalez, University of Minnesota, Blaine, MN, USA

P5-06 Species-specific Identification of Campylobacters by Use of PCR-RFLP and PCR Targeting the Gyrase B Gene — SUSUMU KAWASAKI, P. M. Fratamico, I. V. Wesley, and S. Kawamoto, National Food Research Institute, Ibaraki, Japan

P5-07 DSC DNA Microrarrays for Genotyping and Population Studies of *Campylobacter jejuni* — LAUREN PITTENGER-ALLEY, Mark D. Englen, Jonathan G. Frye, Victoria McNerney, Jaxk Reeves, Katie R. Gay, Paula J. Fedorka-Cray, and Mark H. Harrison, USDA-ARS, Athens, GA, USA

P5-08 DSC Genotypic Characterization of Verotoxin-producing *Escherichia coli* Isolated from Ground Beef Samples — MAJORIE FULLERTON and Leonard L. Williams, Alabama A&M University, Normal, AL, USA

P5-09 DSC Gene Expression Analysis of *Escherichia coli* O157:H7 at 10 and 37°C by Use of High Density Oligo-nucleotide Microarrays — KRISTINA K. CARTER, Julia S. Gouffon, Doris H. D'Souza, and David A. Golden, The University of Tennessee, Knoxville, TN, USA

P5-10 Cloning of Genes Encoding an Antibacterial Peptide Salmine and Construction of Its Expression Vector in *Escherichia coli* Bl21 — CHUNXIAO WANG, Jianzhang Lu, Chengchu Liu, and Jingjing Liu, College of Food Science, Shanghai Fisheries University, Shanghai, China

P5-11 Effect of Salt on the Survival and Cytoplasmic pH of *Escherichia coli* O157:H7, *Listeria monocytogenes*, and *Staphylococcus aureus* in Acetic Acid Treatment — SUN-YOUNG LEE and Dong-Hyun Kang, Chung-Ang University, Anseong-si, Gyeonggi-do, Korea

P5-12 Survival Mechanism of *Escherichia coli* O157:H7 in the Combined Treatment of Acetic Acid and Salt Related to the Known *E. coli* Acid Resistance Response — SUN-YOUNG LEE and Dong-Hyun Kang, Chung-Ang University, Dept. of Food and Nutrition, Chung-Ang University, Anseong-si, Gyeonggi-do, Korea

P5-13 Survival of *Escherichia coli* O157:H7 Isolates in Acetic Acid Solutions is Influenced by the Source of Isolation — DEOG-HWAN OH, Y. Pan, E. Berry, R. Mandrell, and F. Breidt, Jr., USDA-ARS, and North Carolina Agricultural Research Service, North Carolina State University, Raleigh, NC, USA

P5-14 DSC Starvation Effect on Attachment Properties of *Escherichia coli* O157:H7 and a Non-pathogenic Surrogate *E. coli* — JINKYUNG KIM and Mark A. Harrison, University of Georgia, Athens, GA, USA

P5-15 The Lpp Lipoprotein Suppresses Motility in a Biofilm-forming Strain of *Escherichia coli* O157:H7 — GAYLEN A. UHLICH and Darrell O. Bayles, USDA-ARS-ERRC, Wyndmoor, PA, USA

P5-16 Quorum Sensing Signal Production and Its Role on Growth of *Salmonella* Thompson and *Escherichia coli* O157:H7 under Various Conditions — YOHAN YOON, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P5-17 Heat Inactivation Comparison of *Escherichia coli* O157:H7 When Grown Statically or Continuously in a Chemostat — DARRYL G. BLACK and P. Michael Davidson, University of Tennessee, Knoxville, TN, USA

P5-18 Pathogenicity of Acid-adapted *Escherichia coli* O157:H7 in Laboratory Media and Meat Serum — MANPREET SINGH, J. E. Cunnick, and James S. Dickson, Auburn University, Auburn, AL, USA

P5-19 Heat Resistance of Multidrug- and Nonmultidrug-resistant *Salmonella* Serotypes — BALA KOTTAPALLI, Jarret Stopforth, Marissa Lopes, Rico Suhalim, and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P5-20 The Role of Meat Microflora in Gas Production Associated with "Blown-pack" Spoilage of Ground Beef Chubs — BALA KOTTAPALLI, Jarret Stopforth, Marissa Lopes, and Mansour Samadpour, IEH Laboratories & Consulting Group, Lake Forest Park, WA, USA

P5-21 Identification and Molecular Characterization of Class 1 Integron Resistance Genes Cassettes among *Salmonella* Strains from Imported Seafood — ASHAF A. KHAN, Chorng-Ming Cheng, Elizabeth Ponce, Junaid A. Khan, and Christine S. West, FDA, Jefferson, AR, USA

P5-22 Characterization of *Salmonella* Isolates from Sentinel Bivalves (*Corbicula flumenia*) Using Serotyping, Pulsed Field Gel Electrophoresis (PFGE), Multi-locus Sequence Typing (MLST) and Antimicrobial Resistance Analysis (ARA) — XIN LI, P. Mascarelli, M. Raley, N. J. Patel, P. Gerner-Smidt, W. A. Gebreyes, and J. F. Levine, North Carolina State University, Raleigh, NC, USA

P5-23 DSC Multiplex PCR for Identification of Major Pathogenic *Salmonella* Serovars Obtained from Specific Primer Sets by Use of Comparative Genomics — Nam-Uk Jo, Hyun-Joong Kim, Si-Hong Park, and HAE-YEONG KIM, Graduate School of Biotechnology, Kyung Hee University, Gyenggi, Republic of Korea

P5-24 DNA Probe Enumeration and rep-PCR Molecular Typing for Monitoring *Salmonella* Enterica from Environmental Sources — ANITA C. WRIGHT, Masoumeh Rajabi, and Gary E. Rodrick, University of Florida, Gainesville, FL, USA

P5-25 DSC Characterization of Plasmids Harboring the blaCMY 2 Gene Encoding Resistance to Extended-spectrum Cephalosporins in *Salmonella* Isolated from Food-producing Animals in Canada — ELIZABETH HILLYER, Laura Martin, Emily Weir, and Patrick Boerlin, University of Guelph, Guelph, ON, Canada

P5-26 Alteration of Flagella and Lipopolysaccaride on Biofilm Formation by *Salmonella* Enterica Serovar Typhimurium Phage Type DT104 — SHIN-HEE KIM and Cheng-i Wei, University of Maryland, College Park, MD, USA

P5-27 DSC Comparison of Invasiveness and Virulence Potential of Processing Plant Persistent and Clinical Strains of *Listeria monocytogenes* in Different Virulence Models — ANNE JENSEN, Line E. Thomsen, Rikke L. Jensen, Marianne H. Larsen, Bent B. Roldgaard, Bjarke B. Christensen, Hanne Ingmer, Birte F. Vogel, and Lone Gram, Technical University of Denmark, Kgs. Lyngby, Denmark

P5-28 DSC Analysis of the Partial Genomic Sequence among Listeriaphage 20422-1, 805405-1 (Newly Isolated in the United States) and P100 — JAE-WON KIM, Driss Elhanafi, and Sophia Kathariou, North Carolina State University, Raleigh, NC, USA

P5-29 DSC Role of Growth Temperature on Freeze-thaw Resistance of *Listeria monocytogenes* — REHA AZIZOGLU and Sophia Kathariou, North Carolina State University, Raleigh, NC, USA

P5-30 Membrane Fatty Acid Modifications of *L. monocytogenes* Scott A Biofilms Grown at Room Temperature and 4°C on Stainless Steel and Polyoxymethylene (Delrin®) — STEFANIE E. GILBRETH, Peter W. Bodnaruk, and Tony Putt, Ecolab Inc., Eagan, MN, USA

P5-31 Survival of Surface Attached *Listeria monocytogenes* in Drying Up Stress Models — BIRTE FONNESBECH VOGEL, Cisse Hedegaard Hansen, and Lone Gram, Technical University of Denmark, Kgs. Lyngby, Denmark

P5-32 Survival of Thirteen *Listeria monocytogenes* Strains in a Dynamic Model of the Stomach and Small Intestine — JOANNA M. BARMPALIA-DAVIS, I. Geornaras, P. A. Kendall, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

P5-33 Inactivation of Barotolerant Strains of *Listeria monocytogenes* and *Escherichia coli* O157:H7 by High-pressure and tert-Butylhydroquinone Combination — YOON-KYUNG CHUNG and Ahmed Yousef, The Ohio State University, Columbus, OH, USA

P5-34 Determination of Cell Numbers of *Clostridium botulinum* at Which Toxin is Detectable in Broth and Foods — LI MA, Li Ma, Lynne H. Thurber, Chia-Min Lin, and Michael P. Doyle, University of Georgia, Griffin, GA, USA

P5-35 Enterotoxigenic Profile of *Bacillus cereus* Strains from Food Origin — Lina Casale Aragon-Alegro, Graciela Volz Lopes, Gabriela Palcich, Mariza Landgraf, and MARIA-TERESA DESTRO, University of São Paulo, São Paulo, Brazil

P5-36 Resistance Patterns of *Staphylococcus aureus* 8325-4 to Various Stress Conditions and Pathogenicity Profiles on Hep-2 Cell Lines — VAMS K. VASIREDDY and Leonard L. Williams, Alabama A&M University, Normal, AL, USA

P5-37 Effect of Metabolic Enzymes on Amylopectin Content and Infectivity of *Cryptosporidium parvum* — ANGELA D. HARTMAN, Robert Williams, David Lindsay, Kalmia Kniel, Susan Sumner, and Joseph Eifert, GMA/FPA, Washington, D.C., USA

P5-38 The Potential for Pathogen Cross Contamination of Foods with Gloved Hands: Experiments with Feline Calicivirus as a Surrogate for Human Enteric Viruses — SABAH BIDAWID, Jason Tetro, Franco Pagotto, Kirsten Mattison, and Syed Sattar, Health Canada, Ottawa, ON, Canada

P5-39 Construction of Internal Amplification Control and RNA Standard for Detection of Norovirus by Quantitative Real-time RT-PCR — BLANCA ESCUDERO-ABARCA, Helen Rawsthorne, and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

P5-40 Quantitative Evaluation of Human Norovirus Persistence in Different Types of Water — SOLANGE E. NGAZOA and Julie Jean, Universite Laval, Quebec, QC, Canada

