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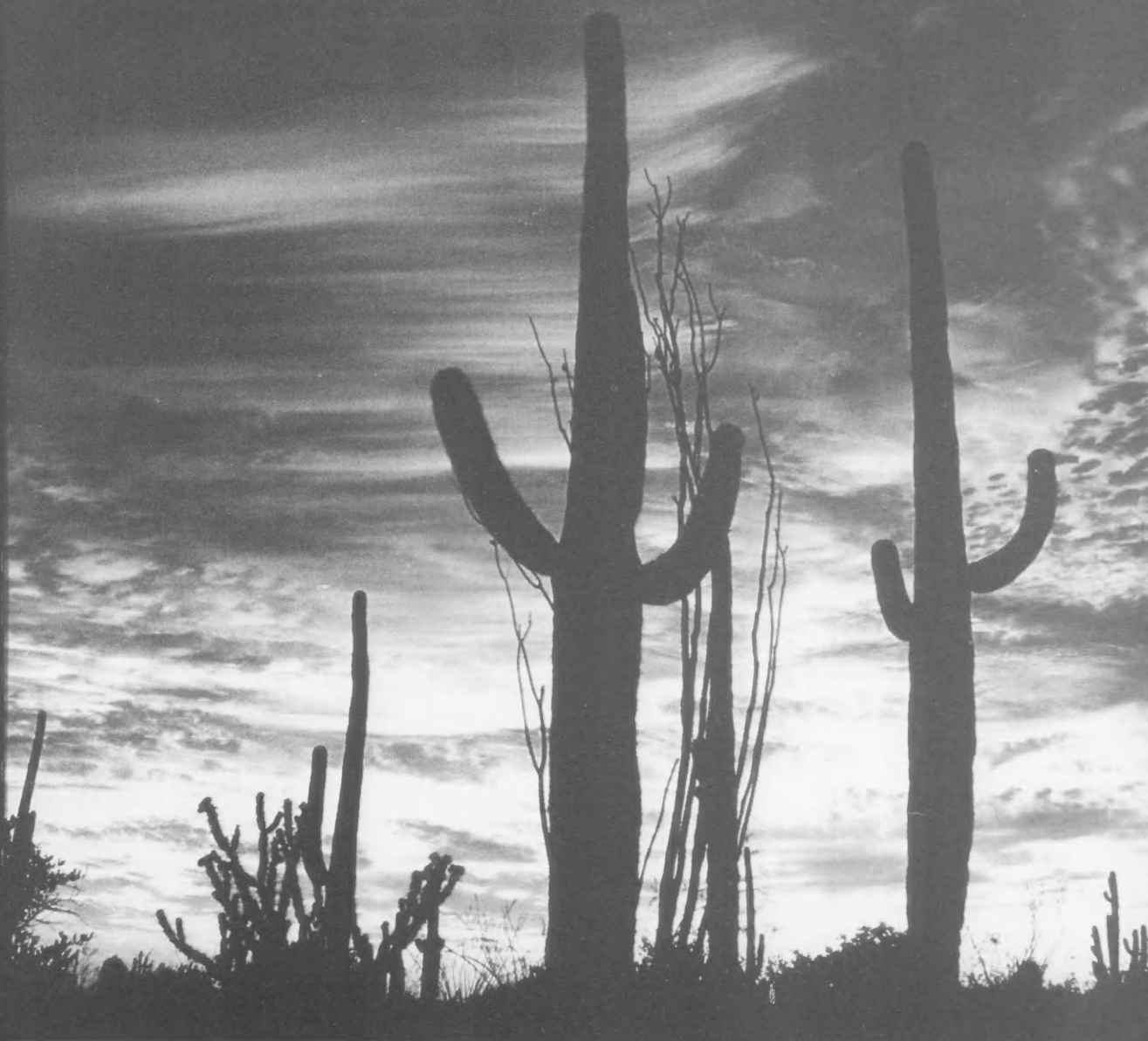
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FOOD PROTECTION TRENDS

