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Food Protection Trends

Science and News from the International Association for Food Protection

Role of Package Type on Shelf-life of Fresh Crab Meat

Prevalence of Foodborne Pathogens in Rural Households



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FOOD PROTECTION TRENDS

VOLUME 30, NO. 12

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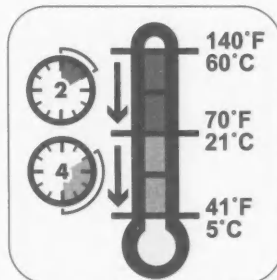
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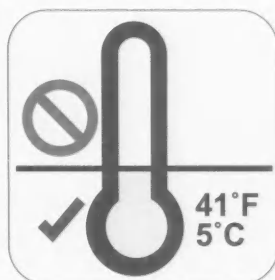
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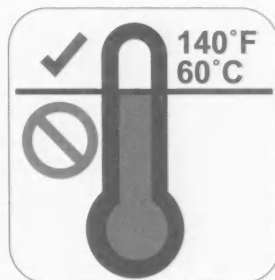
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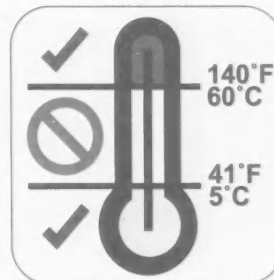
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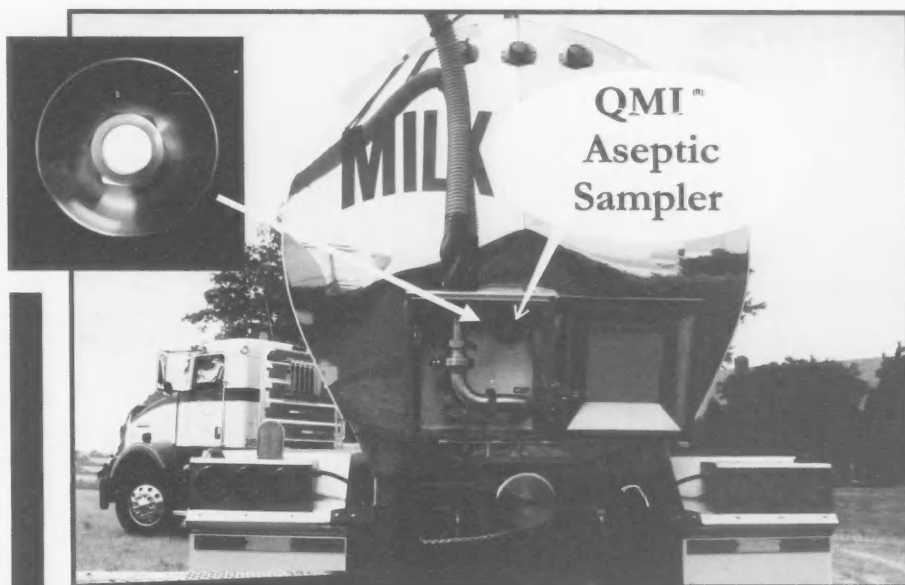
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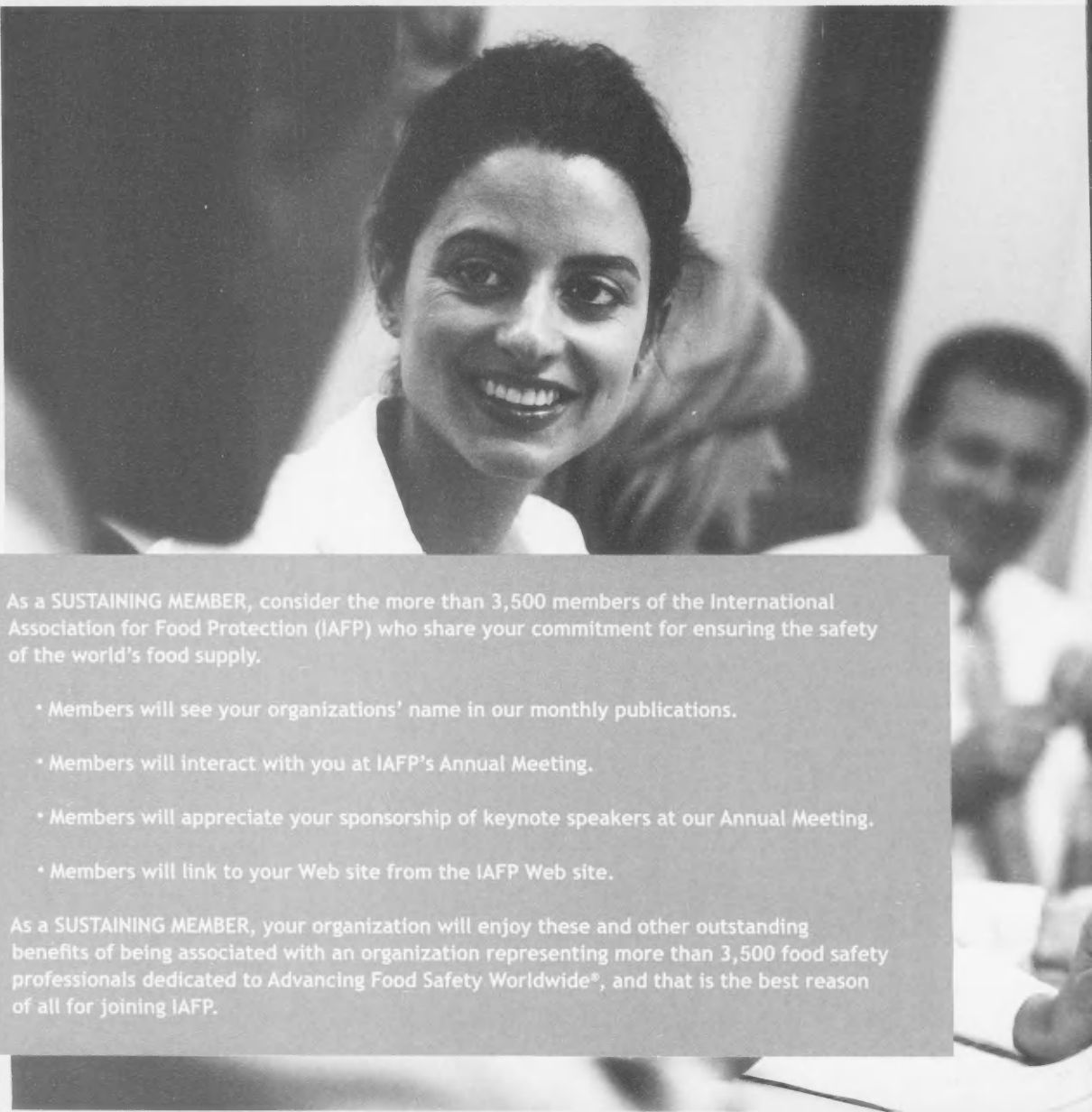


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“REFLECTIONS” OF YOUR PRESIDENT

As the end of the year approaches, it is time to reflect on the successes (and sometimes challenges) of the last twelve months, and plan for the next twelve. Personally, 2010 has been a good but exhausting year for me. Professional highlights have been the opportunity to participate in the drafting of an important Institute of Medicine-National Research Council (IOM-NRC) project to evaluate the role of the U.S. Food and Drug Administration in enhancing food safety; working on a large, interdisciplinary proposal which, if funded, would eventually result in better ways to understand and control foodborne viruses; and of course, serving as your president.

Likewise, IAFP has experienced a successful and challenging year. While our financial situation after IAFP 2009 was less than rosy, we forged ahead and made up for some losses with a very successful 2010 Annual Meeting in Anaheim. We also set several records this year...our largest Annual Meeting attendance (and the highest number of exhibitors ever); the largest European meeting attendance; the highest membership numbers (both individual and sustaining members); and the largest and most diverse group of Affiliates. Our international presence continues to grow as does our Web presence. There are almost more opportunities than we can handle; a nice position for the Association to be in!

Indeed, we have much to be grateful for in 2010, and this degree of growth is likely to carry forward to 2011 and beyond. So, how have we accomplished this? Well, in past columns I have mentioned the amazing IAFP staff. No doubt, if you are reading this column, you know



By **LEE-ANN JAYKUS**
PRESIDENT

“Our Association is largely a labor of love on the part of a strong and dedicated group of food safety professionals”

at least one or two of the IAFP staff. David Tharp, our executive director, is known by almost everyone (and David knows pretty much every one of you by name!). Clearly, he is the “face” of our organization. There are also nine other full-time staff members, including Donna Gronstal and Farrah Benge, who handle accounting issues; Terri Huffman coordinates program development for our meetings; and

Susan Smith handles communications with the affiliates and production of the *IAFP Report*. Didi Loynachan and Donna Bahun coordinate efforts in support of our two scientific publications, *Journal of Food Protection (JFP)* and *Food Protection Trends (FPT)*. Julie Cattanach handles membership services, and Karla Jordan manages the phones, invoicing and orders. Last, but certainly not least, is Lisa Hovey who serves as assistant director, David’s right hand “man” (well, woman) and who is key to making sure that everything remains in tip-top shape. There are a few other part-time staff members who pitch in as well. It is also important to note, that while specific staff members have specific job responsibilities, they all pitch in to assure that the Association’s activities are timely and of high quality, and delivered with a smile.

IAFP is fortunate to have these talented and dedicated employees. But keep in mind, a staff of 10–12 individuals is managing an international organization with close to 3,600 members and 47 Affiliate organizations. They organize and oversee the Annual Meeting in North America and another annual symposium in Europe, in addition to periodic workshops and emerging issues forums. They also interact with a variety of other food safety groups to co-sponsor our annual international symposium, and coordinate IAFP participation, as sponsor or exhibitor, in half a dozen or so meetings annually. Even this is an incomplete list of their many responsibilities.

So this leads me to my main point. IAFP has an awesome staff, yes. But our Association is largely a labor of love on the part of a strong and dedicated group of food safety professionals who contribute their “Time, Talent, and Treasure” in support

of the Association's mission. YOU are an integral part of the success of IAFFP.

So, how do you contribute? In terms of time...how about our scientific editors (for *JFP*, *FPT*, and *IAFFP Report*), who spend hours every month to assure that IAFFP consistently publishes high quality and relevant scientific information? Or the 12 members of the Program Committee, each of whom spend a week or more of their time every year to assure the same excellence in the Annual Meeting scientific program? The same can be said for the European and International Symposium organizing committees. Or the PDG chairs and co-chairs, who keep the IAFFP message alive during the time between Annual Meetings? For that matter, anyone

(PDG affiliated or not) who makes the effort to organize a symposium or workshop?

As for talent, IAFFP has, for a long time, had the best and brightest North American food safety professionals as dedicated members. Increasingly, this list is becoming more international in scope. These folks offer their expertise in so many ways...as speakers in meetings, symposia and workshops; as experts the Association staff can call on when a technical question comes their way, and as a resource in identifying emerging issues.

And for treasure, we cannot overlook our sponsors who provide the financial wherewithal so that IAFFP can continue to produce the excellent programs, publications, and opportunities for networking that

we have all come to expect. Did you know that we now have a total of 108 Sustaining Memberships, a number that has grown even through the downturn of the economy? There are also those who consistently exhibit at either (or both) the Annual Meetings (or the European Symposium). And how about the sustained generosity of those who contribute to the Foundation Fund, and the sponsors of our prestigious awards?

So, as the year comes to an end, I want to say a big THANKS to all who have contributed their "Time, Talent, and Treasure" in support of our organization. You and the staff provide the heart and soul of our Association. So, on behalf of the International Association for Food Protection, as we welcome in 2011...

Many thanks and Happy New Year

Sok köszönet és boldog új évet

شكرا لكم وكل عام وأنتم بخير

Muchas gracias y Feliz Año Nuevo

ευχαριστώ πολύ και ευτυχισμένο το νέο έτος

많은 성원에 감사드립니다. 새해 복 많이 받으세요

Merci beaucoup et Bonne Année

shukrani nyingi na heri ya mwaka mpya

Vielen Dank und frohes neues Jahr

Çok teşekkürler ve mutlu yeni yıl

多くの感謝と新年あけましておめでとうございます

Molte grazie e felice anno nuovo

許多感謝和新年快樂

Veel dank en gelukkig nieuw jaar

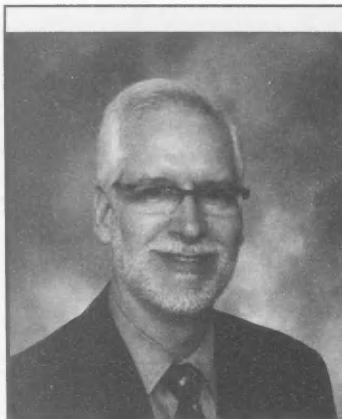
(Key: English; Hungarian; Arabic; Spanish; Greek; Korean; French; Swahili; German; Turkish; Japanese; Italian; Chinese; Dutch.)

“COMMENTARY” FROM THE EXECUTIVE DIRECTOR

It is somewhat unbelievable, but December is here and we are closing in on the end of 2010! The end of the year brings a good time to look back on past accomplishments and also to look ahead to what the New Year may bring. One important aspect of 2011 is that it will mark the One Hundred Year Anniversary for the association now known as the International Association for Food Protection! More on this subject later, because first, I want to look back at 2010.

On page 839, we have presented the financial results for IAFP operations. After a poor performance for our year ending August 31, 2009 (a loss of \$400,000), we are overjoyed to report a rebound to revenue exceeding expense by an amount of \$226,000 for the year ending August 31, 2010. This was a result of many efforts to reduce spending and increase revenues during the year. Of course, IAFP 2010 contributed significantly to the year end financial results. With record attendance, record exhibitor participation and record sponsorship revenues, we could not go wrong! For IAFP 2010, we made a number of calculated attempts to reduce our expenses. Some were very successful and others were not. Just to note here, meal size and quality of food was not one of our expense reduction efforts! We were surely happy with the IAFP 2010 meeting results in all ways.

Other accomplishments for 2010 that come to mind include our additional growth in Membership. We now total 3,500, an increase of more than 125 over last year at the same time. When compared to just three years ago, we have increased Membership by 375 and if we look back six years, Membership has



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

“One important aspect of 2011 is that it will mark the One Hundred Year Anniversary for the association”

increased by nearly 600. These increases are just incredible, especially when you hear most organizations are decreasing in their numbers of members. This coupled with the significant increase in Membership from outside of North America shows why IAFP accepted the challenge to be more involved internationally.

Speaking of our international involvement, in 2010 we have again supported the Dubai International Food Safety Conference (DIFSC) in Dubai; held our European Symposium on Food Safety (in Dublin); actively participated and supported the IAFP Latin America Symposium on Food Safety in Bogota, Colombia; became the Global Sponsor of the China International Food Safety and Quality Conference (CIFSQ) held in Shanghai, China; and we were included as a supporter of the 2nd Turkish Food Safety Congress in Istanbul. Many of these conferences are now entering their fourth, fifth or sixth year with IAFP's participation and I believe this has had a direct effect on our Membership growth. During 2011, we look forward to our continued involvement in these conferences.

Further to the international Membership growth for IAFP, we have seen a large increase in attendance from people outside of North America. For IAFP 2010, we saw 22% of attendees come from outside of North America. Four or five years ago, we typically would have 10% to 12% of our attendees join us from outside of North America. So, with Membership increasing and Annual Meeting attendance increasing along with our more active participation and visibility at international meetings; it is clear to me what is driving our growth!

In addition to the meetings mentioned above, our Executive Board Speaker Program for Affiliate organizations also has boosted our international presence. In 2010, Board Members participated in Affiliate meetings in both Mexico and New Zealand. This is in addition to representation at the Ontario and Quebec meetings in Canada. Our

Board Speaker Program is another success we can point to for 2010 with close to 20 appearances by Board Members at various Affiliate meetings during the year.