P5-41 Persistence of Hepatitis A Virus on Foods and Food Preparation Surfaces — EFSTATHIA PAPAFRAGKOU, Driss Elhanafi, and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

P5-42 Growth Phenotypes, Genotypes and Cold Adaptation Gene Expression Responses in Two *Listeria monocytogenes* Strains of Human and Food-processing Environment Origin — TAURAI TASARA and Roger Stephan, Institute for Food Safety and Hygiene, Zurich, Switzerland

P5-43 Growth Characteristics of *Listeria monocytogenes*, *Listeria welshimeri* and *Listeria innocua* Strains in Broth Cultures and a Sliced Bologna-type Product at 4 and 7°C — Ursina Nufer, Roger Stephan, and TAURAI TASARA, Institute for Food Safety and Hygiene, Zurich, Switzerland

P5-44 Modeling the Influence of Antimicrobials on the Spoilage Microflora of Cooked, Cured Meat Product — MARIOS MATARAGAS, A. Tornaros, P. Skandamis, and E. H. Drosinos, Agriculture University of Athens, Athens, Attica, Greece

P5-45 Comparison of Hydrostatic and Hydrodynamic Pressure to Inactivate Foodborne Viruses — MANAN SHARMA, Kalmia E. Kniel, A. E. H. Shearer, M. Solomon, and D. G. Hoover, Food Technology and Safety Laboratory, USDA-ARS, BARC-EAST, Beltsville, MD, USA

P5-46 DSC A High Pressure Processing Inactivation Model for Hepatitis A Virus — STEPHEN F. GROVE, Alvin Lee, Cynthia M. Stewart, and Tom Ross, University of Tasmania, Food Science Australia, Werribee, Australia

P5-47 Inactivation of *Cyclospora* Surrogate on Produce by Two Nonthermal Treatments — KALMIA E. KNIEL, Adrienne E. H. Shearer, Jennifer L. Cascarino, Gary Wilkins, and Mark C. Jenkins, University of Delaware, Newark, DE, USA

P5-48 DSC Putative Innovations in Extraction of Genomic DNA of Lactic Acid Bacteria — TERESA M. BRAGA, Fátima Lopes, Teresa Crespo, Ana Gomes, and Xavier Malcata, Escola Superior de Biotecnologia, Porto, Portugal

P5-49 Use of Molecular Typing for Classification of Environmental Isolates of *Penicillium* spp. — Suzanne Jordan, Robert Limburn, Patricia Anslow, Phil Voysey, and ROY BETTS, Campden and Chorleywood Food Research Association, Chipping Campden, Gloucestershire, UK

P5-50 Detection and Enumeration of Microorganisms in Ready-to-Eat Foods, Ready-to-Cook Foods and Fresh-cut Produce in Korea — Chang-Min Kim, MYUNG-SUB CHUNG, Hang-Min Kim, Dong-Soo Lee, Won-Young Choi, and Sang-Do Ha, Korea Health Industry Development Institute, Seoul, South Korea

P5-51 Survival of *Bifidobacterium adolescentis* 15703T in Uncoated Gelatin and Alginate-coated Gelatin Microspheres during Exposure to Simulated Gastrointestinal Conditions — Nana T. Annan, Antonela Borza, and LISBETH TRUELSTRUP HANSEN, Dalhousie University, Halifax, NS, Canada

P5-52 pH Contribution in the Evaluation of Quorum Sensing in Milk — C. Michaelidis, V. Stergiou, D. M. Kagkli, and GEORGE-JOHN E. NYCHAS, Agricultural University Athens, Athens, Attiki, Greece

P5-53 DSC Determination of Surrogate Organisms for *Listeria monocytogenes* Treated with Ultra-high Pressure and Pulsed-electric Field — JOY G. WAITE, Beatrice H. Lado, and Ahmed E. Yousef, The Ohio State University, Columbus, OH, USA

P5-54 Carriage of *Escherichia coli* O157 by European Starlings — JACOB KERN, Michael Kauffman, and Jeffrey LeJeune, The Ohio State University, Wooster, OH, USA

P5-55 DSC Microbiological Analysis of United States Currency Collected from Food Service Establishments — BRANDON KINLEY, Amanda Leland, and Xiuping Jiang, Clemson University, Central, SC, USA

P5-56 Microbiological Quality of Pork Meat from Mexican Supermarkets — Luisa Solís, Norma Heredia, SANTOS GARCIA, Rocio Amador, Sagrario García, and Rodolfo Puente, Facultad de Ciencias Biologicas, Universidad Autonoma de Nuevo Leon, San Nicolas, NL, Mexico

P5-57 Microbiological Evaluation of Infant Bottles Used for Feeding Powdered Formula: Implications for *Enterobacter sakazakii* — ELIZABETH C. REDMOND, Chistopher J. Griffith, and Steven Riley, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P5-58 Microbial Analyses of Fungi in Cereal Bars —SILVANA M. SREBERNICH, M. M. S. R. Soares, and M. M. Concon, Pontifícia Universidade Católica de Campinas, São Paulo, Brazil

P5-59 DSC Incidence of *Listeria* in Rural Home Environments with and without Ruminant Animals — MAWILL RODRIGUEZ-MARVAL, Ifigenia Geornaras, Patricia Kendall, Lydia Medeiros, Jeff LeJeune, and John N. Sofos, Colorado State University, Fort Collins, CO, USA

P5-60 Microbiological Quality of Selected Foods from United Kingdom Retail Premises, with a Focus on *Listeria monocytogenes* — SATNAM SAGOO, Christine Little, Iain Gillespie, Jim McLauchlin, and Kathie Grant, Health Protection Agency – Centre for Infections, London, UK

P5-61 DSC *Aspergillus flavus* and *Penicillium* spp. Associated with Musty Off-flavors in Navy Beans — COESHA A. FAIRLEY, Philip Perkins, Bonnie H. Ownley, P. Michael Davidson, and David A. Golden, The University of Tennessee, Knoxville, TN, USA

P5-62 Occurrence of *Carnobacterium* spp. on Retail Samples of Ready-to-Eat Meats — DENISE R. CARLSON, Liru Wang, Michael Stiles, and Lynn McMullen, CanBiocin Inc., Edmonton, AB, Canada

P5-63 DSC Influence of Pressurization Rate and Pressure Pulsing on Inactivation of *Bacillus amyloliquefaciens* Spores during Pressure-assisted Thermal Processing — WANNASAWAT RATPHITAGSANTI, J. Ahn, A. E. Yousef, and V. M. Balasubramaniam, The Ohio State University, Columbus, OH, USA

P5-64 The Survival of *Shigella sonnei* in Frozen Media before and after Ultraviolet Treatment — KATHLEEN T. RAJKOWSKI, USDA-ARS-ERRC-FSITRU, Wyndmoor, PA, USA

P5-65 Exploration of Hurdles to Improve Storage Stability of Braised Kidney Beans, a Korean Seasoned Side Dish — KI-EUN LEE, Duck Soon An, Eun Soon Lyu, Sun Kyung Chung, and Dong Sun Lee, Kyungnam University, Geongnam, South Korea

P5-66 Inhibitory Effects of Exopolysaccharide (EPS) Produced from *Lactobacillus acidophilus* on the Biofilm Formation of Shiga Toxin-producing *Escherichia coli* O157:H7 — HYUN SUN YUN, Younghoon Kim, Yunho Lee, Woojun Park, Sungsu Park, Sejong Oh, and Sae Hun Kim, Korea University, Seoul, Republic of Korea

P5-67 Black Sapote Puree Preserved by Hurdle Technology — Y. D. Ramirez, G.G. Gastélum, T. N. Medina, R. Avila-Sosa, ENRIQUE PALOU, A. López-Malo, and J.A. Guerrero, Universidad de las Americas Puebla, Puebla, Mexico

P5-68 Effect of Phytosterols on Microbial Spoilage of Pasteurized Fluid Milk — EMEFA A. MONU, Emefa Monu, Greg Blank, and Jerzy Zawistowski, University of Manitoba, Winnipeg, MB, Canada

P5-69 Effect of High-hydrostatic Pressure on Pathogenicity and Structural Integrity of *Eimeria acervulina*, a Protozoan Parasite and *Cyclospora cayetanensis* Surrogate — ADRIENNE E. H. SHEARER, Gary C. Wilkins, Mark C. Jenkins, and Kalmia E. Kniel, University of Delaware, Newark, DE, USA

P5-70 Efficacy of Air Cleaning System for Control of Airborne Microbes in Meat Processing Environments — JITU PATEL, Xiangwu Nou, and Gabriel Sanglay, USDA-ARS-BARC-East, Beltsville, MD, USA

P5-71 Selection of Methods for Heat Process Evaluation — JOY E. GAZE and Nick May, Campden & Chorleywood Food Research Association, Chipping Campden, Gloucestershire, UK

P5-72 Isolation and Identification of Radiation Resistance Bacteria from Gamma-irradiated Foods — Jae Hun Kim, P. M. Jeong, J. N. Park, J. K. Park, J. W. LEE, and M. W. Byun, Korea Atomic Energy Research Institute, Jeongeup, Korea

P5-73 DSC Quality and Mold Growth Effects following Microwave Commercial Sterilization on White Enriched Bread for Military Rations — ALEJANDRO ECHEVERRY, Donna G. Lakins, Christine Z. Alvarado, J. Chance Brooks, and Mindy M. Brashears, Texas Tech University, Lubbock, TX, USA

P5-74 Growth and Recovery of *Lactobacillus fermentum*, *Zygosaccharomyces bailii* and *Aspergillus niger* in a Low pH Juice Beverage in the Presence of Sodium Benzoate — PATRICIA L. RULE, bioMérieux, Hazelwood, MO, USA

WEDNESDAY AFTERNOON
JULY 11

SYMPOSIA • 1:30 p.m. – 3:30 p.m.

