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[1] NACMCF Executive Secretariat,* 2007. Analytical utility of *Campylobacter* methodologies. U.S. Department of Agriculture, Food Safety and Inspection Service, Washington, D.C. Journal Food Protect. 70:241-250.
[2] Stern, N.J., B. Wojton, and K. Kwiatek. 1992. A differential-selective medium and dry ice-generated atmosphere for recovery of *Campylobacter jejuni*. J. Food Protect. 55:514-517.

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VOLUME 30, NO. 9

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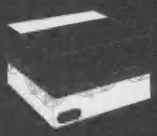

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"REFLECTIONS" OF YOUR PRESIDENT

By LEE-ANN JAYKUS
PRESIDENT

""Thoughts as I look forward to the coming year"

As September is now upon us, I cannot help but ponder the coming academic year with its fresh new faces. One of the most rewarding parts of being a professor is to see that light go off...the "aha" moment, so to speak. Every year I am blessed with one or two students for which this happens. Some go on to become food microbiologists, some don't. But being a part of their journey is an honor and a privilege.

But none of us gets to where we are, personally or professionally, without some help. In fact, not without a lot of help. So, in this my first column as your president, I would like to reflect on my memories of how IAFP meetings, members, and activities have made a difference in my professional development. Like....

My first IAFP meeting (Atlanta, 1993), when I was a soon-to-be newly graduated Ph.D., knowing virtually no one and without a clue about what I was going to do for a living. I did an oral presentation on foodborne viruses at that meeting, a little recognized food safety issue at the time. But Stan Bailey took the opportunity to welcome me personally into the food microbiology fold. I also won a fly swatter in one of the session drawings (still use that fly swatter to this day!). It was at that same meeting that I met with Dr. Peggy Foegeding about a new faculty position they were advertising at NCSU. Was I perhaps interested in applying?

How about Pittsburgh in 1995 and my first Professional Development group meeting, none other than the Committee on Control of Foodborne Illnesses. Talk about intimidating! But Ewen Todd and Pete Cook took me under their wings, being welcoming as ever. Or hearing Anna Lammerding talk about microbial risk assessment in Seattle (1996 and still my favorite IAFP venue) with such authority and passion. That was also the first meeting in which I took a lead in organizing a symposium. I remember having lunch with Ann Marie McNamara to plan our presentations, a bit scared at the prospect of having to introduce so many really qualified and experienced people. Oh, and that was also the first year I officially participated in the ILSI Hospitality Suite (thinking, at that time mistakenly, that you needed a "formal" invitation to get in!).

Then there was 1997 (Orlando), the first time one of my students won a Developing Scientist award. And the Minneapolis meeting (2001), when I really got to know Frank Busta, a dear friend and colleague. Or San Diego (my second favorite venue) when my stepson Robert snuck into one of the sessions and after I finished my presentation, asked me "what's for dinner" (in front of about 100 people!).

There are many faces that I look forward to seeing at every IAFP meeting....Bob Gravani, Helene Uhlman, Vijay Juneja, Zeb Blanton, Randy Daggs and Kathleen Rajkowski, to name but a few. And new faces abound, not just in our student members but young faculty, government and industry folks who, even early in careers, recognize that IAFP as THE food safety organization, and who are dedicating their time and talents to our association.

Since New Orleans (2003), my involvement with IAFP has escalated to a level where the more recent meetings are but a blur. I now have memories of the Program Committee (meeting in Baltimore during the middle of a snowstorm) and that cold February meeting in Calgary, Canada (my husband wondered whose idea that was!). And the Executive Board...Frank Yiannas (a fellow "forward thinker") and Carl Custer (not really sure what kind of thinker he is!).

Included in these new activities has been the opportunity to "go local" and "go global." In visiting the affiliates, I have met many dedicated professionals who frequently work at food protection behind the scenes; their efforts are invaluable. And they have been such gracious hosts (thanks, Gloria). By participating in our recent international meetings,

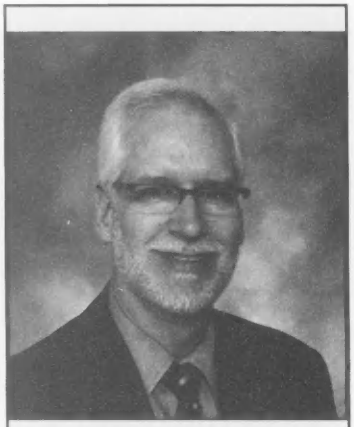
I have gotten to know people like Claude and Michelle Mabilat, Gail Greening and Roger Cook, who have opened up their homes and shared their families with me.

So, besides providing you with some of my own memories, what is my message? I think it is that people touch us in ways that they may never know. I challenge you to think about all your friends and colleagues at IAFP and how they may have impacted your lives. Perhaps a new collaboration or a new job opportunity? Maybe it was the seed of an idea that you were able to use in your work. Or the simple act of connecting with someone having a common food safety interest or passion. Or maybe even sharing a beer at the ILSI suite or after the bioMérieux Symposium? Pick up the phone or send them an E-mail (or "tweet") telling them that they have made a difference in your life. And that they have made a difference to food safety.

I also challenge you to "pay it forward." This expression describes the concept of asking that a good turn be repaid by having it done to others instead. Every time you do something for IAFP, you are supporting your colleagues as well as the safety of the world's food supply. And there are so many opportunities to pay it forward with IAFP. Among those are participation in professional development groups and webinars; organizing workshops and symposia; participating on key association committees; sponsoring events; contributing to our Foundation; writing papers for our publications; and the list goes on and on.

As I round up my first column, then, I would like to thank all those I mentioned, and many that I did not, for what you have meant to me. For those who are no longer with us, we miss you. For those who are, I enjoyed seeing you at IAFP 2010. I am proud to be able to call you colleagues, and I am honored to have the opportunity to serve IAFP this coming year. I have big shoes to fill (thanks to Jeff, Frank, Gary, Stan and Vickie!) and we will need to work together in our common activities to promote the safety of the world's food supply. I look forward to keeping you abreast of my activities over the next year, and ask you to keep me posted on yours. You can always contact me at leeann_jaykus@ncsu.edu or through the IAFP office.

"COMMENTARY" FROM THE EXECUTIVE DIRECTOR



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

"We hope that all IAFP Members see the value in belonging to the Association"

This is always a hard time of the year to write a column for *Food Protection Trends*. Reasons being, it has to be written prior to the Annual Meeting start up, but it will be read by you and other Members almost a month after IAFP 2010 has concluded! So, there is a little "forecasting" and "crystal ball" involved in this month's column.

We won't know the financial outcome from IAFP 2010 until mid- to late-September because of closing out all of the various bills that must be paid, but based on a number of indicators; I have to believe that the meeting will provide the needed influx of revenue to the Association. We have been very surprised at the extreme interest in IAFP 2010 in Anaheim after a disappointing result last year in Grapevine. Although we did expect a rebound, I don't believe that anyone could have predicted what we have experienced!

Preregistration for IAFP 2010 has exceeded all previous records and even reached 2,000 one-week prior to commencement of the meeting. Normally, we have somewhere between 200 and 300 people who register during the week prior or onsite at our Annual Meeting. We won't know the actual outcome in time for this month's column, but indications are that we will exceed 2,100 and break our previous registration record (set in 2007).

For exhibit sales, again we have broken past records. Last year in Grapevine, we were down a little because of the economic conditions at the time and we had 118 booths in the exhibition hall. Our previous record was 132 booths, also occurring in 2007. But this year, all stops were pulled out and we topped 150 booths!!! Our total number of spaces taken was 154; certainly a new record. Add to this that our sponsorship revenues increased to an all-time high and you can see that our expectations are for a very profitable IAFP Annual Meeting.

Of course, this profit will depend on our expense allocation for the meeting. We have undertaken a number of decisions based on expense reductions but have done so with the overall quality of the meeting continuing to be the utmost priority. I'm certain that most repeat attendees will notice a few changes, but for the most part; the Annual Meeting remains the same.

I mentioned that we expect the Annual Meeting to be **very profitable** and sometimes we receive questions about this "goal" (to make a profit from IAFP's Annual Meeting). Let me begin by saying the overall budget for IAFP includes a "contribution" to the bottom line from the Annual Meeting. If we could not count on this addition to the bottom line each year, the monies to operate the Association would need to come from another source. The most likely source would be Member dues.

In order to "fund" the Association for the same activities that we currently carry out (or in other words, to keep the same budgeted revenue), our current base Member dues of $50 would have to be raised by $100 to total $150! You can easily see this is not a good option for IAFP. Therefore, we must be able to maintain collecting more revenue for Annual Meeting than we pay out in expenses (again, creating a profit to be contributed to the bottom line). Most of the time, once this is explained to anyone asking why we should "profit" from the Annual Meeting, the reasons are easily understood.

By keeping our base Membership dues at a very economical $50 (we do have a request to the Board to raise dues by $5 though), we are able to attract and include many more food safety professionals to IAFP than if our dues were $100 higher. Speaking of this, we have seen a large increase in Membership over the past years. If you compare to our total number of Members in 2000, we have increased by 14%. In 2003 and 2004, our Membership dipped down close to 2,900. When comparing to those years, we have increased by 17%. Just in the last three years

(since lowering Membership dues), we have increased by almost 10%.

The number of Members from outside of North America has doubled since 2004! This is a direct result of IAFP's increased activity beyond the North American boarders. Now, fully 21% of our IAFP Members reside outside of North America. This is compared to only 13% just six years ago. We do track our Canada, Mexico and United States Members separately and each group has remained very steady in total over the past few years with Canada losing just a few (10% from a peak of 316), Mexico gaining just a few and the United States gaining 7.6% or about 175 from its low point.

