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# Food Protection Trends

## Science and News from the International Association for Food Protection

A Simple Method to Reduce *Listeria* in Blast and Holding Chillers

Influence of Calcium Lactate-calcium Gluconate Combination

An Assessment of the Burden of Foodborne and Waterborne Diseases in Three World Regions

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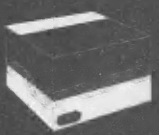

### *Sides*

| | |
|---|---|
| *Salmonella* | AOAC Approved |
| *Listeria* spp. | AOAC Approved |
| *E. coli* O157:H7 | AOAC Approved |
| *Campylobacter* | Available |
| *L. monocytogenes* | Available |
| *C. botulinum* | Available |
| Avian Influenza | Available |

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| | |
|---|---|
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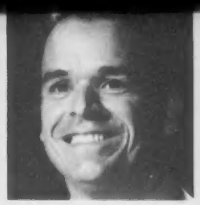






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FOOD PROTECTION TRENDS

VOLUME 30, NO. 8

## ARTICLES



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SCIENCE AND NEWS FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

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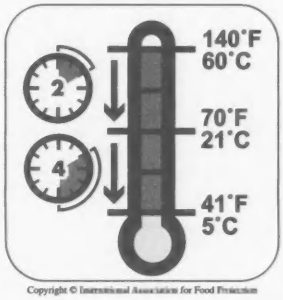




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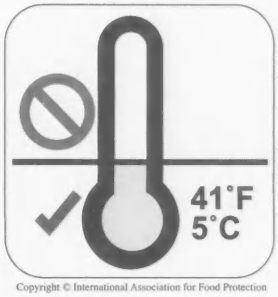




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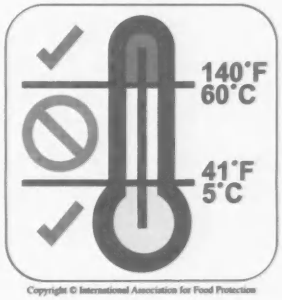




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International Association for Food Protection

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# "VICKIE'S VIEW"
## FROM YOUR PRESIDENT

By **VICKIE LEWANDOWSKI**
PRESIDENT

***"Let's continue to work together to meet our mission: 'To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply'***

Greetings to all! It is the Fourth of July weekend as I write this, my last IAFP President's column. By the time you read this, either in the *IAFP Report* or in *Food Protection Trends*, we will be in the midst of the 2010 IAFP Annual Meeting in Anaheim, CA (August 1–4). I look forward to the Annual Meeting for so many reasons, but the number one reason for me is the reunion of friends and colleagues in the food protection field.

And I've been getting into reunion mode lately, too—big time. My immediate family held our "inaugural" Lewandowski reunion at the end of June. I have eight siblings (six brothers and two sisters), and it had been 10 years since we were all together. We are spread out almost coast to coast, from California to Ohio, Alabama to Minnesota. Two years ago, we picked a date for our nine families to get together in Foley, Minnesota at the dairy farm where we all grew up and where my mom and brother still live. Once everyone arrived, we totaled 59 family members (plus two babies on the way). We all have been very busy with our lives: careers, children, children's lives, and even grandchildren for one of my sisters. We met for three days, spending the time getting caught up with each other, getting reacquainted with the nieces and nephews (some who aren't that little anymore!), meeting the great-nieces and great-nephews, reliving happy childhood memories and making so many new ones. It was our chance to update our family picture and include all those who joined the Lewandowski tribe in the last 10 years (Facebook has been flooded with pictures from the Lewandowski reunion).

To help with identifying who belonged to whom, each of the nine individual families wore t-shirts of the same color, while Mom wore a tie-dyed shirt with all of the colors, symbolic of the tie that binds. There were all types of games and entertainment; lasso golf, badminton, volleyball, horseshoes, baseball, bocce ball, rocket launching, and of course, karaoke! For three days our lives focused on talking, eating and drinking. At one time or another during our gathering, each of us was part of a deep, intense or interesting discussion, whether about our families, our jobs, the economy and so on. On the last night of the reunion we had an informal closing ceremony, complete with glow sticks waving. Did I mention that for three days our lives centered on food? Lots of great food, which we consumed without a thought other than how delicious it was!

As my family and I drove back to Illinois from Minnesota I reflected on the highlights of the reunion, and realized that there are many similarities between a family reunion and the IAFP Annual Meeting. We pick the date and the place for the IAFP meeting years in advance. Each time we meet, our attendance and membership has grown, with more people coming from all corners of the world. We meet for several days, getting a chance to catch up with those close to us and with whom we haven't had the opportunity to spend time with in the past year. We spend time getting reacquainted with those we recognize from here or there. And I don't think that I have ever attended a meeting at which I haven't met at least one new person, so we spend time developing new relationships, too. As we come back together each year for the Annual Meeting, we relive happy memories and spend time making so many new ones.

One of the most striking similarities of a family reunion and IAFP is the parts of the sum: the individual families that make up the one large clan are analogous to our 45 affiliates that help to make up IAFP as a whole, with the Association as "mother" organization, the tie that binds us all. Just as each individual

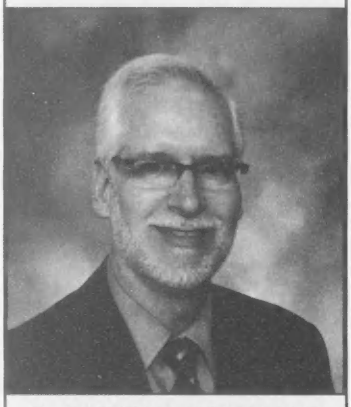
Lewandowski family wore its own color, each affiliate represents its own state or country. At the IAFP Annual Meeting a variety of activities, such as the golf outing, the occasional Monday night social, and the Foundation fundraiser, serve as opportunities for networking, eating, drinking and talking. But the main draw is the educational program itself: the symposia, technical sessions and poster sessions through which we all become a part of deep, intense or interesting discussions. At the end of the meeting there is a closing ceremony, the Awards Banquet. At that time we acknowledge those who have helped to make the current meeting a success, and we honor our colleagues for going above and beyond the call of duty in advancing food safety.

In the end, approximately three days of our lives have centered on food! Okay, maybe I'm stretching the analogy a bit far, since at a family reunion the focus is more on eating the food than on the discussion of the safety of it. (Although I did try to talk about the safety of the foods that I noticed had been sitting on the table for four hours!) But even this thought once again drives home the importance of what our organization and our work is all about: protecting the world food supply. It is because of what we do as food protection professionals that families and friends can come together after one year or 10 to celebrate without worrying about the food and drink that will be the center of their celebration.

I am proud to say that we met the goal that I set last July to continue to work together to move IAFP forward as the premier Association for food protection. Membership in other organizations is down, but membership is up in IAFP and there is a reason why. Let's continue to work together to meet our mission: "To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply." I encourage you to remain active or become more active. It is your association, and it takes all of us collectively to make it even better!

Finally, I would like to thank everyone for reading my columns and giving me feedback during this past year as your IAFP president. I want to call out a special thank you to Julie Larson Bricher for giving me the confidence to submit a column each month, and to everyone in this great organization who has provided support through the past year. I look forward to seeing you all at my favorite reunion in the business: IAFP 2010 in Anaheim, CA. Glow sticks optional!–Vickie Lewandowski.

# "COMMENTARY" FROM THE EXECUTIVE DIRECTOR



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

***"Now, we begin the celebration of our long history – our 100 years of history"***

The other day, I was talking with a Past President and former Board Member of IAFP about the very visible progress that IAFP has made over the years. This Past President served as President in the mid-'90s; not all that long ago. But when you look at some of the changes within IAFP, it is easy to see the progress.

In the mid to late-'90s, an effort was undertaken to change the Association name. Many of our Members fondly recall "IAMFES" or the International Association of Milk, Food and Environmental Sanitarians. That name served the organization very well from 1966 until the year 2000 when we adopted our current name. It was somewhat of a trying time, because the organization proposed to move away from a name containing "milk" or "dairy" in its name and the dairy industry had served as the foundation for forming the Association nearly 90 years earlier. As it was, the dairy segment of the then "IAMFES" recognized the need to have a more succinct name that described the overall work of the organization. Members voted overwhelmingly in favor of the new name.

One rather interesting side note to changing the Association name comes to mind (at least I always found this interesting!). We had certain folks who were sentimental about keeping "milk" or "dairy" in the name which was surely understandable. But we had another group who were most concerned about how you could "pronounce" IAFP! Members were so used to being able to refer to "IAMFES" (or "I-am-fes") that they were concerned that they could not make a pronunciation for "IAFP." We tried to calm those concerns by using other acronym examples that only the letters are pronounced such as USDA, FDA, NFPA (at the time) and others. In the end, now 10 years later, I believe everyone has adapted to saying I-A-F-P!

So this, the name change to IAFP was surely a big change for the Association and one that has helped to tell, more descriptively, what the organization does. Now, when we explain to someone who is not familiar with IAFP or what the organization's goals and mission are, the name makes sense with them very quickly. Under the old name, it took a few minutes to make the correlation between "IAMFES" and food safety and protection.

As I talked further with this Past President, they recounted the dreams of the IAFP Boards they served on about truly becoming an "International" Association. Accepting Members from outside of North America was nice and all, but rarely even participating in events outside of North America did not bode well for an organization naming itself "International." There was even discussion when the name change was made as to whether "International" should be removed from our name!

Fortunately, "International" was kept in our name and beginning in 2005, the European Symposium on Food Safety was begun by IAFP. Our first offering was a joint effort with ILSI Europe (International Life Sciences Institute) where we attracted about 75 people. We continue to partner closely with ILSI Europe and a number of other organizations in Europe to organize this scientific symposium each year in Europe. The latest was held this past June in Dublin with 300 attendees! A report on the Dublin Symposium is presented on page 494 in this issue.

As the European Symposium was building recognition, we found there was a great interest from our other International Affiliates to host an "IAFP" symposium in their region. Beginning in 2008, we partnered with the Brazilian Affiliate to host our first International Symposium on Food Safety. We actually titled this as the "Latin America Symposium on Food Safety." The symposium proved very successful with more than 500 people in attendance. We

then followed this with our first Asia Pacific Symposium on Food Safety organized by our Korean Affiliate and held in Seoul (also attracting more than 500 attendees). And now, we have been working with our Colombian Affiliate and together we will host the Second Latin America Symposium in Bogota this September.

Our efforts outside of North America are supplemented by our participation in the China International Food Safety and Quality Conference (CIFSQ) each year since 2007 and with the Dubai International Food Safety Conference (DIFSC) annually since 2008. Both of these conferences allow IAFP exposure to audiences of more than 1,000 interested food safety professionals where we would not be able to finance our own endeavors in these regions for many years to come. We have seen increased interest from people in each of the regions where IAFP has participated over the past five years and it is rewarding to see the direct connections being made between IAFP Members and those who thirst for information and assistance with their food safety programs.

As we recapped the past fifteen years or so, the Past President commented on how proud they were to have served on the Executive Board during a time that truly shaped the future of this great organization. They pointed to two very important factors that have allowed IAFP to prosper. One, the number of highly-dedicated IAFP Members who volunteer their time to the organization, and two, the IAFP staff who assist the volunteers in achieving the Association goals!

The teamwork between staff and Members has truly been outstanding over the years. With mutual goals, superior efforts and a compelling mission; further growth and progress is certainly possible. We have come a long way in fifteen years, but just think what the next fifteen years might hold for IAFP!

As I close for this month, it should be noted that IAFP is now entering its 100th year as an organization. Citing from IAFP History, "In 1911, a group of men engaged in advocating improved cleanliness in milk production – men whose purpose was 'producing and marketing the products of the dairy cow' – banded together because of their conviction that improvements were needed in the nation's milk supply." This dedication of thirty-eight "men" in 1911, led to the current day, IAFP whose mission is "to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."

Now, we begin the celebration of our long history – our 100 years of history – of the International Association for Food Protection and its predecessor organizations. We invite you to join in the celebration!

ARTICLES
*Food Protection Trends*, Vol. 30, No. 8, Pages 472–476

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International Association for Food Protection

# A Simple Method to Reduce *Listeria* in Blast and Holding Chillers

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## ABSTRACT

Post-cook blast and holding chillers identified as persistent sources of *Listeria monocytogenes* contamination in a ready-to-eat meal production facility were subjected to a regimen of every 14 days air heating through the use of portable heaters and fans. Each of three blast chillers was sampled for *Listeria* species from Monday to Friday over a two-year period, 12 months pre- and 12 months post-commencement of intervention, amounting to 490 samples per blast chiller per year. Over the two years, a total of 2,940 blast chiller environmental samples were drawn. Similarly, each of two holding chillers was sampled for *Listeria* species from Monday to Friday over a two-year period, 16 months pre- and 8 months post-commencement of intervention, amounting to 919 samples per holding chiller over the 16 months pre-intervention, and 551 samples per holding chiller over 8 months post intervention. Over the two years, there was a total of 2,940 holding chiller environmental samples drawn. Although *Listeria* was not eliminated from chillers, even one year after the intervention, there was a statistically significant ($P < 0.001$) reduction in prevalence of *Listeria* in all chillers. No deleterious effects of heating were noted in wall paneling, seals, synthetic floors, or chilling equipment. The air heating regimen was readily incorporated by sanitation staff into the existing Good Manufacturing Practice program. The application of chiller air heating may result in significant reductions in the prevalence of *Listeria* in chillers.

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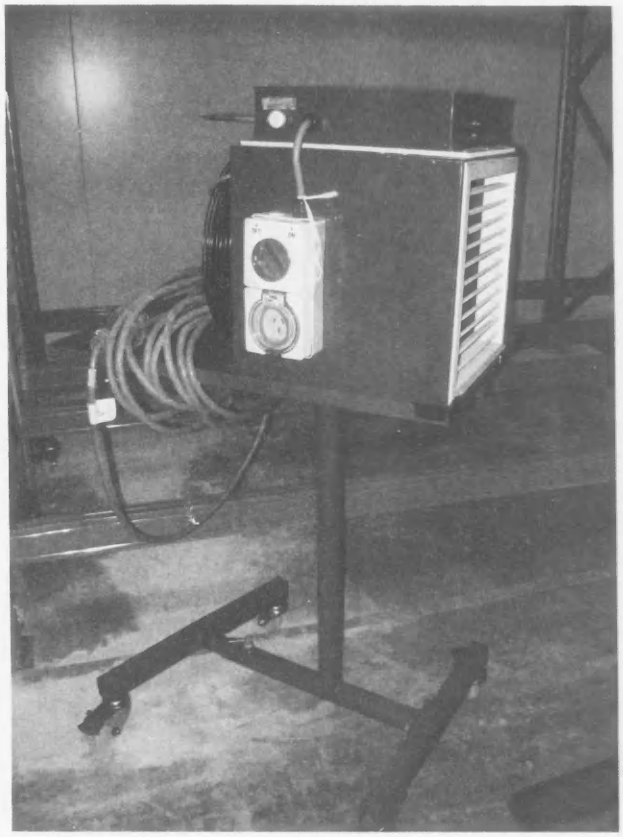
## INTRODUCTION

The ubiquitous presence of *Listeria monocytogenes*, coupled with its high long-term survival, growth at low temperatures *(9, 16)* and preference for wet surfaces, results in the common occurrence of this pathogen in refrigerators and chilling units *(9)*. The colonization of post-cook chillers with *L. monocytogenes* may facilitate final product contamination. Recontamination of cooked product is the primary source of *L. monocytogenes* contamination in many commercially produced ready-to-eat (RTE) foods *(10, 15)*.