We are proud to now have 47 Affiliate organizations around the world. Through our Affiliate organizations, we are able to make more people aware of IAFP and our Mission: *To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply.*

As we now look forward to the year 2011, IAFP will begin a celebration of its 100-Year Anniversary. There will be special columns printed in *Food Protection Trends* in the upcoming months to highlight our past. An "IAFP Timeline" will

be established online for everyone to review. The IAFP History that was printed in 2000 will be amended to add the last 10 years which will then complete the one hundred year history. At IAFP 2011, we are planning a centennial celebration where all attendees can join together to celebrate our 100 years of helping to protect the public's health through a safer food supply. We invite all IAFP Members to come to IAFP 2011 in Milwaukee.

Since I have mentioned IAFP 2011 and the location of Milwaukee for our Annual Meeting, I want to answer in print some Member's question about "why Milwaukee?" Many years ago, 100 years ago in fact, in 1911; our organization began its existence at the *Dairy Congress*

held in Milwaukee. The first name of the Association was the *International Association of Dairy and Milk Inspectors*. From that beginning grew IAFP and our emphasis in food safety, food microbiology and protecting the food supply. So, why Milwaukee? It should be evident to all that we are returning to the very roots of our Association life. What better way to honor those before us who had the foresight to form this great organization than to meet in Milwaukee? We do hope you will plan to be with us for IAFP 2011 in Milwaukee.

As I close for this month, the last of the year 2010, we wish everyone a happy holiday season where you and your family may enjoy safe, wholesome food. We also wish you only the best for the New Year, 2011.



CALL FOR ABSTRACTS

Call for Technical and Poster Abstracts

Technical – Scheduled, 15-minute oral presentations, including a two- to four-minute discussion.

Poster – Permits the author and attendees to discuss research presented.

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

Developing Scientist Awards Competition

The Developing Scientist Awards Competition is open to graduate students (enrolled or recent graduates) from M.S. or Ph.D. programs or undergraduate students at accredited universities or colleges in both Technical and Poster categories.

Deadlines and Notification

Abstract Submission Deadline: January 19, 2011

Submission Confirmations: Automatic

Acceptance/Rejection Notification: March 7, 2011

Questions regarding abstract submission can be directed to Terri Huffman

+1 515.276.3344 or +1 800.369.6337;

E-mail: thuffman@foodprotection.org

Call for Abstract Instructions and Submission Form

Available at

www.foodprotection.org

Role of Package Type on Shelf-life of Fresh Crab Meat

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ABSTRACT

Microbiological quality of fresh (not pasteurized) crab meat stored at 4°C in a 340 g (12 oz) food grade polyethylene traditional snap-lid container and equally fresh crab meat stored at 4°C in a 227 g (8 oz) SimpleStep[®] tray sealed with Cryovac[™] film (oxygen transmission rate of 10,000 cc/m²/24 h) was evaluated over a 12-day period. Aerobic plate counts were conducted on storage days 0, 4, 6, 8, 10 and 12. Anaerobic plate counts were conducted on storage days 0, 5 and 12. Aerobic plate counts of crab meat from the two containers did not differ ($P > 0.05$). Analysis of anaerobic microbial growth indicates that sampling days were significant ($P < 0.05$), but container type or style was not significant ($P > 0.05$). Oxygen and CO₂ in the package headspace was significantly different between container types ($P < 0.05$). Gas concentration between sampling days was not significant ($P > 0.05$). Results of this study demonstrate that there were no significant differences in refrigerated shelf life of crab meat packaged in SimpleStep[®] trays with Cryovac[™] film versus the traditional polyethylene snap-lid container packaging ($P > 0.05$).

INTRODUCTION

In the United States, competition from crab meat imports has adversely impacted the fresh crab meat industry. The Virginia Marine Resources Commission estimates that Virginia's yearly crab harvest has been decreasing since 1995 (21). Several contributing factors have influenced the decline of the blue crab in the Chesapeake Bay area, including a decrease in the number of blue crabs available in the Chesapeake Bay, a decline in the ecological health of the Chesapeake Bay, and a dramatic rise in the importation of crab meat from Asia (15).

Imported crab meat directly competes with domestic crab meat and is sold to local restaurants at cheaper and more predictable prices (21). The combination of abundant supply, low labor cost, and growing demand for crab meat have all contributed to the popularity of imports, forcing a number of large domestic producers out of business (11). New packaging could boost U.S. sales and give the domestic sellers an edge. Prior to the introduction of a new package style, research studies should be conducted to evaluate container head-space gases, microbial growth and shelf life, chemical decomposition, sensory quality and possibility of toxin production by *Clostridium botulinum* (8).

A peer-reviewed article

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The bacterial flora on crabs reflect the environment from which they were harvested; the flora may change from season to season depending on the water quality, water temperature and harvest location (5). The flora are also influenced by environmental factors such as temperature, packaging and duration of storage (5). Fresh (unpasteurized) crab meat is usually hand picked, with no further processing, which contributes to higher bacterial numbers than pasteurized crab meat (22). Furthermore, fresh crab meat is a perishable product that will undergo spoilage and flavor loss within 10–14 days or less during storage (22). Under refrigeration, spoilage of seafood occurs because of growth of psychrotrophic bacteria such as *Pseudomonas* spp. (20) and *Achromobacter* (2). A storage temperature of 4.4°C or lower is recommended for refrigerated, microbiologically sensitive products (6). The shelf life of crab meat depends on several contributing factors, including initial microbial counts and container integrity (18).

New food packaging technologies can improve the quality and safety of food commodities. Packaging not only acts as a barrier for food products, but also can control the growth of microorganisms already present in the food when it is packaged. Polyethylene and polypropylene are rigid or semi rigid acrylic plastics approved for food contact. Fresh blue crab meat in the Chesapeake Bay area and the Virginia coast area is sold in traditional plastic (polyethylene) snap-lid containers of 8 oz., 12 oz. or 16 oz. Pasteurized crab meat is sold in metal cans of 8 oz., 12 oz. or 16 oz. plastic snap-lid containers sealed with metal pop top lids. Plastic and aluminum, commonly used to package crab meat, give longer shelf lives and better sensory and microbial qualities than crab meat packaged in steel cans (9). It has been found that vacuum skinned packaging can improve sensory qualities of freshly cooked and picked crab meat (9).

The FDA has a minimum standard of 10,000 cc/m²/24 h oxygen transfer rate (OTR) for fresh seafood (7). The transmission rate allows the transfer of gas generated from food and the outside environment, preventing the generation of potentially harmful bacteria (4). Cryovac™ produces an OTR film that

is an oxygen permeable film and complies with the FDA's Fish and Fisheries Products Hazard and Control Guidance (Third Edition) (4). Cryovac™'s film is designed to maintain freshness and color of food products without employing CO₂ treatments (4). The benefits of packaging crab meat in a polypropylene SimpleStep® tray with Cryovac™ 10,000 OTR film include innovative convenience features, such as being microwavable, easy opening, reusable and resealable (18).

The new packaging also has the potential to maintain quality and safety of crab meat while providing smaller portion sizes for a broader consumer base (9). Smaller, thinner packages or pouches, boil-in-bag packages and molded trays and cups can significantly increase the heating and cooling rates of their contents, saving the processor money and energy (9, 19).

This study evaluates the shelf life of fresh crab meat packaged in traditional polyethylene snap-lid container and a new SimpleStep® tray sealed with a 10,000 cc/m²/24 h OTR, Cryovac™ film. Identification of aerobic and anaerobic bacteria over the shelf life of the meat was also completed.

MATERIALS AND METHODS

The shelf life of fresh crab meat stored in two different package types (traditional polyethylene snap-lid container, and SimpleStep® tray sealed with a 10,000 cc/m²/24 h OTR, Cryovac™ film) and incubated at 4°C was evaluated over a period of 12 days. Oxygen and CO₂ analyses were also conducted. The entire study was conducted in triplicate. The first two replications were performed with crabs harvested in Fall 2007; the third replication was performed with crabs harvested in Fall 2008.

Fresh crab meat sample preparation

Fresh, handpicked crab meat was obtained from a commercial processor in Cambridge, MD. The crab meat was purchased in the morning after picking was complete. On the day of purchase, 8 oz. of crab meat was transferred from several commercially packaged 12 oz. (340 g) snap-lid tubs into the polypropylene based SimpleStep® trays (8 oz., 227 g), and vacuum sealed with Cryovac™ 10,000 OTR film. Twenty-one

commercially packaged snap-lid tubs and 21 SimpleStep® trays were packed in styrofoam ice chests with ice packs and shipped overnight to Blacksburg, Virginia. Upon arrival, the crab meat containers were stored at 4°C. Three SimpleStep® trays and three snap-lid tubs were evaluated for aerobic organisms on days 0, 4, 6, 8, 10, and 12. Three simple step trays and 3 snap lid tubs were evaluated for anaerobic organisms on days 0, 5, and 12. Testing day 0 was designated as the time the crab meat arrived at the Virginia Tech Food Science & Technology building.

At each sampling time, an 11 g sample of crab meat was aseptically removed from each container with a sterile spatula and placed in a separate sterile stomacher bag (Nasco, Ft. Atkinson, WI) with 99 ml of 0.1% peptone (Oxoid, Basingstoke, Hampshire, England). The samples were blended in a Stomacher Lab Blender 400 (Tekmar Co., Cincinnati, OH) for 30 seconds.

Enumeration of aerobes and anaerobes from fresh crab meat

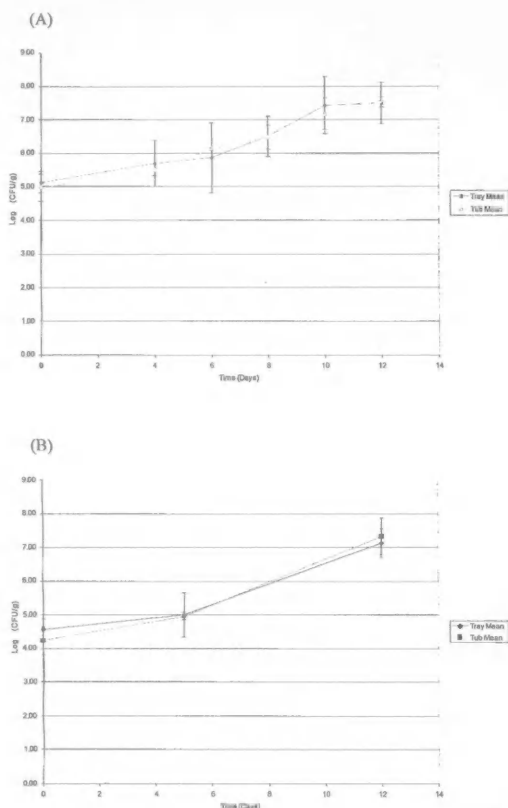
To enumerate aerobes from the crab meat, the homogenate was diluted using 9 ml peptone blanks, and dilutions were spread plated onto trypticase soy agar (TSA; BBL, Sparks, MD and MP Biomedicals, LLC, Solon, Ohio). Plates were incubated at 35°C for 48 h and colonies were counted.

Anaerobic testing was performed according to methods outlined by Holdeman and Moore (10). One ml aliquots from homogenate dilutions were placed in a glass anaerobe roll tube containing Brain Heart Infusion agar (BHI; BBL, Sparks, MD). After the tubes were inoculated, they were placed on a horizontal spinner (Bellco, Houston, TX) until the medium solidified. Roll tubes were incubated at 30°C for five days. After five days, the colonies were examined under a dissecting microscope and counted through the glass roll tube.

Cellular fatty acid identification preparation for aerobes

After colonies were counted, well-isolated colonies were picked and separately streaked onto TSA plates and

FIGURE 1. Aerobic (A) and anaerobic (B) plate count (log CFU/g) of microorganisms isolated from fresh crab meat packaged in SimpleStep® trays and traditional snap-lid tubs stored at 4°C for 12 days.



incubated for 24 h at 35°C. For mixed cultures, the microorganisms were repeatedly streaked until a pure culture was obtained. When a pure culture was obtained, the colonies were transferred into a clean (12 × 100), Teflon-lined screw capped tube, labeled and placed in a commercial freezer (-18°C, up to 15 days) until cellular fatty acid identification.

Cellular fatty acid identification preparation for anaerobes

After colonies were counted, well-isolated colonies were selected for identification. Under a constant stream of anaerobe grade CO₂, the colonies were pierced with a sterile needle and a sample of the colony was placed in a small anaerobic roll tube of cooked meat broth (CM, Difco, Sparks, MD) and placed in a 30°C incubator for 24 h. All cultures in the anaerobic CM were then grown on TSA plates for identification purposes, because results from preliminary stud-

ies demonstrated that no strict anaerobic microorganisms were present.

After 24 h, the broth tubes were checked and viewed for gas production and microbial growth. Under the constant stream of anaerobe grade CO₂ gas, a Pasteur pipette (FisherScientific, Pittsburg, PA) was used to dispense 6 drops of the cooked meat broth into a rubber stoppered 12 × 100 mm glass tube peptone-yeast extract basal medium (PYG), a custom-made solution (10). The inoculated PYG solution was incubated for 24 h at 30°C. After 24 h, the PYG was centrifuged (Sorvall, GLC-1, Newtown, CT) at 3000 RPM for 10 minutes. The supernatant was removed and the remaining pellet subjected to cellular fatty acid identification.

Cellular fatty acid identification for aerobes and anaerobes

All aerobic and anaerobic identifications were performed using the Sherlock Microbial Identification System software

(MIS, Microbial ID Inc., Newark, DE), which uses the cellular fatty acid profile to identify microorganisms. The procedure for cell sample preparation uses four reagents to saponify, esterify, extract and base wash the fatty acid extract, following MIS protocol (12).

After base washing the fatty acid extract, approximately 100 µl of the washed extract was placed into 100 µl glass inserts (Agilent, Newark, DE). The individual glass inserts are housed in phenyl methyl silicone glass vials (25 mm × 0.2 mm ID × 0.3 µm film thickness) (Hewlett-Packard Co., Palo Alto, CA). Eleven mm crimp tops (Agilent, Newark, DE) were securely fastened to the top of the vials to prevent evaporation of the bacterial cellular fatty acid.

Standards and blanks were analyzed in the HP 5890A gas chromatograph (Hewlett-Packard Co., Palo Alto, CA) to standardize the equipment prior to the injection of the unknown samples. The chromatograph is equipped with a model HP 6763 autosampler (Hewlett-Packard), a flame ionization detector and a model HP-3392A integrator (Hewlett-Packard). The air gas flow rate through the chromatograph was 400 ml/min, 30 ml/min for hydrogen, and 30 ml/min for nitrogen. The temperature used was 250°C in the injection port and 300°C for the detector. After injection, the oven temperature of the apparatus was ramped from 170°C to 270°C at a rate of 5°C/min, followed by an additional increase from 270°C to 310°C at a rate of 30°C/min. This end temperature was held for 2 min before returning to 170°C prior to the injection of the subsequent sample.

The MIS software was used to calculate the percentage of area for each compound in its library, comparing it with the total area of the compound detected. Compounds were identified by using the Aerobic TSBA Version 4.0 Library and the 3.9 version for anaerobes.

Gas analyzer

The ratio of gas present in the SimpleStep® trays and the snap-lid tubs was analyzed using the CheckPoint O₂/CO₂ (PBI Dansasensor America, Glenrock, NJ). Testing was conducted on days 0, 4, 6, 8, 10, 12, using 25 gauge 1 1/2" sterile needles (Becton Dickinson, Franklin Lakes, NJ) and 13 mm filters (FisherScientific, Pittsburgh, PA). Tabs of weather stripping were placed on the Cryovac™ film and the snap-lid tops to protect the

TABLE 1. Bacteria isolated from fresh crab meat stored at 4°C in SimpleStep® trays with Cryovac™ 10,000 cc/m²/24 h oxygen transmission rate (OTR) film and traditional polyethylene snap-lid tubs. Microbial colonies were evaluated at each sampling time. This list includes the collective microorganisms isolated from each package type throughout the study.