So, I hope this month's column helps to point out two things about IAFP. One is the importance of a financially successful IAFP Annual Meeting. And the second point is how our low, base Membership fee and our International efforts have truly paid off in bringing more food safety professionals together under the IAFP name. We hope that all IAFP Members see the value in belonging to the Association and that YOU will encourage your coworkers and colleagues to become actively involved with the Association.

Please let us know if we can answer any questions or be of further assistance to you in these efforts!

ARTICLES

Food Protection Trends, Vol. 30, No. 9, Pages 528–531

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

International Association for Food Protection

Inter-agency Public Health Collaboration: Western States *Escherichia coli* O157:H7 Investigation Associated with Ground Beef

BONNIE W. KISSLER,[1]* ROSEMARY TURNER,[2] TIMOTHY C. IHRY,[3] SCOTT A. SEYS[4] and THE INVESTIGATION TEAM[5]

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ABSTRACT

Between January 1 and December 31, 2007, 10 of 21 voluntary recalls of ground beef products were associated with *Escherichia coli* O157:H7 infections. The 2007 Western States *E. coli* O157:H7 investigation illustrates the importance of inter-agency collaboration and availability of accurate product information to enhance outbreak response. Foodborne disease investigations have become increasingly complex. Coordination and collaboration between public health partners throughout investigations are essential to respond to reports of illness and ultimately reduce the burden of illnesses caused by foodborne pathogens.

A peer-reviewed article

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INTRODUCTION

Healthy People 2010 is a comprehensive framework outlining disease prevention and health promotion objectives for the United States *(7)*. The goal of the food safety focus area is to reduce foodborne illnesses, with the specific objectives of reducing infections caused by *Campylobacter*, *E. coli* O157:H7, *Listeria monocytogenes*, and *Salmonella* and reducing outbreaks caused by *E. coli* O157:H7 and *Salmonella* Enteritidis *(7)*. According to the Centers for Disease Control and Prevention (CDC), foodborne infections contribute to approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the U.S. each year *(9)*. In 2007, there were 1,097 outbreaks reported electronically to CDC's Electronic Foodborne Outbreak Reporting System; 257 (23%) of those were confirmed to be attributed to a bacterial etiology and 199 (18%) to a viral etiology *(1)*. There were 36 *E. coli* O157:H7 outbreaks reported to CDC in 2007 *(1)*. The Food Safety and Inspection Service (FSIS) coordinated 21 voluntary recalls of ground beef products in 2007, 10 of which were associated with *E. coli* O157:H7 infections. This paper describes the inter-agency collaboration during one of the *E. coli* O157:H7 investigations.

Foodborne illness investigations that span multiple agencies and jurisdictions have become more common as the U.S. food supply chain has become increasingly complex because of wider distribution of products produced domestically and internationally. Further, advances in epidemiologic and laboratory surveillance have enabled the identification of foodborne outbreaks. Consequently, successful investigations require efficient communication and coordination among local, state, and federal public health agencies and regulated industries. The ability to control and mitigate a foodborne outbreak to prevent further illnesses depends upon rapidly identifying contaminated food products and taking control measures to limit consumers' exposure to contaminated products, including removal of these products from commerce whenever possible.

FSIS is the public health regulatory agency within the U.S. Department of Agriculture responsible for ensuring that the nation's commercial supply of meat, poultry, and processed egg products is safe, wholesome, and correctly labeled and packaged. To ensure compliance with U.S. food safety standards, FSIS inspects and monitors all meat, poultry, and processed egg products sold in interstate and foreign commerce.

The Foodborne Disease Investigations Branch (FDIB) is the point of contact linking public health partners (local and state health departments, local and state agricultural departments, and other federal agencies) to FSIS experts on a variety of food safety issues. FDIB is staffed by public health professionals with backgrounds in epidemiology, environmental health, veterinary medicine, clinical medicine, and other related disciplines. During foodborne illness investigations, FDIB assesses epidemiologic information, assists with traceback of implicated foods to producing establishments, facilitates sampling to identify pathogens that may be causing human illness, and provides information to FSIS senior management.

WESTERN STATES *E. COLI* O157:H7 INVESTIGATION

On May 25, 2007, FDIB was notified by the FSIS Liaison to CDC of a cluster of eight case-patients with an indistinguishable pulsed-field gel electrophoresis (PFGE) pattern combination, in Arizona, California, Colorado, Utah, and Wyoming. California case-patients purchased ground beef products from Grocery Store A. Colorado, Utah, and Wyoming case-patients purchased ground beef products from Grocery Chain B in their respective states.

On May 30 and May 31, 2007, *E. coli* O157:H7 was confirmed in leftover ground beef products collected from California and Colorado case-patients, respectively. Personnel from FSIS and the California Dept. of Public Health, Food and Drug Branch (FDB) conducted a joint traceback investigation on May 31, 2007 at the California retail stores to identify production dates corresponding to the positive leftover products. Limited packaging material from the California case-patient initially identified Establishment X as the supplier of ground beef products purchased at Grocery Store A. No labeling information was available for the Colorado case-patient. A review of grinding logs and invoices corresponding to case-patients' purchase dates identified Establishment X as the supplier of ground beef products to both California and Colorado retail locations. FSIS Office of Program Evaluation, Enforcement and Review investigators from California and Colorado and the FDB initiated a traceback investigation to determine if products from common production dates were distributed and available at retail locations. After a thorough record review, FSIS determined that ground beef products produced on April 20, 2007 by Establishment X were common to the retail locations in California and Colorado. As a result, the establishment voluntarily recalled 75,000 pounds of ground beef products on June 3, 2007. Further investigation by the FDB identified April 13, 2007 as an additional production date of interest. Through the review of invoices and distribution information at the grocery stores, FSIS confirmed the involvement of the additional production date. As a result, on June 6, 2007, the establishment expanded the initial recall to include 375,000 pounds of ground beef products produced on April 13, 2007. The Wyoming and Utah case-patients were unable to provide further details on the dates of purchase; therefore, traceback investigations at those retail stores could not be conducted.

On June 1, 2007, the Arizona Dept. of Health Services (ADHS) reported six case-patients with *E. coli* O157:H7 infections, two with a PFGE pattern combination indistinguishable from the outbreak pattern. Case-patients reported purchasing ground beef products at Grocery Chain C. Leftover product from two case-patients was presumptive positive for *E. coli* O157:H7 on June 5, 2007. A traceback investigation initiated by FSIS also identified Establishment X as the ground beef supplier. Based on the findings from the FSIS investigation and the ADHS epidemiologic investigation, the establishment announced a second expansion of the recall on June 9, 2007 for 5.7 million pounds of ground beef products produced between April 6 and April 20.

After the second recall expansion, ADHS continued to find case-patients with the outbreak strain and a suggestive food history. However, either those case-patients were lost to follow-up or information from supermarket grinding logs was found to be incomplete or partly inaccurate.

Box 1. Product information to assist FSIS with product traceback

- Who?
  - FSIS establishment number, e.g., inside USDA seal
- When?
  - Production date or lot number
  - Sell by/use by date
  - Purchase date
- What?
  - Product name and type, e.g., "90 percent lean ground beef"
  - Product weight and units per case
  - Amount of product purchased
- Where?
  - Point of purchase, including name and complete address
- Does the consumer have purchase receipts?
- Did the consumer use a shopper card for the purchase?
- Is there any leftover product held by consumer?
- Are there other sources of the same product?

COLLABORATIONS AND RESOURCES

FDIB becomes aware of foodborne illnesses in a variety of ways, including reports from the FSIS Consumer Complaint Monitoring System; local, state, and territorial public health departments; and federal agencies such as CDC and the Food and Drug Administration (FDA). FDIB also utilizes information from PulseNet, a national molecular subtyping network coordinated by CDC and comprised of laboratories at state and local public health departments, FSIS, and FDA, to detect clusters of illnesses *(8)*. The Outbreaks Section of the Eastern Laboratory (OSEL) within FSIS routinely conducts PFGE analysis and uploads patterns to PulseNet. Surveillance for foodborne illnesses is an ongoing and daily process within FDIB.

At federally inspected establishments, FSIS routinely samples raw ground beef, beef manufacturing trimmings, and selected ready-to-eat (RTE) products, such as cooked beef patties and dry fermented sausages, for *E. coli* O157:H7 *(6)*. Additionally, all RTE meat and poultry products, and pasteurized egg products, are tested for *Salmonella* and *Listeria monocytogenes*. Raw meat and poultry products that test positive for *Salmonella* collected as part of the Pathogen Reduction-Hazards Analysis Critical Control Points (PR-HACCP) performance testing program *(5)* are also compared to PulseNet.

FSIS investigators also conduct in-commerce surveillance activities to ensure that meat, poultry, and egg products in commerce are safe, wholesome, correctly labeled and packaged, and secure from intentional acts of contamination. For example, FSIS investigators collect samples of raw ground beef for *E. coli* O157:H7 testing when the retail store that ground it fails to record the identity of its suppliers *(4)*.

During foodborne illness investigations, FDIB relies on OSEL to query the PulseNet database for updated PFGE information to guide and address the critical laboratory components of the investigation. FDIB works closely with FSIS microbiologists to review non-FSIS laboratory methods and interpret laboratory findings, such as PFGE and multi-locus variable-number tandem repeat analysis (MLVA).

Local, state, and territorial public health agencies interview case-patients to establish an epidemiologic association between exposure and illness. When alerted to a report of foodborne illnesses, FDIB typically collaborates with foodborne disease epidemiologists, but may also work directly with local or territorial health and agriculture departments, when appropriate. During multi-state foodborne outbreak investigations, FDIB may coordinate activities with epidemiologists at CDC. Epidemiologists collect case-patient information and perform analytic studies to determine the source and vehicle of foodborne illnesses.

FDIB relies on field investigators to complete the essential product identification and verification methods, as well as traceback investigations. Epidemiologic, laboratory, and environmental health information collectively play an integral part in determining whether FSIS is able to take a regulatory action during an outbreak investigation.