The definition of persistence in bacteria is that of a strain that is repeatedly isolated from a food-processing environment over an extended period *(14)*. *Listeria monocytogenes* strains are known to persist within the food processing environment for extended periods of time, 10 years or more in some cases *(14)*. The properties that make a bacterial strain persist are not well understood but are thought to be related to properties such as biofilm formation and elevated resistance to sanitizers *(13, 14)*. Our study was precipitated by the persistent isolation of *L. monocytogenes* in blast and holding chillers in a ready-to-eat food production facility over a number of years (data not presented).

**FIGURE 1.** Hotbox-Axial HBA Fan Blower Heaters HB90415 – 415V 9.0kW used in heat holding chillers



An adjunct to the existing Good Manufacturing Practice (GMP) cleaning regimen was sought to reduce chiller contamination with *L. monocytogenes*. Periodic heat treatment of chillers is an intervention that involves raising the temperature of the chillers to a level which, in combination with the associated drying, may provide multiple stressors and result in a reduction of bacteria present in the chiller. We speculated that periodically holding chillers at an air temperature of 50°C for 2 h may result in reductions in *Listeria* contamination. In this study, we tested this hypothesis by applying this heating and drying regimen to post-cook chillers in an RTE frozen meal production facility, using simple heaters and fans and determining the prevalence of *Listeria* in the chillers before and after implementation of the intervention.

## MATERIALS AND METHODS

### Post-cook blast and holding chillers

A RTE meal production facility based in Brisbane, Australia was operating an externally audited HACCP food safety system, and was listed for export under the jurisdiction of the Australian Quarantine Inspection Service. The facility had a corporate zero tolerance policy for *Listeria monocytogenes* contamination on finished product. Previous work performed within the facility has demonstrated contamination of finished product with *L. monocytogenes* sub-types that also persistently colonize chillers.

Within the facility, three identical post-cook blast chillers (also known as intensive chillers) were used to chill exposed meal components. These components were then transferred into two holding chillers to await meal assembly and freezing.

### Heating of blast chillers

The three blast chillers were each 2 m × 7 m × 4 m. The blast chillers also have a 50 mm sandwich panel mezzanine. Chiller wall panels were 100 mm insulated refrigeration panels consisting of a 1.6 mm sheet over an expanded polystyrene core. These were constructed from Retracom Standard Sandwich Panel 100 (Retracom, Crestmead, Australia) as part of the original building works. Floors were covered in Sikagard 62 (Sika Group, Zurich, Switzerland), a two component high build epoxy resin. Air heating was instituted every 14 days at the end of production and sanitation. The heating of air within blast chillers was achieved by switching ceiling mounted chilling units to heat mode. The blast chiller units were Greenhalgh 16/56-1500 aluminum finned coils (Greenhalgh Asia Pacific, Brisbane, Australia), but these had been changed earlier to stainless finned units because of caustic sanitation chemicals corroding the aluminum fins. The fan motors on these units were sufficient for heating and fans were not used. Heat treatment of blast chillers commenced January 1, 2006. The temperature was maintained at 50°C for a minimum of 2 h at each treatment time.

### Heating of holding chillers

The two holding chillers were 3 m × 7 m × 4 m and 7 m × 7 m × 4 m. These were constructed from Retracom Standard Sandwich Panel 100 (Retracom, Crestmead, Australia) as part of the original building works. Wall panels and floors were identical to those described for blast chillers. Product was consolidated into a different holding chiller each week, allowing for an every-14-days heating regimen at the end of production and sanitation. Empty crates were allowed to remain in the chillers. Heaters and fans were wheeled into alternating corners. The holding chillers use Luve Contardo S3HCW 179 N80A (Uboldo–Varese, Italy) forced draft cooler units. Circulating refrigerant valves within these ceiling mounted units were released prior to operation of heaters and

**FIGURE 2.** Air Boss Pedestal Fan Model #WATPF26 used in holding chillers

fans to minimize heat-induced refrigerant pressure build up. Heaters used were the Hotbox-Axial HBA Fan Blower Heaters HB90415 — 415V 9.0kW and HB15415 415V 15kW (Thermal Electric Elements Pty Ltd, Brisbane, Australia). The fans used were the Air Boss Pedestal Fan Model # WATPF26. Heaters were modified by mounting them onto mobile stands, fitting them with a 10 m × 3 phase cable and installation of a 20A plug top with thermostat/auto cut-off designed to switch the unit off at 50°C. Heat treatment of holding chillers commenced May 1, 2006. The temperature was maintained at 50°C for a minimum of 2 h at each treatment time.

## Sampling and microbiological analysis

Sampling was performed on all chillers from January 2005 to December 2006. All chillers were still used during sampling and still run completely for production. A mix of vegetables, starch (potato mash and rice), sauce and protein (beef and chicken) products were placed in the chillers. The amount of product passing through each chiller varied, but each blast chiller had an approximate 2,000 to 3,000 kg turnover per day. Holding chillers had twice as much turnover. Each of three blast chillers were sampled for *Listeria* species from Monday to Friday over a two-year period, 12 months pre- and 12 months post-commencement of intervention, amounting to 490 samples per blast chiller per year. Over the two years, a total of 2,940 blast chiller environmental samples were drawn. Similarly, each of two holding chillers was sampled for *Listeria* species from Monday to Friday over a two-year period,16 months pre- and 8 months post-commencement of intervention, amounting to 919 samples per holding chiller over the 16 months pre-intervention, and 551 samples per holding chiller over 8 months post intervention. Over the two years, there was a total of 2,940 holding chiller environmental samples drawn. The general areas targeted were internal areas (floors, walls), seals and doors.

Separate polyurethane sponges (Whirl-Pak Speci-Sponge, Nasco, Fort Atkinson, WI), moistened with Butterfield's solution (25 mL; bioMérieux, Hazelwood, MO) were used to sample an area of approximately 25 $cm^2$. Approximately 2,940 environmental samples were drawn.

Sponge samples were tested for the presence of *Listeria* by use of the *Listeria* BAX Automated System (DuPont Qualicon, Wilmington, DE, USA). Each sponge was enriched in 225 ml of buffered *Listeria* enrichment broth (Amyl Media, Melbourne, Australia) for 24 h at 35°C. One ml of enrichment was inoculated into 10 mL MOPS-buffered *Listeria* enrichment broth (Amyl Media) and incubated at 35°C for 18 – 24 h. Enrichment cultures were analyzed using the automated PCR, following the manufacturer's user's guide for preparing reagents, performing the test, and reading the results. Specifically, enrichment cultures were lysed and the lysate was used to hydrate the PCR reagents contained within a proprietary tablet. Processing in the automated PCR unit took approximately 4 hours, and electronic results appear as positive/negative icons on the unit screen. Presumptive positive samples were confirmed following manufacturer's instructions by streaking retained MOPS-buffered *Listeria* enrichment broth onto Oxford and PALCAM agar (Amyl Media) and incubating at 37°C for 48 h. Colonies surrounded by dark brown or black haloes were confirmed as per the Australian Standard method AS1766.2.16 *(1)*. Results were reported as detected or not detected/25 $cm^2$.

## Statistical analysis

The relationship between *Listeria* prevalence and chiller intervention was analyzed using the CHITEST formula in Microsoft Excel 2003. Significance was indicated when $P < 0.001$.

## RESULTS

The prevalence of *Listeria* in chillers pre- and post-chiller interventions is presented in Table 1. Chiller prevalence is the sum of holding and blast chillers

**TABLE 1. *Listeria* prevalence in chillers, pre- and post-chiller interventions**

| | Pre-intervention Blast (Jan. 2005 – Dec. 2005) Holding (Jan. 2005 – April 2006) | | Post-intervention Blast (Jan. 2006 – Dec. 2006) Holding (May 2006 – Dec. 2006) | |
|---|---|---|---|---|
| | n | Detections (%) | n | Detections (%) |
| Blast Chiller | 1470 | 24 (1.63) | 1470 | 7 (0.48) |
| Holding Chillers | 1838 | 25 (1.36) | 1102 | 1 (0.09) |
| All Chillers | 3308 | 49 (1.48) | 2572 | 8 (0.31) |

prevalence. Since numbers of detections were low, all samples types were combined for analysis. The percentage of samples with *Listeria* spp. detections for both chillers was 1.48% pre-intervention and 0.31% post-intervention. The decrease in numbers of *Listeria* detections before and after the introduction of chiller intervention was significant ($P < 0.001$) for both blast and holding chillers. The sampling was completed for *Listeria* species only. It would have been possible to look specifically for *L. monocytogenes*, but the additional resources required to perform this testing was not in line with its key outcomes, namely to evaluate the hypothesis that heating chillers reduces the presence of all *Listeria* species.

## DISCUSSION

Heat treatment of the food processing environment to manage *Listeria*. The main focus when managing *L. monocytogenes* contamination of cooked meals is on preventing contamination by the post-cook factory environment. Heat can be used to manage *L. monocytogenes* in the post-cook factory environment, as this pathogen is not unusually heat resistant among vegetative Gram positive bacteria *(12)*. The maximum growth temperature of *L. monocytogenes* is 45°C *(12)* and heat inactivation takes place above that limit, with the rate of inactivation being a function of both time and temperature. Heat has been used, for example, to surface pasteurize and reduce *L. monocytogenes* on vacuum-sealed precooked ready-to-eat meat products *(11)*. Heat can also be applied as steam directly onto surfaces and equipment that need to be sanitized. Of course, the potential of "caking-on" of product needs to be considered individually, based on the particular food matrix. The application of steam onto equipment can be optimized for complex machinery by covering the equipment to be treated with a tarpaulin so as to maximize steam contact time and penetration. Cookrooms also manage environmental *Listeria* by "pasteurizing" mobile equipment capable of surviving such a heat treatment *(17)*. It has been observed that heating air within a room can be effective for removing moisture at the end of cleaning sanitation *(17)*. A noteworthy observation from staff at the facility we worked in was how the wet chillers were transformed to dry via the heat treatment. Chmielewski and coworkers *(6)* used predictive modeling to suggest that with proper control of time and temperature, hot water sanitation of stainless steel surfaces could serve as an efficient method for elimination of *L. monocytogenes* in biofilms.

### *Listeria* biofilms in the food processing environment

The persistence of *L. monocytogenes* in food processing facilities has been ascribed to the ability of this pathogen to live in biofilms. A biofilm may be defined as "a microbially derived sessile community characterized by cells that are irreversibly attached to a substratum or interphase, or to each other, are embedded in a matrix of extracellular polymeric substance that they have produced, and exhibit an altered phenotype" *(13)*. The *Listeria* present in chillers, targeted by this intervention, are likely to be in this biofilm state and would be expected to be more resistant to both heat and sanitizers than their suspended counterparts *(13)*; if they are in the biofilm strata where nutrients are depleted, cell growth is slow and may induce stress response and clustering. Dense clustering of cells and production of extracellular polymers effectively changes the heating menstruum, providing additional heat tolerance *(5)*. In this survey, the presence of all *Listeria* spp. was monitored. The presence of any *Listeria* species in food may indicate poor hygiene *(12)*. Previous biofilm formation by one species (e.g., a non-pathogenic species) may provide a niche for another species *(2)*. It may be possible for a non-pathogenic bacterial species (*Listeria* or another genus) to take residence and develop a biofilm, and a pathogenic species such as *L. monocytogenes* may then establish residence in the pre-existing biofilm *(5)*. Indeed, many *Listeria* species can exist within the same environmental site *(8)*. Biofilms are more difficult to remove when formed in the presence of food residues *(3, 4)* as soil can have a protective effect on the heat inactivation of planktonic or sessile microorganisms. High fat substrates increase heat resistance of *L. monocytogenes (3, 4)*. Food residues may also promote bacterial growth, subsequently influencing heat inactivation *(7)*. There may be a degree of synergy between chiller heat treatment and desiccation-related stress. It has been suggested that simultaneous stressors may achieve an antimicrobial effect greater than the individual sum of each individually.

### Application of heat treatment of chillers

In the intervention described here, a multi-discipline approach was taken at

the facility level. Engineering, operations and quality assurance teams were all involved in the chiller heat treatment planning as well as the ongoing treatment. The minimum effective parameters that completely dried chillers without impacting internal floor, walls and chilling equipment was found to be 50°C for 2 hours. The engineering team was given the responsibility of preparing chilling units for weekend heating, and no chiller is excluded from the heat treatment for more than 2 weeks. The operations team consolidates product into other chillers, ensuring that a gap around the chiller walls to be treated is maintained to allow airflow and passage of heaters and fans. The quality assurance team verifies temperature graphs displaying each of the chillers treated. As these protocols were developed by all the teams involved, standard operating procedures were readily taken into the GMP program.

We have described a simple way to potentially reduce *Listeria* contamination in the post processing chiller environment. Certainly a limitation of this technique is the required redundancy of chillers, and it is recognized that many facilities do not operate with such a redundancy. Although this protocol is unable to completely eliminate *Listeria*, it does dry chillers, is easily taken up into the GMP program, produces no deleterious effects to the treated chillers and has significantly reduced environmental post cook chiller *Listeria* contamination.

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# Influence of Calcium Lactate-calcium Gluconate Combination and Other Calcium Salts or Mixtures on the Fate of Salmonellae in Artificially Inoculated Orange Juice

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## ABSTRACT

This study was undertaken to investigate the influence of a calcium lactate calcium gluconate combination (CaL-CG) and other calcium salts or mixtures on the fate of salmonellae in artificially-inoculated orange juice. A non-fortified orange juice was supplemented with each calcium salt or mixture at 10 or 30% of the Dietary Reference Intake value for calcium. The fortified juice samples (pH 3.6 or 4.1) were inoculated with a three-strain mixture of salmonellae at $10^5$ CFU/ml and stored at 4 or 10°C for 7 weeks. The juice samples were assayed once a week for the populations of salmonellae. The orange juice supplemented with CaL-CG had significantly lower *Salmonella* populations ($P < 0.05$) than did the control juice at both pH levels and storage temperatures. At 4 and 10°C, the mean populations of salmonellae in the low pH juice supplemented with CaL-CG were numerically lower than the *Salmonella* populations in the low pH juice supplemented with calcium lactate (CaL) and numerically higher than the *Salmonella* population in the low pH juice supplemented with calcium lactate-calcium citrate (CaL-CC) and calcium lactate-tricalcium phosphate mixtures. In the high pH juice stored at 4°C, Cal-CG was less inhibitory to *Salmonella* cells than not only CaL but also CaL-CC. The worst performance of CaL-CG was observed in the high pH juice stored at 10°C. While CaL-CG could be used as a calcium supplement in both high and low acidity beverages at refrigeration temperatures, it might be particularly useful as a replacement for CaL in low pH beverages, in which it could improve the quality of the products.

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**FIGURE 1.** Survival of salmonellae in orange juice samples with a pH value of 3.6 and a calcium concentration equivalent to 30% (A) or 10% (B) DRI value for calcium at 4°C. CaL: calcium lactate, CaL-CC: calcium lactate and calcium citrate (1:1); CaL-TCP: calcium lactate and tricalcium phosphate (1:3); CaL-CG: calcium lactate and gluconate, CON: non fortified control.