S21 Spoilage and Its Control in Meat Products

Grand Republic B

Organizers: Lynn McMullen and Peter Bodnaruk

Convenors: Lynn McMullen and Peter Bodnaruk

1:30 Microbial Spoilage in Ready-to-Eat Meats — ROBIN KALINOWSKI, NCFST, Summit-Argo, IL, USA

2:00 Strategies to Control Spoilage of Fresh Meats — RICHARD HOLLEY, University of Manitoba, Winnipeg, MB, Canada

2:30 Non-microbial Spoilage — DARREN CORNFORTH, Utah State University, Logan, UT, USA

3:00 Case Studies in Microbial Spoilage—Troubleshooting and Control — JEFF KORNACKI, Kornacki Microbiology Solutions, LLC, McFarland, WI, USA

S22 Mitigating Spoilage Risks in Ready-to-Drink Beverages

Nutcracker 1

Organizers: Nancy Jensen and Peter Taormina

Convenors: Nancy Jensen and Peter Taormina

1:30 Sources of Contamination of RTD Beverages — SEAN LEIGHTON, The Coca-Cola Company, Atlanta, GA, USA

2:00 Sanitary Equipment Design and Sanitation in the Beverage Industry — TIM GUTZMANN, Ecolab Inc., Eagan, MN, USA

2:30 Challenge Studies on RTD Beverages — CATHY MOIR, Food Science Australia, North Ryde, NSW, Australia

3:30 An Update on Spoilage of RTD Beverages by Alicyclobacilli and Sporolactobacilli — KEIICHI GOTO, Mitsui Norin Co. Ltd., Fujieda, Shizuoka, Japan and — HISATO IKEMOTO, Suntory Ltd., Kawasaki, Kanagawa, Japan

S23 Emerging Issues Affecting Dairy Product Quality and Safety

Nutcracker 2

Organizer: Dennis Gaalswyk

Convenors: Dennis Gaalswyk and Frank Burns

1:30 Storage Temperatures Necessary to Maintain Cheese Safety — MARIANNE SMUKOWSKI, Wisconsin Center for Dairy Research, Madison, WI, USA

2:00 Biological Barriers Currently Limiting Shelf-life Extension of HTST Fluid Milk: Identification of the Culprits — KATHRYN J. BOOR, Cornell University, Ithaca, NY, USA

2:30 Evaluation of the bioMérieux TEMPO System for the Detection of *Enterobacteriaceae*, Coliform, and *Escherichia* Coliform in Dairy Products and the Environment — KRISTEN DIXON, Chestnut Labs, Springfield, MO, USA

3:00 Pasteurizaiton Requirements for Dairy Products — JOHN LARKIN, FDA, Summit-Argo, IL, USA

ROUNDTABLE • 1:30 p.m. – 3:30 p.m.

RT6 Food Safety Laws: Political Science or Food Science

Nutcracker 3

Organizer: Caroline Smith DeWaal

Convenor: Caroline Smith DeWaal

1:30 Viewpoint: Former US Food Safety Regulator — MIKE TAYLOR, University of Maryland, School of Public Health, Baltimore, MD, USA

2:00 Viewpoint: International, World Health Organization — PETER BEN EMBAREK, World Health Organization, Geneva, Switzerland

2:30 Viewpoint: National Academy of Sciences, Academic — MICHAEL P. DOYLE, Center for Food Safety, University of Georgia, Griffin, GA, USA

3:00 To be determined — JENNY SCOTT, GMA/FPA, Washington, D.C., USA

TECHNICALS • 1:30 p.m. – 3:30 p.m.

T7 Epidemiology and Risk Assessment Technical Session

Ballroom of the Americas A

Convenors: David Lloyd and Marianne Miliotis

T7-01 1:30 Fresh Produce Outbreaks: Using Outbreak Data to Determine Attribution in Developing Risk Assessments — MICHAEL B. CASSIDY and Judy D. Greig, Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON, Canada

T7-02 1:45 An Evaluation of Risk Management in the New Product Development Process within Food Manufacturers — DAVID LLOYD, University of Wales Institute-Cardiff, Llandaf, Cardiff, South Glamorgan, Wales, UK

T7-03 2:00 Developing an Integrated Enteric Disease Surveillance System for Canada — FRANK POLLARI, Andre Ravel, Barbara Marshall, Angela Cook, Katarina Pintar, and Andrea Nesbitt, Public Health Agency of Canada, Guelph, ON, Canada

T7-04 2:15 Developing Risk Profiles to Assist Regulatory Decision Making — MARIANNE MILIOTIS, Sherri Dennis, Robert Buchanan, and John Hicks, USFDA-CFSAN, College Park, MD, USA

T7-05 2:30 Predictive Model for the Growth and Survival of *Vibrio vulnificus* in Chesapeake Bay Shellstock Oysters — LIGIA V.A. da SILVA, Mark L. Tamplin, Angelo DePaola, Chanelle White, John Bowers, Sivaranjani Pagadala, and Salina Parveen, Princess Anne, MD, USA

T7-06 2:45 Modeling Transfer of *Listeria monocytogenes* between Meat Slicer and Ham during Slicing — SHIOWSHUH SHEEN and Cheng-An Hwang, USDA-ARS-ERRC, Wyndmoor, PA, USA

3:00 Break

T7-07 3:30 Modeling the Survival of *Escherichia coli* O157:H7 during Fermentation, Drying, and Storage of a Soudjouk-style Fermented Dry or Semi-dry Sausage — CHENG-AN HWANG, Anna C.S. Porto-Fett, Vijay K. Juneja, Steven C. Ingham, Barbara H. Ingham, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

T7-08 3:45 Modeling to Predict the Fate of *Listeria monocytogenes* on Commercial Frankfurters as a Function of Storage Temperature and Time — YOHAN YOON, I. M. Barmpalia-Davis, I. Geornaras, and J. N. Sofos, Colorado State University, Fort Collins, CO, USA

T8 Education

Ballroom of the Americas B

Convenors: Kofi Adu-Nyako and Gisela Kopper

T8-01 1:30 *Salmonella* Newport as Reported by the Animal Arm of the National Antimicrobial Resistance Monitoring System – Enteric Bacteria (NARMS) — PAULA J. FEDORKA-CRAY, J. S. Bailey, C. R. Jackson, J. G. Frye, J. Haro, B. McGlinchey, and J. R. Plumblee, USDA-ARS-BEAR, Athens, GA, USA

T8-02 1:45 Barriers to Consumer Safe Food-handling Behaviors — Norman Porticella, Michael Shapiro, and ROBERT B. GRAVANI, Cornell University, Ithaca, NY, USA

T8-03 2:00 Withdrawn

T8-04 2:15 Examining Food Safety Behavior of Food Assistance Recipients Using the Health Belief Model — KOFI ADU-NYAKO, Ibrahim Salifou, and Arpitha R. Neravetia, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

T8-05 2:30 The Effect of Race and Ethnicity on Perceptions of Food Safety among United States Consumers — CRAIG K. HARRIS, Andrew Knight, and Michelle Worosz, Michigan State University, East Lansing, MI, USA

T8-06 2:45 Public Perception of Food Handling and Food Safety in Turkey — ARZU CAGRI-MEHMETOGLU, Sakarya University, Mühendsilik Fakültesi, Gyda Mühendislidi Bölümü, Adapazary, Turkey

T8-07 3:00 Costs and Benefits of Implementing HACCP in the Mexican Poultry Processing Sector — EMA S. MALDONADO, Pedro Arturo H. Martinez, Bertha Alicia R. Hernandez, and Jose Artemio M. Cadena, Universidad Autonoma Chapingo/Posgrado en Produccion Animal, Texcoco, Mexico

T8-08 3:15 Enhancing Food Safety Capabilities in Latin America and the Caribbean through Innovative, Online, Graduate Level Education — GISELA KOPPER and E. Perez, University for International Cooperation, San Jose, Costa Rica

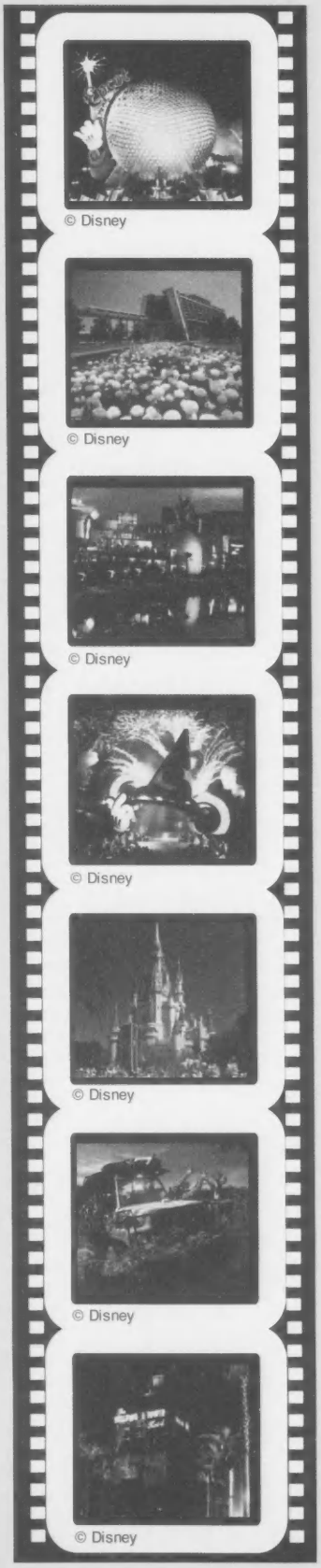
WEDNESDAY AFTERNOON, JULY 11

3:45 p.m. – 5:00 p.m.

John H. Silliker Lecture – *Ballroom of the Americas B*

Trends in Food Safety Management

Terry A. Roberts, Ph.D., Food Safety Hygiene Consultant, Reading, England



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IAFP 2007 NETWORKING OPPORTUNITIES

IAFP FUNCTIONS

WELCOME RECEPTION
Saturday, July 7 • 5:00 p.m. – 6:30 p.m.

Reunite with colleagues from around the world as you socialize and prepare for the leading food safety conference. Everyone is invited!

COMMITTEE MEETINGS
Saturday, July 7 • 3:00 p.m. – 4:30 p.m.
Sunday, July 8 • 7:00 a.m. – 5:00 p.m.

Refreshments sponsored by Springer

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 committees or PDGs. Everyone is invited to attend.

STUDENT LUNCHEON
Sunday, July 8 • 12:00 p.m. – 1:30 p.m.

Sponsored by Texas A&M Agriculture, Department of Animal Science, Food Safety

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.

EDITORIAL BOARD RECEPTION
Sunday, July 8 • 4:30 p.m. – 5:30 p.m.

Editorial Board Members are invited to this reception to be recognized for their service during the year.