FSIS TRACEBACK INVESTIGATION DATA NEEDS

FDIB requests information to establish temporal and spatial relationships between illnesses and regulated products and reviews available epidemiologic information to determine the strength of association. In addition, FSIS field investigators are required to review and re-assess information in order to allow the Agency to make factual determinations about regulated products in commerce.

Foods that are inspected and passed by FSIS receive a mark of inspection containing an establishment number. Finding information, such as establishment name and number, during a traceback greatly enhances the Agency's ability to trace the implicated product back to its original supplying establishment. However, other identifying information, such as product name and type, product lot code or sell by/use by date, and purchase location and date, is important to FSIS for traceback or trace-forward activities (Box 1).

CONCLUSION

FDIB is staffed by a multidisciplinary team of public health professionals who utilize a variety of resources to conduct foodborne illness investigations. FDIB examines and evaluates epidemiologic, laboratory, and traceback information to determine if an association exists between illnesses and regulated product. When FSIS-regulated products are associated with illnesses, collaboration between FDIB and public health partners reduces the burden of illnesses caused by foodborne pathogens. FSIS oversees and coordinates voluntary recalls of meat and poultry products with official establishments by ensuring that contaminated products are removed from commerce. The Agency may also conduct intensified verification testing and/or comprehensive assessments of the food safety system at the producing establishments.

Lessons learned from FSIS' involvement in outbreak investigations have in part influenced the Agency's *E. coli* O157:H7 policies in many ways. The new risk-based approach to control *E. coli* O157:H7 is one such example. This approach involves volume-based production sampling, enhanced traceback activities and intensified sampling, and investigation at the identified slaughter establishments. The first initiative changes the sampling frequency for establishments that produce ground beef products. The Agency collects samples from establishments producing higher volumes of ground beef more frequently than those producing lower volumes. Outbreak investigations have shown that products from higher volume producers are generally more widely distributed; thus, contaminated products from these producers will have a greater public health impact. Traceback activities are enhanced to determine the source of the contamination. All ground beef products testing positive for *E. coli* O157:H7 are traced back to the originating slaughter establishment. For these slaughter establishments, there will be follow-up sampling along with a thorough review of their HACCP/SSOP (Sanitation Standard Operating Procedures) for that particular product to identify issues warranting further investigation *(3, 5)*.

In response to some of the difficulties public health partners experienced in determining whether recalled products were distributed in their state, FSIS made improvements to enhance the recall process. In August 2008, through passage of the final rule, *Availability of Lists of Retail Consignees during Meat or Poultry Product Recalls*, the Agency now makes available to the public via its Web site a list of the retail consignees of meat and poultry products distributed to the retail level for Class I recalls. This change enables public health partners and consumers to identify where recalled products were distributed through retail facilities in their state *(2)*.

This *E. coli* O157:H7 investigation, used as an example, highlights the importance of inter-agency communication and coordination. When public health partners were able to provide product information from purchase receipts or shopper cards from case-patients, this accurate documentation greatly facilitated traceback, leading to the identification of the establishment that had produced the contaminated ground beef. Procedures used to obtain receipts and/or shopper card information should be adopted by health departments, as a means to obtain accurate purchase information during investigations.

During this investigation, aggressive information gathering and extensive epidemiologic investigations by public health partners helped inform FSIS about the scope of product adulteration, which led to expansion of recall activities. These collaborations between state and federal agencies during outbreak investigations are instrumental in obtaining the information needed to initiate voluntary recalls of adulterated product. Through FSIS' involvement in outbreak investigations, the Agency has gained a wealth of knowledge of the ecology of *E. coli* O157:H7 in ground beef products. This knowledge has been crucial in informing new policies that may ultimately have an impact on prevention and control of this pathogen.

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Pathogens Associated with Biltong Product and Their *in vitro* Survival of Hurdles Used during Production

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ABSTRACT

Biltong is a traditional South African spiced and dried, ready-to-eat meat product, and is an increasingly popular commodity worldwide. As few studies have evaluated its safety, this study evaluated 150 samples of South African biltong for aerobic bacteria, *Enterobacteriaceae*, coliforms, *Escherichia coli,* coagulase-positive *Staphylococcus*, *Salmonella* and *Listeria monocytogenes*. Selected strains of potential pathogens were further identified by use of 16S rDNA gene sequencing methods. In addition, the *in vitro* antimicrobial properties of each primary ingredient component of the biltong-making process was tested against selected bacterial isolates. Plate counts were the highest for aerobic bacteria (ca. 7 log CFU/g), followed by *Enterobacteriaceae* (ca. 4 log CFU/g), coliforms (ca. 3 log CFU/g), presumptive *Staphylococcus* (ca. 3 log CFU/g) and *E. coli* (ca. 1 log CFU/g) counts. All samples tested negative for *Salmonella*, while 2 samples tested positive for *L. monocytogenes* and 3 samples for enterotoxin-producing *Staphylococcus* strains. Results also showed that 25% of the isolates grew in the presence of up to 20% NaCl. Apple cider vinegar and brown spirit vinegar inhibited the growth of 63 and 50% of the isolates, respectively, while all 8 isolates (2 *L. monocytogenes*, 3 *S. aureus* and 3 *S. pasteuri*) showed the same growth patterns in the presence and absence of spices traditionally used in manufacturing biltong. Overall, strains of *L. monocytogenes*, *Staphylococcus aureus* and *Staphylococcus pasteuri* showed the most growth in all assays conducted. Results from this study highlighted biltong as a potential reservoir for foodborne pathogens, which have implications for foodborne illness.

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INTRODUCTION

The preservation of meat has always been important to the survival of humans. For example, one of the first references to dry-cured pork was reportedly recorded on Sumerian tablets in 2000 BC *(28)*. Historically, cured, fermented and dried meat products are regarded as microbially safe ready-to-eat (RTE) foods because of their low water activity (a_w) and low pH as well as the presence of curing salts *(15)*. These products have been consumed throughout history, and often have strong cultural associations. For example, pemmican was a dried meat product that provided Native Americans with protein in the lean months of winter. Similarly, carne seca and machaca in New Mexico, jerky in the United States, charqui in South America, kilshi in Sahel, rou gan in China and biltong in South Africa are popular RTE meats in modern times *(16, 29)*.

RTE meats are often produced from meats such as beef, lamb, pork and poultry or mixtures of such meats *(15)*. The Shiga-toxin producing *Escherichia coli (E. coli)* O157:H7, *Listeria monocytogenes (L. monocytogenes), Salmonella* and *Staphylococcus aureus (S. aureus),* have been detected in these types of meat products *(22)*. Indeed, several outbreaks linked with *E. coli* O157:H7 and *Salmonella* in RTE meat products have been recorded *(15)*. For example, there have been 9 recorded foodborne illness outbreaks and 5 recalls have been associated with jerky to date *(1, 26)*.

Biltong is a traditional South African RTE dried and spiced meat product that is easy to produce *(12, 24)*. All that is required is a selection of beef, game, chicken or ostrich meat, which is then cured with several basic flavoring agents (salt, black pepper, dried and roasted coriander and brown sugar) and vinegars (apple cider, brown spirit, wines), after which it is dried at ambient temperatures for several days *(12, 20)*. As a result, biltong production is often a home industry, and the safety of this commodity is of concern *(19)*. In addition, there are several new international markets for biltong, including Australia, Portugal, the UK and the US *(2)*. However, very little updated survey data has appeared in the literature on the safety of this RTE meat *(27, 29)*. Thus, the aims of this study were to update current knowledge on the prevalence of bacterial foodborne pathogens associated with this product and to evaluate the *in vitro* response of selected isolated pathogens to some of the hurdles used during the biltong preparation process.

MATERIALS AND METHODS

Sample collection

One hundred fifty biltong samples were obtained from various geographical locations in the Gauteng province in South Africa during July–September 2008. Suppliers included slaughterhouses (n = 21), biltong bars (small outlets that usually sell biltong as the main source of income, often found in shopping malls) (n = 35), convenience stores (supermarkets) (n = 26), biltong shacks (a biltong bar that sells both raw and dried meat in the same establishment on a small scale) (n = 25), home-based industries (n = 4), shops that sell prepackaged product (n = 19) and sweet (confectionary) shops (n = 10).

Sample processing and enumeration

For each biltong sample, 20 g of the product (if not already sliced, then cut from the original sample, using a sterile blade) was transferred into a Whirl-Pak bag (Nasco, USA), combined with 180 ml diluent (0.1% Bacteriological Peptone {BioLab, Midrand, South Africa} + 0.85% sodium chloride {Saarchem-Merck Chemicals, South Africa}) and homogenized for 2 min with a Colworth 400 Stomacher *(10)*. The homogenized biltong samples were serially diluted in diluent and plated in duplicate, using standard plating procedures, as outlined in Table 1. After plating, the pH of the homogenized samples was recorded by placing a pH detection probe of a laboratory pH meter (Metrohm 744) directly into each sample. In addition, biltong samples were concurrently processed with standard methods for the detection of *Salmonella*, *L. monocytogenes* and presumptive *S. aureus* (Table 1).

Duplicate plates containing between 30 and 300 colonies, or the highest number if fewer than 30 colonies were obtained, were enumerated for aerobic plate (APC), *Enterobacteriaceae* (ECB), coliform (CC), *E. coli* (EC) and coagulase-positive *Staphylococcus* (SAC) counts and expressed as log colony forming unit (log CFU) per gram.

Presumptive pathogens were selected for further molecular identification *(10)*. In addition, presumptive isolates of *S. aureus* were tested for enterotoxin production, using SET-RPLA TD900 kits (Oxoid, London) *(20, 21)*.