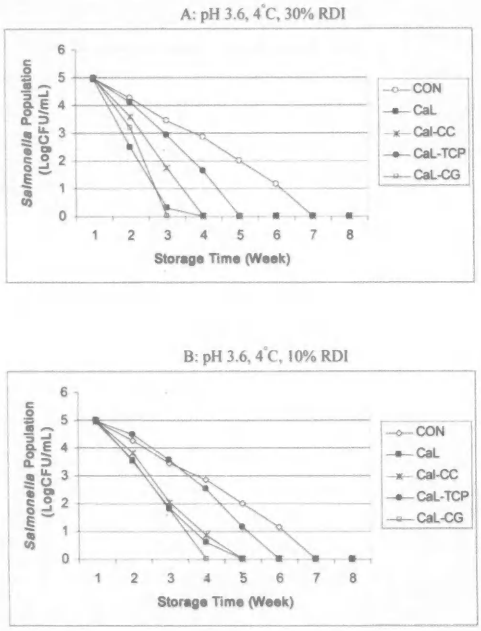
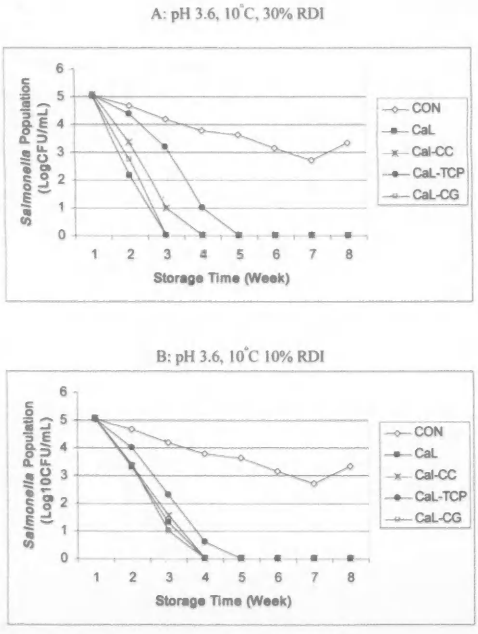



**FIGURE 2.** Survival of salmonellae in orange juice samples with a pH value of 3.6 and a calcium concentration equivalent to 30% (A) or 10% (B) DRI value for calcium at 10°C. CaL: calcium lactate, CaL-CC: calcium lactate and calcium citrate (1:1); CaL-TCP: calcium lactate and tricalcium phosphate (1:3); CaL-CG: calcium lactate and gluconate, CON: non fortified control.




## INTRODUCTION

Orange juice has been recognized as a vehicle of transmitting foodborne diseases *(3, 4, 5, 6, 10)*. In 1989, 67 individuals became ill in a New York hotel after consumption of orange juice *(1)*. The outbreak was linked to infected kitchen workers. In 1995, unpasteurized orange juice consumed at a Florida theme park was epidemiologically linked to 62 confirmed cases of *Salmonella* Hartford infection *(8)*. A probable source of this contamination was amphibians that carried the pathogen into the juice processing facility. In the summer of 1999, an outbreak of salmonellosis in the western United States and Canada sickened 298 people and claimed the life of one individual *(7)*. Unpasteurized orange juice was identified as the vehicle of transmission. Laboratory research has shown that the survival of *Salmonella* could be influenced by orange juice pH and storage temperatures. Cells of salmonellae survived in detectable numbers for up to 27 days at pH 3.5, 46 days at pH 3.8, 60 days at pH 4.1 and 73 days at pH 4.4 *(11)*. Oyarzábal et al. *(9)* reported that salmonellae were able to survive for 12 weeks in orange juice concentrates stored at -23°C.

Calcium fortification of orange juice has become increasingly popular in recent years. The calcium salts and mixtures used for orange juice fortification have included tricalcium phosphate (TCP), calcium lactate-tricalcium phosphate combination (CaL-TCP), calcium citrate malate complex and calcium citrate (CC). Some of these supplements, such as CaL-TCP, not only deliver calcium but also preserve orange juice by inhibiting the growth of microorganisms *(13)*.

The goal of this study was to compare the inhibitory effect of a calcium lactate-calcium gluconate combination (CaL-CG) with that of other calcium salts and mixtures, including CaL (calcium lactate) and calcium citrate mixture (CaL-CC) and CaL-TCP, toward the cells of salmonellae in artificially inoculated orange juice.

**FIGURE 3.** Survival of salmonellae in orange juice samples with a pH value of 4.1 and a calcium concentration equivalent to 30% (A) or 10% (B) DRI value for calcium at 4°C. CaL: calcium lactate, CaL-CC: calcium lactate and calcium citrate (1:1); CaL-TCP: calcium lactate and tricalcium phosphate (1:3); CaL-CG: calcium lactate and gluconate, CON: non fortified control.

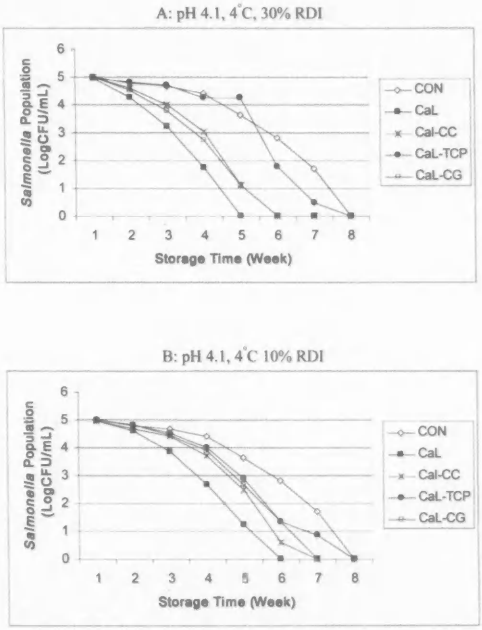
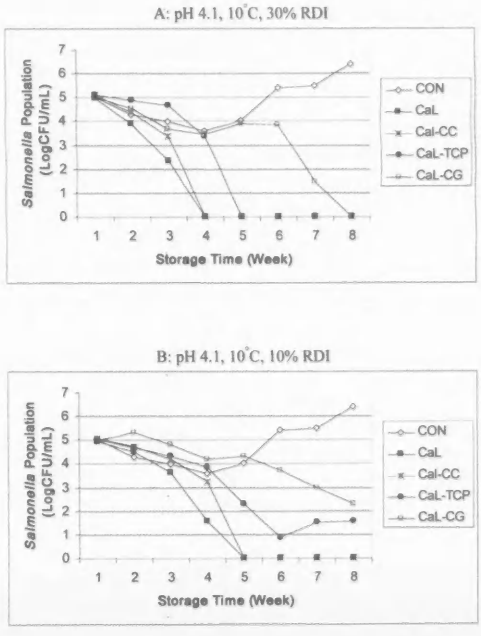



**FIGURE 4.** Survival of salmonellae in orange juice samples with a pH value of 4.1 and a calcium concentration equivalent to 30% (A) or 10% (B) DRI value for calcium at 10°C. CaL: calcium lactate, CaL-CC: calcium lactate and calcium citrate (1:1); CaL-TCP: calcium lactate and tricalcium phosphate (1:3); CaL-CG: calcium lactate and gluconate, CON: non fortified control.




## MATERIALS AND METHODS

### Orange juice and *Salmonella* strains

Pasteurized, pulp-free, non-fortified orange juice was purchased from a local supermarket in Griffin, GA. Microbiological media used in this study—tryptic soy agar (TSA), tryptic soy broth (TSB) and bismuth sulfite agar (BSA)—were purchased from Becton, Dickinson & Company (Sparks, MD) and prepared according to manufacturer's specifications. The *Salmonella* mixture was comprised of *S.* Baildon, *S.* Gaminara and *S.* Hartford. All the *Salmonella* strains were from our laboratory collections.

### Inoculum preparation

The *Salmonella* cultures were grown individually on TSA plates at 37°C for 24 h. A colony of cells of each culture was transferred into 10 ml of TSB and incubated at 37°C for 16 h. Following incubation, the three *Salmonella* cultures in an equal volume were pooled to constitute a three-strain cocktail. The *Salmonella* mixture was centrifuged at 4,000 × g for 20 min at 4°C. The supernatant was then discarded and the cell pellet re-suspended in pasteurized, pulp-free, non-fortified orange juice to obtain a cell concentration of *ca.* $10^7$ colony-forming units (CFU)/ml.

### Orange juice inoculation and storage

Non-fortified orange juice was transferred into sterile flasks and supplemented with CaL, CaL-CC (1:1), CaL-TCP (1:3) or CaL-CG at a concentration equivalent to 10 or 30% of the Dietary Reference Intake (DRI) value for calcium. The CaL-CG combination (12.6% calcium by weight) was provided by PURAC America, Inc., while the other calcium mixtures were prepared in our laboratory, based on a calcium weight / total weight percentage of 13.5 for CaL, 21 for CC and 37 for TCP. The initial pH of each fortified juice sample was adjusted to 3.6 or 4.1 with 10 N HCl or 10 N NaOH, respectively. The juice samples were distributed into sterile glass bottles and subsequently inoculated with the three-strain mixture of salmonellae already described, at a concentration of ca. $10^5$ CFU/ml. Juice samples were mixed

**TABLE 1. Mean populations of salmonellae in orange juice samples with different pH values, stored at different temperatures, and supplemented with different calcium salt or mixtures at 10 or 30% DRI value for calcium**

| | Overall Mean Population of Salmonellae (log CFU/ml)* |
|---|---|
| **DRI** | |
| 10% | 2.28[a] |
| 30% | 2.09[b] |
| **Juice pH** | |
| 4.1 | 2.74[a] |
| 3.1 | 1.62[b] |
| **Storage temperature** | |
| 10°C | 2.29[a] |
| 4°C | 2.07[b] |
| **Calcium supplements** | |
| Control | 3.51[a] |
| CaL-TCP | 2.20[b] |
| CaL-CG | 2.07[b] |
| CaL-CC | 1.70[c] |
| CaL | 1.42[d] |

CaL-TCP: calcium lactate-tricalcium phosphate (1:3); CaL-CC: calcium lactate-calcium citrate (1:1); CaL-CG: calcium lactate-calcium gluconate (1:1); CaL: calcium lactate.

* Means within a test parameter (concentration of calcium supplements, juice pH, storage temperature or type of calcium supplements) not followed by the same letter are statistically different.

thoroughly after the inoculation and stored under aerobic condition at either 4 or 10°C for 7 weeks. The inoculated orange juice samples and the un-inoculated controls were sampled once a week.

### Microbiological sampling

On each sampling day, the orange juice samples were withdrawn from storage and mixed thoroughly. A volume of 1 ml was taken before the juice sample was returned to storage. Samples were serially diluted with 0.1% buffered peptone water. Appropriate dilutions were inoculated in duplicate on BSA plates. The inoculated plates were incubated for 24 h at 37°C before colonies were enumerated.

### Statistical analysis

Two replications were conducted, and each sample was assayed in duplicate. Data collected from the experiments were analyzed by using the general linear model procedure of the Statistical Analysis Software. Significant differences in the cell populations of salmonellae were determined based on a 95% confidence level.

## RESULTS AND DISCUSSION

The calcium salt and mixtures evaluated in the study significantly ($P < 0.05$) reduced the mean populations of salmonellae artificially inoculated in orange juice (Table 1). The mean cell populations of the pathogens in orange juice samples supplemented with CaL-TCP, CaL-CG, CaL-CC or CaL were 1.31, 1.44, 1.81 or 2.09 log CFU/ml lower than the mean population of salmonellae in the control sample (Table 1). Statistical analysis revealed that the mean *Salmonella* populations were significantly lower ($P < 0.05$) in juice samples with a pH value of 3.6, stored at 4°C or with a calcium concentration equivalent to 30% of the DRI value for calcium, compared with samples with a pH value of 4.1, stored at 10°C or with a calcium concentration equivalent to 10% of the DRI value for calcium (Table 1).

The survival trends of salmonellae in orange juice samples with different pH values and calcium concentrations, at different storage temperatures, are shown in Fig. 1–4. The high pH juice supplemented with CaL-CG had an average *Salmonella* population of 2.38 log CFU/ml at 4°C and 3.65 log CFU/ml at 10°C (Table 2), which were significantly lower than the mean *Salmonella* population in the control juice. The mean populations of the pathogens in the low pH juice supplemented with CaL-CG and stored at 10°C were significantly lower than the mean *Salmonella* population in the control juice, whereas the pathogen counts in the same juice stored at 4°C were only numerically different from those in the control juice. CaL was numerically more effective than CaL-CG, CaL-CC and CaL-TCP in the low pH juice (Table 2). In the high pH juice stored at 4°C, the CaL-CG combination inhibited *Salmonella* not only less than CaL but also less than CaL-CC (Table 2). The worst performance of the CaL-CG was observed in the high pH juice stored at 10°C. Although it significantly ($P < 0.05$) reduced the population of salmonellae, the calcium combination was the least effective among all the calcium supplements evaluated in the study.

The mean population of salmonellae in the low pH control juice stored at 4°C (2.14 log CFU/ml) was lower than the population in the juice samples stored at 10°C (3.76 log CFU/ml). However, the populations of salmonellae in calcium-fortified juice samples were greater at 4°C than the populations at 10°C (Table 2). The reason for this is currently unknown, but it could be because bacterial

**TABLE 2. Mean populations of salmonellae in low (3.6) or high (4.1) pH orange juice samples stored at 4 or 10°C**

| | Average Population of Salmonellae (log CFU/ml) | | | |
|---|---|---|---|---|
| | pH 3.6, 4°C | pH 3.6, 10°C | pH 4.1, 4°C | pH 4.1, 10°C |
| Control | 2.14[a] | 3.76[a] | 3.37[a] | 4.77[a] |
| CaL-TCP | 1.81[ab] | 1.54[b] | 2.96[a] | 2.51[c] |
| CaL-CC | 1.38[ab] | 1.18[b] | 2.36[b] | 1.88[c] |
| CaL-CG | 1.25[ab] | 1.01[b] | 2.38[b] | 3.65[b] |
| CaL | 1.14[b] | 1.01[b] | 1.93[c] | 1.61[c] |
| Average | 1.54 | 1.70 | 2.60 | 2.88 |

CaL-TCP: calcium lactate-tricalcium phosphate (1:3); CaL-CC: calcium lactate-calcium citrate (1:1); CaL-CG: calcium lactate-calcium gluconate (1:1); CaL: calcium lactate.

[a]Means in the same column not followed by the same letter are statistically different.

cell membranes tend to be more permissible to the calcium supplements at 10°C than at 4°C or because the solubility of calcium supplements at 4°C was slightly lower than the solubility at 10°C, with the result that more inhibition of salmonellae occurred in calcium-fortified juice samples stored at 10°C. In the high pH juice, however, a similar phenomenon was observed only in the samples supplemented with CaL or CaL-CC (Table 2).

CaL-CG, a relatively new calcium supplement, has the highest solubility among all the calcium salts commonly used for beverage fortification *(12)*. CaL, when applied alone or at high amounts, tends to impart a bitter taste to the beverage due to free calcium ion concentrations. CaL-CG, in contrast, provides a neutral taste to beverage products even at high concentrations. This is primarily due to the ability of CaL-CG to shield the reactive free calcium ions. Gluconic acid has a pKa value of 3.86, similar to that of lactic acid. As a highly polar molecule, it is unable to penetrate the bacterial cell membrane *(2)*. Gluconate itself is therefore not an effective antimicrobial agent. The precise mechanism behind the anti-*Salmonella* activity of CaL-CG is not precisely known. However, it could be related to the presence of undisassociated forms of organic acids in the orange juice samples.

While CaL-CG could be used as a calcium supplement in both high (pH 3.6) and low acidity (pH 4.1) beverages stored at refrigeration temperatures, it might be particularly useful as a substitute for CaL in low pH (ca. pH 3.6) beverages, in which it would be more soluble, inhibit microbial growth, and reduce sourness as well as avoiding the detrimental effect of lactate on the taste of orange juice. Further studies are needed to investigate the interaction among concentrations of calcium supplements, juice pH and storage temperatures.