Microorganism	SimpleStep® trays	Polyethylene snap-lid tubs
<i>Aerococcus viridans</i>	+	+
<i>Aeromonas caviae</i>	+	
<i>Acinetobacter calcoace</i>		+
<i>Acinetobacter johnsonii</i>	+	+
<i>Alcaligene</i>	+	
<i>Bacillus cereus</i>	+	
<i>Bacillus marinus</i>	+	
<i>Bacillus sphaericus</i>		+
<i>Carnobacterium piscicola</i>	+	+
<i>Cellulomonas fimi</i>		+
<i>Chromobacterium</i>	+	
<i>Corynebacterium ammoniage</i>		+
<i>Enterococcus faecalis</i>	+	
<i>Erwinia carotovora</i>	+	
<i>Exiguobacterium acetylicum</i>	+	+
<i>Kocuria varians</i>	+	+
<i>Kurthia gibsonii</i>		+
<i>Lactococcus plantarum</i>		+
<i>Micrococcus luteus</i>		+
<i>Myroides odoratus</i>	+	+
<i>Neisseria</i>	+	
<i>Pseudomonas nautica</i>		+
<i>Pseudomonas putida</i>	+	
<i>Shewanella putrefaciens</i>	+	+
<i>Staphylococcus arlettae</i>		+
<i>Staphylococcus caseolyticus</i>		+
<i>Staphylococcus chromogenes</i>		+
<i>Staphylococcus cohnii</i>	+	+
<i>Staphylococcus gallinarum</i>	+	
<i>Staphylococcus hominis</i>		+
<i>Staphylococcus kloosii</i>	+	+
<i>Staphylococcus sanguis</i>		+
<i>Staphylococcus warneri</i>	+	
<i>Staphylococcus xylosus</i>	+	+
<i>Streptococcus bovis</i>	+	+
<i>Streptococcus mutans</i>	+	

+ indicates that bacterium was found

TABLE 2. Headspace gas composition (%) of SimpleStep® trays with Cryovac™ 10,000 cc/m²/24 h oxygen transmission rate (OTR) film and the traditional polyethylene snap-lid tubs for fresh crab meat stored at 4°C. (Packaging procedure for trial 3 was performed at a different location than trials 1 and 2.)

Days of Storage	Simple Step® trays with Cryovac film						Traditional polyethylene snap lids					
	Trial 1		Trial 2		Trial 3		Trial 1		Trial 2		Trial 3	
	CO ₂	O ₂	CO ₂	O ₂	CO ₂	O ₂	CO ₂	O ₂	CO ₂	O ₂	CO ₂	O ₂
0	0.1	21.0	0.2	20.7	0.0	20.7	0.0	20.9	0.2	20.7	0.0	20.8
4	0.1	20.8	0.0	21.1	0.1	20.7	0.1	20.6	0.0	21.0	1.1	3.9
6	0.1	20.9	0.0	20.8	0.1	20.6	0.1	20.9	0.0	20.7	8.6	0.8
8	0.1	20.9	0.0	20.9	0.0	20.8	0.1	20.9	0.0	21.1	12.5	2.7
10	0.1	21.1	0.0	20.7	0.1	20.6	0.1	0.9	0.0	20.6	12.8	0.5
12	0.1	20.8	0.0	20.7	0.1	20.6	1.1	20.8	0.0	20.8	0.1	16.5

integrity of the package prior to the insertion of the needle.

Statistical analysis

Data were analyzed by use of a completely randomized design. All statistical analyses were conducted using SAS, version 9.1 (SAS Institute, Cary, NC). The mean log survival of aerobic and anaerobic bacterial growth from standard plate counts on TSA and BHI agar (respectively) were analyzed using the general linear model (GLM), and a model mean of the data was compared with the method of least squares means (LSD) for effect. The data readings from the O₂ and CO₂ gas analysis output and coliform MPN were also analyzed using the GLM, and the model means of the data were compared using LSD.

RESULTS

Microbial spoilage in the shelf-life study

For this study, spoilage was defined as microbial counts at or above 7.0 log CFU/g (14). The aerobic plate count of the crab meat on day 0 for the SimpleStep® trays was 5.12 log CFU/g (± 0.32) and 4.97 log CFU/g (± 0.40) for the traditional snap-lids, respectively. By 10 days of storage, the aerobic counts of the fresh crab meat reached 7.0 log

CFU/g (considered spoiled) in both package types (Fig. 1 A). By day 12, aerobic plate count for the SimpleStep® trays was 7.50 log CFU/g (± 0.62) and 7.53 log CFU/g (± 0.15) for the traditional snap-lids, respectively. There was no significant difference in the aerobic counts between package types on each sampling day ($P > 0.05$).

The anaerobic microbial counts on day 0 for the SimpleStep® trays was 4.57 log CFU/g (± 0.32) and 4.23 log CFU/g (± 0.40) for traditional snap-lids, respectively. The anaerobic plate count on day 12 for the SimpleStep® trays was 7.13 log CFU/g (± 0.42) and 7.33 log CFU/g (± 0.55) for the traditional snap-lids. Anaerobic plate counts after the twelve day incubation period showed that anaerobic growth between the two package types was not statistically significant ($P > 0.05$). An evaluation of the bacterial organisms identified in the SimpleStep® trays and polyethylene snap-lid tubs is shown in Table 1.

Gas analysis

The concentration of O₂ and CO₂ gas remained consistent in both types of packaging during the first 8 days of sampling in the first two trials. On day 10 for trial 1, the concentration of CO₂ in the polyethylene snap-lid tubs had increased slightly, and O₂ levels had decreased. By day 12, the CO₂ was still slightly higher

in the snap-lid tubs, but O₂ increased to normal levels. Both CO₂ and O₂ remained constant throughout the second repetition. In the third repetition, CO₂ increased on day 6 and remained elevated until day 12. The O₂ levels dropped on days 4–10, but had recovered on day 12. There were differences in O₂ levels within replications ($P < 0.05$). Carbon dioxide concentrations were higher in the snap-lid containers than in the SimpleStep® trays ($P < 0.05$). Overall, the gas concentrations were not significantly different between sample days ($P > 0.05$) (Table 2).

DISCUSSION

There were no differences in shelf life of crab meat packaged in traditional polyethylene snap-lid cups versus the SimpleStep® trays with Cryovac™ 10,000 OTR film ($P > 0.05$). The crab meat in the SimpleStep® tray with the Cryovac™ 10,000 OTR film showed aerobic bacterial growth similar to that of the meat in the polyethylene snap-lid cups. Gates et al. tested oxygen barrier pouch packaging, non-barrier pouches and vacuum-skin packaging on fresh crab meat and concluded that no packaging material improved the microbiological shelf life (9). The results from this study support Gates et al., indicating that there is no difference in shelf life of the crab meat

in either of the package types that were tested (9).

Environmental conditions (e.g., picking and packing room temperature, Chesapeake Bay water temperature etc.) and handling practices (e.g., picking table cleanliness, use of bare hands or clean gloved hands, etc.) at the crab meat processor and the purchaser's establishment all contribute to the level of contaminants in the fresh crab meat and thereby affect the data. Spoiled meat was determined as meat with bacterial counts at or above 10^7 CFU/g (14). No strict anaerobes were detected in any of the replications, which is similar to the results from a fresh crab meat study performed by Suklim et al. (20). Additionally, Ward et al. noted that when anaerobic colonies were examined, the organisms isolated anaerobically were identified as facultative lactobacilli (22), further indicating that no strict anaerobes were present in the sampled crab meat. Both packaging types were found to have a variety of *Staphylococcus* species, likely a result of the handling conditions. Also isolated were different spoilage bacteria, including *Schewanella*, *Carnobacterium*, and *Pseudomonas* species. *Pseudomonas* species have been previously reported as major spoilage organisms in seafood (22). The processor from whom the crab meat was purchased advertises Chesapeake Blue Crab meat and Indonesian pasteurized crab meat. Interestingly, *Chromobacterium* spp. was isolated from the fresh crab meat purchased from this company. *Chromobacterium* spp. is a component of the normal flora of water and soil of tropical and subtropical regions of the world, suggesting that the domestically picked crab meat was contaminated with microorganisms (17) from the imported crab meat.

Before deciding if a new packaging material should be used, it is necessary to know what will cause product deterioration and the effects of commercial shipping and handling on package failure rate. Ideally, the expectation of new packaging through advanced technologies is to extend the shelf life of perishable food products. The results of this microbial shelf-life study suggest that there were no differences in microbial concentrations between the SimpleStep® trays with Cryovac™ 10,000 OTR film or the polyethylene snap-lid cups that can be attributed to package type ($P > 0.05$).

Regardless of package type, if CO₂ is allowed to build up, the crab meat can deteriorate quickly. The difference in the concentration of CO₂ in the SimpleStep® trays compared with the polyethylene snap-lid tubs on days 10 and 12 (first repetition) and day 4 through 12 of the third replication may be due to the production of CO₂ gas from fermented lactose or the consumption of O₂ by aerobic microorganisms (13, 16). Carbon dioxide can inhibit the growth of spoilage microorganisms, increasing the shelf life of certain food products (1, 3). No consistent trends in CO₂ levels were observed in any repetition, making it difficult to identify a cause for the CO₂ gas fluctuation. Both CO₂ increases in replications one and three occurred in the polyethylene snap-lid tubs, suggesting that the tubs may be less efficient in releasing CO₂ into the outside environment compared with the Cryovac™ 10,000 cc/m²/24 h OTR film.

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Risk Factors Associated with Prevalence of Foodborne Pathogens in Rural Households of Colorado with and without Ruminant Animals

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ABSTRACT

Ruminants are one of the reservoirs for *Listeria*, *Salmonella* and *Escherichia coli* O157:H7, and therefore a potential source of contamination for the household environment. Understanding consumer behavior may help in reducing infections caused by these microorganisms. This study evaluated consumer behaviors in households with/without ruminants, which may be related to increased prevalence of these pathogens. The study was completed over a three-year period, with samples collected during years 1 and 3. Rural Colorado households were recruited, and samples (food, environmental, and fecal) were collected and tested for *Listeria*, *Salmonella* and *E. coli* O157:H7 presence. Participants answered surveys regarding household cleaning habits and food/animal handling. None of the samples tested positive for *E. coli* O157:H7, while *Salmonella* was isolated only from households with ruminants. *Listeria* spp. was isolated from all types of samples with higher, but not significant ($P \geq 0.05$), prevalence in households with ruminants. *L. monocytogenes* was isolated mainly from food samples. Seven indices were developed from survey information and were statistically analyzed for relationships, with the outcome of a sample positive for *Listeria* as the dependent variable. Behavior related to handling and cooking of perishable foods affected ($P < 0.05$) the probability of households testing positive for *Listeria*, regardless of ruminant presence. Personal cleanliness habits were associated with presence of *Listeria* on shoe soles, clothes washing machines, and gloves used for farming activities. Consumer education should include proper food and animal handling practices, as well as proper cleaning of shoes and clothes, in order to reduce the prevalence of *Listeria* in the household.

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INTRODUCTION

Listeria monocytogenes has been identified as a major infectious agent causing neurological syndromes and uterine infections in bovine, sheep and goats (20, 36). Animals carrying *L. monocytogenes* can directly contaminate milk as a consequence of listeric mastitis, encephalitis, or *Listeria*-related abortion (8). Thus, animal feces and the farm environment may be important sources of contamination of raw milk and meat by *L. monocytogenes* (20, 31). In addition, *L. monocytogenes* isolates found in the farm environment, and especially in environments with ruminants, have been linked to human listeriosis cases (7). Other species of *Listeria* that were generally considered to be non-pathogenic to humans, such as *L. innocua*, have been identified as the cause of bacteremia and death (34).

It has been reported that once pathogens that cause intestinal disease enter the domestic environment, they can be transmitted between surfaces, people and the food supply (5, 21). For example, several studies have found *Listeria* in various places throughout the kitchen and the home in general, including vegetable compartments of refrigerators, kitchen sinks, dishcloths, toothbrushes, and the bathroom (2, 6, 47). Duggan and Phillips (6) suggested that contamination with *L. monocytogenes* can be disseminated widely in kitchens. Another potential source of *L. monocytogenes* contamination in the home environment is the asymptomatic carriage of the pathogen by one or more members of the household (41). Asymptomatic human carriage of *L. monocytogenes* has been reported previously (11, 12, 26), and can occur not only in healthy individuals, but also among persons in high risk groups for listeriosis (27, 28). Population groups at a higher risk for infection with *L. monocytogenes* include pregnant women, neonates, individuals with suppressed immune systems, and the elderly (25). Since 1950, the number of persons over 65 years of age in the United States has tripled, from 12.2 million to 36 million, and it is estimated to exceed 80 million by the year 2035 (19); therefore, identification of consumer behaviors that can reduce *L. monocytogenes* prevalence in the home environment is important.

Salmonella and *Escherichia coli* O157:H7 are other foodborne pathogens associated with ruminants and the farm environment that may find their way into the household environment. *Salmonella* has been isolated from different locations in the home, including vacuum cleaners, refrigerators and kitchen countertops (15, 42). However, little information is available on how these pathogens are introduced into the household environment and the potential of household contamination to serve as a source of infection. Thus, the objective of this study was to evaluate, in rural households, consumer behaviors associated with house cleaning and with food and animal handling that may be associated with increased prevalence of *Listeria*, *Salmonella* and *E. coli* O157:H7 in the household environment.

MATERIALS AND METHODS

Recruiting of participants and behavioral data collection

The study protocol was approved by the Human Research Committee of Colorado State University (CSU). Rural households with and without ruminant animals were recruited from the Fort Collins, CO surrounding area by researchers in the Department of Food Science and Human Nutrition. Recruitment methods included letters and fliers sent by email to local 4-H families, veterinarians and Future Farmers of America (FFA) chapters for further distribution. The recruiting flier was also distributed within the CSU campus and Veterinary Teaching Hospital and posted on the CSU Today Web site. Interested families contacted researchers directly by telephone to sign up as participants in the study. Each participant household received a monetary compensation of \$65 in years 1 and 3 for their time and samples collected.

To qualify for the study, participants needed to have their household in a rural environment (outside city limits), have children in the household under age 18 and be willing to participate over a 3-year time period. Each household also needed to be willing to participate in an audio-taped interview, complete additional surveys, allow the research assistant to conduct household environ-

mental and food samplings, and provide human stool samples for microbiological analysis. Households were classified into those with and without ruminant animals (cattle, sheep, goats, llamas and/or alpacas) on their premises. Households without ruminants were required to have no contact with ruminant animals during the sample collection period.

Each household was visited four times, at 2-4 week intervals, between February and July. The primary household food preparer was asked to complete a Household Survey (47 and 42 questions for households with and without ruminants, respectively), and a Food Handling and Eating Preferences Questionnaire (29 questions). Households with ruminants were also asked to complete a Farmer/Rancher Survey (19 questions). Questions included in these instruments had been previously tested and validated for reliability (22). These instruments were mailed in advance to participants and gathered by a researcher during the first household visit. During that visit, the researcher placed a calibrated commercial instant-read digital thermometer (Taylor Precision Products, Las Cruces, NM) in the middle of the middle shelf of the refrigerator, then conducted an audio-taped structured interview with the primary food preparer (70 questions). Following the interview (approximately 1 hour), visual assessments of the cleanliness of the kitchen and refrigerator (scales of 1 = not clean to 5 = very clean) were made, and the temperature of the refrigerator was recorded. Interview questions were developed by the project team to assess awareness and knowledge of foodborne pathogens, food shopping, preparation and storage practices, and kitchen cleaning procedures; pilot tested in two prospective households, and then revised as needed. Survey responses were entered onto the interview form, then rechecked using the audio-taped recording. Food and environmental samples were also collected (procedure follows below), follow-up visits were scheduled, and the participant was provided with a bathroom commode specimen collection system (Cardinal Manufacturers Inc., Streetboro, OH) along with instructions for stool sample collection at follow-up visits. Follow-up visits (visits 2, 3 and 4) involved only sample collection for microbiological analysis. The complete

TABLE 1. Demographic characteristics of participating households

Characteristic	Ruminant households n = 28		Non-ruminant households n = 26	
	Number	%	Number	%
Highest level of education completed by any adult household member:				
High school graduate	1	3.6	0	0.0
Some college/technical school	6	21.4	4	15.4
4-year college degree	14	50.0	3	11.5
Post-graduate studies	7	25.0	19	73.1
Age of house:				
<5 years	3	10.7	4	15.4
5-14 years	7	25.0	5	19.2
15-24 years	5	17.9	3	11.5
>25 years	13	46.4	14	53.9

protocol for behavioral data and sample collection was completed in its entirety during year 1 and year 3 of the study.