SCIENCE AND NEWS

FROM THE
INTERNATIONAL ASSOCIATION
FOR FOOD PROTECTION

MAY 2004



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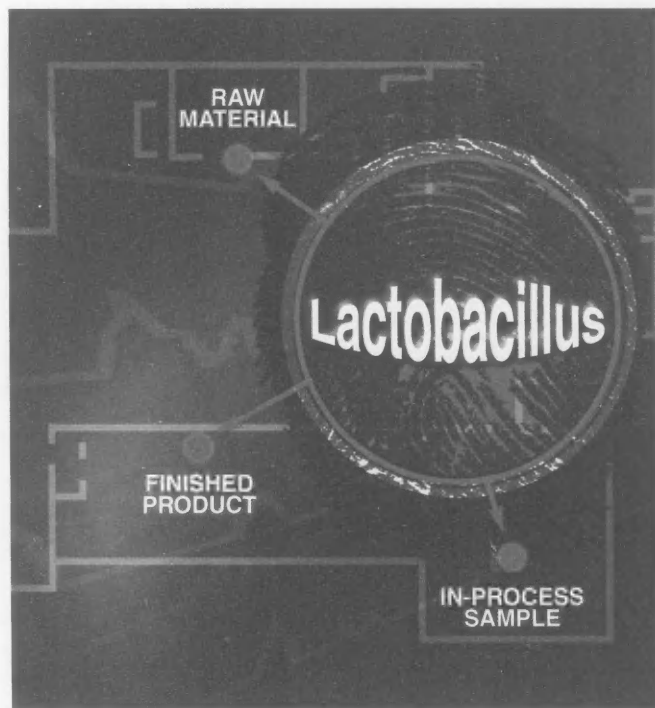
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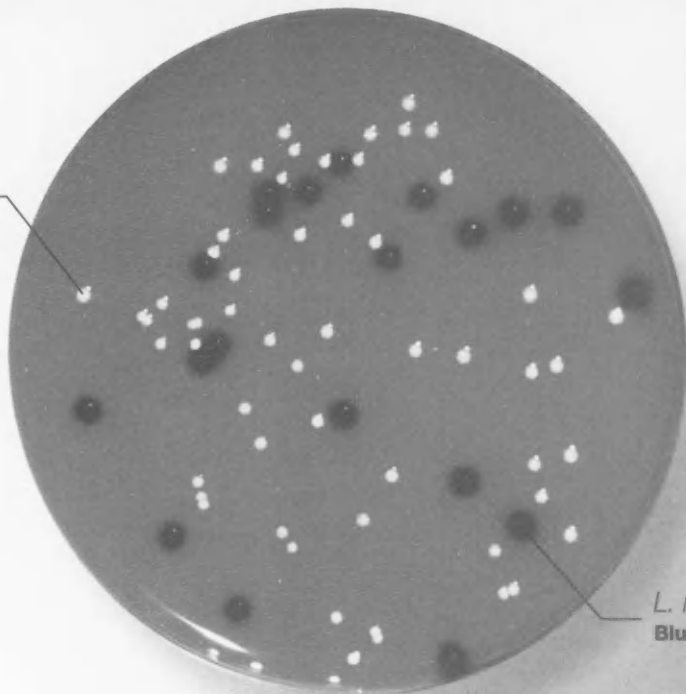
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"PRESIDENT'S" PERSPECTIVE

“Our Success Depends on the Linkages We Create” is a moniker I have used as a manager at Kraft Foods to convey the importance of relationship-building to both our personal, as well as, our organizational success. This is so true in almost every walk of life or any endeavor in which we set out to do. Yes, individual leadership is vital to most successes, but all great leaders have one characteristic in common—the ability to connect with people in ways that lead to successful outcomes. Most great leaders, whether it be through their personal charisma, their power of persuasion or negotiation, or their leadership-by-example, are able to create alliances or connections with individuals or groups in ways that mutually benefit everyone. If a leader is ineffective in creating alliances and linkages, they are usually unsuccessful leaders.

I have had the privilege of working with a number of organizations throughout my professional career and I have had the pleasure of bringing many groups together to address common issues or attain common goals in the area of food safety and quality. One of the accomplishments that I am most proud of is the role I played in helping to bring together the North American Branch of the International Life Sciences Institute (ILSI, N.A.) and our professional association, IAFP. Both of these two great organizations share the common goal of protecting and improving the safety of the world's food supply. So it was only natural for these two professional organizations to come together for their mutual benefit.

For those of you who may not be familiar with ILSI, N.A. it is a



By **PAUL A. HALL**
PRESIDENT

“Our success depends on the linkages we create”

public non-profit scientific foundation with the mission to advance the understanding and application of scientific issues related to the nutritional quality and safety of the food supply as well as health issues related to consumer self-care products. The mission of the ILSI, N.A. Technical Committee on Food Microbiology is “To improve understanding and control of microbial food safety hazards, primarily through support of research and scientific meetings.” Since 1993, the ILSI, N.A. has collaborated with IAFP by sponsoring the ILSI Symposium Series at the IAFP Annual Meeting. The linkage and partnership between ILSI and IAFP has led to a greater awareness

of ILSI across the food safety community and has benefited IAFP by contributing additional leading edge, scientific symposia to our annual meeting. I firmly believe that this partnership has contributed to the success of both organizations. I would like to acknowledge the stellar contributions and leadership of Catherine Nnoka at ILSI over the years in making this linkage with IAFP strong and enduring. Catherine is an inspiration to all of us and should be commended for her great work.

IAFP, the Association Staff, and your Executive Board are continually striving to create additional linkages to make your professional organization stronger and to ensure future growth and success. For example, IAFP recently co-sponsored the “First World Congress on Organic Food: Meeting the Challenges of Safety and Quality for Fruits, Vegetables and Grains” organized by the National Food Safety and Toxicology Center at Michigan State University. One of IAFP's active members, Ewen Todd, was the driving force behind this successful conference. There are many other examples of linkages your Association has already developed or are currently working on. If you have any specific ideas about other linkages we should pursue, please let me, or any of the other Executive Board members know. I would like to charge each of you to develop an idea that could be done to help your Association create new, strong linkages. Your ideas can be big or small, it does not matter. The more good ideas we have and implement, the stronger and more successful our organization will be. As always, I welcome your thoughts and comments at phall@kraft.com. Until next month...