Molecular identification of presumptive bacterial pathogens

Presumptive pathogens were further identified using 16S rDNA gene sequencing. Polymerase chain reaction (PCR) amplification was carried out as previously described, using the primer sets U1392R (5'- ACG GGCGGT GTG TRC-3') and Bac27F (5'-AGA GTT TGA TCM TGG CTC AG\-3') in combination with Fermentas 2× PCR Master Mix (Fermentas Life Science). The purified PCR product was sequenced and analyzed using BLAST against the 16S rDNA gene sequences from GenBank, and samples were submitted to obtain accession numbers *(10)*.

Isolates selected for growth/tolerance assays

Eight isolates that were then selected for further work included strains of *L. monocytogenes*, *S. aureus* and *S. pasteuri* [accession numbers FJ160766; FJ160767; FJ392795; FJ392802; FJ392805; FJ392798; FJ392800 and FJ392804]. In order to generate working inocula, each isolate was successively cultured twice (from previously frozen stock cultures) for 24 h at 37°C in Tryptone Soy Broth (TSB) (BioLab, Midrand South Africa), streaked onto Tryptone Soy Agar plates (TSA) (BioLab, Midrand South Africa) and incubated for 48 h at 37°C. Colony morphology as well as Gram-stain reactions were examined to ensure the purity of the cultures of each isolate, and plates were stored at 4°C.

Growth in high salt concentrations

To evaluate salt tolerance, each isolate was plated by the streak plate technique, in triplicate and on four separate occasions, onto TSA plates supplemented with varying concentrations (5, 10, 15, 20, 25%) of sodium chloride (NaCl) (Saarchem, Merck Chemicals-South Africa)

TABLE 1. Culture methods, media and the aerobic incubation time and temperatures utilized in analysis of the 150 biltong samples obtained

	Incubation and growth media			
	Time (h)	**Temp (°C)**	**Plating method**	
Aerobic Plate Count (APC)	48	30	Pour (10^1) AND Spread	Tryptone Soy Agar (TSA) (BioLab, Midrand South Africa).
Enterobacteriaceae (EBC), Coliform Count (CC), *E. coli* Count (EC)	48	37	Pour	RAPID'*E. coli* 2™ Agar (Bio-Rad, France). All colonies. Blue-green colonies. Purple colonies.
Coagulase-positive *Staphylococcus* (SAC) Count	48	37	Spread	Baird-Parker Agar plus Egg Yolk Tellurite (0.5% w/v) (Scharlau, Spain). Black colonies with halo selected and Gram stained.
	24	37	Spread AND	Selected isolates – DNase agar (Scharlau, Spain). Flooded with 1 ml hydrochloric acid (1M) to show clearing.
	24	37	Streak	Isolates showing clearing on DNAse plates selected for Rapid Staph' Agar (RSA)(Bio-Rad, France) plus Egg Yolk Tellurite (0.5% w/v) (Scharlau, Spain).
Listeria monocytogenes detection	24	30	Pre-enrichment	Fraser ½ (Bio-Rad, France).
	48	37	Enrichment	Fraser 1 (Bio-Rad, France).
	24	37	Streak	RAPID' *L. mono*™ Agar (Bio-Rad, France), Blue colonies selected and Gram stained.
Salmonella detection	18	37	Pre-enrichment	Buffered Peptone Water (Scharlau, Spain).
	24	37	Enrichment AND	Müller Kauffmann Medium plus Brilliant Green Cycloserine supplement (1 vial/ 500 ml) plus 200 µl Gram's Iodine/ 10 ml (Scharlau, Spain).
	24	41.5	Enrichment	Rappaport-Vassiliadis Broth (Scharlau, Spain).
	24	37	Streak AND	Brilliant Green Agar Modified (Scharlau, Spain). Red colonies.
	24	37	Streak	Xylose Lysine Deoxycholate Agar Scharlau, Spain). Black colonies.

TABLE 2. Amendments made to the composition of mock biltong agar (MBA) to create variations that highlight growth susceptibilities to each component

Variation of MBA	Modification of components
MBA 1	No modifications made to original media
MBA 2	Exclusion of brown sugar
MBA 3	Exclusion of beef extract
MBA 4	Exclusion of sodium chloride
MBA 5	Exclusion of both beef extract and biltong spice
MBA 6	Exclusion of both biltong spice and brown sugar
MBA 7	Exclusion of biltong spice

(9). Inoculated plates were incubated at 37°C and qualitatively inspected every 24 h for 7 days for signs of bacterial growth.

Growth at various temperatures

A loopful of each isolate was inoculated into 20 ml of TSB, as well as plated by the streak plate technique onto TSA plates, in triplicate and on four separate occasions, and samples were incubated at 4, 25, 30, 37 and 45°C for 7 days. At 24 h intervals, TSA plates were observed for bacterial growth. In addition, a loopful from each inoculated TSB broth was streak plated onto TSA plates and incubated for 24 h at the appropriate temperature. For example, TSB-grown cultures incubated at 4°C were plated and incubated again at 4°C. These plates were also observed to confirm any bacterial growth.

Growth in the presence of organic acids

To determine if bacterial strains were tolerant to the organic acids used in the biltong manufacturing process, spot-on-lawn assays *(3)* were conducted in triplicate and on four separate occasions. A colony for each isolate was selected and inoculated into 50 ml of TSB, and samples were then incubated at 37°C for 18–20 h. Bacterial lawns and indicator plates were prepared by pour and spread plating of 1 ml of this overnight bacterial culture mixed with TSA to a final colony count of ca. 10^5–10^6 CFU/ml *(3)*. Plates were allowed to stand for 5 h at ambient temperature to allow drying of the surface. Indicator plates were divided into sections and 50 µl of sterile distilled water (negative control) or undiluted apple cider vinegar (Safari SAD, South Africa) or brown spirit vinegar (Safari SAD, South Africa) or 99.7% glacial acetic acid (Associated Chemical Enterprises, South Africa) (positive control) were spotted into each section. Plates were incubated at 37°C and observed every 24 h for 7 days for zones of clearing that would indicate inhibition of bacterial growth *(3)*.

Growth in the presence of biltong spice

To determine the growth of bacterial isolates in the presence of traditional biltong spice (commercially available product, www.biltongmakers.com), eight different agar combinations were prepared as follows:

- TSA was supplemented (prior to auto-claving) with traditional biltong spice (40 g/l) and was referred to as TSAB.
- Bacteriological agar (13 g/l) (Merck, South Africa) was supplemented with a combination of beef extract (10 g/l) (BioLab, South Africa), brown sugar (3 g/l) (Selati, South Africa), sodium chloride (5 g/l) and traditional biltong spice (40 g/l) and was referred to as mock biltong agar (MBA 1).
- Six variations of MBA were also created to highlight growth or inhibition of the various components, as shown in Table 2.

Bacterial isolates were streak plated, in triplicate and on four separate occasions, onto TSAB and all variations of MBA (Table 2), incubated at 37°C and observed every 24 h for 7 days for bacterial growth.

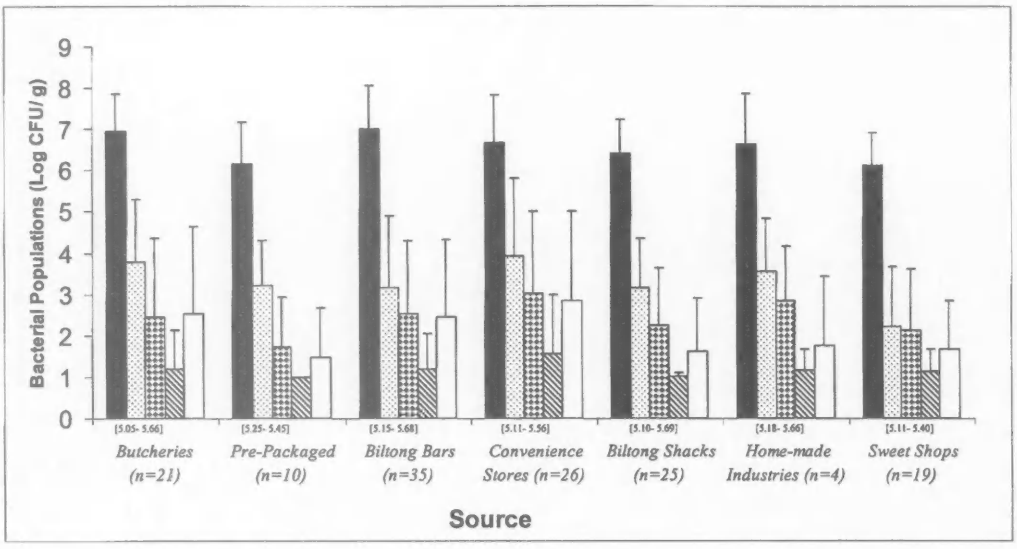
RESULTS AND DISCUSSION

Overall counts from biltong samples linked to points-of-sale

Overall, biltong samples obtained from biltong bars in this study had the highest associated APC counts (ca. 7.01 log CFU/g) (Fig. 1). This product was often sold uncovered, and handling of the product at point-of-sale may have contributed to an overall higher APC *(19)*. In contrast, pre-packaged samples had the lowest APC counts (ca. 6.14 log CFU/g) (Fig. 1), probably because of the protective barrier provided by the packaging *(14)*. Biltong is produced under several microbial growth-limiting conditions such as curing (salts, spices and vinegars), refrigeration and drying *(19)*. Traditional biltong reportedly has a water activity (a_w) of 0.74–0.77 and pH of 5.5–5.8 associated with the final product *(12, 29)*. Although these factors reduce the presence of several microbial populations, biltong thus favors the prevalence of heat-tolerant and salt-tolerant microorganisms.