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# A Comparison of the Burden of Foodborne and Waterborne Diseases in Three World Regions, 2008

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## ABSTRACT

The World Health Organization (WHO) has estimated that 2.2 million deaths occur each year because of diarrheal diseases. Data from WHO show that diarrheal illnesses are a significant cause of mortality in children under five years old in six world regions; however, there are few comparative data on the burden of foodborne diseases, which are primarily diarrheal, among the general population in the WHO-defined regions. The focus of this research was to collect and analyze data on foodborne and waterborne outbreaks, available through public sources, to assess the disease burden across world regions. Researchers at the Center for Science in the Public Interest (CSPI) in the United States collected 416 foodborne and waterborne outbreak reports in English from six world regions during the calendar year 2008. Three regions provided adequate data for comparison; Africa was the region with the highest number of reports (128), followed by the Western Pacific region (118 reports) and Europe (97 reports). Comparisons of these three regions included seasonality of outbreaks, rates of identification of the cause (food, water, unspecified), and reported size of outbreaks by morbidity and mortality. Findings demonstrated that for many regions, valuable information on the incidence of foodborne and waterborne outbreaks can be gathered from the media, international organizations and other non-governmental sources.

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## INTRODUCTION

Foodborne illnesses are prevalent in all parts of the world, and their toll on human health is enormous. They affect consumers and industries all over the world, in developed as well as developing countries; some industrialized countries have estimated that each year up to 30% of their population may become ill from biological hazards in the food supply *(14)*. The World Health Organization (WHO) has identified many different types of food contaminants as major sources of disease, including *Salmonella*, *Campylobacter*, *Clostridium*, hepatitis A, Cholera, *Listeria*, enterohemorrhagic *E. coli*, metals, persistent organic pollutants, biologically derived toxins, pesticides, toxic chemicals and organisms causing transmissible spongiform encephalopathies (TSE)-type diseases (e.g., bovine spongiform encephalopathy) *(15)*.

Some countries publish comprehensive estimates of their national burden of disease linked to foodborne pathogens, while others do not. For example, in the United States, the Centers for Disease Control and Prevention (CDC) estimated in 1999 that foodborne diseases cause 76 million illnesses and 5000 deaths annually *(7)*.

WHO has estimated that each year 2.2 million people, including 1.9 million children, die because of diarrheal diseases *(18)*. This and similar partial estimates provide valuable information, but they do not quantify the global burden of disease from contaminated food and water. WHO therefore convened a panel of experts, the Foodborne Disease Burden Epidemiology Reference Group (FERG), to conduct a more comprehensive assessment. The research reported here was intended to complement the work of the FERG and provide the panel with useful information about the extent of informal reporting of foodborne diseases in different world regions.

Effective methods of disease surveillance can provide important information for assessing the burden of disease. This is admittedly a complicated task, as foodborne illnesses have many different symptoms, with both short- and long-term consequences. Although nausea and diarrhea are the most common symptoms, other consequences can include kidney and liver failure, brain and neural disorders, septicemia and death. For example, *Listeria monocytogenes* infection has a mortality rate of 20–30%, including miscarriages *(2)*. Some illnesses have long-term complications, such as reactive arthritis and paralysis, which can affect 2–3% of those who are infected *(12, 13)*.

Moreover, in many countries, because of economic difficulties, inadequate medical care, and lack of health insurance, medical attention is not sought, making accurate reporting of food and waterborne diseases difficult. For example, according to the Jordan Burden of Illness Study in 2003, only two in five persons with diarrhea sought medical care *(6)*.

Economic globalization has also increased the risk of outbreaks extending beyond national borders, underscoring the need for a comprehensive global assessment of the burden of food and waterborne illnesses. For example, in 2008, an outbreak caused by melamine contamination in infant formula caused sickness in 300,000, hospitalization of 52,000 and death in at least 6 infants in China; the outbreak, which extended to Hong Kong and Taiwan, sparked global recalls of products containing milk and milk ingredients from China *(16)*.

In developing nations, foodborne diseases are a primary cause of malnutrition, which adversely affects the growth and disease resistance of infants and children, making them more vulnerable to a range of ailments such as respiratory infections that contribute to the downward spiral of further malnutrition and disease. Patients can also suffer from arrested physical and mental development, preventing them from reaching their full potential in society *(12)*.

Food also plays a central role at the interface between human and animal diseases, because pathogens that evolve in animals can spread to humans through food. This commonly occurs today, as documented by disease outbreaks linked to *Salmonella*, *Campylobacter* and hemorrhagic strains of *E. coli* linked to both animal and plant food vehicles *(11)*. Human practices in raising animals as food sources can lead to the emergence and spread of new pathogens and the development of antibiotic resistance in common animal pathogens, making it harder to treat the diseases they cause *(4)*. Sometimes, emerging diseases begin at the animal level, e.g., highly pathogenic avian influenza and bovine spongiform encephalopathy, but are then transmitted through proximity to animals or through the food supply *(10)*.

An accurate assessment of foodborne diseases is also important in order to quantify their economic burden. Foodborne diseases can contribute to absenteeism from work or school and can lead to high medical, legal and other expenses. The costs to national governments can include increased costs of health care, outbreak investigations, food recalls, and loss of consumer confidence.

The best estimates of the economic costs of foodborne disease have come from developed countries. In the United States, for example, foodborne disease costs billions of dollars each year; government sources estimate the cost of human illnesses caused annually by seven foodborne pathogens at U.S. $5.6 to 9.4 billion, and a more recent estimate for the total burden of foodborne disease was $152 billion *(5, 8)*. The cost of human *Salmonella* infections in England and Wales in 1992 was estimated at U.S. $560 to 800 million, over 70% of which was directly associated with treatment and investigation of cases and sickness-related absences from work *(12)*. The cost of the estimated 11,500 cases of food poisoning daily in Australia was calculated at AU $2.6 billion annually *(1)*. In the United Kingdom, care and treatment of people with the new variant of Creutzfeldt-Jacob disease (vCJD) would cost £50,000 per case. A £55,000 trust has been set up to care for up to 250 victims as part of the Government's no-fault compensation scheme *(9)*.

For the year 2008, researchers at the Center for Science in the Public Interest (CSPI) analyzed the reporting of foodborne and waterborne illness outbreaks in public sources (news articles, scientific publications, and announcements by governments or international organizations) in English from every world region except North America. It is acknowledged that disease outbreaks that were documented and analyzed constitute a small portion of the true burden of foodborne disease, which clearly is much larger and should be quantified in countries all over the world.

## MATERIALS AND METHODS

### Data collection

In October 2007, Safe Food International (SFI), a project of CSPI, launched a data aggregation project to track outbreak reports linked to contaminated

**FIGURE 1.** Regional reports by quarters, 2008

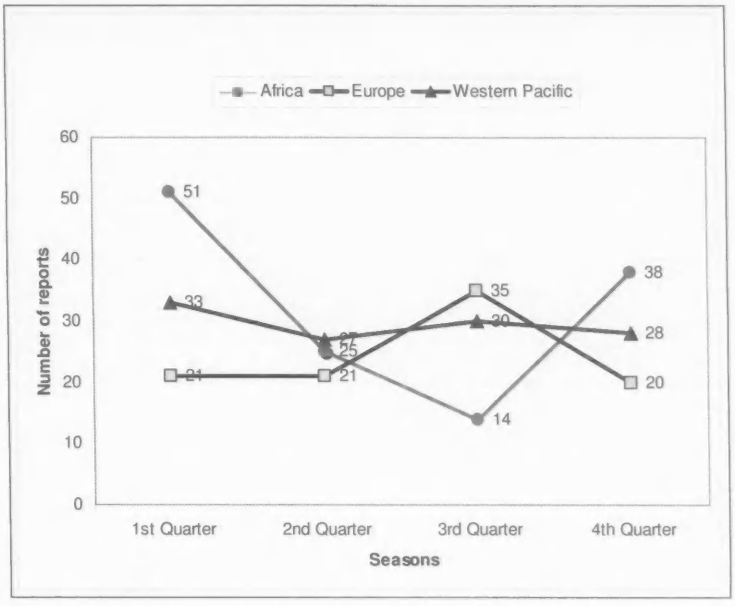
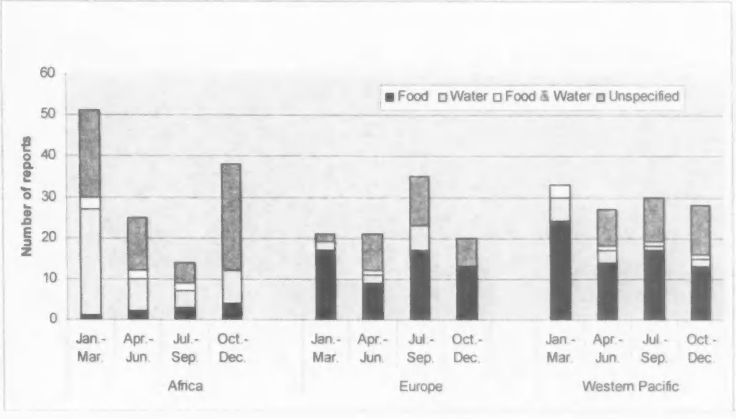



**FIGURE 2.** Reported vehicles by quarters, 2008




food and water, animal disease reports (limited to key food sources), plant disease reports, food safety studies, and food safety policies. The data collection was organized by subject matter and world regions.

The researchers adopted WHO's geographic division of national governments into seven world regions *(19)*: The Western Pacific Region (37 countries), the South East Asian Region (11 countries), the Eastern Mediterranean Region (24 countries), the African Region (46 countries), the European Region (52 countries), the Central and South American Region (28 countries), and the North American Region (3 countries). Because the researchers were situated in, and focus extensively on the food safety issues and policies in, the North American region, that region was not included in this study in order to neutralize any North American bias of the results.

The data were compiled from web-based sources, including news articles, scientific publications, and announcements from international organizations and government entities. Only documents written in or translated to English were included in the 2008 database. For several regions (Latin America, Middle East and Southeast Asia), the small number of reports found led the researchers to conclude that data collection in multiple languages was essential to assess the burden of disease. Therefore, those regions were not included in this analysis. Tests were conducted in French and Mandarin to determine the number of reports that might be captured using these additional languages. The tests involved one region (Africa) and several countries in the Western Pacific Region, mainly China.

The data were obtained by using internet data gathering tools such as Google Alerts, and by consulting news listservs such as ProMED-mail, an emerging diseases monitoring program of the International Society for Infectious Diseases, and FS-Net, developed by Professor Doug Powell at Kansas State University, which provide current food safety news. Information specific to one country or one region was also provided directly by the SFI member consumer organizations in different regions. These reports were included if they were supported by a reliable source of information (consumer organizations contributed a small number of reports, less than one percent).

Each report was assessed to determine whether it represented a new outbreak or provided updated information for an outbreak already reported in the database. Documents related to the same story were grouped together and counted as a single entry. For each report included in the database, the following information was recorded: The original source, the date, and the hyperlink to the webpage where the report was originally published. The reports were listed in the database chronologically and were sorted by categories and geographical location.

As with other studies of the burden of foodborne diseases, the outbreaks included in the SFI database represented only a small proportion of the actual disease outbreaks and illnesses related to food or water. The vast majority of foodborne illnesses are sporadic, and as a result they are not identified as an outbreak. In addition, many foodborne illness outbreaks are underreported, because of a number of factors, including their small size or long incubation period, geographic dispersion and location, lack of access to or use of medical care, and lack of a functioning surveillance system.

TABLE 1. Contaminant attribution

**Africa (n = 128)**

| Contaminant | Number | Percentage |
|---|---|---|
| Cholera | 105 | 82% |
| Gastroenteritis | 2 | 9% |
| Contamination | 2 | 2% |
| Schistosomiasis | 2 | 2% |
| Hepatitis E | 2 | 2% |
| *Salmonella* | 1 | 1% |
| Toxins | 1 | 1% |
| Rabies | 1 | 1% |
| Typhoid | 1 | 1% |
| Botulism | 1 | 1% |
| Melamine | 1 | 1% |

**Europe (n = 97)**

| Contaminant | Number | Percentage |
|---|---|---|
| *Salmonella* | 20 | 21% |
| *E. coli* | 16 | 16% |
| Gastroenteritis | 12 | 12% |
| Norovirus | 9 | 9% |
| *Cryptosporidium* | 6 | 6% |
| Trichinellosis | 5 | 5% |
| Botulism | 4 | 4% |
| Contamination | 4 | 4% |
| vCJD | 4 | 4% |
| Hepatitis A | 3 | 3% |
| Rotavirus | 2 | 2% |
| Unspecified | 2 | 2% |
| Bleach | 1 | 1% |
| Dioxins | 1 | 1% |
| *Listeria* | 1 | 1% |
| Safety violation | 1 | 1% |
| Adenovirus | 1 | 1% |
| Hepatitis E | 1 | 1% |
| Azaspiracid Shellfish Poisoning | 1 | 1% |
| Cholera | 1 | 1% |
| Dysentery | 1 | 1% |
| Paraxysmal myoglobinuria | 1 | 1% |
| *Staphylococcus* | 1 | 1% |
| Brucellosis | 1 | 1% |
| Ciguatera | 1 | 1% |
| *Clostridium botulinum* | 1 | 1% |

**Western Pacific (n = 118)**

| Contaminant | Number | Percentage |
|---|---|---|
| Gastroenteritis | 30 | 25% |
| Cholera | 21 | 18% |
| Contamination | 16 | 14% |
| *Salmonella* | 9 | 8% |
| Hepatitis A | 6 | 5% |
| Melamine | 5 | 4% |
| Norovirus | 5 | 4% |
| *E. coli* | 4 | 3% |
| Dysentery | 2 | 2% |
| *Listeria* | 2 | 2% |
| Toxins | 2 | 2% |
| Pesticides | 2 | 2% |
| *Staphylococcus* | 2 | 2% |
| *Vibrio* | 2 | 2% |
| *Campylobacter* | 2 | 2% |
| *Shigella* | 2 | 2% |
| Unspecified | 2 | 2% |
| *Cryptosporidium* | 2 | 2% |
| *Bacillus* | 1 | 1% |
| Lectin | 1 | 1% |
| Marine biotoxin | 1 | 1% |
| Methanol | 1 | 1% |
| Arsenic | 1 | 1% |
| *Clostridium* | 1 | 1% |
| Clenbuterol | 1 | 1% |
| Typhoid | 1 | 1% |

## Data analysis

Typically, a foodborne outbreak refers to a situation in which two or more people who have consumed the same contaminated food develop the same illness *(3)*. The definition of "outbreak" differs in this project, because the information included in the reports may not always specify the actual number of illnesses. In some report of government recalls or warnings of contaminated food or water, initiated after people became ill, the article reported on the government action, not on the number of illnesses. These reports were characterized as having a morbidity range of 0 to 1 case.