Sample collection

During each visit, 3 food samples, 5 environmental samples and, in the case of farm households, a ruminant fecal sample were collected. In addition, during visits 2, 3 and 4 of year 1, a stool sample from any member of the household was also collected. Food samples included leftovers (preferably from a home-made meal), dairy products (preferably from non-pasteurized milk), deli meats and cut fruit and/or vegetables. Environmental samples were taken from the refrigerator (handles and one shelf, preferably the meat drawer), kitchen sink (faucet and drain), clothes washing machine (rim), shoe soles and the floor underneath the shoes (if this was not carpet), kitchen countertop or utility sink (faucet and drain) next to the clothes washer, and/or gloves used for farming activities. Food samples were collected with a sterilized metal spoon and placed in a sterile Whirl-Pak® bag (15 by 23 cm; Nasco, Modesto, CA). Environmental samples were collected with a moist sponge (10 ml buffered peptone water; HydraSponge™, 3M Microbiology, St.

Paul, MN) by swabbing. All food and environmental samples were collected by the participants, after proper instruction to ensure uniform collection methods. Stool samples from any household member (one sample per visit for visits 2, 3 and 4 of year 1 of the study) were collected from each participant household in the commode specimen collection system. Ruminant fecal samples were collected from the ground with a sterilized tongue depressor and transferred to a Whirl-Pak bag. All samples were transported to the laboratory in coolers with ice packs, and analyzed within 24 h of collection.

Microbiological analyses of samples

All samples were analyzed for presence of *Listeria* by use of the procedure outlined in the U.S. Department of Agriculture Food Safety and Inspection Service (USDA-FSIS) Microbiology Laboratory Guidebook (44), with the following modifications. For environmental samples, 90 ml of Universal Preenrichment Broth (UPB, Difco, Becton Dickinson, Sparks, MD) was added to each pre-moistened sponge in its bag, and for food and fecal samples, 225 ml of UPB was added to 25 g of sample in a Whirl-Pak bag (15 by 23 cm).

Samples were then homogenized for 2 min (Masticator, IUL Instruments, Barcelona, Spain) and incubated at 35°C for 22-24 h. Then, 1 ml of the UPB enrichment was transferred to 9 ml of Fraser Broth (FB, Difco) and incubated at 35°C for 22-24 h. After incubation, tubes of FB showing signs of darkening were streak-plated onto PALCAM agar (Difco) plates and incubated at 30°C for 48 ± 2 h. Colonies on PALCAM agar plates with morphologies typical of *Listeria* were isolated and purified for further biochemical analyses for differentiation between *L. monocytogenes* and other *Listeria* spp. (44, 46). Suspect colonies (up to five per sample) were confirmed as *Listeria* based on Gram Stain, motility, catalase activity and oxidase activity. *L. monocytogenes* was differentiated from other *Listeria* spp. by hemolysis of sheep blood agar and fermentation of rhamnose, xylose and mannitol (46). Isolates identified as *L. monocytogenes* on the basis of their biochemical reactions were sent to the Ohio Agricultural Research and Development Center (The Ohio State University, Wooster, OH) for serotyping, using a previously described (49) multiplex PCR assay.

Environmental samples (i.e., sponge swabs from refrigerators, kitchen and utility sinks, kitchen countertops,

TABLE 2. Samples positive for *Listeria* in Colorado rural households with ruminant animals

ID	Year	Visit	Samples positive for (description of sample [serotype]):		
			<i>Listeria</i> spp.	<i>Listeria monocytogenes</i>	
1	3	4	animal feces (cows)		
2	1	1	animal feces (cows)		
		3	animal feces (cows)		
		1	animal feces (cows), shoe soles, washing machine		
		2	animal feces (cows)		
		3	animal feces (cows)		
3	1	1	animal feces (cows)		
		1	food (chipped beef, cottage cheese), kitchen sink	food (chipped beef [4b and other ^a], cottage cheese [1/2a and 4b]), kitchen sink [4b]	
		2	animal feces (goats)		
		4	animal feces (goats)	animal feces (goats [4b])	
5	1	1	food (cheddar cheese), kitchen sink, washing machine		
		2	refrigerator		
		3	kitchen sink		
		3	1	kitchen sink	
			2	kitchen sink	
			3	kitchen sink	
			4	kitchen sink, shoe soles	
6	1	1	kitchen sink		
		2	animal feces (cows)		
7	3	1	animal feces (sheep)		
8	1	2	food (lunch meat)	food (lunch meat [atypical ^b])	
9	3	4	kitchen sink	kitchen sink [atypical ^b]	
10	1	3	food (turkey)		
		3	2	food (deli chicken breast)	
			3	shoe soles	
11	3	3	shoe soles		
12	1	3	animal feces (cows), refrigerator		
		3	1	food (round steak)	
			2	shoe soles, animal feces (cows), food (pork sausage)	animal feces (cows [1/2a]), food (pork sausage [1/2a])
			3	animal feces (cows), refrigerator	
			4	shoe soles	
13	1	1	animal feces (sheep)		
		2	animal feces (sheep)		
		3	animal feces (sheep)		
		3	1	shoe soles	
			2	animal feces (sheep)	
			3	animal feces (sheep)	
			4	animal feces (sheep), shoe soles, refrigerator	animal feces (sheep [1/2a])
14	3	1	farming gloves		
15	3	1	shoe soles		
16	3	1	shoe soles		
		2	animal feces (cows)		

TABLE 2. Samples positive for *Listeria* in Colorado rural households with ruminant animals (Continued)

Samples positive for (description of sample [serotype]):				
ID	Year	Visit	<i>Listeria</i> spp.	<i>Listeria monocytogenes</i>
17	1	2	food (queso fresco, lettuce)	food (queso fresco [1/2a], lettuce [1/2a])
		3	refrigerator	refrigerator [1/2a]
18	1	1	refrigerator, food (sliced ham)	food (sliced ham [other ^a])
		3	food (ham)	
		4	animal feces (sheep)	animal feces (sheep [4b and other ^a])
19	3	3	shoe soles	
		4	shoe soles	

^aOther serotype different from 1/2a and 4b

^bA 350 bp band was amplified from *inlB* instead of the 500 bp band expected for *L. monocytogenes*

washing machines, shoes and gloves) were also tested for *Salmonella* and *E. coli* O157:H7 presence. For *Salmonella* testing, the USDA-FSIS Microbiology Laboratory Guidebook (45) protocol was followed, with the following modifications. One ml of the UPB enrichment was transferred to 9 ml of Tetrathionate Broth (TTB, Difco) and incubated at 35°C for 22–24 h. After incubation, a loopful of the TTB enrichment was streak-plated onto Brilliant Green Sulfa agar (Difco) and Xylose Lysine Tergitol™ 4 agar (Difco) plates. Plates were incubated at 35°C and were first examined at 18–24 h and later after 48 h for *Salmonella* suspect colonies. Up to five suspect colonies per sample were selected for biochemical confirmation with API 20E strips (bioMérieux sa, Marcy-l’Étoile, France). Serotyping of the isolates was performed by the Veterinary Diagnostic Laboratory, Veterinary Teaching Hospital, Colorado State University (Fort Collins, CO).

To test for the presence of *E. coli* O157:H7 in the environmental samples, the USDA-FSIS protocol (43) was followed, with the following modifications. One ml of the UPB enrichment was transferred to 9 ml of modified *E. coli* broth (mEC, Difco), and after incubation (35°C, 22–24 h) was streak-plated onto sorbitol MacConkey agar (Difco) supplemented with cefixime and potassium tellurite (Invitrogen Dynal, Oslo, Norway) (35°C, 22–24 h). Suspect colonies (up to five per sample) were tested for the O157 antigen, using the RIM™ *E. coli* O157:H7 Latex Test (Remel, Len-

exa, KS). Agglutination-positive isolates were further tested with API 20E strips, and subjected to PCR analysis (17) for confirmation.

Statistical analysis

Answers from surveys and interview questionnaires were coded on a scale of 0 to 5, with 0 being the least desirable behavior/response and 5 being the most desirable behavior/response. Refrigerator temperatures were also coded on a scale of 0 to 5, with 0, 3 and 5 assigned to temperatures $\geq 50^\circ\text{F}$ (10°C), 41 to 49°F (5 to 9.4°C) and $\leq 40^\circ\text{F}$ (4.4°C), respectively. All data were uploaded into Microsoft Excel® files and imported into SAS/STAT® (40). Seven indices were developed by grouping related questions from the behavioral data collection instruments. The PROC CORR function of SAS/STAT® (40) was used to calculate Cronbach’s alpha coefficients to test for internal reliability of each index (3, 4). A Cronbach’s alpha coefficient of at least 0.5 was considered acceptable for relatedness of the questions (3). The indices included Perishable Food Handling and Cooking Index (PFHCI), Pathogen Awareness Index (PAI), Personal Cleanliness Index (PCI), Kitchen and Household Cleanliness Index (KHCI), Inside Cross-contamination Index (ICCI), Outside Cross-contamination Index (OCCI), and Risky Foods Preferences Index (RFPI). Logistic regression analysis with the GLIMMIX® procedure of SAS/STAT® (40) was used to determine the potential relationship between indices and prevalence of *Listeria* in the house-

holds. Prevalence of *Listeria* was divided into Overall Prevalence (OP), which included all samples within a household except for animal and human fecal samples; Food Prevalence (FP), which included all food samples collected; Kitchen Environment Prevalence (KEP), which included all samples from refrigerators, kitchen sinks and kitchen countertops; and Non-kitchen Environment Prevalence (NKEP), which included samples from shoes, utility sink, farming gloves and clothes washing machine. Differences were considered statistically significant at the $P < 0.05$ level.

RESULTS AND DISCUSSION

Household demographics

Table 1 presents the demographic characteristics of the households recruited. A total of 54 rural households were initially recruited, 28 with and 26 without ruminant animals. Ruminant animals on the household premises included (numbers in parentheses are households) cattle (12), goats (13), sheep (9), llamas (5) and/or alpacas (1). Some households, including those classified as non-ruminant households, may have had other animals such as cats, dogs, horses, pigs, and chickens as well as other birds. Two households with ruminants decided not to participate in the second sample collection period (year 3), but their data from the first sample collection period (year 1) were used in the analysis. Two households classified as non-ruminant households in year 1 acquired animals

TABLE 3. Samples positive for *Listeria* in Colorado rural households without ruminant animals

ID	Year	Visit	<i>Listeria</i> spp.	Samples positive for (description of sample [serotype]): <i>Listeria monocytogenes</i>	
A	3	1	food (bacon)	food (bacon [1/2a])	
B	1	1	food (sliced cheese)	food (sliced cheese [other ^a])	
		4	kitchen countertop	kitchen countertop [4b]	
C	1	2	food (roast beef)	food (roast beef [other ^a])	
D	1	2	shoe soles		
E	1	4	food (lettuce)	food (lettuce [4b])	
		3	3	food (bacon)	
F	1	1	refrigerator		
		3	2	kitchen sink	
		3	3	kitchen sink, shoe soles	kitchen sink [4b]
		4	4	kitchen sink	kitchen sink [4b]
G	1	4	washing machine	washing machine [4b]	
H	1	4	refrigerator	refrigerator [other ^a]	
		3	1	food (salmon spread)	food (salmon spread [1/2a])
I	1	3	shoe soles	shoe soles [4b]	
J	1	4	food (taco)	food (taco [1/2a and other ^a])	
K	3	2	food (mushrooms)		
L	1	3	refrigerator	refrigerator [4b and other ^a]	

^aOther serotype different from 1/2a and 4b

after the first sampling period ended, and so were considered ruminant households for the year 3 sample collection period. One household classified as a ruminant household in year 1 sold all their animals after the first sample collection period was completed, and so was considered a non-ruminant household in year 3.

Overall *Listeria* prevalence

Listeria spp. was recovered from all types of samples collected, except from human stools and swabs from utility sinks (Tables 2-4). For reporting purposes, *Listeria*-positive households with ruminant animals were reassigned a number (1 through 19) for identification, and *Listeria*-positive households without ruminants were reassigned a letter (A through L) for identification (Tables 2 and 3). Overall, *L. monocytogenes* prevalence was very low (0 to 3.1% for various types of samples tested; Table

4). Of note, however, was that about half of the samples that tested positive for the pathogen were from foods (7 of 14 positive samples in households with ruminants, and 6 of 13 positive samples in households without ruminants; Table 4). The majority of *L. monocytogenes* isolates belonged to serotypes 1/2a and 4b (Tables 2 and 3), which, along with serotype 1/2b, are responsible for 95% of human cases of listeriosis infection (10). Most of the *L. monocytogenes*-positive food samples were cheeses, meats, and meat products, which are known vehicles for the pathogen. This indicates that food purchase behavior may have an effect on the prevalence of *L. monocytogenes* in the household environment (48).

Because of the low prevalence of *Listeria* spp. and *L. monocytogenes* in the different types of samples, prevalence data were grouped according to the origin of the sample within the household, and the results by household type and

collection year for *L. monocytogenes* and other *Listeria* spp. are presented in Table 5. There was no effect ($P \geq 0.05$) of ruminant presence or collection year on the grouped prevalence of *Listeria* (Table 5). However, there was a clear trend for the grouped prevalence of *Listeria* to be numerically higher in ruminant households than in households without ruminants (Table 5), potentially indicating a higher exposure of these households to *Listeria*. The lack of statistical significance may have been due to the relatively small sample size of households and the very small number of samples that were positive for *Listeria*.