EBC, CC and EC were used in this study to assess the overall hygiene of the production process, as high EBC and ECs are indicative of enteric pathogens *(5)*. From results obtained in this study, it was evident that biltong samples from convenience stores showed the highest associated EBC, CC and EC counts (3.94, 3.03 and 1.57 log CFU/g, respectively) (Fig 1). In contrast, pre-packaged samples had the lowest associated EBC and CC values (2.21 and 1.73 CFU/g, respectively) (Fig. 1), and were the only samples with EC counts

FIGURE 1. Bacterial populations of aerobic bacteria (black bar), total *Enterobacteriaceae* (dotted bar), coliforms (checked bar), *E. coli* (striped bar) and presumptive *Staphylococcus aureus* (white bar) counts obtained from 150 biltong samples (lower detection limit = 1 log CFU/g). {pH ranges associated with samples.}



below the lower detection limit (Fig. 1). The presence of *E. coli*, an index organism, traditionally highlights the suspected presence of other pathogens, such as *Salmonella*, as they are capable of surviving in the same environmental niches *(17)*. However, *Salmonella* was absent from all biltong samples tested in this study.

SAC counts showed that convenience stores, followed closely by slaughterhouses and biltong bars, were associated with samples with higher SAC counts than the other points-of-sale; indeed, all SAC counts observed were below 3 log CFU/g (Fig. 1). As *Staphylococcus* populations are often native to the human nose, throat and skin, high *Staphylococcus* counts are often indicative of poor human handling practices *(15)*.

Presence of bacterial pathogens in biltong

S. aureus

After the screening of 159 presumptive *Staphylococcus* isolates obtained from biltong samples, 15 isolates were singled out as presumptive *S. aureus* strains and further identified with 16SrDNA sequencing. Results from molecular analysis showed that of the 15 isolates, only 3 were confirmed as *S. aureus* (accession numbers FJ392795, FJ392802 and FJ392805). The other 12 were identified as *S. pasteuri* (FJ392791 – FJ392793, FJ392796 – FJ392799, FJ392801, FJ392803 and FJ392804), *S. saprophyticus* (FJ392800) and *Macrococcus caseolyticus* (FJ392794). All 15 isolates were also tested for enterotoxin production. Results showed that 3 isolates produced enterotoxin B, including 2 strains (FJ392795 and FJ392802) identified as *S. aureus* (99% seq-uence similarity to *S. aureus* ATCC 14458). Enterotoxin B-producing strains are reportedly the serotypes that are the third most common in terms of being, associated with food poisoning events, after enterotoxins A, and D *(4)*. Interestingly, a strain of *S. pasteuri* (FJ392798) (99% sequence similarity to *S. pasteuri* AF041361) also produced a positive reaction to enterotoxin B. Although enterotoxin production is often characteristic of coagulase-positive *Staphylococcus* strains such as *S. aureus*, it is not limited to these organisms *(20, 25)*. Even though *S. pasteuri* strains are often associated with food commodities *(18)*, there is no record of this species having been implicated in foodborne illness outbreaks.

The presence of enterotoxin producing *S. aureus* in biltong could potentially be attributed to the high concentration of salts, acidic pH *(25)* and increased a_w of a moister biltong product, especially since strains of *S. aureus* are capable of growth and enterotoxin production at a_ws of 0.85 *(24, 25)*. It is reported that the modern consumer markets favor more moist biltong, which is considered more appealing to the palate *(12)*. Traditionally, dried biltong has a water activity (a_w) of 0.77 *(12)*; however, the favored biltong has 40% more moisture than traditional biltong and an a_w of between 0.85 and 0.93 *(12, 24)* which supports the growth of several pathogens.

L. monocytogenes

The findings of this study showed that 2 of the 150 (1.33%) biltong samples tested positive for *L. monocytogenes* (accession numbers FJ160766 and FJ160767). In comparison, the prevalence of *L. monocytogenes* observed in this study was 1% higher than that observed in a study on jerky *(1)*. Although the minimum dose of *L. monocytogenes* cells required to cause foodborne illness is variable, foodborne illness has often been coupled with elevated levels of this pathogen in a consumed food product *(22)*.

Biltong would generally be considered a potentially unfavorable environment for *L. monocytogenes* because of its

low a_w and high salt concentrations *(7, 8)*, and it would therefore be less likely to harbor and support its growth. However, strains of *L. monocytogenes* are often associated with raw poultry meat *(7, 15)*. In this study, this pathogen was isolated from chicken biltong. The presence of these strains could be attributed to the contamination of biltong prior to and at production, and distribution and within the retail environments of this commodity, due to the ubiquitous prevalence of this foodborne pathogen *(15)*.

Effect of in-process hurdles applied to biltong on selected foodborne pathogens

Overall, strains of *L. monocytogenes* (n = 2), *S. aureus* (n = 3) and *S. pasteuri* (n = 3) showed growth in most of the assays conducted. Seven of the 8 isolates grew in the presence of 15% NaCl. In addition, it was evident that isolates belonging to the *Staphylococcus* genus were the only isolates that showed growth at ≥ 15% NaCl. This was not unexpected, as several strains of *Staphylococcus* have been shown to survive in environments containing high salt concentrations *(9)*.

Both the plate and the broth method used in this study showed the same qualitative growth patterns. Only strains of *L. monocytogenes* grew at 4°C, while all other isolates grew optimally in the temperature range of 25–37°C. In addition, none of the 8 isolates tested showed growth at 45°C. It is important to note that during the biltong manufacturing process, meat slices are often marinated at refrigeration temperatures of ca. 4°C. Although this temperature does not favor the growth of 80% of the isolates evaluated in this study, it did support the growth of strains of *L. monocytogenes*. Such findings are not uncommon, as strains of *L. monocytogenes* are known to proliferate at refrigeration temperatures *(15)*.

Results from this study showed that all isolates were inhibited by undiluted glacial acetic acid (positive control), while the apple cider vinegar and brown spirit vinegar inhibited the growth of only some strains. It has previously been reported that acetic acids, such as vinegars and wines, possess bacteriostatic and bacteriocidal properties *(13)*. For example, a study conducted by Entani and associates *(13)* showed that even at the lowest concentrations, vinegar had bacteriocidal properties against *Escherichia coli* O157:H7. Although apple cider vinegar exhibited enhanced antimicrobial properties compared to brown spirit vinegar, both vinegars were inadequate to cause complete growth inhibition of foodborne pathogenic and enterotoxin producing strains. Vinegar marination is an important component of the biltong manufacturing process, and survival of potential foodborne pathogens during this process is cause for concern.

Furthermore, results also showed that all 8 isolates exhibited the same growth patterns in the presence and absence of traditionally used biltong spice. Spices such as black pepper and coriander, which are the predominant spices in the traditional biltong spice mix, are known to possess weak to mild antimicrobial properties in general *(6, 11)*.

CONCLUSION

This study highlighted biltong at point-of-sale as a potential vehicle for foodborne pathogens and showed that *S. aureus*, *S. pasteuri* and *L. monocytogenes* may also survive the hurdles used during biltong production. However, the findings in this study were based on *in vitro* results. Thus the question remains as to whether the same foodborne pathogens are able to survive the biltong manufacturing process *in situ*, a question which is currently being investigated.

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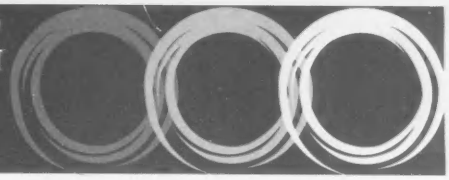


NRA and Silliker Partner on New Nutrition Awareness Efforts

Silliker, an international provider of food testing and nutrition services, will provide laboratory, technical and information services to restaurants as part of the National Restaurant Association's (NRA) nutrition awareness efforts. The service agreement was reached in response to the passage of a new federal law in March mandating labeling requirements for U.S. chain restaurants.

Under the Nutrition Labeling of Standard Menu Items at Chain Restaurants directive, restaurants and similar retail food establishments with 20 or more locations will be required to provide "clear and conspicuous information" to consumers that:

- Declare the number of calories each standard menu item provides as it is typically prepared and present required calorie information in terms of suggested caloric intake in the context of an overall diet.
- Provide additional nutrition information upon consumer request. This information must include: Macronutrients per serving size or other unit of measure: calories, calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrates, sugars, dietary fiber and protein. Statements must appear on the establishment's menu and menu board informing consumers of the availability of this additional information.

"Restaurateurs have an increasing interest in obtaining accurate nutrition information of the dishes they serve, but the analysis process has presented challenges," said David Gilbert, chief operator officer of the National Restaurant Association. "With the new law on nutrition disclosure in effect for certain restaurants, it has become imperative to find solutions to those challenges. That is why we partnered with the best nutrition-analysis providers in the business to meet our members' needs for customized service at affordable rates."

Silliker will offer analytical nutrient testing, database recipe analysis, nutrient content reviews, and consulting services to NRA members at special membership pricing.

New FDA Final Rule to Ensure Egg Safety, Reduce *Salmonella* Illnesses Goes into Effect

The U.S. Food and Drug Administration says that as many as 79,000 illnesses and 30 deaths due to consumption of eggs contaminated with the bacterium *Salmonella* Enteritidis may be avoided each year with new food safety requirements for large-scale egg producers.

The new food safety requirements became effective on July 9, 2010, through a rule for egg producers having 50,000 or more laying hens – about 80 percent of production. Among other things, it requires them to adopt preventive measures and to use refrigeration during egg storage and transportation.

Large-scale egg producers that produce shell eggs for human consumption and that do not sell all of their eggs directly to consumers must comply with the refrigeration requirements under the rule; this includes producers whose eggs receive treatments such as pasteurization. Similarly, those who transport or hold shell eggs must also comply with the refrigeration requirements by the same effective date.

Egg-associated illness caused by *Salmonella* is a serious public health problem. Infected individuals may suffer mild to severe gastrointestinal illness, short-term or chronic arthritis, or even death. Implementing the preventive measures would reduce the number of *Salmonella* Enteritidis infections from eggs by nearly 60 percent.