The majority of reported foodborne and waterborne illness outbreaks do not have complete outbreak information. Of all outbreaks included in the database, 38% had no known food or water attribution; for these, the outbreaks were categorized as "unspecified." Some outbreaks did not specify a pathogen but identified the illness as

**FIGURE 3.** Government action during reported outbreaks

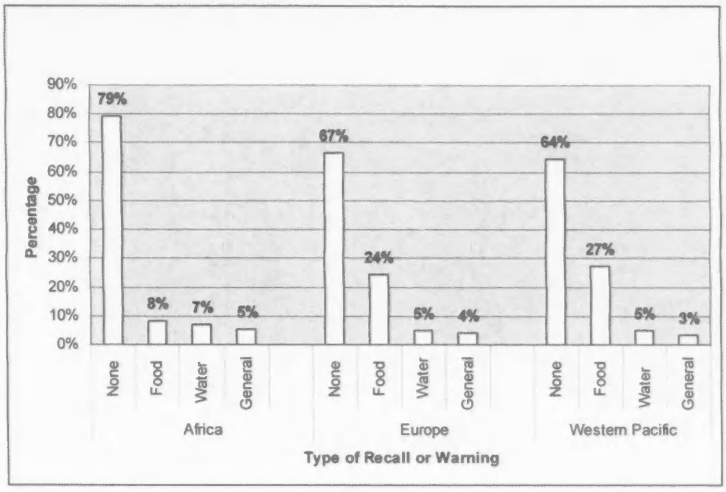
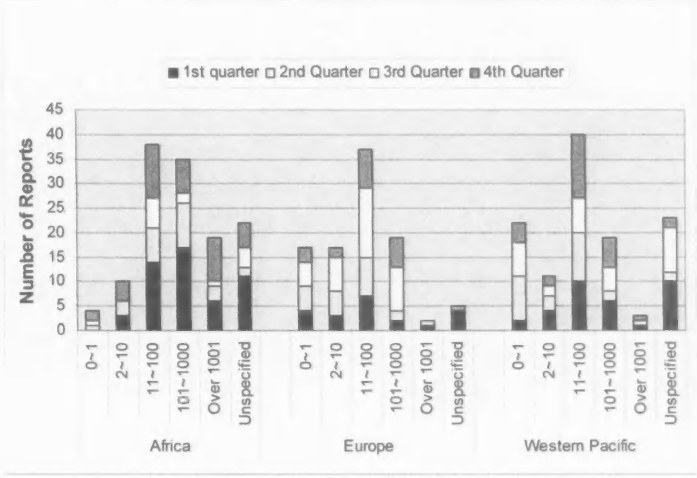



**FIGURE 4.** Morbidity by region, 2008




"food poisoning"; these cases were placed in the general "gastroenteritis" category. Because the vehicle and pathogen attribution were not well identified in many reports, they should be used cautiously, as the ability to verify either was limited in many countries and regions.

To analyze seasonal trends, reports were divided into quarters: The first quarter (January, February, March), the second (April, May, June), the third (July, August, September), and the fourth (October, November, December).

The research relied on the reports being available in English through the internet. For non-English speaking countries, this may result in a bias toward larger outbreaks or those with a more unique fact pattern, such as a unique food or disease agent. Taking into consideration the complete database, reporting was greatest in the regions with a larger number of English-speaking countries.

Three of the six regions (Africa, Western Pacific and Europe) had sufficient data in 2008 to be analyzed. Results analyzed from those three regions included seasonality of outbreaks, rates of identification of the cause (food, water, unspecified) of the outbreaks, size of outbreaks reported, and reported mortality rate.

## RESULTS

Researchers collected 416 foodborne or waterborne outbreak reports from the regions studied during the calendar year 2008. The region with the highest reporting was Africa, with 128 reports. The Western Pacific region had 118 reports, followed by Europe with 97 reports, Southeast Asia with 35 reports, the Middle East with 28 reports and Latin America with 10 reports.

### Europe

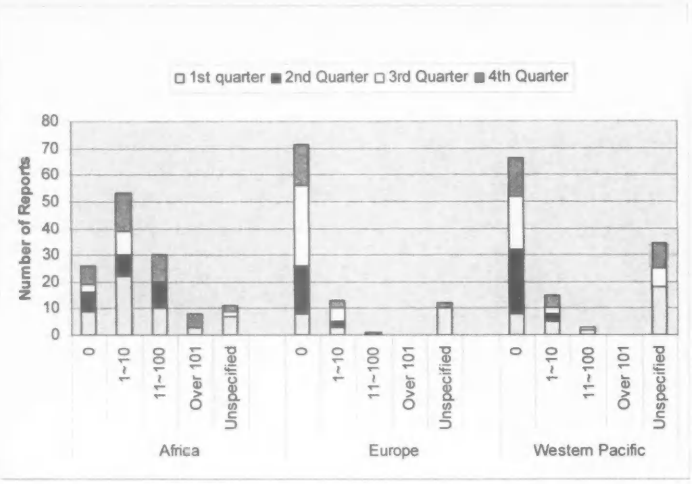
Europe is the most industrialized of the three geographical regions included in this study. The region is characterized by advanced public health sectors and highly developed communication systems that include formal (governmental) and informal (media) reporting systems. Nearly 100 reported outbreaks from this region for the year 2008 were analyzed.

The largest number of outbreaks (35) was reported in the third quarter, which consists of the warmest months in this region (Fig. 1). The numbers of reports were nearly identical (20–21) during the other three quarters. In the first, third, and fourth quarters, food was the most frequently identified vehicle of outbreaks. In contrast, in the second quarter, food and the "unspecified" category each comprised 43% of the vehicle of outbreaks (Fig. 2). Water was consistently the least frequently identified vehicle.

The reports identified a broad variety of pathogens, although *Salmonella* and *E. coli* were reported most frequently, followed by Norovirus in the fourth quarter. (Table 1). Occasionally, warnings were issued for specific food or water vehicles. In 34% of the total reports in the European region, the government took action by issuing a recall or warning in response to food contamination, with specific food recalls mentioned in nearly 20% of the total reports in this region (Fig. 3).

In every quarter, the majority of outbreaks reported in Europe affected 11–100 people, although several very large outbreaks were reported during the year. For example, an outbreak affecting 700 people was linked to consumption of chicken meat. The next most frequently reported size of outbreaks was in the 2–10 person range for the first and second quarters, and in the 101–1,000 range in the third and fourth quarters (Fig. 4).

**FIGURE 5.** Mortality by region, 2008




Deaths linked to the outbreak reports were less common in this region than in the others. Deaths were reported in 14% of the outbreak reports, and half of these deaths were linked to *Salmonella* (Fig. 5).

## Africa

Africa reported the largest number of outbreaks among the three geographical regions included in this study, with a total of 128 reported in 2008. The region is unique in many ways, such as seasonality, vehicle, size of the outbreaks and number of illnesses and deaths associated with outbreaks. Because of its less developed public health sector, the role of the media in outbreak reporting becomes more relevant and important for assessing the public health impacts of contaminated food or water.

The largest number of outbreaks was reported in the first quarter (51), followed by the fourth (38), second (25) and third (14). In 2008, waterborne disease outbreaks that were diagnosed as cholera were more frequent, larger, and more severe in the end of the fourth and beginning of the first quarters, during the rainy season (Fig. 1).

Unlike the outbreaks in the other two regions included in this study, only a small percentage of reported outbreaks in Africa were specifically linked to food consumption. In the first quarter, water was identified as the dominant vehicle (more than 50%), while in the other quarters, most reports did not identify a vehicle (Fig. 2).

*Vibrio cholerae* was the most frequently reported pathogen in this region, identified in 71% to 86% of the reports, depending on the quarter. Contaminated food and water were the likely vehicles of exposure, though the exact route was frequently unspecified and probably not known. The lack of a specified vehicle may indicate that the surveillance system in this region was relatively ineffective in determining causation (Table 1).

A government-issued warning or recall was mentioned in 20% of the reports (Fig. 3). The size of the outbreaks reported from Africa was larger than in any of the other regions included in this study. In the first two quarters of the year, one-third of reported outbreaks had 101–1,000 illnesses. In the third quarter, 43% of the reported outbreaks had 11–100 illnesses, while outbreaks of 101–1,000 persons were reported in 14%. The final quarter (Oct., Nov., Dec.) had a unique distribution: 29% of the outbreaks were in the 11–100 range, 18% in the 101–1,000 range, and 24% over 1001 (Fig. 4).

In the final quarter of 2008, a very large cholera outbreak began in Zimbabwe and spread to surrounding countries as refugees crossed borders. Five other countries (Botswana, Mozambique, Malawi, South Africa and Zambia) reported outbreaks linked to the one that originated in Zimbabwe *(17)*. These outbreaks were counted as six separate outbreaks in that quarter, because of the number of countries involved, with morbidity estimates ranging from 8 to over 26,000.

The death rate associated with outbreaks in Africa was comparatively high. Mortality was reported in 70% of the outbreak reports, with mortality of 1–10 persons in 41% of outbreaks. In the final quarter, the number of outbreaks with mortality of over 100 persons rose to 42% (Fig. 5).

Note: The researchers analyzed outbreak reports collected in the first quarter of 2009 in both English and French for the African region and found that most outbreaks were reported in both languages. This resulted in part from the involvement of the WHO and other international non-governmental organizations that work extensively in the African region and publish their reports in multiple languages. For example, in March 2009, only two reports were carried in French exclusively and not accessed by our regular methods of information gathering.

## Western Pacific

A total of 118 reports from the Western Pacific region in 2008 were analyzed. This region includes economically developed and developing countries. There was consistent reporting in English from Australia, New Zealand and a number of Asian nations in the region, including Japan and the Philippines.

Reported outbreaks did not show a seasonal trend in this region, which is not surprising because the region covers countries on both sides of the equator. Outbreak reports in the four quarters ranged from 33 to 27. The percent of cholera outbreaks increased over each successive quarter, from 9% in the first quarter to 19% in the second, 20% in the third, and 25% in the fourth (Fig. 1).

Food, the most common vehicle of the reported outbreaks, was implicated in the majority of reports from the Western Pacific region in each of the quarters. The next most reported vehicle was "unspecified" in three of the quarters (Fig. 2).

No specific pathogen dominated the reports. Reports used less specific terms, such as "contamination" and "gastroenteritis," with greater regularity. "Gastro-

enteritis" was the specified cause in 25% of the reports for the year, and cholera was specified in 18%. Reports documenting chemical contamination occurred more frequently in this region than in the other regions studied, being identified in 24% of the reports in the first quarter and 29% of those in the fourth quarter (Table 1).

Food recalls and warnings were issued in 36% of the outbreaks, which is slightly more frequently than in any other region included in this study. Interestingly, given the lack of seasonal variability in the reports from this region, warnings declined in the final quarter, from 39% in the first quarter, 38% in the second, and 39% in the third to 28% in the fourth quarter (Fig. 3).

Outbreaks in this region most commonly affected 11–100 persons, which was similar to data from the European region. However, both smaller and larger outbreaks were commonly reported. Very small (0 to 1 case) and large (101 to 1,000 cases) outbreaks each contributed 20% of the reports. Outbreaks affecting 11 to 100 persons were reported in one-third of the reports (Fig. 4).

Deaths were reported in 21% of the reports in the first quarter. Afterwards, mortality rates decreased to 11% and 10% of the reports in the second and third quarter, respectively, but increased to 18% in the fourth quarter. The mortality rate was lower than in Africa, as only a few reports mentioned deaths in the 11–100 range, and there were no reports of outbreaks with mortality of over 101 persons (Fig. 5).

Note: Outbreak reports collected from the Western Pacific region in the first quarter of 2009 (January to March) were analyzed in English and in Mandarin. The researchers found many additional outbreaks reported in Mandarin that were not covered in the English media. Between January and March 2009, 16 reports were carried in Mandarin exclusively and therefore were not accessed by our regular methods of information gathering.

## DISCUSSION

The researchers tracked the reporting of foodborne and waterborne disease outbreaks through reports that were publicly available in the media and that were from international and non-governmental organizations. Such informal reporting systems are available in every region. This research provided preliminary evidence that informal reporting systems can provide valuable information that can be used to compare the burden of foodborne and waterborne diseases in different regions. The researchers analyzed public reports of foodborne and waterborne outbreaks in three regions: one with highly developed surveillance systems (Europe), one with less developed surveillance systems (Africa), and one with intermediate systems (the Western Pacific region).

Surveillance systems vary greatly from region to region. Several countries have sophisticated surveillance systems that can support formal estimates of the burden of foodborne disease, while many others have rudimentary or developing systems. For further research, it would be valuable to compare informal reporting results with the formal estimates available in some countries.

Seasonality was more evident in both Europe and Africa than in the Western Pacific region. In Africa, the pattern of cholera outbreaks seemed to correlate strongly with the rainy season in the end of the fourth quarter and the beginning of the first. In Europe, the surveillance system provided more specific identification of pathogens causing the outbreaks, allowing observation of seasonality, such as the increase in Norovirus reports in the winter and fall months of the fourth quarter. In the Western Pacific region, seasonal trends were difficult to observe and identification of pathogens was relatively unspecific, necessitating the use of more general categories such as "contamination" and "gastroenteritis."

With respect to vehicle attribution, it was observed that the outbreaks linked to food were more common in Europe and the Western Pacific region than in Africa, which reported more waterborne outbreaks than the other two regions. Outbreaks with an unspecified vehicle were reported in every region, although the proportion varied greatly by season in each region.

The pathogens identified varied widely between regions. Despite having the highest number of outbreak reports, Africa had the least diversity among the pathogens reported, as 82% of the reports identified the cause as "cholera" *(Vibrio cholerae)*. The consistency of this narrow finding led the researchers to postulate that use of the term "cholera" may not be the result of a laboratory finding, but rather may indicate a non-specific category of diarrheal diseases. Europe identified *Salmonella*, *E. coli* and Norovirus most frequently and overall identified a much greater variety of pathogens in its reports. The Western Pacific region had no specific pathogen that dominated the reports, and its reports used nonspecific terms, e.g., "contamination." Also, that region reported more chemical contamination problems than either of the other two regions.

Food recalls and warnings were issued by governments in a minority of the outbreaks reported. The region with the greatest number of such consumer alerts (recalls and warnings) was the Western Pacific region, where recalls or warnings were reported in approximately 36% of the outbreaks. Europe issued alerts in approximately 34% of the outbreaks, and alerts were least frequent (20%) in the outbreaks reported from the African region.

The most frequently reported range of illnesses was 11–100 persons for each region during most of the seasons. Africa was an exception for the first two quarters, when the most frequent range was 101–1000 persons. This may indicate that surveillance was more efficient in Europe and Western Pacific than in Africa, because these regions were better able to issue recalls and warnings and publicize outbreaks before more than 100 persons became ill.

The rates of mortality showed the greatest differences between the regions. In Africa, mortality was reported in 70% of the outbreak reports, and the proportion of outbreaks with mortality of over 100 persons was very high, especially in the fourth quarter (42%). The European region had lower mortality rates, perhaps as a consequence of less potent pathogens circulating in the region or better outbreak surveillance systems that ensured more rapid control of outbreaks.

## CONCLUSION

At the level of international governance, there is increasing focus on infectious diseases, especially those at the interface of humans, animals and the ecosystem, under the One World, One Health Strategic Framework. This framework was developed by the Food and Agriculture Organization (FAO) of

the United Nations, the World Organization for Animal Health (OIE), the World Health Organization (WHO), the United Nations Children's Fund, and the World Bank, responding to recommendations that emerged from national governments *(11)*.

As the WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) states, foodborne diseases place both a public health and an economic burden on countries *(20)*. Understanding waterborne and foodborne disease trends by region and country is necessary to focus resources on actual disease problems and identify locally important diseases that could become a threat to global health. While improving capacity in disease surveillance at the local, national, regional, and international level is a long-term objective, developing tools to analyze informal and public reporting of foodborne illness and promote information sharing can facilitate important public health protection. Available information streams should be utilized to develop baselines that could help estimate the regional burden of foodborne illness. They may also prove essential in more rapid identification and assessment of infectious disease agents and other emerging public health problems.

## ACKNOWLEDGMENTS

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# Innovations in Printing Technology Can Help Boost Food Safety

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With our heightened awareness of food packaging safety today, it seems unthinkable that just 200 years ago, no one gave a second thought to sealing tin cans with lead soldering – a process that caused widespread lead poisoning.

Fast forward to the first decade of the 21st century, and we can see the tremendous innovations that have occurred, along with public recognition of the importance of preventing food packaging components – especially inks used on labels – from migrating into the food inside the package.