OPENING SESSION AND IVAN PARKIN LECTURE
Sunday, July 8 • 6:00 p.m. – 7:00 p.m.

Join us to kick off IAFP 2007 at the Opening Session. Listen to the prestigous Ivan Parkin Lecture delivered by Carl S. Custer.

CHEESE AND WINE RECEPTION
Sunday, July 8 • 7:00 p.m. – 9:00 p.m.

Sponsored by Kraft Foods

An IAFP tradition for attendees and guests. The reception begins in the Exhibit Hall immediately following the Ivan Parkin Lecture on Sunday evening.

IAFP JOB FAIR
Sunday, July 8 through Wednesday, July 11

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, July 9 • 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 committee.

EXHIBIT HALL LUNCH
Monday, July 9 • 12:00 p.m. – 1:00 p.m.

Sponsored by JohnsonDiversey

Tuesday, July 10 • 12:00 p.m. – 1:00 p.m.

Sponsored by SGS North America

Stop in the Exhibit Hall for lunch and networking on Monday and Tuesday.

EXHIBIT HALL RECEPTIONS
Monday, July 9 • 5:00 p.m. – 6:00 p.m.

Sponsored by DuPont Qualicon

Tuesday, July 10 • 5:00 p.m. – 6:00 p.m.

Join your colleagues in the Exhibit Hall to see the most up-to-date trends in food safety techniques and equipment. Take advantage of these great networking receptions.

PRESIDENT'S RECEPTION (By invitation)
Tuesday, July 10 • 6:00 p.m. – 7:00 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, July 10 • 7:00 p.m. – 9:30 p.m.

Past Presidents and their guests are invited to this dinner to socialize and reminisce.

BUSINESS MEETING
Tuesday, July 10 • 12:15 p.m. – 1:00 p.m.

You are encouraged to attend the Business Meeting to keep informed of the actions of YOUR Association.

JOHN H. SILLIKER LECTURE
Wednesday, July 11 • 4:00 p.m. – 4:45 p.m.

The John H. Silliker Lecture will be delivered by Dr. Terry A. Roberts.

AWARDS BANQUET
Wednesday, July 11 • 7:00 p.m. – 9:30 p.m.

Bring IAFP 2007 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Frank Yiannas, M.P.H. to Incoming President, Dr. Gary R. Acuff.

IAFP 2007
Event Information

EVENING EVENTS

American Adventure at *Epcot*®
Monday, July 9 • 6:30 p.m. – 10:00 p.m.
Sponsored by DuPont Qualicon

Travel backstage *Epcot*® where you will be escorted to the American Adventure Rotunda. Relive America's glorious past in the beautiful setting of a classic 18th century American Rotunda. A reception-style dinner will be offered as you enjoy the magnificent setting. The finale of the evening takes you outside to an exclusive dessert party in a viewing area overlooking the World Showcase Lagoon. Here, experience the premier night-time spectacular at *Epcot*®, *IllumiNations: Reflections of Earth*. This one-of-a-kind show tells its story and touches the spirit by combining video technology, water fountains, lasers, special lighting effects, and pyrotechnics, all programmed to an original musical score. A perfect finish to your *Epcot*® Adventure.

IAFP Foundation Fundraiser – Adventurers Club at Downtown Disney®
Tuesday, July 10 • 6:30 p.m. – 9:30 p.m.

This will be a night to remember! You will be transported to Downtown Disney® and escorted through the streets of Pleasure Island to the Adventurers Club. The entertainment here is outrageous as the world's most eccentric explorers welcome you to their legendary club of the 1930s. Swap tall tales with a marvelously mad professor, a dashing daredevil pilot, a frisky French maid, and other characters while you enjoy live shows featuring everything from talking masks and a floating head to a ghostly piano. A reception-style buffet will be offered while the show happens all around you. At the conclusion of the event you will have the option to remain at Downtown Disney® and experience all of the clubs of Pleasure Island or return to the *Contemporary* Resort.

GOLF TOURNAMENT

Golf Tournament at *Disney's Magnolia* Golf Course
Saturday, July 7 • 6:30 a.m. – 12:30 p.m.

Join your friends and colleagues for a relaxing round of golf before IAFP 2007. Step onto the first tee and into the shoes of champions. These beautifully manicured links, designed by Joe Lee, are named for an abundance of fragrant Magnolias. Elevated tees, spacious greens and tranquil water hazards immerse you in a natural setting fit for a fulfilling round of championship golf. Enhance your on-course experience with the latest GPS Technology in each golf cart. *Disney's Magnolia* has provided a backdrop for the PGA Tour's elite for over 30 years. A classic Florida golf course, complete with a Mickey Mouse bunker!

Price includes transportation, greens fees with cart, range balls, lunch and prizes.

DAYTIME TOURS

Kennedy Space Center
Saturday, July 7 • 8:30 a.m. – 4:30 p.m.

Each year, millions of visitors make the trek to Kennedy Space Center, NASA's launch headquarters, where many of mankind's greatest accomplishments take place. Your exploration starts with a world-renowned tour where you see many NASA landmarks, including the massive launch pads, the gigantic Vehicle Assembly Building, the awe-inspiring Apollo/Saturn V Center and the International Space Center. View 10-story high rockets from all eras of space exploration in the Rocket Garden, walk through a full-size Space Shuttle mock-up, enjoy IMAX Theater space films on gigantic five-story screens and see an actual Gemini program capsule on display. You will also have lunch with an astronaut. Share in the excitement of space exploration through the eyes and personal stories of one of NASA's best while enjoying a buffet meal. You will have an inspiring day at Kennedy Space Center!

NOTE: Government-issued photo identification is required.

Merritt Island Airboat Excursion
Sunday, July 8 • 9:00 a.m. – 3:00 p.m.

Merritt Island National Wildlife Refuge is certified as the greatest endangered wildlife experience in North America. Our first stop is at the visitors' center for a 20-minute orientation film. Then, take an easy one-hour nature walk through one of the diverse, critical hardwood hammock habitats. Infused with wildlife, more than 1,000 species of plants are found throughout the refuge. Enjoy a picnic lunch at the refuge before heading to the Manatee over-look area. Then it's off to St. John's River for refreshments and gator tail. Certified eco-guides and Coast Guard captains will then take you on a 30-minute airboat tour through central Florida's everglades. Binoculars will be supplied for your viewing pleasure.

***Disney* Behind-the-Scenes Tour – Innovation in Action**
Monday, July 9 • 9:00 a.m. – 12:00 p.m.

When most people hear the name "Walt Disney," they think of *Mickey Mouse*, classic movies, and theme parks. What they often don't think of, or even know about, are his many innovative ideas that eventually led to the creation of the *Walt Disney World*® Resort. Innovation in action highlights Walt's many accomplishments and takes you on an unforgettable journey where you will see, first-hand, how Disney makes "magic"! Tour places most Guests never get to see including:

- *The Walt Disney World*® Nursery and Tree Farm – See how Disney horticulturists create world-famous topiaries.
- Textile Services – Visit the new state-of-the-art laundry facility, one of the largest in the world.
- Main Street, U.S.A.® – Discover how Walt's life and film career heavily influenced this turn-of-the-century location.
- The "Utilidor" System – Journey beneath the *Magic Kingdom*® Park to visit support systems located in the "tunnel."

NOTE: You must be 16 years old and carry a government-issued photo identification. There is walking involved, so comfortable shoes are recommended and attire should be suitable for current weather conditions.

***Disney* Behind-the-Scenes Tour – Gardens of the World**
Tuesday, July 10 • 9:00 a.m. – 12:00 p.m.

Everywhere you look at the *Walt Disney World*® Resort, the trees, shrubs and flowers play a vital role in setting the stage for recreation, entertainment, and beauty. Disney landscaping has become a recognized show in itself, providing color and enjoyment throughout the year. Your horticulture instructor turns *Epcot*® into a living classroom, using facilities "on stage" to describe the basic process of plant design and how it is incorporated in the landscape for the World Showcase pavilions. In addition, you will learn how you can apply many of these design elements to theme your home garden.

NOTE: You must be 16 years old and carry a government-issued photo identification. There is walking involved, so comfortable shoes are recommended and attire should be suitable for current weather conditions.

***Disney* Cooking Class – Now That's a Panini**
Wednesday, July 11 • 10:30 a.m. – 1:30 p.m.

The sights, sounds and wonderful aromas of a Disney cooking demonstration will make your mouth water! A Disney Chef will share some great ideas for creating magical meals on your grill at home. A sample of items include: cigar shrimp, jerk skewered chicken, balsamic glazed portobello mushroom skewers, tequila and lime beef quesadillas and pizzas sweet and savory. You will not go away hungry!

FIELD TOURS

Food Safety is Magical, But It Doesn't Magically Happen
Saturday, July 7 or Thursday, July 12
9:00 a.m. – 12:00 p.m.

During this tour, you will learn about the world-class food safety program at the *Walt Disney World*® Resort. This tour will include a presentation on the theory and operational aspects of Disney's food safety program, followed by a walking tour of one of the largest food service operations on property to illustrate the application of principles.

Behind the Seeds Tour
Saturday, July 7 or Thursday, July 12
9:00 a.m. – 12:00 p.m.

Get "up close and personal" with plants, insects and fish to explore and discover how scientists are working on innovative technology to support the future of food production. You will learn about the use of aquaculture in production of fish and shellfish, innovative plant-growing techniques and the use of predator insects to control pests.

Reedy, Set, Go – Behind the Scenes of Environmental Services
Thursday, July 12 • 9:00 a.m. – 12:00 p.m.

Go behind the scenes of the Reedy Creek Improvement District Environmental Services lab. This tour will include an overview of the history of the Reedy Creek Improvement District, a discussion of the essential role they play in monitoring the environment on and around the *Walt Disney World*® Resort property and a tour of the environmental services laboratory operations.

Food Irradiation Facility Tour
Thursday, July 12 • 8:30 a.m. – 11:30 a.m.

This is your opportunity to tour the Food Technology Service, Inc. facility. Food Tech was constructed as the nation's first commercial food irradiation company. Since 1992, the facility has been the leader in processing irradiated produce, poultry, and meat products for processors, retailer, and foodservice companies.

Food Tech has a long history of partnering with its customers to educate, introduce and implement irradiation as a food safety tool. Don't miss this exciting opportunity to see a working gamma food irradiation plant and learn more about this technology.