Salmonella Enteritidis can be found inside eggs that appear normal. If the eggs are eaten raw or undercooked, the bacterium can cause illness. Eggs in the shell become contaminated on the farm, primarily because of infection in the laying hens.

"Preventing harm to consumers is our first priority," said Margaret A. Hamburg, M.D., commissioner of food and drugs. "This action will help prevent thousands of serious illnesses from *Salmonella* in eggs."

The rule requires egg producers with fewer than 50,000 but at least 3,000 laying hens whose shell eggs are not processed with a treatment, such as pasteurization, to comply with the regulation by July 9, 2012.

Producers who sell all their eggs directly to consumers or have less than 3,000 hens are not covered by the rule.

Under the rule, egg producers whose shell eggs are not processed with a treatment, such as pasteurization must:

- Buy chicks and young hens only from suppliers who monitor for *Salmonella* bacteria
- Establish rodent, pest control, and biosecurity measures to prevent spread of bacteria throughout the farm by people and equipment
- Conduct testing in the poultry house for *Salmonella* Enteritidis. If the tests find the bacterium, a representative sample of the eggs must be tested over an eight-week time period (four tests at two-week intervals); if any of the four egg tests is positive, the producer must further process the eggs to destroy the bacteria, or divert the eggs to a non-food use
- Clean and disinfect poultry houses that have tested positive for *Salmonella* Enteritidis
- Refrigerate eggs at 45°F during storage and transportation no later than 36 hours after the eggs are laid (this requirement also applies to egg producers whose eggs receive a treatment, such as pasteurization).

To ensure compliance, egg producers must maintain a written *Salmonella* Enteritidis prevention plan and records documenting their compliance. Egg producers covered by this rule must also register with the FDA. The FDA will develop guidance and enforcement plans to help egg producers comply with the rule.

During the 1990s, the FDA and the U.S. Department of Agriculture implemented a series of post-egg production safety efforts such as refrigeration requirements designed to inhibit the growth of bacteria that may be in an egg. While these steps limited the growth of bacteria, they did not prevent the initial contamination from occurring.

The new rule is part of a coordinated strategy between the FDA and the USDA's Food Safety and Inspection Service (FSIS). The FDA and the FSIS will continue to work closely together to ensure that egg safety measures are consistent, coordinated, and complementary.

In addition to the new safety measures being taken by industry, consumers can reduce their risk of foodborne illness by following safe egg handling practices. The FDA reminds consumers to buy eggs that have been refrigerated, make sure eggs in the carton are clean and not cracked and cook eggs and foods containing eggs thoroughly.

3-A SSI Issues Comprehensive Revisions of Two Standards

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

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

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

Preventing Lead Poisoning from Municipal Water System

CDC leaders addressed Congress about questions related to CDC's work in 2004 to help prevent lead poisoning from the Washington, D.C. municipal water system.

The CDC protected the public's health by working closely with the Washington, D.C. Department of Health, the D.C. Water and Sewer Authority, the Environmental Protection Agency, the U.S. Public Health Service and other federal and local agencies to help mitigate the problem and prevent additional lead exposures. In our work we determined the health consequences of lead exposures from the contaminated water, and published our findings in the MMWR, reiterating that that there is no safe level of lead exposure, and that all lead exposures in children should be eliminated.

In our urgency to rapidly assess the situation and protect the public's health, the CDC communicated our scientific results poorly and did not convey our conclusions and recommendations clearly. One of CDC's core values is to pursue excellence in the science behind public health. Although we believe in this case that our scientific analysis and conclusions were correct, we did not place our findings into the proper perspective.

For nearly three decades, CDC has spearheaded an effective

national lead poisoning prevention campaign that has reduced the prevalence of blood lead levels above 10 µg/dL in children by nearly 90 percent. This is one of our nation's greatest public health success stories.

In Washington, D.C., we have worked to strengthen the city's lead prevention program and ensure that residents are protected. Elevated blood lead levels among the city's children have fallen by half over the past five years and are now lower than the national average and similar to those in other large cities.

CDC is committed to continuing our progress toward childhood lead elimination. The agency will work with partners in the US and internationally to support blood-lead screening for children and testing of water and other sources of potential lead poisoning in homes, workplaces and communities and implement effective lead-poisoning prevention programs. CDC supports and depends on the work of our scientists and other staff. We are motivated by a desire to protect the public's health and committed to basing our decisions on the best available science and to communicating our results clearly.

Information about CDC's activities related to lead in drinking water in the District of Columbia and prevention tips are posted at http://www.cdc.gov/nceh/lead/lead-inwater/.

SunOpta Inc. Announces Appointment of Alan D. Murray to the Board of Directors

The Board of Directors of SunOpta Inc. has announced the appointment of Mr. Alan Murray to its Board of Directors, effective immediately.

Mr. Murray brings strong business experience to the SunOpta Board of Directors with a background in manufacturing, business turn-around situations, business integration and profitable organic growth. Mr. Murray has lived and worked abroad including Western and Eastern Europe and Africa. He held a number of progressively responsible positions over the last twenty years with Tetra Pak, a supplier of equipment and materials for the processing and packaging of liquid food products. Most recently, Mr. Murray served as president and CEO of Tetra Pak, North America.

Component Hardware Group Appoints David Kennedy as Chief Financial Officer

Component Hardware Group, Inc. (CHG), a manufacturer of premium plumbing, hardware and specialty products for commercial, foodservice, institutional and healthcare applications, is pleased to announce the appointment of David Kennedy as chief financial officer.

Mr. Kennedy comes to CHG with strong international operating experience as well as extensive financial management knowledge. In his new role, he will be responsible for all financial, administrative and information technology aspects of the business.

"David has already been extremely helpful in our process improvement efforts as well as providing a whole new level of financial analysis for the constituents within the business," said CHG President and CEO, Harry Franze. "David's experience and unique insight will be a valuable addition to our senior management team."

Prior to joining CHG, Kennedy was the business unit controller for Alcan Rolled Products Division, a Rio Tinto Company. In addition, he has held positions as corporate controller, vice president of finance, chief financial officer as well as president and CEO within the Marmon Group of companies. He began his management career as the operations manager for Zenith Electronics' Mexican Operations.

Mr. Kennedy obtained a bachelor's degree in finance as well as a master's degree in business administration from the University of Iowa.

INDUSTRY PRODUCTS

WLD-TEC

New Flame 100 Safety Bunsen Burner

WLD-TEC has introduced the new Flame 100 Safety Burner, the safe alternative for all traditional Bunsen or alcohol burner applications.

The Flame 100 is ideally suited for all flame-related applications in the laboratory. The 15 millimeter precision flame allows safe sterilization of microbiological instruments as well as graduated heating of dental tools. Flame size and intensity can be adjusted infinitely.

The Flame 100 Burner activates immediately with the push of a button. No match or a pilot flame are required. Optionally, the Flame 100 can also be operated by a foot pedal or an external infrared motion sensor.

The Flame 100 is suitable for stationary natural gas and propane/butane gas supplies as well as gas cartridges or gas cylinders.

The proven Safety Control System (SCS) is also incorporated in the Flame 100. All potential hazards are constantly monitored and, if necessary, protective measures – such as the shutting off the gas supply – are activated.

WLD-TEC
310.589.3709
Chicago, IL
www.WLD-TEC.com

New HemiPleat® Nano Filter Offers Higher Efficiency, Longer Life, Energy Savings

A new HemiPleat® Nano dust collector filter from Camfil Farr Air Pollution Control offers higher filtration efficiencies, longer service life, and lower pressure drop than competitive nano fiber filters, for energy savings and enhanced performance. The manufacturer uses a new technology to apply a thick layer of highly durable nano fibers to the surface of the patented HemiPleat filter, yielding a MERV 14 efficiency rating – higher than that of most competitive filters.

The HemiPleat Nano media is strong enough to handle difficult dust challenges such as laser and plasma cutting, welding and thermal spray; and it will withstand rigorous pulse-cleaning for all types of dry dust applications, bringing longer service life and lower operational costs. The product line includes MERV 14 and MERV 16 efficiency options, with a choice of high performance standard or fire retardant cellulose-blend base media.

The new filter is also the only one to combine nano media with HemiPleat's patented open-pleat design. Open-pleat spacing allows better utilization of the media pack, resulting in better airflow through the cartridge for more efficient performance. Dust also releases more readily during pulse cleaning using less compressed air for many applications, bringing further energy savings. All HemiPleat filters carry a written performance guarantee to run at a lower pressure drop, meet or exceed current collection efficiencies, and last longer.

Camfil Farr APC
800.479.6801
Jonesboro, AR
www.farrapc.com

SDIX to Help Egg Producers Meet New FDA Regulatory Challenge

A provider of biotechnology-based products and services for a broad range of life science, biotechnology, diagnostic, and food safety applications, commercially launched the RapidChek® SELECT™ *Salmonella* Enteritidis testing system. The new system was designed in coordination with leading experts in egg safety. It is applicable to both egg and poultry industries. However, it will specifically help U.S. commercial egg producers comply with the new Food and Drug Administration (FDA) regulation that requires them to test poultry houses and eggs for *Salmonella* Enteritidis (SE).

The new FDA rule became effective July 9, 2010 for commercial egg producers with over 50,000 laying hens and becomes effective July 9, 2012 for egg producers with between 3,000 and 49,999 laying hens. The new Rule will affect app-

roximately 4,000 commercial egg producers in the USA. It is estimated that 47 billion eggs are consumed annually in the U.S. and according to reports from the USDA and FDA, there are 2.3 million eggs annually contaminated with *Salmonella* Enteritidis.