Listeria prevalence in human stools

Because none of the stool samples tested positive during year 1 of sample collection, this collection was discontinued in year 3 (Table 4). Household

TABLE 4. Number of samples positive for *Listeria* (%) in households by type of sample, collection year, and presence of ruminants

Type of sample	Year 1						Year 3						Total (Year 1 + Year 3)					
	Ruminants			No ruminants			Ruminants			No ruminants			Ruminants			No ruminants		
	n	L. spp.	L. m.	n	L. spp.	L. m.	n	L. spp.	L. m.	n	L. spp.	L. m.	n	L. spp.	L. m.	n	L. spp.	L. m.
Food	336	(2.7)	(1.8)	309	(1.3)	(1.3)	322	(0.9)	(0.3)	304	(1.3)	(0.7)	658	(1.8)	(1.1)	613	(1.3)	(1.0)
Refrigerator	112	(3.6)	(0.9)	103	(2.9)	(1.9)	106	(1.9)	(0.0)	100	(0.0)	(0.0)	218	(2.8)	(0.5)	203	(1.5)	(1.0)
Kitchen sink	112	(3.6)	(0.9)	103	(0.0)	(0.0)	106	(3.8)	(0.0)	100	(4.0)	(1.3)	218	(3.7)	(0.5)	203	(2.0)	(1.5)
Kitchen countertop	60	(0.0)	(0.0)	87	(1.1)	(1.1)	53	(0.0)	(0.0)	74	(0.0)	(0.0)	113	(0.0)	(0.0)	161	(0.6)	(0.6)
Washing machine	112	(0.9)	(0.0)	103	(1.0)	(1.0)	106	(0.9)	(0.0)	98	(0.0)	(0.0)	218	(0.9)	(0.0)	201	(0.5)	(0.5)
Shoe soles	112	(0.0)	(0.0)	103	(1.9)	(1.0)	103	(11.7)	(0.0)	98	(1.0)	(0.0)	215	(5.6)	(0.0)	201	(1.5)	(0.5)
Utility sink	37	(0.0)	(0.0)	15	(0.0)	(0.0)	38	(0.0)	(0.0)	17	(0.0)	(0.0)	75	(0.0)	(0.0)	32	(0.0)	(0.0)
Farming gloves	16	(0.0)	(0.0)	*	*	*	14	(7.1)	(0.0)	7	(0.0)	(0.0)	30	(3.3)	(0.0)	4	(0.0)	(0.0)
Human stools	77	(0.0)	(0.0)	73	(0.0)	(0.0)	*	*	*	*	*	*	77	(0.0)	(0.0)	73	(0.0)	(0.0)
Ruminant feces	107	(8.4)	(0.9)	n/a	n/a	n/a	97	(13.4)	(3.1)	n/a	n/a	n/a	204	(10.8)	(2.0)	n/a	n/a	n/a

n: number of samples collected

L. spp.: *Listeria* spp.

L. m.: *Listeria monocytogenes*

*: samples of this type were not collected for this sampling period

n/a: not applicable

members who provided a stool sample were between 11 months and 69 years of age. *Listeria* was not recovered from any of the samples, probably because of the small number of samples collected, long sample collection intervals (2–4 weeks), different individuals within the same household providing the samples, and the short length of *Listeria* fecal shedding periods in humans, which have been reported to last no more than 4 days (1, 12). It has been reported that the prevalence of *Listeria* in human stools is low (<1 to 3.4%) among healthy individuals (11, 12, 23, 26, 39).

Listeria prevalence in feces of ruminants

Listeria spp. were isolated from fecal samples of cows (12 positive out of 70 samples tested, 17.1%), sheep (8 out of 46, 17.4%), and goats (2 out of 58, 3.4%) (Table 2). A combined sample of goat and sheep feces was also positive. Four samples were positive for *L. monocytogenes*, one each from cows and goats and two from sheep (Table 2). None of the fecal samples from alpacas or llamas were positive for any *Listeria*. Ivanek et al. (18) reported on the dynamics

of pathogen fecal shedding, specifically *L. monocytogenes*, and their results indicate that fecal shedding is subtype specific and can vary from 2 to 92%. These authors also found considerable day-to-day variability in fecal shedding of the pathogen and suggested that fecal samples should be collected at least daily in order to calculate the true prevalence within a herd of cattle (18). This finding may explain the low number of animal fecal samples found positive for *L. monocytogenes* in this study, since samples were collected every 2–4 weeks. Nonetheless, overall, 17.1% (12 out of 70) of the fecal samples

TABLE 5. Grouped prevalence of *Listeria* by household type and collection year (number of positive samples/total number of samples collected, [%])

Year	Ruminants	Overall (OP)	Food (FP)	Kitchen Environment (KEP)	Non-kitchen Environment (NKEP)
1	Yes	18/897 ^a (2.0)	9/336 ^a (2.7)	8/284 ^a (2.8)	1/277 ^a (0.4)
	No	11/823 ^a (1.3)	4/309 ^a (1.3)	4/293 ^a (1.4)	3/221 ^a (1.4)
3	Yes	23/848 ^a (2.7)	3/322 ^a (0.9)	6/265 ^a (2.3)	14/261 ^a (5.4)
	No	9/795 ^a (1.1)	4/304 ^a (1.31)	4/274 ^a (1.5)	1/217 ^a (0.5)
Total 1+3	Yes	41/1745 (2.3)	12/658 (1.8)	14/529 (2.6)	15/538 (2.8)
	No	20/1618 (1.2)	8/613 (1.3)	8/567 (1.4)	4/438 (0.9)

OP: includes all samples except for human and animal fecal samples

FP: includes all food samples

KEP: includes refrigerator, kitchen sink and kitchen countertop samples

NKEP: includes shoe soles, washing machine, utility sink and farming glove samples

^aGrouped prevalence with same superscript within a column are not significantly different ($P \geq 0.05$)

from cattle and 9.6% (10 out of 104) of the fecal samples from goats and sheep were positive for *Listeria* spp. However, none of the households with ruminants reported to have had a case of listeriosis in their animals within the 12-month period before sample collection began, indicating asymptomatic carriage of *Listeria* by these animals.

Several studies have reported that ruminant animals may be asymptomatic carriers of *Listeria*, and thus may serve as a reservoir and source of contamination for other animals (25, 30, 31, 32), as well as humans and food manufacturing environments. For example, Wagner et al. (48) reported a case in a cheese-producing farm, where *L. monocytogenes* was possibly transmitted from contaminated animal feeds to the milk supply, onto the working surfaces of the cheese-making facility and into humans. In the same study, *L. monocytogenes* was detected two months after the outbreak on the boots and in the feces of a worker (48). As a consequence, a cross-contamination cycle between the worker and the cheese processing environment was established. This may also have been the case in our study, since there were several instances

where shoe samples tested positive at the same time as other samples taken from inside the household environment (kitchen sinks, washing machines and refrigerators) (Table 2). The shoes were probably contaminated while being used to work with the animals (48).

In household #2, which had cows on the property, the animal feces sample tested positive for *Listeria* spp. twice during year 1 and all four times during year 3 sample collection (Table 2). Swabs from shoes and the washing machine also tested positive at the same time, indicating a potential scenario of cross-contamination between the animals and the household. In another case, household #5, which had goats on the property, had samples from food (cheddar cheese), and the refrigerator, washing machine and kitchen sink (twice) test positive for *Listeria* spp. in year 1, and samples from the kitchen sink, along with one shoe sample tested positive for *Listeria* spp. during all four visits in year 3 (Table 2). These results may indicate not only potential cross-contamination events but also re-contamination or persistence of *Listeria* within the household environment.

Feces from cows in household #12 tested positive in year 1 (*Listeria* spp.) and again in year 3 (*Listeria* spp. and *L. monocytogenes*; Table 2). In addition, during year 3, multiple food, refrigerator and shoe samples were positive for both *Listeria* spp. and *L. monocytogenes*, in another potential cross-contamination scenario where the most likely source may have been the animal feces. These results point to ruminant animals as an important source of contamination for the household environment, and to a potentially higher exposure of the household members to the microorganism, compared exposure of members of households without ruminants.

Listeria prevalence in the kitchen environment

Listeria spp. and *L. monocytogenes* were isolated from all sampling sites within the kitchen (Tables 2-4). The overall prevalence of *Listeria* in the kitchen environment (KEP; Table 5) was higher in households with ruminants (2.6%) than in those without (1.4%), though not statistically higher ($P \geq 0.05$). As was the

TABLE 6. Number of households with samples positive for *Listeria* by year and household type

Ruminants	At least one positive sample			Two positive samples			Three or more positive samples		
	Year 1	Year 3	Both years	Year 1	Year 3	Both years	Year 1	Year 3	Both years
Yes	11	13	6	4	3	0	5	4	2
No	10	6	3	1	0	0	0	1	0

TABLE 7. Cronbach's alpha coefficient values for the behavioral indices

Index ^a	Cronbach's alpha coefficient ^b
Perishable Food Handling and Cooking Index (PFHCI)	0.747
Pathogen Awareness Index (PAI)	0.659
Personal Cleanliness Index (PCI)	0.679
Kitchen and Household Cleanliness Index (KHCI)	0.796
Inside Cross-contamination Index (ICCI)	0.787
Outside Cross-contamination Index (OCCI)	0.823
Risky Foods Procurement Index (RFPI)	0.500

^aEach index comprises a series of questions from the different instruments used and was calculated as the average for the answers given by participants

^bCronbach's alpha coefficient measures the internal consistency or reliability of an instrument, and is a function of the extent to which questions in each index have high commonalities (3, 4)

case with samples involving animal feces and shoes, several cases of possible cross-contamination, re-contamination and/or persistent contamination occurred within the kitchen environment of several households. For example, the kitchen sink and two different food samples in household #3 tested positive for *L. monocytogenes* during the same visit (Table 2). In this case, both of the food samples and the kitchen sink were positive for strains of the same serotype (4b). In household #17, two food samples and the refrigerator swab also tested positive for the same *L. monocytogenes* serotype (1/2a) on two consecutive visits. In another case, household #18 had two food samples and the refrigerator test positive for *Listeria* spp., and one of the food samples was positive for *L. monocytogenes* (Table 2). Even when it was not possible to establish the origin of contamination, it was clear that cross-contamination occurred within the kitchen environment, a phenomenon

that has been reported before (38, 47). In the present study, cases of potential cross-contamination/re-contamination with multiple samples from different sites testing positive at the same time or throughout the sample collection period occurred more often in households with ruminants (10 out of 30 households) than in households without ruminants (2 out of 28 households) (Tables 2 and 3). Samples positive for *Listeria* in non-ruminant households tended to be isolated (single samples from a given household testing positive for a given visit; Table 6).

Listeria prevalence in non-kitchen environmental samples

In the non-kitchen environment, *L. monocytogenes* was isolated only from one shoe sole and one washing machine sample, both collected from households without ruminant animals (Tables 3

and 4). While the overall *Listeria* prevalence in the non-kitchen environment (NKEP; Table 5) was numerically higher in households with ruminants on their premises than in those without (2.8 and 0.9%, respectively), differences were not significant ($P \geq 0.05$) by ruminant presence or by collection year. However, the interaction between ruminant presence and collection year was significant ($P < 0.05$), primarily due to a large increase from year 1 to year 3 in the number of shoe soles testing positive for *Listeria* spp. in households with ruminant animals (Table 4). Our results show a trend of higher prevalence of *Listeria* in households with ruminant animals on their premises, indicating an increased exposure to the microorganism and a potentially higher risk for listeriosis infection to the household members. Thus, families in households with ruminants on their property should be educated about the potential for increased risk of

TABLE 8. Behaviors associated with increased *Listeria* prevalence in rural households

	Covariate effect	β^a	P-value	exp (β) ^b
Overall Prevalence (OP)	Perishable Food Handling and Cooking Index (PFHCI) Associated behaviors: Refrigeration of leftover foods within 2 h of preparation How full is the refrigerator? Refrigerator temperature Use of thermometer for cooking of whole chicken, ground beef, steaks and roasts Coverage of leftovers inside fridge Presence of visible spoiled food, odors, spills and/or dripping inside the fridge	-0.9064	0.0288	0.4040
Non-kitchen Environment Prevalence (NKEP)	Personal Cleanliness Index (PCI) Associated behaviors: Hand wash after farming/pet activities Boots change after farming activities Clothes change after farming activities Location, frequency and technique of hand wash after farming activities Use of an automatic dryer for clothes	-1.0450	0.0337	0.3517

^a β : measures the degree of association between the probability of any given household having a positive sample and the value of a particular index (33)

^bexp (β): the odds ratio of any given household having a positive sample when an specific index changes one unit

exposure to *Listeria* and about preventive measures that can be applied during and after farming activities, with special attention to personal cleanliness habits, such as hand washing and change of clothing and shoes, after animal care. This type of educational campaign may help in preventing cross-contamination, re-contamination and persistent contamination of the household environment and food supply.

Risk factors associated with increased *Listeria* prevalence

Cronbach's alpha coefficients for the seven behavioral indices developed ranged from 0.500 to 0.823 (Table 7), indicating an acceptable level of relatedness between the questions in each index (3, 4). High relatedness between questions is desirable since it indicates that variance in the responses is due to indi-

vidual differences between the subjects providing the answers (3).

Logistic regression analysis (40) found that only two of the seven behavioral indices correlated with any of the four *Listeria* prevalence factors (OP, FP, KP, and NKEP). For this study, all recovered *Listeria* spp. were considered for the analysis of risk factors, since other species of *Listeria* may share the same ecological niches in the environment with *L. monocytogenes* (including food, vegetation and soil) (24) and may grow faster than *L. monocytogenes* (9, 35). Further, the detection of any *Listeria* spp. within the household environment may be cause for concern, since *Listeria* in general is used as a hygiene indicator in all stages of the food processing chain (20).

Table 8 shows the two behavioral indices that correlated with prevalence of *Listeria* in the households. The Beta coefficients are negative, meaning that

as the mean value of the index increases, the predicted prevalence will be reduced. This indicates that households that apply more desirable behaviors will have a decrease in the prevalence of *Listeria* in the environment.

The Overall Prevalence (OP) of *Listeria* was significantly ($P < 0.05$) affected only by a negative score on the Perishable Food Handling and Cooking Index (PFHCI) (Table 8). This suggests that the way people handle and cook perishable foods at home is very important in the prevention of *Listeria* contamination. A high score for this index included using a thermometer to ensure adequate cooking of chicken and meat products, refrigerating leftovers within 2 h of preparation, covering refrigerated leftovers and keeping the refrigerator cold, clean and not too full. This is good advice for all consumers, but is especially important for persons at increased risk for listeriosis,

including the elderly, pregnant women, neonates, and the immunocompromised (25). From data in Table 5, it can be calculated that 29 and 40% (12 out of 41, and 8 out of 20, respectively) of the *Listeria*-positive samples came from food samples in households with and without ruminants, respectively. More specifically, 50% (7 out of 14) and 46.1% (6 out of 13) of the samples positive for *L. monocytogenes* (Table 4) were food samples in households with and without ruminants, respectively, pointing to foods as the main source for the pathogen in the household, regardless of the presence of ruminants on the property, and stressing the importance of carefully handling foods commonly contaminated with *Listeria*.

The Personal Cleanliness Index (PCI) showed a significant ($P < 0.05$) effect on the Non-kitchen Environment Prevalence (NKEP) of *Listeria* spp. (Table 8). The behaviors included in this index are associated with personal hygiene, especially after farming activities and before entering the house (Table 8). Practices that should be followed after farming chores include changing footwear and clothing to avoid tracking of soil and dirt into the house. This was found to be especially important for households with ruminants, where prevalence of *Listeria* on shoes was nearly four times that on shoes from non-ruminant households (5.6 and 1.5%, respectively). Personal cleanliness is generally important in reducing the spread of bacteria, and based on this study, has special importance in reducing the spread of *Listeria* from the farm to the household environment.

***E. coli* O157:H7 and *Salmonella* prevalence**

While this study focused on *Listeria* prevalence, environmental samples were also tested for *E. coli* O157:H7 and *Salmonella*. None of the samples tested positive for *E. coli* O157:H7. *Salmonella* was isolated from samples taken from the refrigerator (1 out of 421 samples; *Salmonella* Senftenberg), farming gloves (1 of 34 samples; *Salmonella* Infantis), washing machine (1 of 419 samples; *Salmonella* Cerro), and shoes (2 of 422 samples; *Salmonella* Typhimurium var. Copenhagen and *Salmonella* Cerro). All samples positive for *Salmonella* were recovered

from households with ruminants. With the exception of one household, all of the *Salmonella*-positive samples were collected in households that also had multiple samples positive for *Listeria* in both years 1 and 3 (Table 2). These results support the theory of potential cross-contamination, re-contamination and/or persistence discussed earlier. There was a trend for households with ruminants to have more positive shoe samples, as well as multiple samples being positive at the same time as the shoes, indicating that it is highly likely that contamination of the household may have occurred from shoes that tracked dirt inside the house from animal pens.