Last year, the European Commission implemented strict new standards for food packaging after a potentially dangerous chemical found in printing inks was discovered on some breakfast cereal boxes. The chemical, 4-methylbenzophenone (abbreviated 4-MBP), is a potential carcinogen. The EC required food manufacturers using packaging printed with UV cured inks to document that they'd put measures in place to prevent migration to the food inside the packaging.

Just four years earlier, the EC had investigated another printing ink chemical, ITX (isopropylthioxanthone), after it was found to have migrated into a milk product for babies. Nestle was forced to recall hundreds of thousands of containers of the product from Italy, France, Portugal and Spain, and the company that made the packaging, Tetra Pak AB, said it would eliminate the use of ITX.

## FOOD PACKAGING GUIDELINES EVOLVE

In the U.S., food packaging guidelines became much more complex and stringent after the U.S. "Bioterrorism Act" of 2002 was enacted in response to the 2001 terrorist attacks. The act classified as a "food additive" any substance that may, either directly or indirectly, result in "becoming a component or otherwise affecting the characteristic of any food." This includes any substance intended for use in packaging. Under its Food Contact Notification Program, the U.S. Food and Drug Administration will conduct a phased review of packaging substances and the chemicals used in inks to ensure their safety.

Food safety has reached top-of-mind awareness for food manufacturers. This year's PACK EXPO in Chicago, produced by the Packaging Machinery Manufacturers Institute, will feature a Food Safety Resource Center. In addition, the Packaging Association of Canada announced plans this year to spend USD $568,825 to help improve food safety in the supply chain.

## REVOLUTIONARY CHANGES TO PRINTING TONER

Fortunately for food safety professionals and consumers, the past 10 years have seen major innovations in printing technologies related to direct and non-direct food contact that help meet the requirements of not only stricter regulations but consumer safety as well. Dry toner technology has emerged as a safer, more environmentally friendly alternative to liquid inks, because it's non-toxic, and certain dry toners used with electrophotographic printing are approved for direct and indirect contact with dry food.

To fully understand the safety regulations around food packaging, we should examine what the FDA defines as direct or indirect contact with food. Direct contact means contact with a substance that is intended to be added to food, which includes substances regulated by the FDA as direct food additives. Indirect contact means contact with a substance that is on the side of the package that is not in contact with food, so that the packaging acts as a functional barrier to separate the food from the printed material. The FDA will look at the structure and thickness of the packaging and laminates to determine whether they can prevent migration of inks into the food.

Ultra Violet (UV) inks, used in inkjet printing systems, may offer the advantages of fast curing and high quality, but these advantages are somewhat offset by the potential environmental and health concerns they create when used with food. At issue is the fact that printers can't ensure that some chemical residues from photoinitiators, which are used to cure UV inks quickly on packaging, won't migrate into food.

### WHAT ARE THE ADVANTAGES OF DRY TONER?

Unlike many conventional solvent-based liquid printing inks, dry toner is non-toxic, offering the added benefit of producing no Volatile Organic Compounds (VOCs) during the printing process. The cartridge contains a dry plastic powder, eliminating the need for a drying or curing process. Unlike liquid toner, dry toner can be used for printing on nearly any kind of substrate: conventional label material such as paper, polyethylene terephthalate (PET) foil, and polypropylene (PP). In addition, some dry toner technologies available today are formulated so that they are easily removed from printed materials, thus allowing for higher recycling rates.

### FOOD SAFETY UNDER HEIGHTENED SCRUTINY

Food safety professionals face pressures throughout the food safety system that didn't exist and weren't imagined a generation ago. The reappearance of foodborne illnesses such as Mad Cow Disease and foot-and-mouth disease are reminders of the unwanted side effects of globalization of food trade.

With increasing regulations and heightened consumer perceptions of the importance of food safety, professionals along the food supply chain can't afford to cut corners when it comes to ensuring the safety of food packaging. Any safety review of food packaging should include consideration of the printed inks, coatings and initiators, as well as the composition of the packaging itself, taking into account not only compliance issues but the safety of the consumer. Moving away from conventional, solvent-based inks toward more environmentally friendly ink technologies such as dry toner to eliminate the ink-migration risks can help ensure a safer and more stable food supply chain.

*Michael V. Ring is president of Itasca, IL-based Xeikon North America, a manufacturer and distributor of digital color printing systems and related consumables such as the dry toner.*

# Highlights of the Executive Board Meeting
# April 26-28, 2010
# Des Moines, Iowa

Following is an unofficial summary of actions from the Executive Board Meeting held in Des Moines, Iowa on April 26-28, 2010:

**Approved the following:**

- Minutes of February 7, 2010 Executive Board meeting
- Minutes of February 7, 2010 Executive Board Executive Session meeting
- Affiliate Charter for Nebraska Association for Food Protection
- *JFP* Policy on Plagiarism

**Discussed the following:**

- Committee appointments for 2010
- Results of IAFP Secretary election
- PDG Webinars and other Webinar types
- Sanitation PDG Webinar series
- Retail PDG project
- Awards report for IAFP 2010
- President's Lifetime Achievement Award
- Young Professionals organizational meeting
- *FPT* survey results
- Foundation Golf Tournament
- IAFP 2010 planning update
- Local Arrangements update
- Sponsorship and exhibit sales update
- Future Annual Meeting sites – proceed with Indianapolis
- Long-range planning session
- European Symposium – Dublin, June 2010; registration & sponsorship both strong
- International Symposium – Colombia, September 2010; program in place and being promoted
- International planning; China, October 2010 and Australia (2011)
- Investment results for 2008, 2009 and year to date, 2010
- IFPTI – name close to IAFP's
- Center for Produce Safety sponsorship of conference
- ASM-National Registry of Certified Microbiologists (NRCM)
- 100-Year Anniversary
- APHA Compendium
- Non-O157 *E. coli* white paper
- 3-A Sanitary Standards
- Publication issues
- Journal comparisons
- ILSI Europe Workshop proposal for European Symposium
- APS Workshop proposal
- APEC update
- Executive Director contract
- Annual Meeting future site planning

**Reports received:**

- *IAFP Report*
- *Food Protection Trends*
- *Journal of Food Protection*
- IAFP Web site
- Financial statements
- Board Members attending Affiliate meetings
- *Affiliate View* newsletter
- Future Annual Meeting schedule
- Future Exhibiting by IAFP

**Next Executive Board meeting – July 30-August 5, 2010.**

# IAFP's Sixth European Symposium

## *Advancing Food Safety Worldwide*

June 7-11, 2010
Dublin, Ireland


The International Association for Food Protection–in collaboration with the International Life Sciences Institute Europe, the Society for Applied Microbiology, the World Health Organization and the Food and Agricultural Organization of the United Nations–hosted IAFP's Sixth European Symposium at University College Dublin (UCD) in Dublin, Ireland, 9-11 June. Over 300 people from 32 countries attended the conference.

The conference opened with a welcome address from Ireland's Minister of Agriculture, Mr. Brendan Smith, TD. Alan Reilly, Food Safety Authority of Ireland, delivered the keynote lecture, "Food Safety in a Global Market". Globally renowned invited speakers presented over 40 presentations, including topics such as *Persistence and Survival of Pathogens in Dry Food Processing Environments, Emerging Food Safety Issues, Global Food Safety Management Standards* and *Rapid Methods and Method Validation.* More than 90 posters were displayed and presented, and for the first time, 18 technical presentations were made. Presentations from many of the sessions are available on the IAFP Web site. One technical presentation and two posters won the student competition. The winners were Rocio Morales-Rayas, Universite Lavale, Quebec City, Canada; Orla Condell, UCD, Centre for Food Safety, Veterinary Health Sciences Centre, Dublin, Ireland and Shane Cooney, UCD, Centre for Food Safety, Veterinary Health Sciences Centre, Dublin, Ireland.

On the evening of 10 June, bioMérieux Industry hosted a reception at the historic former home of the Guinness family, Farmleigh. This elegant home is now owned by the Irish government and has beautiful architecture, sculptures and a rare book library. Attendees enjoyed hors d'oeuvres and entertainment provided by a harpist.

Eighteen prominent companies shared their food safety expertise through innovative



displays and demonstrations at the exhibit hall. Exhibitors and sponsors helped by financially supporting the symposium (see list below).

IAFP thanks the Organizing Committee chaired by Dr. Pratima Jasti and Dr. Michele Storrs, for the time and effort taken to plan this excellent conference and to the outstanding companies on whose generosity and enthusiastic contributions IAFP depends when seeking to extend its mission of facilitating food safety communications around the world. Be watching for details on IAFP's Seventh European Symposium on Food Safety to be held in the spring of 2011!


## *Sponsors of IAFP Sixth European Symposium*

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This membership was previously a Silver Sustaining Membership

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# NEW SUSTAINING MEMBER

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# WHAT'S HAPPENING IN FOOD SAFETY

### 3-A SSI Announces 2010 Volunteer Awards and Progress Report

3-A Sanitary Standards, Inc. (3-A SSI) announced the recipients of its 2010 Volunteer Service Awards and the release of a special progress report, *Moving Ahead in Our Mission*, at the 3-A SSI Annual Meeting in Milwaukee, WI.

Introduced in 2008, the 3-A SSI Volunteer Service Awards recognize the extraordinary dedication and commitment of individuals who contribute to the development of voluntary standards and the mission of 3-A SSI. Nominations for the awards are made by fellow volunteers from the three stakeholder groups in 3-A SSI – regulatory sanitarians, fabricators and processors – and others.

Winners of the 3-A SSI Volunteer Service Awards for 2010 announced at the meeting included:

- Helen Piotter (Dean Foods) received the Leadership Service Award for outstanding service to 3-A SSI voluntary standards development and significant contributions to the mission of 3-A SSI.
- Chuck Meek (Tetra Pak) received the Advancement Award for outstanding accomplishments on behalf of 3-A SSI.

### FDA and NIH Launch Web-based Safety Reporting Portal to Increase Adverse Events Reporting of FDA-regulated Products

The Food and Drug Administration (FDA) and the National Institutes of Health (NIH) have launched the Safety Reporting Portal (SRP) Web site allowing increased accessibility to submit reports concerning FDA-regulated products. SRP allows even the concerned citizen to submit a safety report related to foods, drugs, and veterinary products. "As access to this internet tool increases," says Benjamin L. England, Food and Drug Law professional and founder of FDAImports.com, "the number of safety reports to FDA will certainly increase as well." Because some safety reporting is mandatory for certain products by some private manufacturers and processors, 'required organizations,' use of the SRP will become the upgraded replacement for all safety reporting to FDA. For instance, the SRP now replaces FDA's previous *Reportable Food Register*. One upgrade to the electronic and online reporting system permits consumers to submit reports concerning adverse events and products, product manufacturers, processors, packers, warehouses, researchers, and health care professionals already had the ability (and sometimes the duty) to report safety problems to FDA.

Currently, in order to report an adverse event to FDA, even federal investigators, as well as required organizations, must submit duplicate reports to several federal agencies. Each of these reports requires use of different forms, vocabularies, reporting time frames and criteria. The SRP standardizes all submitting requirements across commodities, industries and market participants. Previously, multiple agencies were receiving the same safety report in varying formats. This had the potential to cause confusion among government authorities concerning which department should investigate and potentially take enforcement action. "SRP shows that FDA and NIH are serious about taking action toward uniting and coordinating the diverse federal requirements that are currently in place for the reporting and reviewing of adverse events," says Benjamin England.

Similar to the old portal system, SRP requires certain organizations to submit mandatory reports relating to Reportable Foods, Animal Drug Safety and Gene Transfer Research. SRP now enables anyone who has internet access, including consumers, the ability to report a safety concern voluntarily. SRP was created with advanced software that makes reporting a problem or concern simpler than ever before. "This is a very simple system to access," says Benjamin England, "Simplicity leads to more reports, including those from consumers, which is likely also to lead to a higher number of lower quality reports that FDA must sift through."

For more information, visit the FDA Web site at www.fda.gov/NewsEvents/PublicHealthFocus/ucm212845.htm.

### New Food Defense Toolkit Helps Restaurants Reduce Risk of Intentional Food Contamination

Attacks on our food supply do happen, although rare, according to Multnomah County Health Department's Environmental Health program. The Health Department's Food Defense Project is the nation's first comprehensive program to assist restaurant operators in both reducing the threat of a food terrorism event and responding to an attack.

In 1984, Dalles, Oregon experienced the first and single-largest food bio-terrorist attack in United States history. More than 750 people were diagnosed with *Salmonella* after eating at salad bars that were intentionally contaminated in ten local restaurants. The event heightened the visibility of public health and their responsibilities in food safety and disease monitoring in the food service industry.

Multnomah County's Food Defense Toolkit, funded by the Food and Drug Administration, uses an 8-point risk assessment system to prompt restaurant managers to monitor frequently overlooked security areas and offers suggested remedies that can be tailored to each restaurant's unique situation. An employee training guide, training videos and posters complete the toolkit.

"An alert and well-trained staff makes intentional contamination of food very difficult. Our goal is to give restaurants the tools they need to protect the public's health," says Lila Wickham, environmental health manager for Multnomah County Health Department.

The Food Defense Toolkit is available online http://www.mchealthinspect.org/restaurant.html#defense.

## 3-A SSI Issues Comprehensive Revisions of Two Standards

3-A Sanitary Standards, Inc. has announced the release of two major revisions of key 3-A Sanitary Standards.

3-A Sanitary Standard for Non-Coil Batch Pasteurizers (24–03) is the first major revision of this standard in five years. This standard covers the sanitary aspects of non-coil type batch pasteurizers used to pasteurize milk, fluid milk products, or other fluid food products and includes those appurtenances necessary to meet pasteurization requirements. The scope of this standard includes the points where the product enters and exits the non-coil type batch pasteurizer.

3-A Sanitary Standard for Double-Seat Mixproof Valves (85–01) was revised with significant technical changes to maintain consistency with the Pasteurized Milk Ordinance (PMO). This standard covers the sanitary aspects of double-seat mixproof valves used on processing equipment and on equipment and lines which hold or convey milk, milk products, and other comestibles. These valves cannot be used to separate raw milk and milk products from pasteurized milk, milk products, and other comestibles.

All 3-A Symbol holders must verify conformance to the latest revision of the standard covering their equipment in the next license renewal period. Copies of the new standards are now available for purchase in electronic format or printed version through the 3-A SSI Web site at www.3-a.org.

## New Smartphone App Alerts Consumers to Food and Product Recall Info

Popular technology will now help Americans verify what they eat is safe. The U.S. Government's Products Recall app for the Android smartphone is now available at the revamped USA.gov Web site, and the apps for Blackberry and iPhone are soon to follow.

"Alerting consumers quickly to food and product recall information through this technology can prevent untold illness and save lives. Instead of trying to find recalls on many different Web sites at home, consumers who download this tool can use technology to make informed decisions even before they put a product in their grocery cart or open the package to prepare a meal for their family," said Agriculture Secretary Tom Vilsack.

The app was unveiled by the General Services Administration as part of the new mobile app store on the updated USA.gov Web site. The new Mobile Apps store at USA.gov will collect all in one place the mobile applications developed throughout the federal government.

Using information from several agencies across the government, including the U.S. Department of Agriculture's Food Safety Inspection Service (FSIS) and the Department of Health and Human Services' Food and Drug Administration (FDA), the Products Recall app for smartphones is a powerful tool that will help reduce foodborne illness and enhance the lives of Americans. It puts information about any recalled products – including foods – at consumers' fingertips.

The app allows consumers to view the most recent recall press releases and any pictures associated with those products. Consumers can get information of specific interest to them using a feature on the app that searches recalled products by product name or category.