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- AOAC (St-Louis, Sept. 19-23)
- AMI (Nashville, Sept. 30-Oct. 2)

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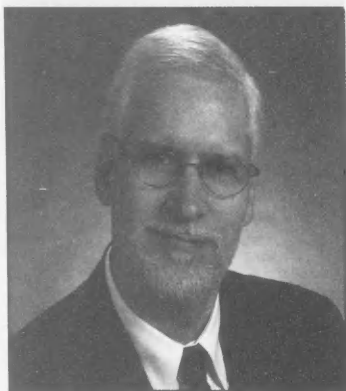
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“COMMENTARY” FROM THE EXECUTIVE DIRECTOR

This issue of *Food Protection Trends* is our Pre-Annual Meeting issue, which provides additional information about IAFP 2004. The section begins on page 360 and will help you to plan which sessions you want to attend, the social activities you want to participate in and the exhibitors who are a “must see” on your list. To complement this information, supplementary information is available at the IAFP Web site, www.foodprotection.org. Soon, you will be able to find presentation titles, presenters, and scheduled presentation times along with details of each poster session. Just click the Annual Meeting logo from the IAFP Home page.

We have the newest resort property in the Phoenix area reserved for IAFP 2004 and you will not want to miss this meeting! The J.W. Marriott Desert Ridge Resort and Spa is a fabulous property on the northeast side of Phoenix. It is brand new having opened just 18 months ago. It is convenient to shopping and restaurants although you would never need to leave the resort as it has its own shopping and five excellent restaurants! Rooms at Desert Ridge go for more than \$300 “in season” but you have the opportunity to experience this luxury for only \$139 per night—less than half the cost. There are just not enough words to describe the beauty of this resort property; you have to see it to believe it!

There are plenty of things to see and do in Phoenix for you and your family or friends who want to “tag along” to Arizona. This year’s event information begins on page 362 and includes daytime tours. Beginning on Saturday this year, a full-day tour to Sedona and the Verde Valley is planned and you still can get back in time for the New Member Reception and the Affiliate



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

**“We look
forward to
seeing you
in Phoenix”**

Reception. The tours cover a wide range of interest items in the Phoenix Valley, but my favorite is the Frank Lloyd Wright Architectural School, Taliesin West, on Tuesday.

Also this year, we have scheduled a golf tournament to be held on Saturday morning. There are two 18-hole golf courses right on the Marriott Desert Ridge property and the tournament will be held on the Arnold Palmer Signature Course. We will tee it up at 6 a.m. to beat the Arizona heat, so plan to come to Phoenix a day or two early to enjoy some golf or other activities!

After your round of golf (and a shower!) you might decide to spend the rest of the day at the pool or the

spa. Both would be an excellent choice! There are four pools and a lazy river for your leisure — more than 4 acres of total pool area (be sure to bring your sunscreen!). To really unwind and treat those sore muscles, maybe a treatment at the 24,000 square foot spa is more your style. There are numerous treatments to choose from.

You might decide to come in early to attend one of the excellent workshops planned for Friday and Saturday, August 6th and 7th. See page 366 for detailed descriptions of each workshop. Again this year, there are a number of opportunities for networking before and after the sessions. These are pointed out on the page titled Networking Opportunities (page 361).

I want to point out a couple of special events, too. On Saturday, we have tickets reserved for you to attend an Arizona Diamondbacks baseball game. The bus leaves our hotel at 12:00 noon and should return about 4:00 p.m. I already mentioned the Golf Tournament and that should be concluded in time if you wanted to attend the baseball game. Our Monday Night Social will be held at the Rawhide Western Town. This will be a fun evening as we step back in time to the days when the West ran wild! Plan now to attend the Monday Night Social to enjoy food, fun and the Wild West with your colleagues.

As you can see, there are lots of activities associated with IAFP 2004. You can pick and choose an item here and there or you can participate in everything this meeting has to offer. The choice is yours to make. One thing is for sure though, you will want to come for the Meeting content and build around that for leisure and fun! We look forward to seeing you in Phoenix later this year.

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Implementing Targeted Good Manufacturing Practices and Sanitation Procedures to Minimize *Listeria* Contamination of Smoked Seafood Products

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SUMMARY

The Smoked Seafood Working Group (SSWG), a collaboration of two national industry trade organizations, smoked seafood processors and academia, developed guidelines to minimize *Listeria monocytogenes* contamination of finished products in smoked seafood operations. The SSWG identified five elements required for a complete *Listeria* control program: (1) *Listeria* specific Good Manufacturing Practices (GMPs) and sanitation procedures, (2) employee training, (3) environmental microbiological monitoring and testing, (4) raw material controls, and (5) temperature controls for finished product. This manuscript describes specific GMPs and sanitation procedures to minimize *Listeria* contamination in smoked seafood operations. Targeted procedures that need to be implemented include GMPs to prevent cross contamination caused by improper design and layout of processing operations, the movement of people and equipment in the plant, and inadequate employee hygiene and food handling practices. In addition, cleaning and sanitation procedures for equipment and the processing plant environment that are designed to target *Listeria* contamination specifically need to be in place.

A peer-reviewed article

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INTRODUCTION

Since 2001, a collaborative effort between two national industry trade associations, representatives from smoked seafood processing companies across the US, and academia has been under way to develop guidelines for the control of the foodborne pathogen *Listeria monocytogenes* in smoked seafood manufacturing plants. The intent of this manuscript is twofold: to summarize and communicate current information on *L. monocytogenes* and appropriate measures to reduce its prevalence in smoked seafood products, and to provide guidelines for processors of smoked seafood products to help them evaluate and implement effective *Listeria* controls in their operation.