- The RapidChek SELECT system is an easy, accurate, flexible and rapid food pathogen detection technology. It combines the simplicity of advanced immuno-based detection system with SDIX's proprietary, patented phage-based enrichment media to significantly enhance both the specificity and sensitivity of the test and to enable improved pathogen detection. The system is designed to:
- Make it easier to comply with the new FDA Rule – easy to learn and use, fast results, robust detection for a better overall picture of hen house cleanliness, layer health and egg safety
- Help minimize disruption to daily operations – high accuracy virtually eliminates false positives. Ease of us and speed to results reduce workflow impacts
- Help minimize costs – reduces training, labor, operating costs. Reduced false positives decreases unneeded egg testing costs

The RapidChek® SELECT™ *Salmonella* Enteritidis system has been evaluated at several large egg producers and independent testing laboratories during development to ensure it meets customer needs. Significant validation work has already begun and the company expects to submit the system to the FDA, AOAC RI, and NPIP for approval and certification during the second half of 2010.

The new testing system is comprised of the RapidChek® SELECT™ *Salmonella* Enteritidis detection system for screening environmental drag swags or pooled eggs and the RapidChek® CONFIRM™ *Salmonella* Enteritidis immunomagnetic separation system for confirmation.

Tim Lawruk, SDIX food safety marketing manager, said "Commercial egg producers are faced with significant technical and business challenges as they strive to meet the FDA's new requirements for both poultry house and egg testing. The new RapidChek SELECT *Salmonella* Enteritidis testing system is specifically designed to help them meet those challenges and provides SDIX with an opportunity to leverage its expertise in pathogen detection. The system offers competitive advantages that include ease of use, low start-up and operating costs, and a faster time-to-result than other methods. Moreover, the new system's high accuracy virtually eliminates false positives and the harmful business impacts they can have. It enables egg producers to focus more on their core business of providing safe, high-quality eggs."

SDIX
302.456.6789
Newark, DE
www.sdix.com

pH Meter Kit Provides Quick and Safe Food Analysis

Mettler Toledo, a global supplier of precision instruments, introduces the FiveGo™ pH Food Kit–a portable pH measuring instrument designed for use in the food and beverage industry.

FiveGo™ pH, the handy, portable measuring instrument is ideal for anyone working on a tight budget, who nevertheless requires rapid and reliable results. FiveGo™ instruments all feature storage capacity for up to 30 measurements, including automatic endpoint recognition and calibration with automatic buffer recognition. Operation is easy and intuitive with dedicated buttons for starting and ending a measurement and for saving and accessing measurements and the latest calibration data.

These user-friendly products have been designed with food applications in mind. They enable quick and safe measurements of solid samples, such as cheese and meat. The LE427 and FiveGo™ Food Kit provides the perfect solution for the quality control of foodstuff or agricultural products.

FiveGo™ pH – FG2 Food Kit includes:

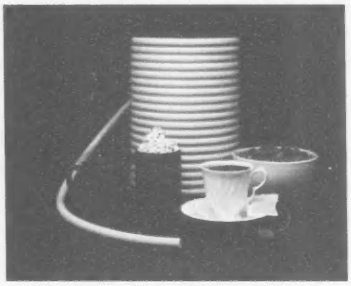
- Compact pH meter FiveGo™
- Robust LE427 pH puncture electrode
- Buffer sachets for first calibrations

New LE427 Puncture pH Electrode

- Spear-shaped tip makes it easy to penetrate smaller samples, such as food or soil

- Gel electrolyte – easy to handle and low on maintenance, and
- Protective hard plastic cover for more safety and piece of mind.

Mettler Toledo
614.438.4936
Columbus, OH
www.mt.com



Saint-Gobain Performance Plastics

Improve Performance and Reduce Costs with Saint-Gobain Critical Connections Solutions from Saint-Gobain Performance Plastics

Saint-Gobain Performance Plastics (SGPPL) introduces safe and high-performance critical connections solutions for food and beverage applications, including dairy product transfer and beverage dispensing. SGPPL's solutions are designed to help companies reduce total systems costs, maintenance and repair expenses, resulting in minimized operations downtime. In addition, the solutions meet stringent food regulatory standards, ensuring product safety.

SGPPL's critical connections solutions combine the Gladiator® range of high-performance hoses and ReSeal® fittings for use in all stages of the dairy transfer process – from the dairy farms, to tanker trucks, to plant storage and within the plant itself. The crush-resistant Gladiator hoses are rated for high-pressures. They guarantee a secure and flexible connection between systems and pipes for loading and unloading raw products in high-traffic areas. SGPPL's ReSeal fittings are completely reusable and offer savings of up to 50% on standard replacement costs over time.

SGPPL's critical connections solutions for dairy transfer have been created with ease-of-use in mind. Designed for Clean-in-Place (CIP) convenience, no disassembly is required, minimizing operational downtime and associated costs.

To ensure optimum performance under the high pressures and temperatures associated with dairy processing, SGPPL offers critical connections solutions that incorporate SaniGard® hosing and ReSeal fittings. SaniGard hoses are specifically designed for higher temperatures and demanding chemical applications. They can withstand frequent cleaning and sterilization-in-place (CIP and SIP) without imparting taste or odor.

SGPPL's critical connections solutions incorporate a range of Tygon®-branded tubing for use in beverage dispensing processes. These solutions minimize the potential for bacterial growth and promotes a sanitary fluid path thanks to a smooth, non-porous tubing surface that inhibits particle entrapment. It also protects flavor consistency of beverages – imparting no taste or odor of its own – while maintaining high performance and withstanding extreme temperatures, corrosion and varying pressures.

Tygon tubing is both NSF listed under Standard 51 and also compliant with FDA regulations and meets the stringent, listed 3-A Plastics Standard Criteria.

Saint-Gobain Performance Plastics
330.798.6945
Akron, OH
www.plastics.saint-gobain.com

Eriez® Offers High Speed Cross Feeders for Packaging Lines

Eriez® offers a wide range of electromagnetic cross feeders and conveyors designed for use in packaging applications. These high speed, high deflection and high volume vibratory cross feeders and conveyors distribute product into weigh scale equipment. Feeders can be equipped with a peripheral discharge to insure the best product distribution on the radial scale cone. Models are available to deliver nearly any capacity of material.

Eriez' HS (High-Speed) and HD (High Deflection) vibratory feeders featuring low energy, AC electromagnetic drives provide superior reliability, precise cycling and low operating cost. The high deflection series is recommended when feeding lightweight, loose or sticky materials where a higher deflection (3/16") and lower frequency (30 cps) produces more accurate feed characteristics. Both HS and HD series use the same style AC drive, enabling systems to cycle up to 100 times per minute.

Eriez' VMC Series Electromagnetic Conveyors use a two-mass vibrating system also powered by electromagnetic drives. The VMC is an excellent choice when longer trays are required. Specially designed corrosion-resistant fiberglass springs amplify the stroke and are adjustable for easy fine-tuning of the conveyor's motion. They use no sliding or rotating parts that wear out, or belts and bearings that eventually will need to be replaced. A variable voltage controller allows "watch-like" precision in the control of conveyor amplitude. Units are available for base or suspension mounting.

Eriez' cross feeders can be supplied with a peripheral discharge and/or screens to eliminate fines or damaged product during packaging.

Eriez
888.300.3743
Erie, PA
www.eriez.com

New Adhesive Films in Roll Format for Automated Microplate Sealing

Excel Scientific introduces Roll-Seal™ adhesive sealing films on rolls for use with high-throughput automated microplate sealers. Constructed on three-inch plastic cores, Roll-Seal rolls are compatible with most common adhesive sealers. The Roll-Seal format provides reliable, efficient sealing at a lower cost per plate than sheets or heat-seal films with minimal user intervention. Currently offered in the Roll-Seal format are three of Excel's extensive line of adhesive sealing films:

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

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

Automated Sample Preparation and PCR Setup for Pathogen Testing in the Food Market from BIOTECON Diagnostics and Xiril AG

BIOTECON Diagnostics GmbH, Potsdam, Germany and Xiril AG, Hombrechtikon, Switzerland announced a new OEM partnership in July 2010: based on Xiril's Robotic Workstations BIOTECON Diagnostics will distribute their own automation solution labelled "foodproof® RoboPrep+ powered by Xiril" together with BIOTECON Diagnostics' foodproof® Magnetic Preparation Kit I and real-time PCR-based detection kits for the food market, e.g., for *Salmonella* detection.

After an intensive validation program performed at BIOTECON Diagnostics laboratories, the foodproof® RoboPrep+ Series is now commercially available to the worldwide food market. This is the first validated automated solution for PCR-based microbial testing specifically designed for the food market.

Xiril and BIOTECON Diagnostics share many synergies and both companies look forward to introducing these affordable and innovative automated liquid-handling technologies.

"For us, the new application in the food testing market is a perfect addition to our existing range of proven OEM solutions. It demonstrates the advantages of the open and modular design of our liquid handling workstation," comments Dr. Jürgen Lindemeier, CEO of Xiril AG.

BIOTECON Diagnostics developed the foodproof® RoboPrep+ Series to meet the need of a leading international confectionery manufacturer, who has now introduced the system into several of its factories for automated *Salmonella* testing. Multiple food matrices have been tested, making the system very useful for any kind of food industry with pathogen testing needs at medium to high throughput.

A stepwise introduction of the technology for other parameters, such as *E. coli* or *Listeria*, is in development.

BIOTECON Diagnostics GmbH
+49.331.2300.200
Hombrechtikon, Switzerland
www.bc-diagnostics.com

Be sure to mention, "I read about it in *Food Protection Trends*"!

COMING EVENTS

OCTOBER

- **5–6, Iowa Association for Food Protection Annual Conference,** Quality Inn & Suites, Ames, IA. For more information, contact Lynn Melchert at 563.599.2394 or E-mail lynne.melchert@swissvalley.com.
- **6–7, Associated Illinois Milk, Food and Environmental Sanitarians Fall Conference,** Hotel Pere Marquette, Peoria, IL. For more information, go to http://aimfes.org/calendarofevents.html.