An association between dirt and dust contamination with *Salmonella* and salmonellosis infection, especially in young children, has been reported (13, 14, 42). Haddock and Nocon (14) found that vacuum cleaners used in homes of infants with confirmed salmonellosis infection were more likely to contain *Salmonella* than those used in control households. In another study, Haysom and Sharp (16) found *Salmonella* counts recovered from vacuum cleaner dust to be significantly higher in samples from rural than urban environments and in households where pets were present. These authors concluded that major sources of bacterial contamination in rural areas were livestock, manure and soil that could be introduced into the domestic environment on footwear, the feet of pets and air currents (16). These findings and the fact that a high proportion of cases of *Salmonella* infection are reported in children 5 years of age or younger (13, 16), make the study of the household environment a priority in the search for control measures for prevention of this disease. The results presented here stress the importance of educating household members, especially in rural households with ruminant animals, about appropriate hygiene habits for cleaning of clothes and farming shoes after animal care and before entering the house.

LIMITATIONS

One limitation of this study is the small sample size of households, which may be the reason that statistically significant differences or effects were not detected, even when the differences in

trends were clear between households with and without ruminant animals on their premises. Another limitation is the bias that is inevitable when working with human subjects and self-reported behaviors. It is possible to have recall bias, in which the individual reporting a specific behavior may not correctly remember the details. Also, human subjects given options (which was the case in most data collection instruments used in this study) tend to report the behavior they think is the best, rather than their actual behavior. Differences between self-reported and current behavior have been observed (29, 37). Also, the results of this study are limited to a specific area with its specific conditions, such as climate, that may have affected the prevalence of *Listeria*.

CONCLUSIONS

Households with ruminant animals tended to have higher prevalence of *Listeria* and *Salmonella* in the environment, potentially leading to higher exposure of household members to these pathogens and increasing their risk of infection. Results point to foods as a potentially important source of *L. monocytogenes* for the household environment. Furthermore, findings suggested that cross-contamination, re-contamination and/or persistent contamination may have occurred in some cases with both microorganisms. Handling of perishable foods and personal cleanliness practices immediately after farm animal care play important roles as potential routes for contamination. Education on better cleanliness habits regarding shoes, clothing and hand washing after animal handling may reduce the risk of contamination to those households.

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Highlights of IAFP's Latin America Symposium on Food Safety

September 21-24
Bogota, Colombia



The International Association for Food Protection, in collaboration with Colombian Association of Food Science and Technology (ACTA) and

the Latin American and Caribbean Association of Food Science and Technology (ALACCTA), held IAFP's Second Latin America Symposium on Food Safety in Bogota, Colombia. More than 600 food safety professionals from around the globe gathered at the Hotel Cosmos 100 in Bogota over the dates of September 21-24.

The meeting was expertly organized by ACTA, IAFP's Affiliate organization in

Colombia. Under the direction of Jairo Romero, the entire team of volunteers tended to every need of each attendee. The friendly welcome received from the organizers and the Colombian people will long be remembered by those who were fortunate to attend the conference. Sessions were well attended right up to the 6:00 p.m. closing session on Friday evening!

Attendees had the opportunity to network with influential leaders from government, science, industry, and academia, while meeting top vendors providing solutions and products for the food safety industry. IAFP speakers included IAFP President Lee-Ann Jaykus, Katie Swanson, Paul Hall, Frank Yiannas, Stan Bailey, Alex Castillo, Randy Huffman, Maria Teresa Destro, Bob Gravani and Dan Engeljohn. More than 50 presentations in total were delivered





over the three-day conference schedule. IAFP established new relationships through the interactions with our Latin American Members, who continue to help spread the word about the benefits of IAFP and the importance of food safety worldwide.

A number of social events were planned in the evenings to allow for introductions and networking. After the opening ceremony, a celebration of ACTA's 35th Anniversary took place at the hotel. Diversey Inc. sponsored a presentation by Dale Grinstead and a reception followed. On Thursday evening, a Colombian Night celebration was sponsored by Larkin, where all attendees celebrated the Colombian culture through music and dancing. This was followed by an opportunity to "extend the evening" with a trip to Audre's Carne de Res in Chia, just north of Bogota. This was surely one unique restaurant! Everyone attending this evening truly experienced the warmth and friendliness of the Colombian people.

Plans are already forming for the next Latin America Symposium on Food Safety to be held in 2012. The location has not yet been determined, but the interest is very strong to continue the tradition of this symposium series.





AWARD NOMINATIONS

The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. You do not have to be an IAFP Member to nominate a deserving professional. Nomination criteria is available at:

www.foodprotection.org

Nominations deadline is March 1, 2011

You may make multiple nominations. All nominations must be received at the IAFP office by March 1, 2011.

- ◆ Persons nominated for individual awards must be current IAFP Members. Black Pearl Award nominees must be companies employing current IAFP Members. GMA Food Safety Award and Frozen Food Foundation Research nominees do not have to be IAFP Members.
- ◆ Previous award winners are not eligible for the same award.
- ◆ Executive Board Members and Awards Selection Committee Members are not eligible for nomination.
- ◆ Presentation of awards will be during the Awards Banquet at IAFP 2011 in Milwaukee, Wisconsin.

Contact IAFP for questions regarding nominations.

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International Association for
Food Protection®

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Des Moines, IA 50322-2864, USA
Phone: +1 800.369.6337 +1 515.276.3344
E-mail: info@foodprotection.org

Nominations will be accepted for the following Awards:

Black Pearl Award

Award Showcasing the Black Pearl
*Sponsored by Wilbur Feagan
and F&H Food Equipment Company*

Presented in recognition of a company's outstanding commitment, and achievement in, corporate excellence in food safety and quality.

Fellow Award

Distinguished Plaque

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

Honorary Life Membership Award

Plaque and Lifetime Membership in IAFP

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

Harry Haverland Citation Award

Plaque and \$1,500 Honorarium
Sponsored by ConAgra Foods, Inc.

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

Food Safety Innovation Award

Plaque and \$2,500 Honorarium
Sponsored by Walmart

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

International Leadership Award

Plaque, \$1,500 Honorarium
and Reimbursement to attend IAFP 2009
Sponsored by Cargill, Inc.

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

GMA Food Safety Award

Plaque and \$3,000 Honorarium
Sponsored by Grocery Manufacturers Association

This Award alternates between individuals and groups or organizations. In 2011, the award will be presented to an individual in recognition of a long history of outstanding contributions to food safety research and education.

Frozen Food Foundation Freezing Research Award

Plaque and \$2,000 Honorarium
Sponsored by the Frozen Food Foundation

Presented to an individual, group or organization for preeminence and outstanding contributions in research that impacts food safety attributes of freezing.

Maurice Weber Laboratorian Award

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

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

Larry Beuchat Young Researcher Award

Plaque and \$2,000 Honorarium
Sponsored by bioMérieux, Inc.

Presented to a young researcher who has shown outstanding ability and professional promise in the early years of their career.

Sanitarian Award

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

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

Elmer Marth Educator Award

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

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

Harold Barnum Industry Award

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

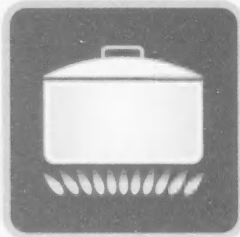
Presented to an individual for dedication and exceptional service to IAFP, the public, and the food industry.

Cook.

Even for experienced cooks, the improper heating and preparation of food means bacteria can survive.



be food safe.



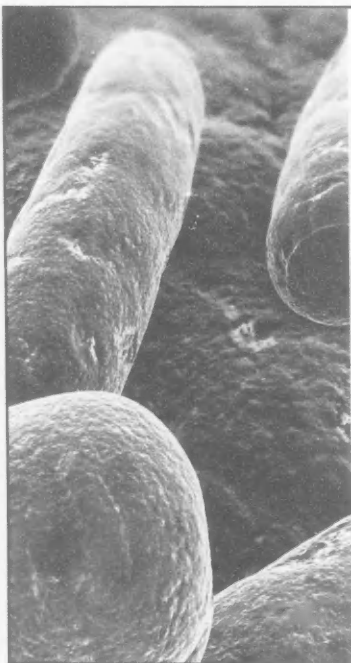
cook

cook to safe temperature

- **USE** a food thermometer—you can't tell food is cooked safely by how it looks.
- **FOOD** is safely cooked when it reaches a high enough internal temperature to kill the harmful bacteria that causes illness.
- **REFER** to www.befoodsafe.org for temperature chart.

Chicken 165 °F
Ground Beef 160 °F
Pork 160 °F
Fish 145 °F
Steaks and Roast 145 °F
Egg dishes 160 °F

Partnership for Food Safety Education



Decontamination Services

If you have contamination issues or are interested in facility decontamination as preventative maintenance, Clordisys can help.

What?

- Processing Rooms
- Processing Tanks
- Equipment
- Entire Facility
- Ductwork

When?

- Scheduled Maintenance
- Contaminations
- Facility Shut Downs

Clordisys' method of using chlorine dioxide gas allows for complete decontamination using an EPA registered sterilant offering minimal downtime and no residues.

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International Association for Food Protection®

6200 Aurora Avenue, Suite 200W
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December 2010

Fellow IAFP Members:

As we prepare for a new year, I want to encourage you to become involved in the International Association for Food Protection's (IAFP) Committees and Professional Development Groups (PDGs). Committees and PDGs are a vital part of the life of the Association. For those who have participated in our Committees or PDGs in the past, **thank you for your service!** We could not be the Association we are today without your valued participation. I encourage you to stay involved.

For those who have not participated in these active and impactful groups, consider doing so to enrich your experience. Please review the list of Committees and PDGs and their mission statements, which can be found on the following pages or on our Web site at <http://www.foodprotection.org/about-us/committee-professional-development-groups>. If you find one that sounds interesting or relevant to you, simply contact the IAFP office to let us know which group you want to join. Getting started is really that simple.

The Committees and PDGs meet during the Annual Meeting and also share information throughout the year via conference calls or E-mail. So, even if you are unable to attend IAFP 2011 in Milwaukee, Wisconsin, your involvement is still possible and your insight important. There are two types of committees within IAFP: Standing Committees and Special Committees. Standing Committees provide operational or functional support to IAFP. Individuals are appointed by the President-Elect and confirmed by the Executive Board. Special Committees provide support services to IAFP on a continuous basis. Individuals are recommended by the Chairperson of each committee, subject to the Executive Board's review.

Professional Development Groups are forums where professionals with common interests in specific aspects of food safety come together to share information and serve IAFP in the organization of symposia, preparation of white papers and other scientific endeavors. IAFP currently supports 20 PDGs. If you wish to start a new PDG, please contact the IAFP office.

Take it from my personal experience – participation in **your** professional association's Committees and PDGs can be a highly rewarding experience! While you serve the Association in many ways, involvement gives you multiple opportunities for professional development. The PDGs provide a forum for exchange of ideas with other professionals having similar food safety interests and expertise. Participation in PDGs allows you to serve our Association and your peers by providing your own unique talents and time in the promotion of food safety. A bonus is you'll also be networking with leading experts in the field, learning from their experiences and developing valued relationships. It's a professional win-win, not to mention the many life-long friends that you'll find in your IAFP colleagues!

As usual, your comments, questions, and suggestions are welcomed, and do not hesitate to contact the IAFP office or me if we can be of help. And please join me in making 2010–2011 an active and vital year for the IAFP Committees and PDGs. We need the efforts of everyone as we seek to *Advance Food Safety Worldwide*®.

Best Regards,

Katherine M.J. Swanson
Vice President, IAFP

"Our mission is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."

Publisher of the *Journal of Food Protection* and *Food Protection Trends*

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IAFP Committee, Professional Development Group, Task Force and Affiliate Council Mission Statements

STANDING COMMITTEES

FPT Management Committee

The mission of the *FPT* Management Committee is to provide guidance to the Executive Board on matters concerning *Food Protection Trends*.

JFP® Management Committee

The mission of the *JFP*® Management Committee is to provide guidance to the Executive Board on matters concerning the *Journal of Food Protection*®.

Program Committee

The mission of the Program Committee is to develop the Annual Meeting program, evaluate abstracts, identify symposia and speakers, identify all sessions' convenors, and oversee Developing Scientist Awards Committee.

SPECIAL COMMITTEES

3-A Committee on Sanitary Procedures

The mission of the 3-A Committee on Sanitary Procedures is to serve as IAFP representatives to the 3-A Sanitary Standards Committee; to review and provide comments on proposed changes and revisions to the 3-A Sanitary Standards.

Audiovisual Library Committee

The mission of the Audiovisual Library Committee is to review and evaluate audiovisual materials for accuracy and appropriateness of content, make recommendations regarding the purchase of audiovisual materials, and provide guidance on matters concerning the AV Library.

Awards Committee

The mission of the Awards Committee is to select recipients for the IAFP awards.

Black Pearl Selection Committee

The mission of the Black Pearl Selection Committee is to select the recipient of the Black Pearl Award.

Committee on Control of Foodborne Illness

The mission of the Committee on Control of Foodborne Illness is to review information on epidemiology and control of communicable diseases of primary concern to food safety and related areas, and prepare manuals and articles addressing investigation and control of food safety-related problems.

Constitution and Bylaws Committee

The mission of the Constitution and Bylaws Committee is to review and study the Constitution and Bylaws of IAFP and make recommendations to the Executive Board for changes to be considered for submission to the Membership for ratification.

Developing Scientist Awards Committee

The mission of the Developing Scientist Awards Committee is to select finalists and judge the Developing Scientist Awards Competition at the IAFP Annual Meeting.

Fellows Selection Committee

The mission of the Fellows Selection Committee is to solicit nominations and make recommendations to the Executive Board for eligible Members to be confirmed as Fellows by the Executive Board.

Foundation Committee

The mission of the Foundation Committee is to oversee IAFP Foundation monies, solicit gifts to the Foundation, and identify and fund programs, which further the goals and objectives of the Association.

Membership Committee

The mission of the Membership Committee is to develop strategies to retain current members and attract new members.

Nominating Committee

The mission of the Nominating Committee is to select and submit names of nominees for the office of Executive Board Secretary for election by the IAFP Membership.

Past Presidents' Committee

The mission of the Past Presidents' Committee is to serve as an advisory committee to the Executive Board.

Tellers Committee

The mission of the Tellers Committee is to count and certify the results of each election and other membership votes.

PROFESSIONAL DEVELOPMENT GROUPS

Applied Laboratory Methods PDG

The mission of the Applied Laboratory Methods PDG is to provide a forum for the exchange and sharing of information related to the development and use of laboratory methods for the analysis of food and related commodities.

Beverage PDG

The mission of the Beverage PDG is to provide a forum to discuss and develop symposia on issues facing the beverage industry.

Dairy Quality and Safety PDG

The mission of the Dairy Quality and Safety PDG is to promote the production and processing of safe, high quality dairy products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Developing Food Safety Professionals PDG

The mission of the Developing Food Safety Professionals PDG is to develop, connect, empower and retain IAFP members who are in the early years of their food safety career.

Food Chemical Hazards and Food Allergy PDG

The mission of the Food Chemical Hazards and Food Allergy PDG is to facilitate communication on topics in food toxicology including food allergens.

Food Defense PDG

The mission of the Food Defense PDG is to provide a forum to discuss issues of interest pertaining to food defense.

Food Hygiene and Sanitation PDG

The mission of the Food Hygiene and Sanitation PDG is to provide information on the developments in hygiene and sanitation in the food industry.

Food Law PDG

The mission of the Food Law PDG is to provide an international forum for the exchange of information on the scientific issues associated with food laws, regulations and policy.

Food Packaging PDG

The mission of the Food Packaging PDG is to provide a forum to discuss issues of interest to the food packaging industry.

Food Safety Education PDG

The mission of the Food Safety Education PDG is to provide IAFP members and their clientele information on food safety education.

Fruit and Vegetable Safety and Quality PDG

The mission of the Fruit and Vegetable Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of fruit and vegetable products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

International Food Protection Issues PDG

The mission of the International Food Protection Issues PDG is to provide a forum to discuss scientific issues of interest to the international food protection community.

Meat and Poultry Safety and Quality PDG

The mission of the Meat and Poultry Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of meat and poultry products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Microbial Modelling and Risk Analysis PDG

The mission of the Microbial Modelling and Risk Analysis PDG is to facilitate communication on the topic of microbial risk analysis (MRA), promote application and use of MRA and encourage research and data reporting methods that support MRA.