The individuals and organizations involved in this effort are working together as the Smoked Seafood Working Group (SSWG) of the National Fisheries Institute and the National Food Processors Association. Representatives of both national industry trade organizations, individuals from at least 10 smoked seafood firms, and food safety or seafood specialists from Cornell University and the Sea Grant programs in New York, Virginia and Delaware are participating in SSWG activities. The guidance developed by the SSWG is based on general guidelines for *Listeria* control in food processing plants developed by Tompkin et al. in 1999 (41) and the specific guidelines for smoked fish processors outlined in the Appendix of a United Nations Food and Agriculture Organization (UN/FAO) consultation report in 1999 (17). The SSWG convened a series of meetings and discussions that utilized the experience and expertise of industry, the trade associations, and academic participants to evaluate and adapt existing information on *Listeria* control from Tompkin et al. (41) and FAO (17) and to incorporate new information from studies in progress (26, 39) to produce this set of working

guidelines for smoked seafood processors. Information and experiences from pilot studies on *L. monocytogenes* contamination patterns and controls in smoked seafood processing environments conducted by members of the SSWG (21, 26, 33, 34, 39) were also used to develop these guidelines. This initiative was also part of a Cornell University project to develop "control strategies for *Listeria monocytogenes* in food processing environments," funded under the National Food Safety Initiative in 2000 by the Cooperative State Research, Education and Extension Service of USDA, Project Number 00-51110-9768.

L. monocytogenes is a Gram-positive foodborne pathogen that can grow in the range of 1 to 45°C (34° to 113°F) and between zero and 10% water phase salt (NaCl). Under current US regulatory policy, if any *L. monocytogenes* is detected in a 25 gram sample of a Ready-To-Eat (RTE) seafood product, including smoked seafood, the product is considered adulterated. Detection of *L. monocytogenes* in smoked fish and other RTE food products has resulted in numerous product recalls and economic loss. *L. monocytogenes* is widespread in the environment, and has been found in soil, water, sewage, and decaying vegetation. It can be readily isolated from humans, domestic animals (including pets), raw agricultural commodities, food processing environments, and the home (37). The organism is found in a wide variety of foods, including meats, poultry, vegetables, dairy products, and fishery products (10, 19, 31, 37). It has frequently been isolated from smoked seafood (7, 11, 19, 23, 29). A reported prevalence of 6–36% in RTE cold smoked salmon and cooked fishery products has raised concern about the public health impact associated with the presence of *L. monocytogenes* in these foods (3). While *L. monocytogenes* present in raw fish

may survive process treatments typical for many minimally processed seafoods, such as cold-smoked products (13), contamination from the processing plant environment during or after processing appears to be the major source of finished product contamination for smoked seafood, as well as for other RTE foods (2, 21, 26, 33, 39, 40).

Because *L. monocytogenes* is ubiquitous, there can be constant re-introduction of the organism into the plant environment. Contamination of smoked seafood that supports growth of *L. monocytogenes*, even with small quantities of this organism, is a particular concern because of its ability to multiply at refrigeration temperatures during storage. Farber (15) reported that moderate to severe temperature abuse of contaminated fish products may greatly enhance the growth of *Listeria* spp. on fish and indicated that, because of the low naturally-occurring levels of *L. monocytogenes* found on fish, combined with the relatively short shelf life of seafood, *Listeria*-contaminated fish stored at temperatures $\leq 4^{\circ}\text{C}$ present little risk of serious health consequences.

Although *L. monocytogenes* is frequently isolated from RTE seafood, seafood products, including smoked seafood, have rarely been implicated as a source of human listeriosis. RTE fish products have occasionally been linked to sporadic cases of listeriosis, and epidemiological evidence suggests that listeriosis has been caused by smoked mussels (4), "gravad" trout (14), and smoked trout (30). At least some *L. monocytogenes* subtypes present in RTE foods may have limited pathogenic potential for humans (34, 40). However, because of the potential for serious illness, and even death, in susceptible individuals, it is prudent for industry to take measures to minimize the potential for *L. monocytogenes* contamination of RTE smoked seafood.

LISTERIA IN THE PROCESSING PLANT ENVIRONMENT

L. monocytogenes can survive in non-host environments, including processing plants. *L. monocytogenes* may be introduced into processing plants via a variety of routes, including raw materials, employees' shoes or clothes, containers (e.g., boxes, crates, carts, pallets) and equipment. *L. monocytogenes* tolerates and can grow in conditions (e.g., refrigeration temperatures and high salt levels) that prevent the growth of many other foodborne pathogens. *L. monocytogenes* also has the tendency to establish persistent resident populations that colonize niches in the plant (21, 26, 39, 40). Routine sanitation procedures and general-purpose cleaners and sanitizers do not easily eliminate these resident populations.