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

MEETING INFORMATION

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

Full Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- John H. Silliker Lecture
- Exhibit Hall Lunch (Mon.-Tues.)
- Awards Banquet
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception (Mon.-Tues.)
- 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 June 5, 2007. After this date, late registration fees are in effect.

CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by June 22, 2007. No refunds will be made after June 22, 2007; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 16, 2007.

Event and tour tickets purchased are nonrefundable.

International Association for Food Protection®

EXHIBIT HOURS

Sunday, July 8, 2007	7:00 p.m. – 9:00 p.m.
Monday, July 9, 2007	10:00 a.m. – 6:00 p.m.
Tuesday, July 10, 2007	10:00 a.m. – 6:00 p.m.

DAYTIME EVENTS

Saturday, July 7, 2007	8:30 a.m. – 4:30 p.m.
Kennedy Space Center (Lunch included)	
Sunday, July 8, 2007	9:00 a.m. – 3:00 p.m.
Merritt Island Airboat Excursion (Lunch included)	
Monday, July 9, 2007	9:00 a.m. – 12:00 p.m.
Disney Behind-the-Scenes Tour–Innovation in Action	
Tuesday, July 10, 2007	9:00 a.m. – 12:00 p.m.
Disney Behind-the-Scenes Tour–Gardens of the World	
Wednesday, July 11, 2007	10:30 a.m. – 1:30 p.m.
Disney Cooking Class – Now That's a Panini (Lunch included)	

EVENING EVENTS

Sunday, July 8, 2007	
Opening Session	6:00 p.m. – 7:00 p.m.
Cheese and Wine Reception *Sponsored by Kraft Foods*	7:00 p.m. – 9:00 p.m.
Monday, July 9, 2007	
Exhibit Hall Reception *Sponsored by DuPont Qualicon*	5:00 p.m. – 6:00 p.m.
Monday Night Social – American Adventure at *Epcot*® *Sponsored by DuPont Qualicon*	6:30 p.m. – 10:00 p.m.
Tuesday, July 10, 2007	
Exhibit Hall Reception	5:00 p.m. – 6:00 p.m.
IAFP Foundation Fundraiser – *Disney's* Adventurers Club	6:30 p.m. – 9:30 p.m.
Wednesday, July 11, 2007	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

FIELD TOURS

Saturday, July 7, 2007 (Limited number of tickets available)	
Food Safety is Magical, But It Doesn't Magically Happen	9:00 a.m. – 12:00 p.m.
Behind the Seeds Tour	9:00 a.m. – 12:00 p.m.
Thursday, July 12, 2007 (Limited number of tickets available)	
Food Safety is Magical, But It Doesn't Magically Happen	9:00 a.m. – 12:00 p.m.
Behind the Seeds Tour	9:00 a.m. – 12:00 p.m.
Reedy, Set, Go – Behind the Scenes of Environmental Services	9:00 a.m. – 12:00 p.m.
Food Irradiation Facility Tour	8:30 a.m. – 11:30 a.m.

GOLF TOURNAMENT

Saturday, July 7, 2007	
Golf Tournament at *Disney's Magnolia* Golf Course	6:30 a.m. – 12:30 p.m.

HOTEL INFORMATION

Hotel reservations can be made online at www.foodprotection.org.

International Association for Food Protection
6200 Aurora Avenue, Suite [illegible]W
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

IAFP 2007 Registration Form

IAFP 2007 • 94th Annual Meeting • July 8–11 • Lake Buena Vista, Florida

Member Number: _____

First name (as it will appear on your badge) _____ Last name _____

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.

❒ 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 JUNE 5, 2007 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES	MEMBERS	NONMEMBERS	TOTAL
Registration	$ 405 ($ 455 late)	$ 615 ($ 665 late)	
Association Student Member	$ 80 ($ 90 late)	Not Available	
Retired Association Member	$ 80 ($ 90 late)	Not Available	
One Day Registration* ❒ Mon. ❒ Tues. ❒ Wed.	$ 220 ($ 245 late)	$ 340 ($ 365 late)	
Spouse/Companion* (Name): _____	$ 60 ($ 60 late)	$ 60 ($ 60 late)	
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	
Children 14 & Under* (Names): _____	FREE	FREE	
*Awards Banquet not included			
Additional Awards Banquet Ticket – Wednesday, 7/11	$ 50 ($ 60 late)	$ 50 ($ 60 late)	
Student Luncheon – Sunday, 7/8	$ 10 ($ 15 late)		
DAYTIME EVENTS		**# OF TICKETS**	
Golf Tournament – Saturday, 7/7 (Lunch included)	$ 165 ($ 175 late)		
Kennedy Space Center – Saturday, 7/7 (Lunch included)	$ 99 ($ 109 late)		
Merritt Island Airboat Excursion – Sunday, 7/8 (Lunch included)	$ 110 ($ 120 late)		
Disney Behind-the-Scenes Tour–Innovation in Action – Monday, 7/9	$ 105 ($ 115 late)		
Disney Behind-the-Scenes Tour–Gardens of the World – Tuesday, 7/10	$ 104 ($ 114 late)		
Disney Cooking Class – Now That's a Panini – Wednesday, 7/11	$ 50 ($ 60 late)		
EVENING EVENTS			
Monday Night Social – American Adventure at *Epcot*® – Monday, 7/9	$ 45 ($ 55 late)		
IAFP Foundation Fundraiser – *Disney's* Adventurers Club – Tuesday, 7/10	$ 150 ($ 160 late)		
FIELD TOURS			
Saturday, 7/7 (Limited number of tickets available)			
Food Safety is Magical, But It Doesn't Magically Happen	$ 10		
Behind the Seeds Tour	$ 10		
Thursday, 7/12 (Limited number of tickets available)			
Food Safety is Magical, But It Doesn't Magically Happen	$ 10		
Behind the Seeds Tour	$ 10		
Reedy, Set, Go – Behind the Scenes of Environmental Services	$ 10		
Food Irradiation Facility Tour	$ 10		

PAYMENT OPTIONS: ❒ VISA ❒ MasterCard ❒

❒ Check Enclosed

TOTAL AMOUNT ENCLOSED $ _____
US FUNDS on US BANK

Credit Card # _____

Expiration Date _____

Name on Card _____

Signature _____

Refunds subject to cancellation policy

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 2007 WORKSHOPS

WORKSHOP 1	WORKSHOP 2	WORKSHOP 3	WORKSHOP 4
Environmental Sampling of Food and Water – Wet Lab	**Creating a Food Safety Management System (FSMS)**	**Predictive Microbiology as a HACCP Validation and Support Tool**	**Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop**
Friday and Saturday, July 6–7	Saturday, July 7	Saturday, July 7	Saturday, July 7
8:00 a.m. – 5:00 p.m.	**8:00 a.m. – 5:00 p.m.**	**8:00 a.m. – 5:00 p.m.**	**8:00 a.m. – 5:00 p.m.**

Workshop 1 – Environmental Sampling of Food and Water – Wet Lab – Friday and Saturday, July 6–7

Organized in cooperation with the Applied Methods PDG

This course is designed for laboratory technical staff, laboratory managers, supervisors and quality assurance managers and others responsible for making decisions about sampling plans and corrective actions in response to data retrieved in food production facilities. Topics of discussion and demonstrations include food and ingredient sampling plans, sample compositing schemes, and environmental swabbing and sampling in a production facility, to include air and water testing. The workshop program will include demonstration by vendors and opportunity for laboratory hands-on experience. The workshop will provide a close networking environment for discussion with instructors and other participants as well as a binder of information to reinforce the practical experience gained during the workshop.

Topics:

- Principles and Applications of Sampling for Foods and Food Environments: Challenges and Opportunities
- New and Novel Approaches to Sampling the Environment with Method Demonstrations
- Environmental Sampling Plans, Compositing Methodology, Frequency and Corrective Action
- Pathogen Specific vs. Standard Hygiene Monitoring
- ATP and Allergen Testing Discussions and Demonstrations
- Laboratory Hands-on Experience Including Related Methodologies via Vendor Demonstration

Intended Audience

Microbiologists, quality assurance and laboratory personnel, especially professionals in small- to medium-sized laboratories or companies

Instructors:

Bruce Bradley, Microbial-Vac, Jerome, ID, USA
Larry Cohen, Kraft Foods, Inc., Glenview, IL, USA
Tim Freier, Cargill, Minneapolis, MN, USA
Charles Gerba, University of Arizona-Tempe, Tuscon, AZ, USA
Elliot Ryser, Michigan State University, East Lansing, MI, USA
Jeff Kornacki, Kornacki Microbiology Solutions Inc., McFarland, WI, USA
Purnendu C. Vasavada, University of Wisconsin-River Falls, River Falls, WI, USA

Organizers:

Jeff Kornacki, Kornacki Microbiology Solutions Inc., McFarland, WI, USA
Purnendu C. Vasavada, University of Wisconsin-River Falls, River Falls, WI, USA

Laboratory Host:

Roseann S. White, University of Central Florida, Orlando, FL, USA

Workshop 2 – Creating a Food Safety Management System (FSMS) – Saturday, July 7

Ongoing public concerns regarding the safety of the food supply have not abated. Stimulated by a steady stream of food safety incidents and resultant media attention, today's consumers have lost confidence in some sectors of the food supply. Consumers want assurances the food they buy is safe to eat, regardless of where it was grown, raised, or manufactured. They are asking questions about the integrity of the food supply – how is food safety maintained? Who is providing the assurance? Who is validating and verifying the systems implemented?

Retailers and food service corporations, sensitive to the demands of their customers, now require their food suppliers implement better and more consistent food safety and quality management systems (and this is not to be confused with "just having an audit").

The purpose of this workshop is to raise awareness of the need for food suppliers to implement credible food safety management systems. Information will be provided on the different food safety management systems that suppliers can choose from. The content will cover the importance of gaining management commitment, outline how to develop and implement a food safety management system and finally how to validate and verify the food safety controls implemented. Further instruction will be provided on how to conduct internal audits (self assessment) and to prepare for the external audit.

A panel session at the end of the day will enable participants to further discuss the topics covered.