Pre Harvest Food Safety PDG

The mission of the Pre Harvest Food Safety PDG is to work towards understanding the factors that affect the emergence, persistence, transmission and ecological niches of pathogens that may impact human health at the pre-harvest food safety level.

Retail Food Safety and Quality PDG

The mission of the Retail Food Safety and Quality PDG is to provide the retail food safety industry worldwide with information to prepare and serve safe food.

Seafood Safety and Quality PDG

The mission of the Seafood Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of seafood products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Student PDG

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as members of IAFP.

Viral and Parasitic Foodborne Disease PDG

The mission of the Viral and Parasitic Foodborne Disease PDG is to promote awareness of non-bacterial causes of foodborne disease by encouraging food safety professionals and others to seek education and training that will enable them to contribute to preventing non-bacterial foodborne infections and outbreaks.

Water Safety and Quality PDG

The mission of the Water Safety and Quality PDG is to provide a forum to discuss items as to the role the safety and quality of water plays globally in the farm-to-table chain and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

TASK FORCE

Rapid Response Series Task Force

The mission of the Rapid Response Series Task Force is to identify developing conditions affecting food safety and organize meetings on these issues to educate IAFP members.

AFFILIATE COUNCIL

The Affiliate Council is an advisory body to the IAFP Board, represents Affiliate Associations' interests, responsible for IAFP Awards Committee, interchanges ideas and recommendations on programs, awards and procedures between Affiliates and the Board.



NEW MEMBERS

AUSTRALIA

Karen R. Smedley
Coca-Cola South Pacific Pty. Ltd.
Kempsey, NSW

BRAZIL

Eduardo Tondo
UFRGS
Porto Alegre

CANADA

Jill Binder
Food Safety Solutions
Calgary, Alberta

Benoit Gagnon
Sani Marc Group
Cornwall, Ontario

Jafar Husain
Crystal Claire Cosmetics Inc.
Toronto, Ontario

Melanie J. Rice
3M Canada
London, Ontario

COLOMBIA

Victor Eduardo Hoyos Hernandez
Universidad De La Salle
Bogota

Adriana Urrea Zabala
Universidad De La Salle
Bogota

CZECH REPUBLIC

Ladislav Kokoska
Czech University of Life Sciences
Prague
Prague

FRANCE

Edna F. Arcuri
EMBRAPA
Montpellier, Languedoc Roussillon

HUNGARY

Agnes Belak
Corvinus University of Budapest
Budapest

Fekete Brigitta
Corvinus University of Budapest
Budapest

SINGAPORE

Yap Hooi Ming
National Environment Agency
Singapore

SPAIN

Avelina Fernandez
Spanish Council of Research
Valencia

Diego Garcia-Gonzalo
Tecnologia de los Alimentos,
Universidad de Zaragoza
Zaragoza

TAIWAN

WenHwa Ko
Fu Jen University
Taipei

THE NETHERLANDS

Roger Scheffler
Intralox, LLC Europe
Amsterdam, AJ

Manoj Thomas
Intralox, LLC Europe
Amsterdam, AJ

UNITED STATES

ALABAMA

Jacob M. Smith
Auburn University
Auburn

Jacqueline Telesford
Fort Rucker

ARIZONA

Crystal Brillhart
University of Arizona
Tucson

ARKANSAS

Peggy Cook
Safe Foods Corporation
Rogers

CALIFORNIA

Sangwei Lu
University of California
Berkeley

Tyler Singleton
Golden State Foods
City of Industry

FLORIDA

Eduardo Antonio Guerrero, Sr.
Apollo Ship Chandlers, Inc.
Miami

George R. Rego
National Deli, LLC
Miami

Paula Safko
The Coca-Cola Co.
Apopka

Sally K. Williams
University of Florida
Gainesville

GEORGIA

David W. Heffner
KES Science & Technology, Inc.
Kennesaw

Leila Laniado
SGS
Atlanta

IOWA

Ned Rucker
Ecolab
Waverly

Tom Tegeler
Swiss Valley Farms
Dyersville



NEW MEMBERS

Yuan Xi

Iowa State University
Ames

KANSAS

Paul S. Dominick

3M Food Safety
Overland Park

LOUISIANA

Vibha Sheel

Intralox, LLC
Harahan

MARYLAND

Magaly A. Toro Ibaceta

University of Maryland-College Park
College Park

Kenneth Nieves

US Food and Drug Administration
College Park

Candace O. Rodgers

University of Maryland Eastern Shore
Salisbury

MISSOURI

Kristina Goings

Mars Petcare
Kansas City

NEW JERSEY

Thomas Kuhn

Roka Biosciences
Warren

NORTH CAROLINA

Rabin Gyawali

NC A&T State University
Greensboro

OHIO

Vincent J. Fasone

Columbus Public Health
Columbus

Michelle Kelly

Q Laboratories, Inc.
Cincinnati

Mike Paul

Zep Manufacturing
Stoutsville

Gabriel C. Sanglay

The Ohio State University
Columbus

OKLAHOMA

Jon S. Grubich

SGSC
Tahlequah

Brad Morgan

Oklahoma State University
Stillwater

TEXAS

Carl M. Burns

Chiquita - Fresh Express
Grand Prairie

VIRGINIA

Young Blue

Kraft Foods
Richmond

WASHINGTON

Robert C. Brooke

Brooke & Rowen Consulting, LLC
Bremerton

Daryl Funston

Wesmar Company Inc.
Lynnwood

WISCONSIN

Tiffany R. Moloney

Kitchen Fresh Foods
Green Bay

Michael W. Pariza

University of Wisconsin-Madison
Madison

Paul A. Pickett

Land O'Lakes, Inc.
Spencer

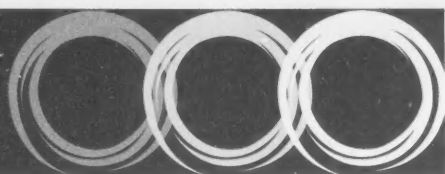
Dennis L. Seman

Kraft
Madison

Steve Turriff

VVP Group LLC
Norwalk

WHAT'S HAPPENING IN FOOD SAFETY



DuPont Announces Leadership Changes

DuPont recently named Terry Caloghiris as President – Strategic Initiatives and John McCool as President – Performance Coatings, both became effective November 1.

Terry currently is president of Performance Coatings. During his 31-year career with DuPont, Terry has held a range of senior leadership roles around the world in business management, sales, marketing, technical and operations.

John currently is vice president of Performance Coatings for the company's Europe-Middle East-Africa (EMEA) region. He has served in several leadership positions since joining DuPont in 1976.

Safe Quality Food Institute Names Robert L. Garfield Senior Vice President

The Safe Quality Food Institute (SQFI) is pleased to announce the appointment of Robert L. Garfield as senior vice president.

Mr. Garfield will be responsible for the management of the SQF Institute, including strategic planning, business development and financial management. He will also oversee technical development for the SQF certification program.

"Bob's broad experience in the food industry makes him well-suited to lead the Safe Quality Food Institute," said FMI president and chief executive officer Leslie G. Sarasin. "He has designed and implemented food safety and environmental, legislative and regulatory initiatives on behalf of the frozen food

industry, and has broad expertise in food processing operation systems and scientific applications. I am very happy to have Bob join us."

Mr. Garfield joins SQFI from the American Frozen Food Institute (AFFI) where he was senior vice president of public policy and international affairs for the past nine years. He also served as interim president of AFFI from 2008–2009. Previously, he was vice president of regulatory and technical affairs at AFFI where he was responsible for planning and implementing industry policy in conjunction with the activities of the U.S. Food and Drug Administration, U.S. Department of Agriculture, Environmental Protection Agency and Occupational Safety and Health Administration. His experience also includes work in the dairy and wine industries.

Mr. Garfield earned a Bachelor of Business Administration from the University of Cincinnati and a Master of Science in Agriculture from California State University. He is a graduate of the Institute for Organization Management through the U.S. Chamber of Commerce.

He serves on the board of directors at the Partnership for Food Safety Education. Mr. Garfield is chairman of the Food Industry Environmental Council and chairman of the Food Industry Current Good Manufacturing Practices Coalition.

Dr. Jorgen Schlundt New Deputy Director of the National Food Safety Institute

After over 10 years at the World Health Organization (WHO), Dr. Jorgen Schlundt, director of the department of food

safety and zoonoses, has taken up the position of deputy director of the National Food Safety Institute, at the Danish Technical University in Copenhagen. WHO's work on food safety will continue with new push from Member States, who have recently defined new directions for WHO's work on food safety. Dr. Danilo Lo Fo Wong has been designated to be acting director.

New CFP Chair Elected

The Conference for Food Protection (CFP) is pleased to announce that Sheri Morris has been selected by the CFP Executive Board to serve as Conference Chair for the term ending at the 2012 biennial meeting in d Laboratory Services. She was first elected to the CFP Executive Board in 2008 as the representative of the Mid-Atlantic state regulators. Ms. Morris has served CFP as the Pennsylvania voting delegate since 2002 and as a council and committee member. As the point person for the adoption of the 2003 Food Code in Pennsylvania, she played a key role in ensuring a smooth implementation process. Prior to joining the Pennsylvania Dept. of Agriculture in 1999, Sheri spent more than fifteen years in various positions in the food industry.

CFP elects a Conference Chair from among the regulatory members of the Executive Board for a two-year term at each biennial meeting. Mary Fandry, who was elected at the 2010 biennial meeting in Providence, RI, resigned her position in August. CFP Vice-Chair, Michael Roberson, of Publix Super Markets, Inc., served as interim chair until Sheri Morris was selected by the Executive Board.



Cold Chain Expert, Ray Pidock, Joins the Cryopak Team

Cryopak, an innovator in temperature controlled products, is excited to announce the addition of Ray Pidock to the family of companies. Mr. Pidock is the latest addition to the business development team and is responsible for the Midwest territory.

Mr. Pidock's early background was on the operations side managing warehouse and distribution facilities in Columbus, OH. His technical business development experience began with materials dispensing and lubrication at the F. D. Johnson Company. Mr. Pidock's packaging career started with odd-form packaging in the electronics assembly area at GPAX Incorporated. Odd-forms include products such as displays, speakers and vibrator motors – typical components in cellular phones. These components change rapidly and require new package designs every year.

Mr. Pidock will join Cryopak's current team of technical experts in an effort to continually serve the cold chain industry with products' designed to protect temperature sensitive products during transit. He has been tasked with building a true Midwest presence for Cryopak.

FMI Names Carol Abel Vice President of Education and Research

The Food Marketing Institute (FMI) has announced the appointment of Carol Abel as vice president, education and research. Ms. Abel will be responsible for the development and execution of FMI's education programs and research initiatives.

"As provided in the new FMI strategic plan approved earlier this year by the Board of Directors, we are laser focused on enhancing our industry education programming and expanding opportunities in leadership development for those who work in our member companies," said FMI president and chief executive officer Leslie G. Sarasin. "Carol has an impressive background and extensive expertise, and her previous success in identifying innovative educational strategies makes her a welcome addition to the FMI team."

Ms. Abel comes to FMI from the American Pharmacists Association where she most recently served as senior director of education strategy and compliance officer. She was responsible for their pharmacy accreditation program, continuing education best practices, standards and new initiatives. Previously she served as director of education for the association.

"Carol's experience will enable FMI to expand opportunities for industry education and research on behalf of our members," said Patrick J. Walsh, senior vice president of industry relations, education and research. "Her background makes her uniquely qualified to create and direct FMI's education programs and coordinate our research studies. We are excited to have her join us."

She also served as vice president of marketing and director of pharmacy CE at LearnSomething, where she was responsible for building and directing all marketing campaigns, materials production and distribution for the multimedia and training development company.

Ms. Abel holds a BA in English literature and American studies from Florida State University. She graduated Magna Cum Laude with a Master of Arts in American studies from

Florida State University and was a member of Phi Beta Kappa.

Bettcher Industries Names Horacio Maestretti to International Sales Management Position

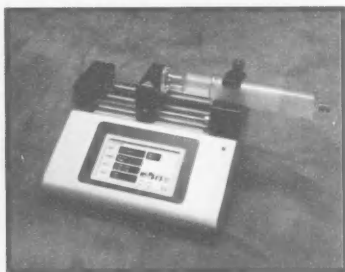
Bettcher Industries, a manufacturer and supplier of precision cutting tools for food processing, foodservice and industrial applications, announces that Horacio Maestretti has joined the company as international sales manager. In this position, Mr. Maestretti will be responsible for sales and market development functions for the company's product line in Europe, including managing distributor relationships in various European countries.

Mr. Maestretti has a 23-year background in food processing technology and equipment. During this time, he has managed international sales, technical service and product development activities for four companies based in Europe and Latin America.

Prior to joining Bettcher Industries, Mr. Maestretti served as a European area manager for SigPack Systems AG, an integrated packaging systems company for dry food and pharmaceutical applications. He also served as the international sales director for Pasta Technologies, an Italian manufacturer of fresh pasta processing machinery, as well as a European and Latin American business units manager focusing on pasta and nutrients markets for Swiss-based Bühler AG, a global leader in food process engineering technologies and equipment.

A native of Switzerland, Mr. Maestretti holds a Masters of Science degree in industrial engineering from the Catholic University of Buenos Aires in Argentina.

INDUSTRY PRODUCTS



KD Scientific

KD Scientific Announces the New Legato 100 Syringe Pump

A single syringe infusion-only pump with a touch screen interface, the Legato 100 has a wide flow rate range from 1.28 $\mu\text{l}/\text{min}$ to 88.28 ml/min .

Any type of syringe can be used in the unit, including stainless steel, plastic or glass. The syringes are held in place by KD Scientific's new clamping mechanism designed to hold the syringes securely in place.

Syringes from 0.5 μl to 60 ml can be used. The Legato 100 has an accuracy of $\pm 0.5\%$ and a reproducibility of $\pm 0.05\%$.

The large color display allows the user to see all the pumps operating parameters to ensure proper operation during the experiments. Syringe size and flow rates are easily displayed as well as the volume delivered and the elapsed time.

The Legato 100 can be used in flow cytometry, electrospinning, mass spec calibrant delivery, microfluidics, neuroscience applications and more.

KD Scientific designs, manufactures and sells a range of quality fluidics equipment used by research laboratory markets worldwide.

KD Scientific syringe pumps are an economical solution to delivering precise and smooth flow in research, pilot plants and production applications. They are recognized worldwide for quality, accuracy and reliability. A broad line of syringe pumps are offered: from a simple one syringe infuse only, to a programmable multi-syringe infuse/withdrawal pump.

KD Scientific

+1 508.429.6809

Holliston, MA

www.kdscientific.com

BioControl Announces MicroVal Certification of 24-hTest Method for Total Aerobic Plate Counts

BioControl Systems, Inc., a provider in food safety testing, is pleased to announce that SimPlate® Total Plate Count Color Indicator (TPC-CI) has been granted MicroVal Certificate 2009LR26. SimPlate TPC-CI is a rapid method for quantifying total aerobic plate counts from food samples in only 24 hours. Developed to overcome the limitations of other counting procedures such as agar plates and film methods, SimPlate consists of proprietary formulations of pre-measured media and a patented plating device.

SimPlate uses patented Binary Detection Technology™ which produces an easily interpreted color change. The isolation wells on the

SimPlate device are used to confine these color reactions, allowing technicians to simply count the number of positive wells to determine the aerobic plate count of a sample. "While other common agar and film plating methods require duplicate plating of multiple dilutions of samples, SimPlate's expanded counting range of up to 738 CFU's eliminates these extraneous steps," according to Tara Staten, BioControl product manager. "The device's unique isolation wells provide an ease of counting, not found in other plating methods," says Staten, "and prevent interference from sample particulates, ensuring accuracy and saving labs both time and money."