Eklund et al. (12) identified incoming product as the primary source for *L. monocytogenes* contamination in smoked fish, but others report that the primary source for contamination is the equipment and processing environment (2, 35, 42). Recent in-plant studies using molecular subtyping also indicate the processing plant environment, more often than raw materials, seems to be responsible for most incidences of finished product contamination for both hot and cold smoked products (2, 8, 26, 31, 39, 42). For example, Rørvik et al. (35) and Autio et al. (2) reported a low prevalence of *L. monocytogenes* on incoming raw fish, with approximately one-third of finished product and environmental samples testing positive for *L. monocytogenes*. Similarly, Vogel et al. (42) found that although no *L. monocytogenes* was detected on any incoming raw fish, the pathogen was isolated from product collected immediately after slicing. In addition, an Institute of Food Technologists (IFT) expert panel concluded that reduction of *L. monocytogenes* in the processing plant was directly dependent on adherence to

Good Hygienic Practices (GHPs) and Good Manufacturing Practices (GMPs) (22). Areas in the processing plant that were identified as requiring particular attention include the brine, injection needles, and slicing equipment.

Studies using molecular fingerprinting techniques have improved our understanding of the ecology, sources, and spread of *L. monocytogenes* and *Listeria* spp. in processing plant environments. A variety of different *L. monocytogenes* strains are found in most processing plants (including seafood plants), and individual processing facilities often harbor unique *L. monocytogenes* populations and strains. These resident populations and strains can persist for months or years in a plant, or on its products, despite sanitation protocols designed to eliminate them (2, 8, 21, 26, 33, 36, 39, 43). Patterns of persistent *L. monocytogenes* processing plant contamination have been reported for a variety of food processing environments, including smoked seafood, poultry, meat and dairy foods (1, 26, 27, 32, 33, 35, 39). These studies also indicated that, even though a variety of different *L. monocytogenes* may be introduced (probably daily) into the plant environment from different sources, most are eliminated by routine cleaning and sanitation. Some subtypes appear to colonize specific niches in the plant environment and persist in these niches for long periods of time. Persistent *L. monocytogenes* contamination in processing plants is a major concern for the industry and for public health. Studies using molecular subtyping of *L. monocytogenes* isolates specifically showed that subtype(s) that persisted in a plant over time were responsible for the majority of finished product contamination incidents (26, 31). Another study has shown that eradication of persistent strains in a plant will reduce the risk of finished product contamination from environmental sources (2). Environmental post-processing contamination is believed to have been the source of a 1998/99

multi-state listeriosis outbreak linked to the consumption of contaminated hot dogs and deli meats. An increased level of environmental *Listeria* contamination (possibly associated with a construction event in the implicated plant) coincided with the time when product contamination with the outbreak strain first occurred. Apparently, environmental contamination was responsible for finished product contamination over an extended time period (> 4 months), thus leading to a large outbreak (5, 6, 25).

Employees and processing personnel represent a potential source for the introduction of *L. monocytogenes* in the processing plant environment. Employees can serve as an indirect source of *L. monocytogenes* contamination (e.g., shoes, clothing, hands) as well as a direct source of contamination during post-processing handling of products. It has been estimated that 1–10% of healthy adults have *L. monocytogenes* present in their feces (16, 38).

To verify *L. monocytogenes* controls, plants should implement a *Listeria* specific environmental monitoring program, using *Listeria* spp. as an indicator for possible *L. monocytogenes* contamination (40, 41). Each plant-specific monitoring plan should identify areas to be sampled for *Listeria* spp., frequency of sampling, and actions to be taken when *Listeria* spp. is detected. This aspect of a *Listeria* control program will be covered in a subsequent manuscript in this series.

DEVELOPING AND IMPLEMENTING A LISTERIA CONTROL PROGRAM

Implementation of an effective *Listeria* control program is a long-term commitment. The SSWG identified at least five key elements that need to be included in an effective *L. monocytogenes* control program for RTE seafood products. These elements are:

- (1) Targeted GMPs and Sanitation Procedures for *Listeria*
- (2) Training of Plant Personnel
- (3) Environmental Monitoring and Testing
- (4) Raw Material Controls
- (5) Refrigeration of Finished Products (preferably below 38°F (3°C))

Each plant should decide how to implement these control elements over time and refine them as experience is gained. Developing and implementing an effective *Listeria* control program requires a long-term commitment by both plant management and all employees. For most processing plants, components of all five elements of the control program suggested by the SSWG will be needed to effectively minimize *Listeria* contamination and growth in finished products. It is important to establish both an immediate and a long-term strategy for the development and implementation of a *Listeria* control program in each plant.

GMPs that include effective sanitation procedures and procedures to prevent cross contamination are the foundation of an effective *Listeria* control program. As a first step in the process of developing and implementing a *Listeria* control program, a team of employees from a plant should evaluate the operation and identify where *Listeria* contamination problems are most likely to occur and what improvements or changes are needed to prevent product contamination. If the team has insufficient expertise to make this evaluation, outside experts may be needed to assist. A plan should be developed outlining specific changes that are needed in the process flow, facility design and layout, processing procedures, and equipment to adequately control *Listeria* contamination. A realistic timetable to implement these changes should be developed. An environmental *Listeria* monitoring and

testing program should also be developed and implemented before *Listeria* controls are implemented and finalized. Data collected during this monitoring phase will help the plant's team evaluate the impact of the proposed changes as they are implemented and ensure that any necessary adjustments are made to focus control efforts on higher risk areas of the operation and/or areas that have existing *Listeria* contamination problems.

CROSS CONTAMINATION PREVENTION

Raw seafood may contain *L. monocytogenes*, although the presence of the organism and the levels of contamination can vary widely (21, 26, 31, 39). Raw products should be treated as though they are contaminated, and steps should be taken to prevent cross-contamination from raw product and raw product handling areas to areas where exposed finished product is handled, in order to eliminate or reduce the potential for finished product contamination.