Topics:

- Why Do You Need a FSMS?
- Choosing the Food Safety Standard That Meets Your Business Needs and the Needs of Your Customer
- Where are You and Where Do You Want to Be?
- Documenting and Implementing Your FSMS – A Case Study
- Validating and Verifying the FSMS – Internal and External Audits

Intended Audience

Retailers, manufacturers/ processors, food service companies, primary producers, food safety professionals (auditors, trainers, consultants), food regulators

Instructors:

Richard Baines, Management Systems Food Safety and Environment, Royal Agricultural College, Cirencester, Gloucestershire, UK
Larry Hood, JohnsonDiversey Consulting, Bridgewater, NJ, USA
Marjorie Jones, SGS Consumer Testing Services, Fairfield, NJ, USA
Paul Ryan, Food Marketing Institute, Arlington, VA, USA

Organizer:

Paul Ryan, Food Marketing Institute, Arlington, VA, USA

Workshop 3 – Predictive Microbiology as a HACCP Validation and Support Tool – Saturday, July 7

How severe is this cooling deviation? How long does it take for pathogens to grow at low temperatures such as 50°F? What can the HACCP team do to justify the rationale behind chosen critical limits? Does my heat treatment provide sufficient lethality? What are the boundaries for microbial growth that I can use for product formulation? Increasingly, both regulatory agencies and food industry scientists and managers are placing a renewed emphasis on HACCP validation for important pathogens such as *C. perfringens*, *B. cereus*, *S. aureus*, *Salmonella*, and *L. monocytogenes*, just to name a few. This workshop will serve as an introduction to the practical application of predictive microbiology as a tool to help answer such questions. Scientific and regulatory perspective on using predictive microbiology will be presented, along with an overview and demonstration of growth, survival and inactivation models in programs such as the Pathogen Modeling Program, ComBase Growth Predictor, and the Integrated Lethality Spreadsheet. Half a dozen case studies will be presented and discussed, including a hands-on working group exercise to illustrate the use (and how to avoid misuse) of various models to address real life problems.

Topics:

- Scientific Perspective on Predictive Microbiology and Its Relationship to HACCP Validation
- Fundamentals of Predictive Microbiology
- Overview and Demonstration of Software Tools
- Regulatory Perspective of FSIS and FDA on the Use of Predictive Microbiology
- Case Study and Working Group Exercises

Intended Audience

Food industry professionals responsible for HACCP validation; food safety and quality assurance professionals; and regulatory agency officials and academic food microbiologists with a special interest in predictive microbiology

Instructors:

Richard Whiting, Food and Drug Administration, College Park, MD, USA
Donald Schaffner, Rutgers University, New Brunswick, NJ, USA
Yuhuan Chen, GMA/FPA, Washington, D.C., USA
Jenny Scott, GMA/FPA, Washington, D.C., USA

Organizers:

Yuhuan Chen, GMA/FPA, Washington, D.C., USA
Donald Schaffner, Rutgers University, New Brunswick, NJ, USA

Workshop 4 – Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop – Saturday, July 7

While the number of recalls due to *Listeria monocytogenes* contamination on ready-to-eat meat and poultry products have decreased, the pathogen is still a challenge to control for meat and poultry processors, especially the small processors. There have been several efforts to control this pathogen for the past decade, but recent USDA-FSIS regulations have prompted the RTE meat and poultry industry to take a fresh look and institute controls to reduce the risk of this pathogen. There is an increasing volume of research being conducted on control strategies for this pathogen, especially in RTE meat and poultry products. These strategies include improved sanitation methods to eliminate the pathogen from the RTE meat and poultry processing environment, post-lethality treatments to reduce the populations as well as a myriad of antimicrobial agents to control growth during subsequent refrigerated storage. This workshop is intended to train the trainers such as extension personnel at land grant universities, food safety personnel at meat processing establishments and other food safety consultants who work with processors routinely.

This train-the-trainer workshop is partially funded by a grant from the National Integrated Food Safety Initiative (Special Emphasis Grant No. 2005-51110-03278) of the Cooperative State Research, Education, and Extension Service, US Department of Agriculture to Colorado State University, Cornell University, University of Nebraska-Lincoln, Kansas State University and The Ohio State University. The project focused on the development of methods and technologies to reduce the risk of *L. monocytogenes* in RTE meat and poultry products. The workshop is designed to provide state-of-the-art knowledge on control of *L. monocytogenes* and reducing its risk to the processors as well as the consumers.

Topics:

- Communicating with an Adult Audience – Relevance to Extension Education Programs
- *Listeria monocytogenes*: Is It Still an Issue in RTE Meat and Poultry Products?
- *Listeria monocytogenes* – Ecology of an Elusive Foodborne Pathogen in RTE Processing Environment
- Regulations Pertaining to RTE Meat and Poultry Products – Current Perspective
- Post Lethality Treatments to Reduce *Listeria monocytogenes* on RTE Meat and Poultry Products – An Update
- Antimicrobial Agents to Control *Listeria monocytogenes* on RTE Meat and Poultry Products – An Update
- Strategies to Control *Listeria monocytogenes* on RTE Meat and Poultry Products – A Small Processor Perspective

Intended Audience

Extension specialists in the areas of food safety, microbiology and meat processing as well as food safety and QA personnel from the RTE meat and poultry industry

Instructors:

Dennis E. Burson, University of Nebraska, Lincoln, NE, USA
Pat Kendall, Colorado State University, Fort Collins, CO, USA
Randall Phebus, Kansas State University, Food Science Institute, Manhattan, KS, USA
John Sofos, Colorado State University, Fort Collins, CO, USA
Harshavardhan Thippareddi, University of Nebraska, Lincoln, USA
Martin Wiedmann, Cornell University, Ithaca, NY, USA

Organizer:

Harshavardhan Thippareddi, University of Nebraska, Lincoln, NE, USA

IAFP 2007 WORKSHOP REGISTRATION FORM

First Name (will appear on badge) _____

Last Name _____

Company _____ Job Title _____

Address _____ City _____

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

Area Code & Telephone _____ Fax _____

E-mail _____ Member # _____

❒ Check Enclosed ❒ VISA ❒ ❒

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

Account Number _____ Expiration date _____

Signature _____

*** REGISTRATION ***

Payment must be received by June 15, 2007 to avoid late registration rates.

WORKSHOP 1	Early Rate	Late Rate
IAFP Member	$575.00	$650.00
NonMember	$675.00	$750.00

WORKSHOP 2	Early Rate	Late Rate
IAFP Member	$375.00	$450.00
NonMember	$475.00	$550.00

WORKSHOP 3	Early Rate	Late Rate
IAFP Member	$360.00	$435.00
NonMember	$460.00	$535.00

WORKSHOP 4	Early Rate	Late Rate
Extension Specialist	$150.00	$225.00
Other	$350.00	$425.00

GROUP DISCOUNT:
Register 5 or more people from your company and receive a 15% discount. Registrations must be received as a group.

For student rates, call the Association office.

Refund/Cancellation Policy
Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by June 22, 2007. 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 July 16, 2007. The workshop may be cancelled if sufficient enrollment is not received by June 15, 2007.

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 ***

Register online or 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, USA

IAFP 2007 Exhibitors

Companies scheduled to exhibit as of May 7, 2007

▲ Indicates IAFP Sustaining Member

▲ 3-A Sanitary Standards, Inc.
703.790.0295 www.3-a.org

▲ 3M Microbiology
800.328.1671 www.3m.com/microbiology

A&B Ingredients, Inc.
973.227.1390 www.abingredients.com

A2LA (American Association for Laboratory Accreditation)
301.644.3204 www.a2la.org

▲ ABC Research Corporation
352.372.0436 www.abcr.com

Accugenix, Inc.
800.886.9654 www.accugenix.com

Advanced Instruments, Inc.
800.225.4034 www.aicompanies.com

AES – Chemunex, Inc.
609.497.0166 www.aeschemunex.com

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WTI – A World Leader in Food Safety and Functional Food Ingredients

World Technology Ingredients Company, Inc. (WTI, Inc) is a specialty ingredients company founded in 1978 to provide ingredients and technology to the meat, poultry and seafood industries. Since 1988, World Technology Ingredients has been issued 12 patents in ingredient and food process technology.

WTI manufactures dry and liquid ingredients for use by food manufacturers to enhance finished product performance and inhibit a broad range of bacteria, yeast and molds. All ingredients manufactured and sold by World Technology Ingredients are approved for use in USDA and FDA regulated products. All WTI ingredients are Generally Recognized As Safe (GRAS), nonallergenic and safe for direct contact.

WTI opened its new state of the art production facility in Jefferson, Georgia in December 2005 with additional capacity to do Custom Blending and Contract Packaging. The facility, carefully designed to exceed all Good Manufacturing Practices (GMP's) requirements received a SUPERIOR rating by the AIB on its very first inspection.

WTI is committed to providing safe, new and innovative solutions for its customers. Through leading edge research and technical initiatives, WTI is able to meet the needs of its customers, both large and small. Our goal is simple – to continuously identify and develop new ingredients/technology which provides our customers the tools to profitably succeed.

WTI Products Portfolio

World Technology Ingredients manufactures five different brands of product, each designed to profitably enhance selected performance attributes of a wide variety of foods. The product lines are: *IONAL, Myosol, MOstatin, TenderIn, Marinal and FlavorIn.*

IONAL Products

The *IONAL* brands of antimicrobials consist of three basic product lines: *IONAL, IONAL Plus* and *IONAL LC* – all based upon blends of buffered citrates alone or in combination with diacetate or acetate. Since it's approval as an antimicrobial for meats and poultry in 1995 extensive research has been conducted into the use of buffered citrates to inhibit the growth of pathogenic and nonpathogenic bacteria in/on raw and ready to eat meats and poultry.

IONAL is straight buffered sodium or potassium citrate. As the name implies it increases ionic strength. In muscle protein systems this equates to increased marinade/brine retention and yield during processing with less moisture migration and purge in the finished package.

IONAL Plus products are buffered citrates with diacetate or acetate. It primarily is used to increase the shelf life of perishable foods, especially raw marinated meats, fish and poultry. Typically incorporation of *IONAL Plus* into a food system will double the products shelf life.

IONAL LC products are buffered citrates with diacetate or acetate which have been specifically formulated to inhibit the growth of pathogenic bacteria such as *Listeria monocytogenes* in/on foods, especially ready to eat meats. Studies have also shown it to be an effective means of inhibiting the outgrowth of *Clostridium perfringens*.