The app's "report incident" feature allows consumers to connect directly with their government to report concerns of unsafe products. A "tips" option will feature rotating educational messages for consumers about a variety of products, such as highlighting safe food-handling tips as popular cooking holidays approach.

"Our goal is to quickly inform the public and media when food products are recalled. This app puts the information directly in the hands of consumers, giving them the power to take action," said USDA Deputy Under Secretary for Food Safety Jerold Mande.

In addition to foods regulated by FSIS and FDA, the Products Recall app also includes recall information for drugs, cribs, strollers, child safety seats, tires and other consumer products.

### USDA Finalizes Ground Beef Standards for School Lunch and Nutrition Programs

Agriculture Secretary Tom Vilsack has announced that USDA has finalized tougher new standards for ground beef purchased by the Agricultural Marketing Service (AMS) for federal food and nutrition assistance programs including the National School Lunch Program.

"It is one of my highest priorities to ensure that food provided to the National School Lunch Program and other nutrition programs is as safe and nutritious as possible. The new standards guarantee our purchases are in line with major private-sector buyers of ground beef. We will continue to apply the best scientific knowledge to increase the safety across the board of our nutritional programs," Sec. Vilsack said.

Secretary Vilsack announced a series of initiatives in February to improve the safety of food purchased for nutrition assistance programs. The final standards are the result of a detailed, ongoing review by USDA's Food Safety and Inspection Service (FSIS) and Agricultural Research Service (ARS).

The new requirements will be applicable to AMS ground beef contracts awarded on or after July 1, 2010. The AMS released a draft of the plan in May with a request for comments. Based upon comments and data submitted by the Department of Agriculture's FSIS and ARS and members of the general public, revisions were made to the final specification that will be used for purchases beginning in July 2010.

In addition to continuing a zero tolerance for *E. coli* O157:H7 and *Salmonella*, the new AMS standards: (1) tighten microbiological testing protocols; (2) tighten the microbiological upper specification and critical limits; (3) increase microbiological sampling frequency for finished products to every 15 minutes; and, (4) institute additional rejection criteria for source trimmings used to manufacture AMS purchased ground beef. AMS will also consider any vendor classified by FSIS as having a long-term poor safety record as an ineligible vendor until a complete cause-and-effect analysis is completed.

The new purchasing requirements can be found in their entirety at: http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5085021.

### Robert E. Brackett Named Director of the National Center for Food Safety and Technology

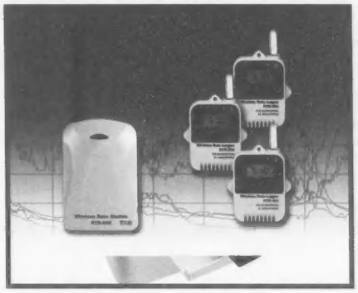
Robert E. Brackett, Ph.D. has been named by President John Anderson as the new director and vice president of the National Center for Food Safety and Technology at Illinois Institute of Technology. Brackett will be responsible for managing the center and will report directly to IIT's Provost, Dr. Alan W. Cramb.

Dr. Brackett most recently served as senior vice president and chief science and regulatory officer for the Grocery Manufacturers Association (GMA), a position he has held since 2007.

Dr. Brackett has nearly 30 years of experience in scientific research in industry, government and academia. Prior to his position at GMA, he worked at the U.S. Food and Drug Administration's Center for Food Safety and Applied Nutrition where he started as a senior microbiologist in the Office of Plant and Dairy Foods and Beverages in 2000.

Earlier in his career, Dr. Brackett held professorial positions with North Carolina State University in Raleigh, and the University of Georgia in both its Department of Food Science and Technology and the Center for Food Safety and Quality Enhancement.

# INDUSTRY PRODUCTS



*TandD Corporation*

### New Wireless Data Logging System

TandD Corporation has introduced the new RTR-500 Data Logging System which provides the ability to monitor and download data without the need to physically retrieve the loggers.

In addition, warning notifications are available from the remote locations via email when parameters are out of norm. The new RTR-500 is a wireless base station which connects to a PC through a USB port. This unit can function as a base station or as a repeater to expand the range of wireless communications in increments of about 500 ft per unit. With the use of multiple repeaters, the range is virtually unlimited.

The new RTR-501, RTR-502 and RTR-503 are data loggers built to work and last in harsh environments.

The RTR-501 can be used indoors or outdoors and has an internal sensor with a temperature range of -40° to +80°C.

The RTR-502 features a variety of optional external sensors including waterproof sensors with a range of -60° to +155°C.

The RTR-503 also features an external sensor which measures both temperature from 0° to 55°C and relative humidity from 10% to 95%.

"The RTR-500 Software that is included free of charge with the unit, allows for a variety of data retrieval options. This includes the option to download data files in popular formats such as XML or CSV, and to 'push' the data to remote locations via email or to an FTP server."

New features of the RTR-500 Family include improved transmission range of up to 500 ft line of sight, improved battery life of 1 year standard or 4 years with the optional large battery pack. These new units also feature improved download speed which is twice the speed of its predecessors.

**TandD Corporation**
518.669.9227
Saratoga Springs, NY
www.tandd.com

### Bio-Rad Launches High Throughput Real-time PCR Protocols

Bio-Rad Laboratories has announced the launch of iQ-Check™ real-time PCR high throughout protocols. To meet the demands of high volume users, a high throughput DNA extraction procedure was developed using a 96-well deepwell microplate format. These new faster, easier DNA extraction protocols have been granted Performance Tested Method℠ status by the AOAC Research Institute for *Salmonella*, *E. coli* O157:H7, *Listeria monocytogenes* and *Listeria* spp. After an 8–24 h sample enrichment, depending on the test, there is one 15 min heating step and the samples are ready for PCR. All transfers can be done with a multichannel pipette for ease of use. Extraction is the same for all tests so all samples can be run at the same time, on the same plate.

Two instrument platforms are available to run the iQ-Check test. The MiniOpticon is a 48-well real-time instrument for small to medium volume users. For high throughout analysis, the CFX96 instrument is available. To run these instruments, Bio-Rad has created a new user-friendly software. The CFX Manager™ software is a powerful tool for life science research customers. The Industrial Diagnostic Edition (IDE) of this software was designed with the user experience in mind created especially for the needs of food scientists. It combines the power of the research software with the ease of use that is expected in the food industry. The IDE software has many extra features including automatic email notification of results, sample setup in plate or table format, import and export to LIMS, improved traceability, various security levels from admin with full rights to user with limited rights, reagent lot tracking and many other user preferences that can be customized.

The iQ-Check high throughput protocols combined with the IDE software make real-time PCR for

pathogen detection faster, easier and better.

**Bio-Rad Laboratories**
800.424.6723
Hercules, CA
www.foodscience.bio-rad.com

## Eriez® Eddy Current Separators Allow PET Flake Recyclers to Obtain High Purity and High Yield

The recycling of beverage containers made from polyethylene terephthalate (PET) is garnering higher purity and yield with high speed, high strength eddy current separation technology from Eriez®.

Eriez's newest line of Eddy Current Separators deliver exceptional nonferrous particle separation from PET flake. Recyclers can obtain a single pass aluminum reduction up to 92 percent and achieve a clean PET yield of 97 percent to 99 percent. According to studies conducted by Eriez, a one-percent improvement in good product yield can save a company up to $230,000 in recycled PET annually with a 60-inch wide Eddy Current Separator.

Once the PET is purified, it can be re-used to make fiber, banding, or blended to make recycled content beverage and food containers. Recycled PET can be used in such diverse products as carpet, food containers, clothing, auto parts, tool handles and sleeping bag insulation.

Eriez's Eddy Current Separators use powerful Rare Earth magnets that are arranged into a high-speed, composite shelled rotor. The PET containing metal contaminants—such as aluminum—are fed onto a conveyor belt in a controlled, low-density thin layer. The belt then passes over the rotating magnets and eddy currents are created in the aluminum.

When the polarity of the magnetic field around the aluminum is the same as the rotating magnets, the aluminum is repelled from the magnet. This causes the trajectory of the nonferrous metal to be different than the PET flake. The two streams of material are separated by an adjustable splitter in a simple, high-volume manner.

The heart of the separator is the Rare Earth Arched (REA) rotor, which uses powerful Rare Earth magnets that are curved to the shell contour. This high-frequency rotor has 22 poles and offers effective removal of small and medium nonferrous metals from aluminum cans as well as electronic scrap, plastics, glass cullet, foundry sand and urban wood waste. This REA rotor uses patented Kevlar/ceramic tile surface shells and grease retainer chambers and is balanced to operate up to 3200 RPM. Normal bearing life with good maintenance is calculated to be more than 15 years.

The equipment controls are housed in a NEMA 4-rated enclosure and include a belt speed tachometer. Also available is an Eriez vibratory pan feeder, hopper and belt conveyor to assure an even, controlled flake depth to enhance the separation performance.

**Eriez**
888.300.3743
Erie, PA
www.eriez.com

## DuPont Qualicon BAX® System Test for *E. coli* O157:H7 Certified as AOAC Performance Tested Method℠

DuPont Qualicon has announced certification for its recently released BAX® System test for *E. coli* O157:H7 in food. The AOAC Research Institute has validated this real-time PCR assay, developed in collaboration with the USDA Agricultural Research Service, as a Performance Tested Method℠ for detecting the pathogen in spinach, lettuce, raw ground beef and beef trim with same-day results.

The AOAC Research Institute, a subsidiary of AOAC International in Gaithersberg, MD, provides rigorous evaluation and review of analytical methods before awarding its widely recognized Performance Tested Method℠ certification mark.

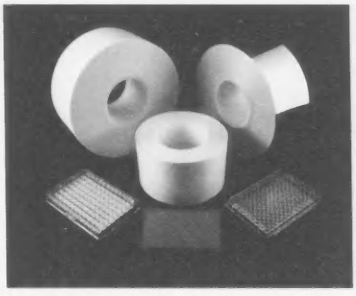
"Fast, accurate results are critical when testing perishable products for pathogens," said Luiz Fischmann, global marketing manager – DuPont Qualicon. "This assay was developed to detect all known *E. coli* O157:H7, even atypical strains, within hours instead of days. Now meat and produce processors that require a certified method for quality control can benefit from BAX® System speed, accuracy and ease of use."

*E. coli* O157:H7 are foodborne pathogens that live in the gut of cattle and other ruminant animals. These bacteria produce shiga toxin, which can cause serious illness when ingested, even in very low doses. Although thorough cooking destroys the pathogen, the U.S. Centers for

Disease Control estimates about 70,000 people are infected each year from consuming *E. coli* O157:H7.

Food processing companies around the world rely on the BAX® system to detect pathogens or other organisms in raw ingredients, finished products and environmental samples. The automated system uses leading-edge technology, including polymerase chain reaction (PCR) assays, tableted reagents and optimized media to detect *Salmonella*, *Listeria* species, *Listeria monocytogenes*, *E. coli* O157:H7, *Enterobacter sakazakii*, *Campylobacter*, *Staphylococcus aureus*, *Vibrio*, yeast and mold.

**DuPont Qualicon**
302.695.5300
Wilmington, DE
www.qualicon.com



*Excel Scientific, Inc.*

### Excel Scientific New Adhesive Films in Roll Format for Automated Microplate Sealing

Excel Scientific introduces Roll-Seal™ adhesive sealing films on rolls for use with high-throughput automated microplate sealers.

Constructed on three-inch plastic cores, Roll-Seal rolls are compatible with most common adhesive sealers. The Roll-Seal format provides reliable, efficient sealing at a lower cost-per-plate than sheets or heat-seal films with minimal user intervention.

Currently offered in the Roll-Seal format are three of Excel's extensive line of adhesive sealing films:

ThermalSeal RTS™ clear films with ultra-strong silicone adhesive for qPCR and sitting-drop protein crystallization; AlumaSeal® pierceable aluminum foils for PCR, HTS and cold storage; and breathable AeraSeal™ films for cell and tissue culture.

**Excel Scientific, Inc.**
760.246.4545
Victorville, CA
www.excelscientific.com

### New QT Power Chain® II Belt Drive System from Altra Industrial Motion

The QT Power Chain II belt drive system from TB Wood's consists of a synchronous belt, sprockets, bushings and idlers that are all designed to work together to deliver the best value in power transmission – whether the application is low-speed or high-speed. When compared with standard roller chain, this powerful belt drive system provides important performance advantages and significantly reduces overall costs. The new sizes of belts and sprockets along with increased power ratings (up to 40% higher than its predecessor) allow QT Power Chain II drive systems to be designed in widths narrower and more compact than ever before.

The result of state-of-the-art design and engineering, the body and teeth of QT Power Chain II belts are made of a durable polyurethane compound, specially blended for uncompromising adhesion to the tensile cords and heavy nylon tooth facing. This makes the belt virtually immune to abrasion and chemical attack. QT Power Chain II belts get their muscle from Aramid fiber tensile cords and perform flawlessly under the harshest operating conditions. The cords provide exceptional flex fatigue life and high impact strength to handle shock and surge loading. These belts are tough enough to outlast standard roller chain 3-1. With no metal-to-metal contact between belt and sprocket, sprocket life increases significantly over roller chain sprockets by a ratio of 10 to 1.

QT Power Chain II sprockets are designed to carry hefty belt power loads utilizing the robust, industry-proven Taper-Lock bushing system. Taper-Lock bushings are split through the flange and gradually taper to provide a true clamp fit on the shaft that is the equivalent of a shrink fit.

The Taper-Lock bushing system keeps the sprocket hubs narrow so the length-thru-bore dimension is less than ever before. The left-justified hub design allows shaft mounting close to bearings, keeping the center of load dimension small while preventing issues with high overhung loads.

TB Wood's QT Power Chain II belt drive systems are designed for use in a variety of industries including lumber, pulp and paper, packaging,

food processing, bottling, aluminum and steel, petrochemical, sand, gravel, concrete and glass.

**Altra Industrial Motion**
815.967.0929
Braintree, MA
www.AltraMotion.com

## Mettler Toledo Announces ISO 14001 Environmental Certification

Mettler Toledo proudly announces ISO 14001 environmental certification of its Worthington, Ohio facility. The production facility creates weighing solutions for both industrial and retail applications and serves as a distribution center for delivering Mettler Toledo products in the Americas.

ISO 14001 certification provides companies with a standardized framework for creating an effective environmental management system. It offers a systematic approach to identifying environmental objectives and targets, and helps to control the environmental impact of company activities.

To ensure its environmental efforts remain a priority, Mettler Toledo created an Environmental Management Team comprised of employees from various departments – including management level representation. The goal of this team is to implement and maintain the facility policies according to ISO 14001. The team has created an open dialog with all plant employees. They regularly hold informational meetings and frequently ask for suggestions to improve the program.

"Through this certification, Mettler Toledo has gained greater insight into the environmental impact of our products and activities, and we have taken strides to lessen our ecological footprint," said Darrell Flocken, quality manager at the Worthington facility and member of the Environmental Management Team,

"...although ISO 14001 accreditation is new to our facility, most of our environmental procedures are not. In fact, some policies have been in place for over 30 years, and our workplace policies span all departments from product design, production, logistics and service."

The newly certified Mettler Toledo facility has an extensive recycling program that not only includes production waste, but also recyclable items from its customers and employees. Mettler Toledo is active in recycling 14 different categories of waste, and only uses recyclable or re-usable packaging materials for its products. In addition to the nearly 230 tons of waste that was recycled in 2009, the Worthington facility also provides proper disposal of employees' batteries, light bulbs and computer equipment. In addition, as a service program for its customers, Mettler Toledo helps to recycle and dispose of used customer equipment and non-working printed circuit boards (PCB).