  7–8, GlobalGap Tour 2010, Hilton London Metropole Hotel, London, UK. For more information, call +49(0)221.5.79.93.25 or go to www.summit2010.org.
- **13, Metropolitan Association for Food Protection Fall Seminar,** Douglass Student Center, Rutgers University, New Brunswick, NJ. For more information, contact Carol Schwar at cschwar@co.warren.nj.us or go to www.metrofoodprotection.org.
- **17–20, Food Microbiology Symposium,** River Falls, WI. For more information, go to www.uwrf.edu/afs-all/institutes/foodmicro/.
- **20–22, 7th International Symposium: Milk Genomics & Human Health,** UC-Davis Conference Center, Davis, CA. For more information, go to www.cdrf.org.
- **26–28, North Dakota Environmental Health Association Annual Conference,** Bismarck, ND. For more information, go to www.ndeha.org.
- **31– Nov. 2, Sweets and Snacks Middle East 2010,** Dubai International Convention and Exhibition Centre, Dubai, U.A.E. For more information, go to www.sweetsmiddleeast.com.
- **31– Nov. 3, PACK Expo International 2010,** McCormick Place, Chicago, IL. For more information, contact Amy Riemer at 978.475.4441 or go to www.packexpo.com.

NOVEMBER

- **2–3, PACK Expo International 2010,** McCormick Place, Chicago, IL. For more information, contact Amy Riemer at 978.475.4441 or go to www.packexpo.com.
- **3–5, Dairy Practices Council Conference,** Ramada Plaza Hotel and Conference Center, Columbus, OH. For more information, go to www.dairypc.org.
- **4–6, Mexico Association for Food Protection Annual Meeting,** Puerto Vallarta, Mexico. For more information, contact Javier Castro Rosas at jcastro@uaeh.edu.mx or capicr@hotmail.com.
- **6–10, American Public Health Association Annual Meeting and Expo,** Denver, CO. For more information, go to www.apha.org/meetings/.
- **8–11, IDF World Dairy Summit,** Auckland, New Zealand. For more information, contact Christian Robert at CRobert@fil-idf.org or go to www.wds2010.com.
- **10–11, China International Food Safety and Quality Conference & Expo,** Shanghai, Longemont Hotel, P.R.C. For more information, go to www.chinafoodsafety.com.
- **10–12, 2010 EFFoST Annual Meeting–Food and Health,** Dublin, Ireland. For more information, go to http://www.effostconference.com.
- **17, Ontario Food Protection Association Fall Conference,** Mississauga Convention Centre, Mississauga, Ontario, Canada. For more information, contact Victoria Rosa at 519.265.4119 or visit info@ofpa.on.ca.
- **18, Alabama Association for Food Protection 2010 Annual Meeting,** Montgomery Marriott Prattville Hotel & Conference Center at Capital Hill, Prattville, AL. For more information, contact G. M. Gallaspy at gm.gallaspy@adph.state.al.us.

DECEMBER

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

JANUARY

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

FEBRUARY

- **16–18, Global Food Safety Conference,** London, UK For more information, go to www.tcgffoodsafety.com.

IAFP UPCOMING MEETINGS

JULY 31-AUGUST 3, 2011
Milwaukee, Wisconsin

JULY 22-25, 2012
Providence, Rhode Island

JULY 28-31, 2013
Charlotte, North Carolina

ADVERTISING INDEX

High-Risk Customers:
Serve Your Fare with Extra Care

NATIONAL RESTAURANT ASSOCIATION®

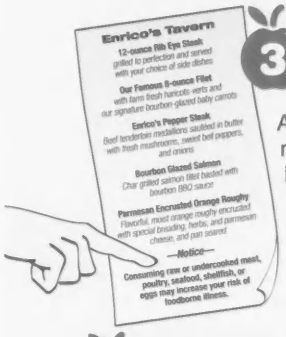
1 Recognizing High-Risk Customers

A high-risk person's immune system does not work as well as most people's. Unsafe food can cause serious problems for high-risk customers. Looking at a customer does not tell you they are high-risk. Practice food safety on a daily basis to help protect high-risk customers.

2 Children and Food Safety Risk

Infants and preschool children get sick from food more easily than adults. You can lower the food safety risk for children.

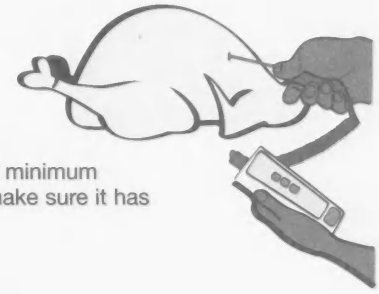
- Don't offer children raw or undercooked meat, poultry, seafood or eggs.
- Follow food safety practices on a daily basis.



3 Foods to Avoid

Any customer might be a high-risk customer. Help customers make safe meal choices. Know which items on your menu should be avoided by high-risk customers, and properly cook food items to help keep them safe.

4 Minimum Internal Cooking Temperatures



Help high-risk customers steer clear of undercooked food. Cook food to the required minimum internal temperature. Use a thermometer to make sure it has reached the right temperature.

5 Five Food Safety Risk Factors

Avoid the five most common factors that make food unsafe to eat.

1. Purchasing food from unsafe sources
2. Failing to cook food adequately
3. Holding food at incorrect temperatures
4. Using contaminated equipment
5. Poor personal hygiene

Sponsored By: Good things come from Sysco

nfsem National Food Safety Education Month

IAFP OFFERS

All Guidelines now available on CD

"Guidelines for the Dairy Industry" from the Dairy Practices Council®

IAFP has agreed with the Dairy Practices Council® to distribute their guidelines. DPC is a non-profit organization of education, industry, and regulatory personnel concerned with milk quality and sanitation. Its membership roster lists individuals and organizations throughout the world. Professionals working through six permanent DPC task forces write DPC guidelines. Prior to distribution, every guideline is peer reviewed and submitted for approval to state regulatory agencies, where exceptions to each state's regulations are noted in the final document. These guidelines represent the state of the knowledge at the time they are written.

The guidelines are renowned for their common sense and useful approach to proper and improved sanitation practices. We think they will be a valuable addition to your professional reference library.

Guidelines are available on CD and in printed form.
Complete sets in printed form are bound in 3-ring binders.
Please check which guidelines you are ordering.

Complete set (over 80 guidelines):	CD ($270) ☐	Printed ($330) ☐
Farm Set (58 guidelines):	CD ($180) ☐	Printed ($250) ☐
Plant Set (44 guidelines):	CD ($135) ☐	Printed ($160) ☐
Small Ruminants (19 guidelines):	CD ($61.20) ☐	Printed ($68) ☐

Please add $20.00 for each printed set and $4.00 for each CD for shipping and handling. Outside US shipping depends on existing rates. Make checks payable in US dollars on a US bank or pay by credit card.

Name_____ Phone No._____

Company_____

Street Address_____

City, State_____
Province, Code
VISA/MC/AMEX No._____
Exp. Date_____
Signature_____

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Research Notes

Review

General Interest

AUDIOVISUAL LIBRARY ORDER FORM

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PLEASE CHECK BOX NEXT TO YOUR VIDEO CHOICE OR PLACE TAPE # HERE _____

(Allow 4 weeks minimum from date of request.)

DAIRY

- ❒ D1010 The Bulk Milk Hauler: Protocol & Procedures
- ❒ D1031 Dairy Plant
- ❒ D1050 Food Safety: Dairy Details
- ❒ D1060 Frozen Dairy Products
- ❒ D1080 High-Temperature, Short-Time Pasteurizer
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1105 Milk Hauling Training
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1130 Pasteurizer: Design and Regulation
- ❒ D1140 Pasteurizer: Operation
- ❒ D1180 10 Points to Dairy Quality

ENVIRONMENTAL

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

FOOD

- ❒ F2005 A Lot on the Line
- ❒ F2007 The Amazing World of Microorganisms
- ❒ F2008 A Recipe for Food Safety Success
- ❒ F2009 Basic Personnel Practices
- ❒ F2011 Available Post Harvest Processing Technologies for Oysters
- ❒ F2012 Control of *Listeria monocytogenes* in Retail Establishments
- ❒ F2013 Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments
- ❒ F2014 Controlling Food Allergens in the Plant
- ❒ F2015 Controlling *Listeria*: A Team Approach
- ❒ F2016 Bloodborne Pathogens: What Employees Must
- ❒ F2017 Building a Better Burger – Improving Food Safety in the Food Supply Chain
- ❒ F2021 Egg Production
- ❒ F2025 The Special of the Day: The Eggceptional Egg
- ❒ F2030 "Egg Games" Foodservice Egg Handling & Safety
- ❒ F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef
- ❒ F2037 Cooking and Cooling of Meat and Poultry Products
- ❒ F2039 Food for Thought – The GMP Quiz Show
- ❒ F2040 Food Irradiation
- ❒ F2045 Food Microbiological Control
- ❒ F2050 Food Safe-Food Smart – HACCP and Its Application to the Food Industry (Part 1 & 2)
- ❒ F2060 Food Safe Series I (4 videos)
- ❒ F2070 Food Safe Series II (4 videos)
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- ❒ F2107 Tape 4 – Sanitation
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- ❒ F2152 Tape 2 – Personnel and Personnel Facilities
- ❒ F2153 Tape 3 – Building and Facilities
- ❒ F2154 Tape 4 – Equipment and Utensils
- ❒ F2155 Tape 5 – Production and Process Controls
- ❒ F2160 GMP: Sources and Control of Contamination during Processing GMPs for Food Plant Employees
- ❒ F2161 Tape 1 – Definitions
- ❒ F2162 Tape 2 – Personnel and Personnel Practices
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