Myosol Products

Myosol branded liquid phosphates; Myosol and *Myosol Plus* are performance enhanced functional ingredients designed to improve product/process yield and meat tenderness. *Myosol* brand phosphates are supersaturated tetrapotassium pyrophosphate solutions which are pH optimized to meet your specific needs. They are readily soluble in cold water and instantaneously reactive in meat systems.

MOstatin Products

MOstatin brand products are all natural, consumer friendly, clean label ingredients designed to enhance the retention qualities of marinades in muscle foods and inhibit the growth of pathogens and spoilage microorganisms in a wide array of food systems. MO for microorganism; statin for stasis or no growth. There are four basic product lines of *MOstatins: MOstatin LV, MOstatin V, MOstatin VE, and MOstatin LVE. MOstatins* have been successfully used as a CCP for *Listeria* in ham. They have also performed successfully against this pathogen of public health significance in refrigerated salads and soups.

MOstatin LV

MOstatin LV is an all natural blend of lemon juice concentrate and vinegar designed to enhance the organoleptic properties of foods while inhibiting a broad spectrum of bacteria, yeast and molds. *MOstatin LV* increases the water holding capacity of muscle protein systems. At low concentrations *MOstatin LV* does not have any flavor impact on the finished product. At higher concentrations, its slight citric taste enhances the natural flavors of meats, fish, poultry and vegetables.

MOstatin V

MOstatin V is a buffered vinegar product designed to inhibit a broad spectrum of bacteria, yeast and molds in foods. At low concentrations *MOstatin V* does not have any flavor impact on the finished product. At higher concentrations it yields a slight vinegar taste and odor.

MOstatin VE

MOstatin VE is a buffered vinegar system with native tapioca or potato starch designed to enhance/increase marinade retention in ready to eat muscle foods while inhibiting a broad spectrum of bacteria, yeast and molds. At low concentrations *MOstatin VE* does not have any flavor impact on the finished product. At higher concentrations it yields a slight vinegar taste and odor.

MOstatin LVE

MOstatin LVE is on all natural blend of lemon juice concentrate, vinegar and native tapioca or potato starch. It is designed to increase cook yield of ready to eat muscle foods while inhibiting pathogen and nonpathogenic bacteria, yeast and molds.

Marinal Products

Marinal brand marinades are customized systems designed to deliver maximum performance at an affordable cost. They are specially formulated to maximize the interactions between substrate, process and packaging in order to achieve the customers' desired performance objectives.

TenderIns

TenderIns are all natural, consumer friendly, clean label alternatives to phosphates for use in muscle foods. *TenderIns* are derived from fruit juices and vegetable bi-products. They are species specific products – each formulated to accommodate the different functional characteristics encountered by different muscle foods: a.k.a. beef, chicken, pork, turkey or fish.

TenderIn L

TenderIn L is the liquid form of *TenderIns*, each custom blended to meet the specific performance requirements of a wide range of food systems.

TenderIn DL

TenderIn DL is processed lemon juice concentrate dried onto a rice flour carrier designed to increase the cook yield of ready to eat meats and overall viscosity of food systems. The rice flour is a specialty blend formulated to deliver the optimum amylose and amylopectin concentrations. Its unique properties in cooked systems make *TenderIns* a viable alternative to phosphates.

FlavorIns

FlavorIns are all natural flavor systems derived from fruit, vegetable and vinegar based ingredients designed to enhance to organoleptic attributes of food systems throughout the shelf life of a product. They are available in both a dry and liquid form depending upon the desired functionality in the finished product.

IAFP 2007 Exhibitor

COMING EVENTS

JULY

- **6–7, IAFP 2007 Workshops,**
  Workshop 1 – Environmental Sampling of Food and Water – Wet Lab
  Workshop 2 – Creating a Food Safety Management System (FSMS)
  Workshop 3 – Predictive Microbiology as a HACCP Validation and Support Tool
  Workshop 4 – Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop
  For more information, contact Julie Cattanach at 800.369.6337; E-mail: jcattanach@foodprotection.org. See our registration form on page 493.
- **8–11, IAFP 2007,** *Disney's Contemporary* Resort, Lake Buena Vista, FL. For more information, contact Julie Cattanach at 800.369.6337; E-mail: jcattanach@foodprotection.org. See our registration form on page 489.
- **10–12, Meat and Poultry Marination Short Course,** University of Georgia Food Science, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.com.
- **17, GMA/FPA HACCP Train-the-Trainer Workshop,** GMA/FPA Conference Center, Washington, D.C. For more information, contact Jenny Scott at 202.639.5985 or go to http://www.fpa-food.org/content/FSW.asp.
- **28–Aug. 1, Institute of Food Technologists Annual Meeting and Food Expo,** Chicago, IL. For more information, call 312.782.8424; E-mail: info@ift.org.

AUGUST

- **7–9, Using SPC for HACCP Verification in Poultry and Food Industry,** University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- **13–17, Introduction to Food Microbiology Short Course,** Boise State University, Boise, ID. For more information, contact Paula Peterman at 208.364.6188; E-mail: paulap@uidaho.edu.
- **21–23, Developing & Implementing Food Safety Programs,** Atlanta, GA. For more information, contact AIB International at 800.633.5137 or go to www.aibonline.org.

SEPTEMBER

- **11–12, GMA/FPA Advanced HACCP: Verification and Validation Workshop,** GMA/FPA Conference Center, Washington, D.C. For more information, contact Jenny Scott at 202.639.5985 or go to http://www.fpa-food.org/content/FSW.asp.
- **11–12, Meat & Poultry HACCP Accredited Workshop,** University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- **12–13, China International Food Safety and Quality Conference and Expo,** The Landmark Tower Hotel, Beijing, China. *Program assistance provided by IAFP.* For more information, go to www.chinafoodsafety.com.
- **18–20, New York State Association for Food Protection 84th Annual Conference,** E. Syracuse, NY. For more information, contact Janene Lucia at 607.255.2892; E-mail: jgg3@cornell.edu.
- **19–21, Washington Association for Food Protection Annual Meeting,** Campbell's Resort and Conference Center, Lake Chelan, WA. For more information, contact Stephanie Olmsted at 206.660.4594; E-mail: Stephanie.Olmsted@safeway.com.
- **24–26, Indiana Environmental Health Association Fall Conference,** Radisson Hotel, Merrillville, IN. For more information, contact Helene Uhlmann at 219.942.7636.
- **25–27, Wyoming Environmental Health Association Annual Educational Conference,** Little America Hotel & Resort, Cheyenne, WY. For more information, contact Doug Evans at 307.686.8036; E-mail: devans2@state.wy.us.

OCTOBER

- **3–4, Advanced HACCP for Meat & Poultry Processors Workshop,** University of Georgia Food Science, UGA Campus, Athens, GA. For more information, call 706.542.2574; E-mail: marianw@uga.edu.
- **7–10, AACC International Annual Meeting,** San Antonio Convention Center, San Antonio, TX. For more information, go to http://meeting.aaccnet.org.
- **11–12, GMA/FPA HACCP for Juice and Other Beverages Workshop,** GMA/FPA Conference Center, Washington, D.C. For more information, contact Jenny Scott at 202.639.5985 or go to http://www.fpa-food.org/content/FSW.asp.
- **15–17, GMA/FPA Prerequisite Programs and Sanitary Design Workshop,** Cornell University's Statler Hotel, Ithaca, NY. A workshop to formalize your HACCP foundation, For more information, contact Bob Gravani at 607.255.3262; or go to http://www.fpa-food.org/content/FSW.asp.

IAFP UPCOMING MEETINGS

JULY 8-11, 2007
Lake Buena Vista, Florida

AUGUST 3-6, 2008
Columbus, Ohio

JULY 12-15, 2009
Grapevine, Texas

COMING EVENTS

- **15–17, 2nd Food Processing Suppliers Association,** Las Vegas Convention Center, Las Vegas, NV. For more information, call 703.761.2600 or go to www.fpsa.com.
- **21–24, UWRF 27th Food Microbiology Symposium and Workshop,** *Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology,* University of Wisconsin-River Falls, River Falls, WI. For more information, call 715.425.3704 or go to www.uwrf.edu/food-science, click on workshops, then the link to the food microbiology symposium.
- **24–27, Worldwide Food Expo,** McCormick Place, Chicago, IL. For more information, call 703.934.5514 or go to www.worldwidefoodexpo.com.

NOVEMBER

- **3–7, APHA 135th Annual Meeting and Expo,** Washington, D.C. For more information, call 202.777.APHA (2742) or go to www.apha.org.
- **6–7, 2nd Annual International Conference for Food Safety/Quality,** San Francisco, CA. For more information, go to www.foodhaccp.com.
- **8, Ontario Food Protection Association 49th Annual Meeting,** Mississauga Convention Centre, Mississauga, Ontario. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.

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Continued on page 508

researchers, who tend to favor program takeoffs, not their endings. Consequently, the focus has been on design and implementation of training and development programs rather than evaluation.

The food safety literature increasingly contains calls to action to there is a call to action to for researchers and health promotion folks to develop more compelling safe food-handling messages, yet similar to the field of nutrition, there has been limited evaluation of the effectiveness of various food safety interventions. Without observing actual behavior, food safety educators may be developing interventions that are successful in changing what individuals report they do, but may do little in changing what they actually do.

Brae Surgeoner is a research assistant with the International Food Safety Network at Kansas State University; foodsafety.ksu.edu; bsurgeon@uoguelph.ca.

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Research Notes

Review

ERRATUM

In the article, "Efficacy of Neutral Electrolyzed Water To Inactivate *Escherichia coli*, *Listeria monocytogenes*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* on Plastic and Wooden Kitchen Cutting Boards" by M. A. Deza, M. Araujo, and M. J. Garrido that appears in the *Journal of Food Protection* 70(1):102–108, the sentence "NEW was generated with an Envirolyte EI-900 unit (Envirolyte Industries Internacional Ltd., Tallin, Estonia)" should be changed to "NEW was generated with a Eurostel EE-90 unit obtained through Aquastel Balti OU in 2002."