**Mettler Toledo**
614.841.5001
Columbus, OH
www.mt.com

# COMING EVENTS

## SEPTEMBER

- **9, Georgia Association for Food Protection Fall Meeting,** Russell Research Center, Athens, GA. For more information, contact Pam Metheny at 678.450.3061; E-mail: pam.metheny@waynefarms.com.
- **9, Quebec Food Protection Association Annual Meeting,** Quebec City, Canada. For more information, contact Julie Jean at 418.656.2131 ext. 13849; E-mail: julie.jean@fsaa.ulaval.ca.
- **13–15, International Dairy Show,** Dallas Convention Center, Dallas, TX. For more information, call 202.737.4332 or go to www.idfa.org/events.
- **14–16, Sustainable Packaging Forum & Expo,** Arizona Grand Resort, Phoenix, AZ. For more information, call 610.935.2183 or go to www.packstrat.com.
- **21–22, Sensory Evaluation,** New Brunswick, NJ. For more information, go to www.cpe.rutgers.edu.
- **21–23, New York State Association for Food Protection 87th Annual Meeting,** Syracuse, NY. For more information, contact Janene Lucia at 607.255.2892; E-mail: jgg@cornell.edu.
- **21–24, IAFP's Latin American Symposium of Food Safety,** Bogota, Colombia. For more information, go to www.acta.org.co/Congreso2010.php.
- **22–23, Wisconsin Association for Food Protection Joint Education Conference,** Holiday Inn, Eau Claire, WI. For more information, go to www.wafp-wi.org.
- **22–24, Kansas Environmental Health Association Fall Conference,** Great Wolf Lodge, Kansas City, KS. For more information, go to www.e-keha.org.
- **22–24, Labelmaster's 5th Annual Symposium for Dangerous Goods Shipping Instructors,** Embassy Suites Hotel, Chicago, IL. For more information, call 800.621.5808 ext. 2201 or go to www.airregs.com/conferences.
- **22–24, Washington Association for Food Protection Annual Conference,** Campbell's Resort, Lake Chelan, WA. Contact Stephanie Olmsted at 206.660.4594 or go to www.waffp.org.
- **23, Making Sense of the Numbers: Statistics for Food Scientists,** New Brunswick, NJ. For more information, go to www.cpe.rutgers.edu.
- **26–29, Indiana Environmental Health Association Fall Educational Conference,** Abe Martin Lodge, Brown Co. State Park, Nashville, IN. For more information, go to http://iehaind.org/conference.html.
- **28–29, Arkansas Association for Food Protection Annual Meeting,** Tyson Foods, Springdale, AR. For more information, contact Mike Sostrin at 479.277.8641 or go to http://arkafp.org.

## OCTOBER

- **5–6, Iowa Association for Food Protection Annual Conference,** Quality Inn & Suites, Ames, IA. For more information, contact Lynn Melchert at 563.599.2394 or E-mail lynne.melchert@swissvalley.com.
- **6–7, Associated Illinois Milk, Food and Environmental Sanitarians Fall Conference,** Hotel Pere Marquette, Peoria, IL. For more information, go to http://aimfes.org/calendarofevents.html.
- **7–8, 10th Annual GLOBAL G.A.P. Conference,** London, UK. For more information, go to www.summit2010.org.
- **13, Metropolitan Association for Food Protection Fall Seminar,** Douglass Student Center, Rutgers University, New Brunswick, NJ. For more information, contact Carol Schwar at cschwar@co.warren.nj.us or go to www.metrofoodprotection.org.
- **17–20, Food Microbiology Symposium,** River Falls, WI. For more information, go to www.uwrf.edu/afs-all/institutes/foodmicro/.
- **20–22, 7th International Symposium: Milk Genomics & Human Health,** UC-Davis Conference Center, Davis, CA. For more information, go to www.cdrf.org.
- **26–28, North Dakota Environmental Health Association Annual Conference,** Bismarck, ND. For more information, go to www.ndeha.org.
- **31– Nov. 3, PACK Expo International 2010,** McCormick Place, Chicago, IL. For more information, contact Amy Riemer at 978.475.4441 or go to www.packexpo.com.

## NOVEMBER

- **2–3, PACK Expo International 2010,** McCormick Place, Chicago, IL. For more information, contact Amy Riemer at 978.475.4441 or go to www.packexpo.com.
- **3–5, Dairy Practices Council Conference,** Ramada Plaza Hotel and Conference Center, Columbus, OH. For more information, go to www.dairypc.org.
- **4–6, Mexico Association for Food Protection Annual Meeting,** Puerto Vallarta, Mexico. For more information, contact Javier Castro Rosas at jcastro@uaeh.edu.mx or capicr@hotmail.com.
- **6–10, American Public Health Association Annual Meeting and Expo,** Denver, CO. For more information, go to www.apha.org/meetings/.
- **8–11, IDF World Dairy Summit,** Auckland, New Zealand. For more information, contact Christian Robert at CRobert@fil-idf.org or go to www.wds2010.com.
- **10–11, China International Food Safety and Quality Conference & Expo,** Shanghai, Longemont Hotel, P.R.C. For more information, go to www.chinafoodsafety.com.

# COMING EVENTS

- **10–12, 2010 EFFoST Annual Conference–Food and Health,** Dublin, Ireland. For more information, go to http://effost@event-logistics.co.uk.
- **17, Ontario Food Protection Association Fall Conference,** Mississauga Convention Centre, Mississauga, Ontario, Canada. For more information, contact Victoria Rosa at 519.265.4119 or visit info@ofpa.on.ca.
- **18, Alabama Association for Food Protection 2010 Annual Meeting,** Montgomery Marriott Prattville Hotel & Conference Center at Capital Hill, Prattville, AL. For more information, contact G. M. Gallaspy at gm.gallaspy@adph.state.al.us.

## DECEMBER

- **9–10, 2nd Food Safety Congress,** Military Museum, Istanbul, Turkey. Organized by the Turkish Food Safety Association. For more information, go to www.ggd.org.tr.

## JANUARY

- **21–26, ILSI Annual Meeting 2011,** Buena Vista Palace Hotel, Lake Buena Vista, FL. For more information, go to www.ilsi.org.

## IAFP UPCOMING MEETINGS

**JULY 31-AUGUST 3, 2011**
Milwaukee, Wisconsin

**JULY 22-25, 2012**
Providence, Rhode Island

**JULY 28-31, 2013**
Charlotte, North Carolina

# ADVERTISING INDEX

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- ❒ D1010 The Bulk Milk Hauler: Protocol & Procedures
- ❒ D1051 Dairy Plant
- ❒ D1050 Food Safety: Dairy Details
- ❒ D1060 Frozen Dairy Products
- ❒ D1080 High-Temperature, Short-Time Pasteurizer
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1105 Milk Hauling Training
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1130 Pasteurizer: Design and Regulation
- ❒ D1140 Pasteurizer: Operation
- ❒ D1180 10 Points to Dairy Quality

## ENVIRONMENTAL

- ❒ E3031 Allergy Beware
- ❒ E3040 Asbestos Awareness
- ❒ E3055 Effective Handwashing – Preventing Cross Contamination in the Food Service Industry
- ❒ E3125 Good Pest Exclusion Practices
- ❒ E3128 Integrated Pest Management (IPM)
- ❒ E3131 Key Pests of the Food Industry
- ❒ E3133 Physical Pest Management Practices
- ❒ E3235 Regulatory and Good Manufacturing Practices
- ❒ E3236 Rodent Control Strategies
- ❒ E3240 Sink a Germ
- ❒ E3245 Wash Your Hands
- ❒ E3251 Would Your Restaurant Kitchen Pass Inspection?
- ❒ E3260 Swabbing Techniques for Sampling the Environment and Equipment

## FOOD

- ❒ F2005 A Lot on the Line
- ❒ F2007 The Amazing World of Microorganisms
- ❒ F2008 A Recipe for Food Safety Success
- ❒ F2009 Basic Personnel Practices
- ❒ F2011 Available Post Harvest Processing Technologies for Oysters
- ❒ F2012 Control of *Listeria monocytogenes* in Retail Establishments
- ❒ F2013 Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments
- ❒ F2014 Controlling Food Allergens in the Plant
- ❒ F2015 Controlling *Listeria*: A Team Approach
- ❒ F2016 Bloodborne Pathogens: What Employees Must
- ❒ F2017 Building a Better Burger – Improving Food Safety in the Food Supply Chain
- ❒ F2021 Egg Production
- ❒ F2025 The Special of the Day: The Eggceptional Egg
- ❒ F2030 "Egg Games" Foodservice Egg Handling & Safety
- ❒ F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef
- ❒ F2037 Cooking and Cooling of Meat and Poultry Products
- ❒ F2039 Food for Thought – The GMP Quiz Show
- ❒ F2040 Food Irradiation
- ❒ F2045 Food Microbiological Control
- ❒ F2050 Food Safe-Food Smart – HACCP and Its Application to the Food Industry (Part 1 & 2)
- ❒ F2060 Food Safe Series I (4 videos)
- ❒ F2070 Food Safe Series II (4 videos)
- ❒ F2080 Food Safe Series III (4 videos)
- ❒ F2081 Food Safety Begins on the Farm
- ❒ F2090 Food Safety: An Educational Video for Institutional Food Service Workers Food Safety for Food Service Series I
- ❒ F2095 Now You're Cooking
- ❒ F2101 Tape 1 – Food Safety for Food Service: HACCP Food Safety for Food Service Series II
- ❒ F2104 Tape 1 – Basic Microbiology and Foodborne Illness
- ❒ F2105 Tape 2 – Handling Knives, Cuts, and Burns
- ❒ F2106 Tape 3 – Working Safely to Prevent Injury
- ❒ F2107 Tape 4 – Sanitation
- ❒ F2110 Food Safety is No Mystery
- ❒ F2111 Controlling *Salmonella*: Strategies That Work
- ❒ F2121 Food Safety the HACCP Way Food Safety Zone Video Series
- ❒ F2125 Tape 1 – Food Safety Zone: Basic Microbiology
- ❒ F2126 Tape 2 – Food Safety Zone: Cross Contamination
- ❒ F2127 Tape 3 – Food Safety Zone: Personal Hygiene
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- ❒ F2130 Food Safety: You Make the Difference
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- ❒ F2133 Food Safety First
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- ❒ F2148 GMP – GSP Employee
- ❒ F2150 GMP: Personal Hygiene and Practices in Food Manufacturing GMP Food Safety Video Series
- ❒ F2151 Tape 1 – Definitions
- ❒ F2152 Tape 2 – Personnel and Personnel Facilities
- ❒ F2153 Tape 3 – Building and Facilities
- ❒ F2154 Tape 4 – Equipment and Utensils
- ❒ F2155 Tape 5 – Production and Process Controls
- ❒ F2160 GMP: Sources and Control of Contamination during Processing GMPs for Food Plant Employees
- ❒ F2161 Tape 1 – Definitions
- ❒ F2162 Tape 2 – Personnel and Personnel Practices
- ❒ F2163 Tape 3 – Building and Facilities
- ❒ F2164 Tape 4 – Equipment and Utensils
- ❒ F2165 Tape 5 – Production/Process Controls
- ❒ F2168 HACCP Advantage – Good Manufacturing Practices
- ❒ F2169 HACCP: Training for Employees – USDA Awareness
- ❒ F2170 The Heart of HACCP
- ❒ F2172 HACCP: Training for Managers
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- ❒ F2350–1 Step One: Starting Out with Food Safety
- ❒ F2350–2 Step Two: Ensuring Proper Personal Hygiene
- ❒ F2350–3 Step Three: Purchasing, Receiving and Storage
- ❒ F2350–4 Step Four: Preparing, Cooking and Serving
- ❒ F2350–5 Step Five: Cleaning and Sanitizing
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- ❒ M4030 Ice: The Forgotten Food
- ❒ M4050 Personal Hygiene and Sanitation for Food Processing Employees
- ❒ M4060 Psychiatric Aspects of Product Tampering
- ❒ M4070 Tampering: The Issue Examined

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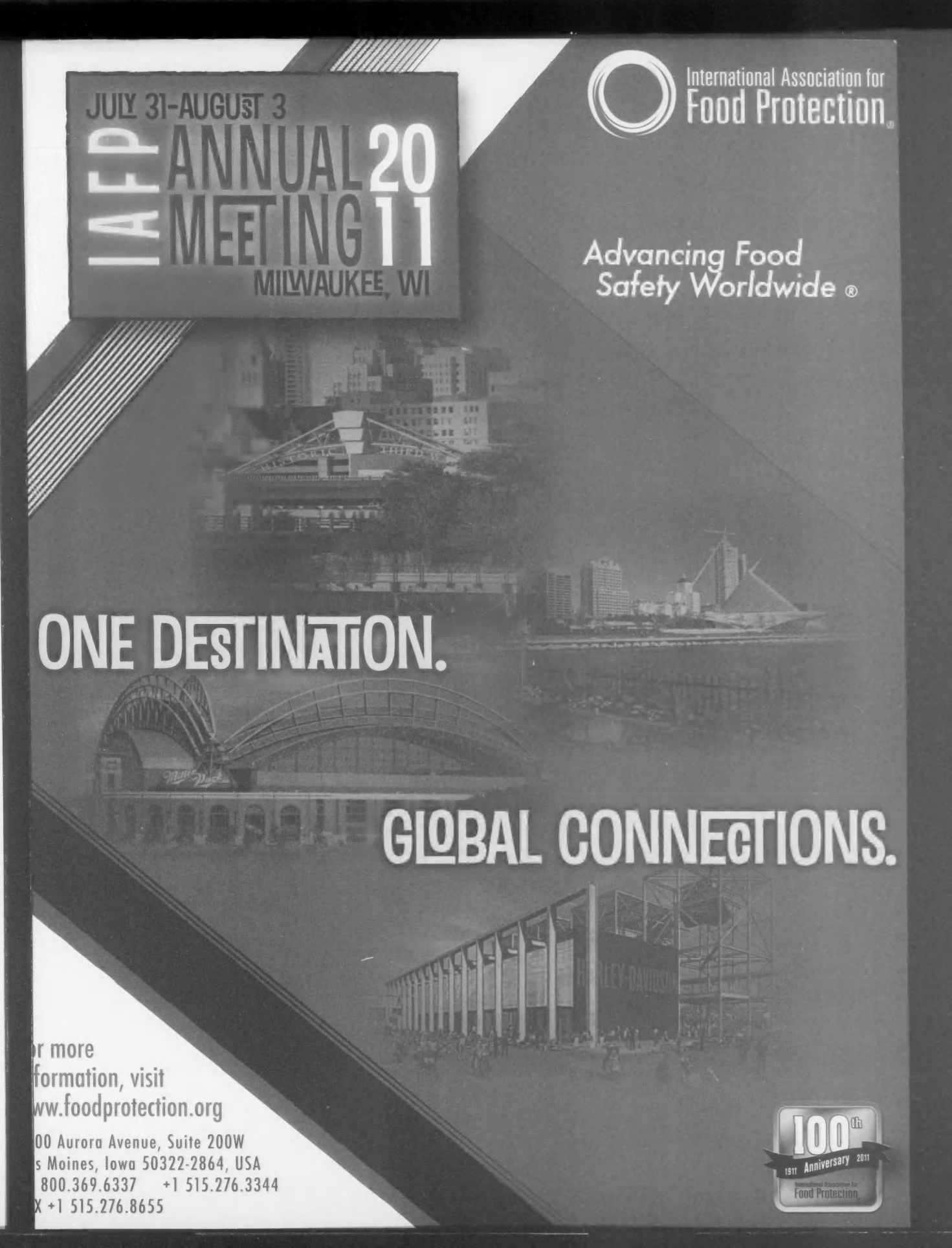
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