Rapid methods such as SimPlate can offer dramatic financial benefits to food processors, allowing them to release product days earlier than with conventional methods. The reference culture method for aerobic plate counts provides results in 48 hours while SimPlate results are available in just 24 hours.

SimPlate TPC-CI has also been approved as AOAC Official Method of Analysis 2002.07 and is one of several products in the SimPlate product line which includes SimPlate Yeast & Mold Color Indicator (MicroVal Certificate No. 2009LR25 / AOAC Official Method 2002.11), SimPlate Coliform/E. coli Color Indicator (AOAC Official Method 2005.03), SimPlate *Enterobacteriaceae* and SimPlate *Campylobacter*.

BioControl Systems, Inc.

+1 425.603.1123

Bellevue, WA

www.biocontrolsys.com

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INDUSTRY PRODUCTS



Hardy Diagnostics

EnviroBootie II™, Simplified *Salmonella* Recovery Environmental Sampling Bootie for the Poultry Industry

Hardy Diagnostics, an ISO certified biomedical firm, is pleased to announce the release of EnviroBootie II™, a sterile fabric bootie that is to be hydrated with double-strength skim milk broth and used for the recovery of *Salmonella* spp. from the environment. The EnviroBootie II™ worn by the technician, while walking through the poultry barn, allows for the easy yet effective collection of environmental bacterial samples. Once the sample is collected, the EnviroBootie is placed back into the transport bag and sent to the laboratory for *Salmonella* detection.

Egg-associated salmonellosis is an important world-wide public health concern, and monitoring *Salmonella* contamination at the farm level is an important step in resolving this potential public health problem. The bacterium, *Salmonella* Enteritidis (SE), can infect the ovaries of healthy hens and contaminate their eggs before the hard shell has formed. In addition, SE can penetrate the egg shell through its many pores.

Salmonella can grow undetected inside perfectly normal-appearing eggs, and result in illness when these raw or undercooked eggs (or associated egg products) are consumed.

To reduce the risks of *Salmonella* contamination in livestock shelters, many government agencies and members of the egg industry have taken steps to decrease the potential for *Salmonella* outbreaks. Farm-based environmental monitoring for *Salmonella* is required as part of the egg safety program developed by the FDA. The program was implemented to prevent *Salmonella* from contaminating eggs on the farm; thereby reducing the risk of human illness of outbreaks associated with contaminated eggs. Environmental testing is also used in facilities that have been implicated in USDA tracebacks from foodborne *Salmonella* outbreaks in an effort to control the spread of this bacterium. EnviroBootie II™ represents a new, simple, and effective way to accomplish the detection of *Salmonella* in order to prevent gastro-intestinal disease.

Hardy Diagnostics

+1 805.346.2766

Santa Maria, CA

www.HardyDiagnostics.com

Romer Labs Extends Food Safety Solutions with Advanced Food Allergen Testing Products

Romer Labs® and The Institute for Product Quality (IFP), a provider of biotechnology-based products and services for a broad range of life science, biotechnology, diagnostic and food safety applications, have announced the signing of

a cooperation agreement for IFP's Food Allergen rapid testing products. Under the terms of the agreement, Romer Labs® will have exclusive global distribution rights for IFP's allergen test strip products.

A food allergy is an immune response to a protein present in food that the body mistakenly believes is harmful. The most common foods, showing allergenic potential, are gluten-containing cereals, crustaceans, eggs, fish, peanuts, soybeans, nuts, milk, lupines, mustard, sesame, celery and molluscs. Food allergies affect 1–3% of the adult population and 5–8% of children. Even a minor exposure to a food allergen in the milligram range can cause symptoms from mild skin rashes to a fatal anaphylactic shock in allergic persons.

Food allergens respectively the allergenic foods are either part of the composition or recipe or can come via cross-contamination during the production process into finished foods. While in the first case, allergic persons will be warned by the ingredients list, the second situation need to be avoided at production. Testing on-site, at the manufacturing point of food, is a need for hazard prevention and quality control.

AgraStrip® Food Allergen Lateral Flow Device Test Kits are easy-to-use, accurate, and affordable food allergen detection systems for ingredients, prepared foods, equipment and cleaning procedures. AgraStrip® tests enable rapid on-site testing of food, environmental swabs and wash waters. Visual results can be seen within 11 minutes including extraction. With the sensitive AgraStrip® Allergen Lateral Flow Test Kits easy and fast determination of allergens

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INDUSTRY PRODUCTS

is possible and ensures safe food and contributes to consumer protection.

Romer Labs Inc.

+1 636.583.8600

Union, MO

www.romerlabs.com

Now Collect Data from Your Loggers through an Ethernet LAN Connection from TandD Corporation

TandD Corporation has added the new RTR-500NW, an Ethernet LAN connected data collector for wireless data loggers.

The RTR-500NW acts as a wireless base unit for any of TandD's RTR-500 series data loggers as remote units.

The RTR-500NW automatically downloads recorded data from the remote units via a 900MHz wireless link and transmits the data via e-mail or to an FTP server, without a PC, making it possible to share and manage data over a network.

In addition to automatically collecting and transmitting recorded data, the RTR-500NW can also send warning reports via e-mail or issue a warning via contact output when a remote unit has entered or recovered from a warning condition.

The RTR-500NW is fully compatible with TandD's free "Web-Storage Service," which allows for storage of downloaded data, viewing of current monitoring readings, and monitoring of the battery status of the remote unit(s), all via a simple Web Browser from anywhere, anytime.

TandD Corporation

+1 518.669.9227

Saratoga Springs, NY

www.tandd.com

Mettler-Toledo Safeline Announces a New Metal Detector Set to Rewrite Industry Standards

Mettler-Toledo Safeline, a provider in metal detection and x-ray inspection, announces a new metal detector designed specifically for the inspection of free-falling products in vertical packaging applications.

At the heart of the new Super Throat metal detector is the company's revolutionary Power-PhasePRO electronics platform, which is available in fixed or multi-frequency configurations. The new detector benefits from an advanced detection coil system and new detector head geometry that delivers incredible levels of sensitivity with improvements being greater than 30% in typical food production environments. Applications include the inspection of snack foods, cereals, confectionery, IQF products and any products packed in a VFFS bag making operation.

Since the introduction of its revolutionary Zero Metal Free Zone (ZMFZ) technology fifteen years ago, Mettler-Toledo has dominated this market segment. ZMFZ technology allows the metal detector to be installed in the confined space typically found between the outlet of a multi-head weigher and the inlet to the VFFS bag maker. The new Super Throat also incorporates this unmatched technology.

The detection performance of the Super Throat has been further enhanced by a new software algorithm that identifies the signals given off by metal contamination and discriminates between these signals

and those generated from the actual product itself. "It is conceivable that many snack food producers could improve their current detection levels by a factor of two," says a company spokesman.

The Super Throat metal detector not only provides the ultimate in metal detection performance, but customers can benefit from reduced manufacturing costs and greater levels of production uptime through the development of a unique Condition Monitoring system that permanently monitors key elements of the metal detectors functionality and its performance levels.

During food safety risk management audits and HACCP analysis processes, many metal detectors are designated as Critical Control Points (CCPs). If a malfunction were to occur with the metal detector, the production line should shut down until the problem is rectified as the CCP is no longer protected. The costs associated with this can be very high; therefore a metal detector that alerts when a fault occurs is beneficial. However, a better solution is to have a metal detector that can provide an early warning before the fault actually occurs. This can provide a window of opportunity to conduct investigations and plan rectification maintenance work when it is more convenient; for example, during a planned line shut down or shift change.

While sensitivity is the measure of metal detection performance, other customer-focused features have been developed to help make the Super Throat an integral part of a user's effective contamination prevention program.

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INDUSTRY PRODUCTS

Ensuring food safety compliance is met, helping to increase uptime and cost reduction are all key elements that are fundamental to the success of a food producer's business.

To help in avoiding this unnecessary downtime, the Super Throat has a secure personalized login system that allocates every user a unique access password linked to the user profile. Access levels can be configured in the language of the operator's choice from 18 options.

Several important functions and checks need to be performed on all metal detectors to maintain quality. These include the periodic testing of the metal detector systems' performance – which, if left unchecked, will lead to a non-compliance issue. Quality managers need to be kept informed of test requirements and overdue tests. Likewise, if a breakdown or early warning alert is generated, this needs to be passed to the maintenance manager to activate the necessary service intervention.

In highly automated processes, there are fewer operators working on the line and an increased risk that these occurrences could go unreported for considerable periods

of time with the potential for an extremely costly outcome. All detectors in the PowerPhaserPRO range utilize the latest in communications technology enabling them to be configured to send E-mail or text communications to various key people within the business meaning key personnel are never out of touch with the needs of the business.

Mettler Toledo
+1 800.638.8537
Columbus, OH
www.mt.com

New Mini Centrifuge Ideal for Micro Samples from Scie-Plas

The Scie-Plas Ltd. has introduced their new Mini Centrifuge, a compact, easy-to-use unit designed to meet the wide range of applications found in research.

The Scie-Plas Mini Centrifuge includes three rotors, a 6 place x 1.5 ml rotor, a PCR strip rotor and a 1" x 3" slide rotor. In addition, 2 adapters are included for 0.5 to 0.65 ml and 0.4 ml.

At 6000 rpm /2000 g, it is perfect for quickly spinning down samples, micro gel filtration applications and micro-volume centrifu-



Scie-Plas Ltd.

gation. For samples requiring low temperatures, the unit is cold room compatible. Fast acceleration and braking make it perfect for quick spins.

The Scie-Plas Mini Centrifuge has a very small footprint of 6" x 6" (153 mm) and has a safety interlock which automatically shuts off the unit when the lid is opened. In addition, the unit is CE marked. Scie-Plas is constantly investigating new ways to improve its products as well as looking for new areas of research where our products will be of relevance and significant benefit.

Scie-Plas Ltd.
+44 (0).1223.427888
Cambridge, UK
www.scie-plas.com

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COMING EVENTS

JANUARY

- **12, Ohio Association for Food Protection Annual Meeting**, Reynoldsburg, OH. For more information, contact Gloria Swick-Brown at gloria.swick-brown@odh.ohio.gov.
- **12, SfAM Winter Meeting**, Royal Society, Carlton House Terrace, London, England. For more information, go to www.sfam.org.uk.
- **21-26, ILSI Annual Meeting 2011**, Buena Vista Palace Hotel, Lake Buena Vista, FL. For more information, go to www.ilsi.org.
- **23-26, National Mastitis Council 50th Annual Meeting**, Hyatt Regency Crystal City, Arlington, VA. For more information, go to www.nmconline.org/meetings.html.
- **24-28, Combined Workshop-Internal Auditor and Food Safety Management Standards**, Spring Hill Suites Marriott, Orlando, FL. For more information, go to www.newsflow.com.
- **26-28, International Poultry Expo**, Georgia World Congress Center, Atlanta, GA. For more information, phone 770.493.9401 or go to www.ipe11.org.

FEBRUARY

- **2-3, Ground Beef Production and Safety Workshop**, Marriott Country Club Plaza, Kansas City, MO. For more information, go to www.meatami.com/education.
- **8-10, Food and Beverage Test Expo 2011**, Cologne, Germany. For more information, go to www.food-testexpo.com.
- **16-18, Global Food Safety Conference**, London, UK. For more information, go to www.tcgffood-safety.com.
- **19-23, AFFI Frozen Food Convention**, Hyatt Regency, San Francisco, CA. For more information, go to www.affi.com.

- **20-22, 2011 Annual Meat Conference**, Hyatt Regency Dallas, Dallas, TX. For more information, go to www.meatconference.com.
- **27-March 2, 6th Dubai International Food Safety Conference**, Dubai. For more information, go to foodsafetydubai.com.
- **28-March 2, HACCP Plan Development**, Spring Hill Suites Marriott, Orlando, FL. For more information, go to www.newsflow.com.

MARCH

- **1-2, 9th World Food Technology and Innovation 2011**, Brussels, Belgium. For more information, go to www.foodinnovate.com.
- **2-4, Advanced HACCP**, Spring Hill Suites Marriott, Orlando, FL. For more information, go to www.newsflow.com.
- **2-4, 2011 Beef Industry Safety Summit**, Dallas, TX. For more information, go to www.bifsc.org.
- **14-17, Dairy Technology Workshop**, Birmingham, AL. For more information, contact Randolph Associates, Inc. at 205.595.6455, ext. 224.
- **16-18, Idaho Environmental Health Association Conference**, Student Union Building, Boise State University, Boise, ID. For more information, go to <http://jami.delmore@phd3.idaho.gov>.
- **30, Missouri Milk, Food and Environmental Health Association (MMFEHA) Conference**, Columbia, MO. For more information, go to www.mmfeha.org.

APRIL

- **7-8, IAFP Microbial Challenge Testing for Foods Workshop**, Embassy Suites O'Hare, Chicago, IL. For more information, go to www.foodprotection.org.
- **10-13, 2nd ICC Latino-American Conference 2011**, Santiago de Chile, Chile. For more information, go to www.icc.or.at.

- **13-16, AMI International Meat, Poultry & Seafood Industry Convention, & Expo**, McCormick Place, Chicago, IL. For more information, go to www.amiexpo.com.
- **19-21, 13th Annual Food Safety Summit**, Washington, D.C. Convention Center, Washington, D.C. For more information, go to www.foodsafetysummit.com.
- **24-26, ADPI/ABI Annual Conference**, Chicago Marriott Downtown, Chicago, IL. For more information, go to www.adpi.org.
- **28-May 4, National Conference on Interstate Milk Shipments Conference**, Sheraton Baltimore City Center, Baltimore, MD. For more information, contact Marlena Bordson at 217.762.2656 or E-mail: ncims.bordson@gmail.com.

MAY

- **11-12, Pennsylvania Association of Milk, Food and Environmental Sanitarians 72nd Annual Conference**, Nittany Lion Inn, State College, PA. For more information, contact Kara Krall at kmk183@psu.edu.
- **16-20, 3-A Annual Meeting**, Wyndham Milwaukee Airport Hotel, Milwaukee, WI. For more information, call 800.558.3862 or go to www.3-a.org.
- **18-20, IAFP Seventh European Symposium**, Reehorst Hotel, Ede, The Netherlands. For more information, go to our Web site at www.foodprotection.org.
- **22-26, iCEF II, International Congress on Engineering and Food Conference**, Athens, Greece. For more information, go to www.icef11.org.

JUNE

- **5-8, 2011 Association of Public Health Laboratories (APHL) Annual Meeting and Fifth State Environmental Laboratory Conference**, Omaha, NE. For more

COMING EVENTS

information, contact Terry Reamer at terry.reamer@aphl.org or go to www.aphl.org.

- **18-22, 2011 Association of Food and Drug Officials (AFDO) Annual Educational Conference**, Marriott Dallas/Plano at the Legacy Town Center, Plano, TX. For more information, go to www.afdo.org.

- **21-23, First International Conference on Food and Environment - The Quest for a Sustainable Future**, New Forest, UK. For more information, go to www.wessex.ac.uk/11-conferences/cmem-2011.html.

- **26-30, 4th Congress of European Microbiologists**, Geneva, Switzerland. For more information,

go to www2.kenes.com/fems2011/Pages/Home.aspx.

JULY

- **31-Aug. 3, IAFP 2011**, Frontier Airlines Convention Center, Milwaukee, WI. For more information, go to www.foodprotection.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

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For the Year Ended August 31, 2010

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Advertising	\$123,042
Membership & Administration	456,357
Communication	685,840
Annual Meeting	1,224,172
Workshops & Symposia	25,125
International Symposia	343,801
Total revenue	\$2,858,337

Expense:

Advertising	91,471
Membership & Administration	759,853
Communication	708,846
Annual Meeting	779,497
Workshops & Symposia	17,654
International Symposia	275,180
Total expense	\$2,632,501

Change in General Fund **\$225,836**

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General Fund	494,451
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Letter to the Editor

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