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- ❒ F2080 Food Safe Series III (4 videos)
- ❒ F2081 Food Safety Begins on the Farm
- ❒ F2090 Food Safety: An Educational Video for Institutional Food Service Workers
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- ❒ F2100 Tape 1 – Food Safety for Food Service: Cross Contamination
- ❒ F2101 Tape 2 – Food Safety for Food Service: HACCP
- ❒ F2102 Tape 3 – Food Safety for Food Service: Personal Hygiene
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- ❒ F2104 Food Safety for Food Service Series II: Tape 1 – Basic Microbiology and Foodborne Illness
- ❒ F2105 Tape 2 – Handling Knives, Cuts, and Burns
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THOUGHTS
ON TODAY'S FOOD SAFETY...

Show Me, Don't Tell Me

Brae V. Surgeoner
Kansas State University
Manhattan, Kansas

The study of consumer food-handling practices has relied almost exclusively on data obtained in self-report surveys. In Redmond and Griffith's review of food safety studies on consumer food-handling in the home (2003) they found that self-reported practice questions were used in 92 per cent of survey studies. Ad nauseam, researchers ask questions like how often primary food preparers wash their hands after touching raw meat, wash utensils used to handle raw food before they are used for cooked foods and, of course, use a thermometer to check the internal temperature of meat, poultry, and egg dishes. The advantage of the self-reported approach is that data can be collected from representative samples to estimate the prevalence of improper food-handling practices in the population. Likewise, in-depth profiles of consumer food-handling behavior can be generated to document risk factors and offer insight into the relative contribution of both intrinsic and extrinsic factors that affect engagement in safe food-handling behaviors.

Consumer reports about what they say they do in their kitchens are essential to food safety professionals and inspire many research endeavors. However, the validity of self-reported data cannot be taken for granted.

The problem is that people often lie.

Errors in self-reporting may result from an inability to comprehend the question being asked, errors in recalling information from memory and, as is the case in food preparation, focus on recurring events that may blend together in memory and be difficult to report in isolation. Previous research has also found that social desirability bias is pervasive in self-report responses. In other words, the tendency to over-report the frequency with which one engages in socially desirable behaviors ("I *always* wash my hands after using the bathroom"), and under-report the frequency with which one engages in socially undesirable behaviors ("I *never* wash my hands after using the bathroom"). Still, self-report data positions researchers to identify strategies that enhance the information that consumers report.

In 1999, a team of Australian researchers, in their article, "A Video Study of Australian Domestic Food-handling Practices," impressed upon readers of the *Journal of Food Protection* the discrepancy that exists between what consumers say they do, and what they actually do. Comparing responses to a food-safety questionnaire administered prior to video surveillance of participants in their home kitchens, the researchers found significant deviations between stated and actual behavior. For example, there was a highly significant difference between self-reported and observed hand-washing practices.

Observational studies are not without limitations. Often they are too expensive, obtrusive, and/or time consuming to conduct. Moreover, researchers require ethical approval from their Institutional Review Board (IRB) to protect the rights, welfare, and privacy of human subjects who agree to participate. In some sense, this is a daunting task. But, as various government bodies and institutions work to assess the risk of the public health impact from foodborne pathogens associated with a particular food, increasingly, this type of reality-research is required to inform mathematical models. As it stands, current models must, for the most part, assign wide bands of uncertainty for many inputs that are dependent on human behavior (i.e. cooking method).

In the study presented in this issue, Walter and colleagues survey government employees in Osceola County, Florida to determine their in-home food-handling practices and to assist in the development of educational materials. The latter objective raises the question of how to evaluate the effectiveness of the material.

There is considerable debate in the health promotion literature over the definition and measurement of relevant outcomes to health promotion, including the use of evaluation methodologies that assess both the outcome achieved and the process by which it was achieved. Nevertheless, the evaluation component is paramount to encourage funding decision-makers to continue to support food safety efforts.

It's widely accepted in the field of nutrition that education programs possess considerable potential for increasing knowledge and producing change, but documenting these changes have proven difficult for

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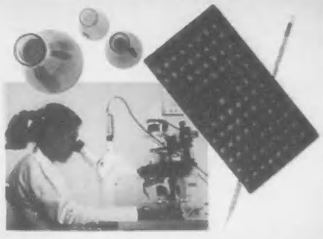
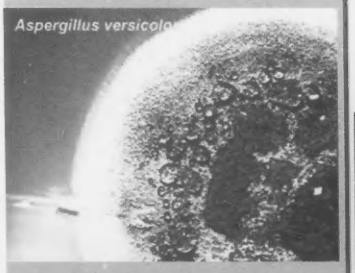


Food Microbiology



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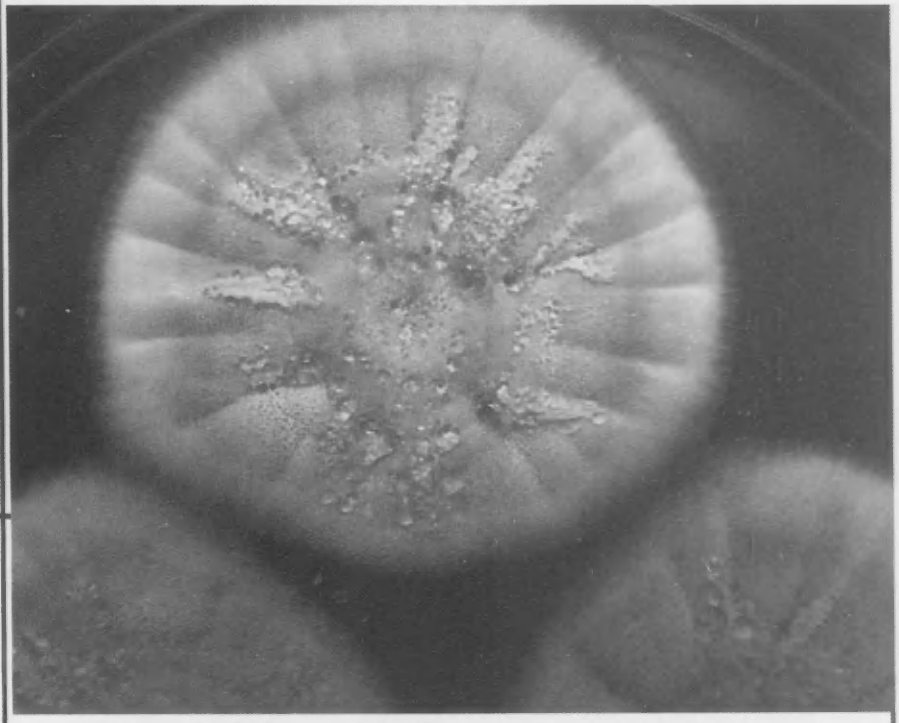

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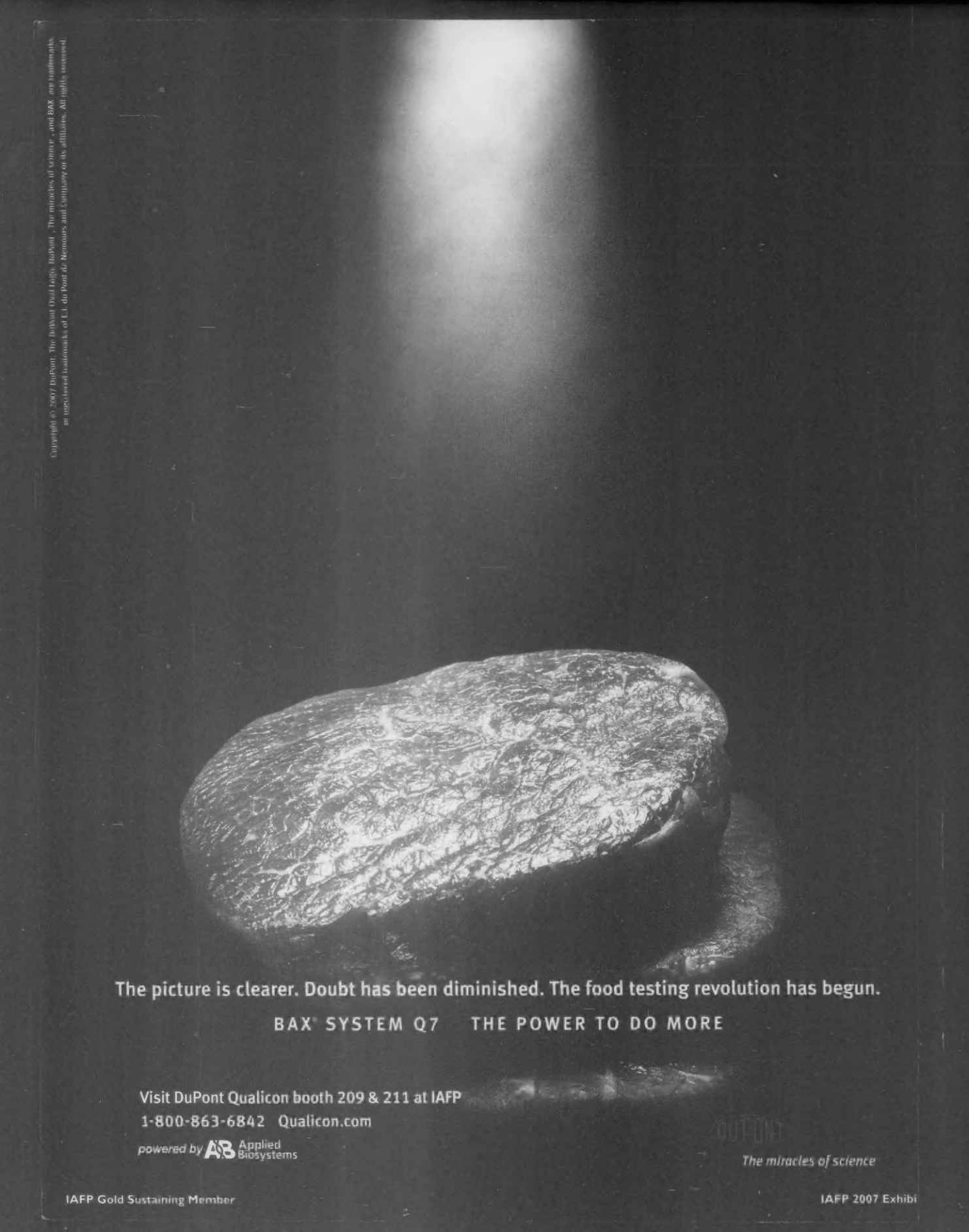

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