The following key control measures adapted from Tompkin et al. (41) and FAO Fisheries Report No. 604 (17) should be evaluated in each plant's unique environment to minimize the potential for movement of environmental *Listeria* contamination within the plant and to prevent cross contamination of products and product contact surfaces.

DESIGN AND LAYOUT OF PROCESSING OPERATIONS

Processing zones

Processors should consider how to establish successively "cleaner" zones, or zones with decreasing levels of contamination, within the processing plant as the product moves through the entire process. Areas

where raw products are received, stored and processed should be considered the "dirtiest" zones, where potential environmental contamination levels are highest, with decreasing levels of environmental contamination for intermediate processing steps. Areas where exposed finished products are handled (e.g., storage after smoking, slicing, weighing, packing) should be the "cleanest" zones, where environmental contamination levels are lowest.

Product and traffic flow

A linear flow of product through the operation, from the raw ingredients to the finished product, should be established to the extent possible. The location of each processing step and the equipment used at that step should be evaluated and the process flow should be rearranged (e.g., by re-locating equipment) to ensure adequate separation of raw from RTE smoked seafood. Separation of operations involving raw, semi-finished and finished products and control of traffic flow patterns between these areas of the operation are needed to prevent *L. monocytogenes* from being transferred from the "dirty," or "raw," side of the operation to the "clean," or RTE side. Using a designated color code for employee attire and equipment in the raw area and a different color code for the RTE area can facilitate monitoring and control of traffic in the plant. Raw or in-process products and exposed (unpackaged) finished products should not be handled in the same area at the same time. If raw or in-process products are handled in or near areas where exposed finished product will be handled, a procedure should be established to ensure that the area will be thoroughly cleaned and sanitized before exposed finished products are handled. Another alternative would be to establish physical barriers, or separate processing rooms if necessary, to prevent contamination. The potential for

L. monocytogenes to be brought back into a clean environment where finished products are handled should be a primary concern. This may occur as a result of traffic into and out of the raw product and finished product handling areas as people and equipment, such as trolleys and forklifts, enter from more contaminated points in the operation, or as a result of non-routine activities such as unscheduled equipment maintenance.

Wet processing environments

Efforts to control the movement of *Listeria* from one area of the plant to another can be more difficult if the plant environment is wet. When processing fishery products, at least some processing steps may require significant amounts of water. In a smoked fish operation, these steps could include thawing frozen raw materials, as well as raw material preparation steps such as filleting, trimming, brining, rinsing, and hanging or racking wet brined fillets or whole fish for smoking. The areas in which these operations occur are likely to be areas where floors are wet and the humidity is high during production. These wet and humid areas of the plant should be isolated to the extent possible from areas of the plant where exposed finished RTE products are handled and processed. Processing steps such as slicing and packaging finished products should be conducted in an environment that is as dry and clean as possible to help minimize the risk of finished product contamination.

Product movement at the smoking step

The smoking step is one point in a smoked fish operation where raw and finished products are likely to be in close proximity when they are moved into and out of the smoking chamber. The movement of raw prod-

uct into and out of the smokehouses and the coolers should be monitored to assess the potential for cross contamination. Standard Operating Procedures (SOPs) should be established to ensure that raw products being moved into the smokehouse or out of refrigerated storage do not contaminate finished products that are being moved out of the smoking chamber(s) and into refrigerated storage. Separation may be temporal (e.g., by ensuring that raw and finished products are not handled or moved at the same time) or physical (e.g., by separating raw and finished product areas by distance or by using barriers such as walls or controlled entries and exits) to prevent cross contamination.

PROCEDURES TO PREVENT CONTAMINATION IN RTE AREAS

Contamination sources in RTE areas

Potential contamination sources and vehicles for the entry or movement of *Listeria* into areas where exposed RTE finished products are handled should be evaluated. Any direct entry from the exterior of the plant to any RTE area should be eliminated or prohibited from use to minimize the introduction of microorganisms such as *L. monocytogenes* from outside the plant into RTE areas. Pallets, boxes or other items from outside the facility should not be brought into RTE areas of the plant. Where possible, overhead fixtures or other structures should be removed from areas where RTE products are handled, particularly if these structures are located over exposed product and food contact surfaces. Dust and condensate can collect on these structures and contaminate food contact surfaces or RTE products directly. If these structures cannot be avoided, the product and/or the line should be

shielded, and overhead fixtures and pipes should be cleaned and sanitized regularly (at least weekly) to prevent them from becoming a source of contamination. Trench drains should be avoided when possible. If trench drains are used, there should be no connection between trench drains from the "dirty" or "raw" side of the plant and those in the "clean" or RTE side.

Equipment movement between raw and RTE areas

The movement of equipment into and out of areas where exposed RTE products are handled should be monitored and managed to prevent the spread of *Listeria* contamination during the workday. Separate equipment, utensils, trash barrels, and cleaning tools that are labeled or color-coded (e.g., to facilitate monitoring and ensure that they are used in their assigned areas) should be used in RTE areas of the plant. Containers, tubs, or totes used for storing or transporting finished products should be designated for that use only and should not be used in other ways. These portable items should also be appropriately labeled or color-coded, and cleaned and sanitized after each use. Using separate color-coded or labeled carts, racks, totes, or other portable items that are used only in RTE product areas can minimize the potential for errors that could lead to contamination of exposed finished products. If any of these items move from one area to another, proper controls must be in place to prevent the transfer of contamination from one area to another. Controls may include using chemical foam or other barriers for carts and racks at the entrance to RTE areas, the use of sanitizer sprays on cart or rack wheels, and special procedures to clean and sanitize racks, tubs, totes or other equipment used in raw areas and then moved to RTE areas of the plant.

Preventing contamination during production

Finished product areas should be routinely monitored throughout the workday to ensure that conditions are adequate to prevent finished product contamination. Standing water in all areas of the plant, and particularly in the RTE areas, should be removed as soon as possible to prevent transfer of bacterial contamination to product from carts and shoes that have tracked contaminated water through the plant. Hoses should be hung, stored properly, or removed in areas where RTE products are exposed before start of operation each day. Plants should have washing areas and systems designated for equipment used in the RTE area, and these systems should not be used for equipment from the raw processing area. If only one equipment washing and cleaning area is available in a plant, equipment from the raw and RTE areas of the plant should not be handled or stored in this area at the same time, and the washing area must be cleaned and sanitized before any RTE equipment is handled, cleaned and sanitized in this area.

Chemical barriers and footbaths

Chemical foam barriers or footbaths can be used to minimize the spread of contamination from raw areas to RTE areas of the plant. Footbaths or foam barriers should be properly installed, maintained, and monitored or they will not be effective and can even become a source of contamination. These chemical barriers should be located at all entrances to RTE areas of the plant. It is important to monitor and maintain proper sanitizer concentrations in footbaths and foam barriers to ensure that they are effective. Quaternary ammonia sanitizers (quats), iodophors, or other products especially formulated for

Listeria control should be used. Manufacturer recommendations for this use (foot baths or foam barriers) should be followed when determining the proper concentration, monitoring frequency, and timing of application for foam barriers. Chlorine is not recommended since it can quickly become inactivated. Shoes or boots should be kept clean, since footbaths or foam barriers will not be ineffective if boots or shoes are carrying large amounts of organic material (e.g., compacted dirt or seafood waste).

EMPLOYEE POLICIES TO PREVENT CONTAMINATION OF RTE AREAS

Personnel policies and training

Smoked seafood processors should establish personal hygiene practices and policies with *L. monocytogenes* control as a major objective. Employee training in GMPs is necessary; along with specific controls or policies related to employee movement in the plant and procedures to minimize the potential for employees to bring contamination into RTE areas. Control measures for employee hygiene and traffic management are likely to be most stringent in areas where exposed finished products are handled or processed. All company policies and procedures related to employee hygiene, food handling practices, and employee movement in the plant need to be included in employee training programs for *L. monocytogenes* control. Employees not directly involved in processing (e.g., maintenance staff, equipment technicians, the cleaning and sanitizing crew, managers, sales staff, and other office personnel) should be included in training programs, since they can cause significant problems if they do not understand and follow GMPs and company policies and proper practices designed to prevent *Listeria* contamination.

Employee attire

Personnel policies and procedures should be developed and implemented to ensure that employee attire does not contaminate RTE products. Employees who handle RTE products must use clean gloves, smocks, and aprons to minimize product contamination. Disposable gloves, aprons, arm covers, hair covering and/or beard covers should be used in RTE areas. All disposable items should be discarded when leaving the work area and replaced with new items when returning. Personnel procedures should also ensure that all employees and visitors who enter areas where exposed finished products are handled wash and sanitize their hands and put on clean outer garments such as disposable smocks or aprons, hair covering, and shoe covers or work boots.

Employee traffic

The movement of employees into and out of areas where exposed RTE products are handled should also be monitored and managed to prevent the spread of *L. monocytogenes* contamination during the workday. The movement of employees into and out of RTE areas should be limited where possible, and when movement is necessary, appropriate precautions must be taken to prevent the spread of contamination. Precautions may include changing outer garments, washing hands, and changing into clean smocks, gloves, and boots before entering the RTE area. Color-coding of employee attire can be useful to facilitate monitoring and to help manage the movement of employees into and out of RTE areas. Maintenance personnel, sales, office or other non-production staff must also follow these procedures that prevent the inadvertent transfer of *L. monocytogenes* from the raw to the RTE side of the operation.

Hand washing and other employee facilities

An adequate number of easily accessible and properly equipped and maintained hand washing and sanitation stations should be available in all areas of the plant. It is particularly important to locate hand-washing facilities in areas where exposed finished products are handled, as well as at all entrances to RTE finished product areas. Policies that ensure that hands are washed and sanitized properly or gloves are changed when an unclean surface is touched must also be implemented and monitored. All employees (including those not directly involved in processing activities) should be trained to ensure that they understand the importance of proper hand washing, how to wash their hands and/or gloves properly, as well as when to wash their hands and/or gloves. Plant management must also provide restrooms and break rooms that are easily accessible and located in areas that minimize the potential for contamination of food processing or handling areas. Policies, including appropriate monitoring procedures, should also be developed to ensure that personal items are not allowed at work stations and that equipment, soiled clothing, or food is not stored in lockers.

TARGETED SANITATION PROCEDURES

Sanitation procedures targeting *Listeria* should focus on the most likely sources of direct product contamination. Processors will need to assess where exposed products are likely to become contaminated along the product flow. The highest potential risk is likely to occur in areas where exposed finished products are handled. Many different areas in the processing plant environment can become indirect sources of *Listeria* contamination. Such areas can har-

bor the organism and, under certain conditions, can contaminate product contact surfaces or the product itself. Minimizing the presence of *L. monocytogenes* in the environment can reduce the risk that finished RTE products or product contact surfaces will become contaminated. The importance of different areas of the processing plant as a potential *L. monocytogenes* contamination source will vary depending upon the age and condition of the facility, the type and location of processing procedures conducted, the temperature and humidity of the plant environment, and the raw materials used.

It is possible to have random isolated contamination with *L. monocytogenes* from the environment even if a plant has an effective control program (26, 40). However, contamination is more likely to occur after the organism has become established in a niche, where it is not easy to eliminate with routine cleaning and sanitizing procedures (21, 26, 39). If equipment that contains a niche harboring *L. monocytogenes* is operated, bacteria may be dislodged from the niche and become deposited on equipment or other surfaces. As product moves over or through the equipment, it can become contaminated. Identifying *L. monocytogenes* niches and eliminating them can correct this situation.

Identifying and eliminating *Listeria* contamination sources

A number of studies have identified sites likely to be potential persistent reservoirs of *L. monocytogenes* in the processing plant environment of smoked seafood and other RTE foods (9, 17, 21, 23, 26, 33, 35, 39, 40, 41). Table 1 provides a list of sites, equipment, or materials that have been found to be frequent or intermittent sources of *L. monocytogenes* contamination. This list of contamination sources and the following procedures

for equipment design and maintenance were developed using information from Tompkin et al. (41), FAO Fisheries Report No. 604 (17), and Lappi et al. (26).

Equipment design and maintenance

Each processing facility must examine and evaluate the equipment used in the facility, its location, its condition, and how easy it is to clean and sanitize to prevent persistent *L. monocytogenes* contamination sources from becoming established, and to ensure that sporadic contamination is eliminated with routine cleaning and sanitizing procedures. The design of any new or replacement equipment should be evaluated from a microbiological and sanitation viewpoint. Quality control and sanitation personnel should be included in equipment design and purchase decisions to ensure that sanitation considerations are evaluated before purchasing decisions are made.

All equipment should be evaluated to ensure that there are no crevices, cracks, rough seams, unsealed joints, pitted or corroded surfaces, or hollow areas where water and food debris can collect and serve as harborage for *L. monocytogenes*. Equipment design should minimize the use of nuts, bolts, and threads, as they can be a particular problem with respect to niches for *L. monocytogenes*. Properly designed equipment should not contain nuts and bolts in any location that could directly or indirectly contaminate products during operation. Nuts and bolts that could be an indirect contamination source should be routinely removed for cleaning and sanitizing. Equipment, platform framework, table legs, machine platforms, or conveyor rollers that are hollow should be avoided because hollow areas provide an opportunity for water and food particles to collect and harbor *L. monocytogenes*. Hollow rollers on conveyors and any

TABLE 1. Potential sources of *L. monocytogenes* contamination in smoked seafood plants*

Air curtains
Air filters through which compressed air must pass (especially if poorly maintained)
Brining solutions and brine injection equipment
Ceilings and overhead structures
Cleaning tools (e.g., sponges, brushes, floor scrubbers)
Condensate
Containers (e.g., bins, tubs, baskets, totes) used for raw or RTE products
Conveyances (e.g., trolleys, carts, hand trucks, pallet jacks) including their wheels
Conveyor belts, especially if porous, frayed or in poor condition
Conveyor rollers that are hollow
Drains
Employee attire (e.g., gloves, aprons, shoes)
Floors and floor mats
Framework (metal or plastic) especially if wet, rusting, hollow, pitted or corroded
Ice and ice makers
Implements with hollow handles or other components including box cutters
Insulation in walls, around pipes, or in coolers that has become wet
Maintenance tools
Mixers and meat-bone separators
Motor housings
Nuts, bolts, screws and crevices in or on equipment
On/off switches
Open bearings within equipment
Packaging equipment
Pallets (plastic or wooden)
Racks for transporting raw fish and finished product
Raw fishery products
Rubber seals around doors
Scales
Slicers
Skinning machines
Standing water on poorly drained floors in processing areas and coolers
Trash cans and waste receptacles
Utensils (e.g., hand tools, knives, scrapers) that contact exposed finished product
Walls that are cracked and can retain moisture

*Adapted from Tompkin et al. (41), FAO Fisheries Report No. 604 (17), and Lappi et al. (26)

other equipment that has hollow areas where water could collect should especially be avoided in areas where exposed finished products can become contaminated. Portable equipment (e.g., smoking racks, carts, dollies, slicers, tubs, totes) used for exposed product should be designed to avoid the possibility that splashing water or other residue from the floor, a likely source of *L. monocytogenes*, may contaminate products. Racks used for transporting exposed RTE product should have cover guards over the wheels to prevent spray from the wheels from contaminating the rack and product as the racks are moved.

Non-routine activities or changes in processing operations may lead to the introduction of a new contamination source. Examples include plant construction; moving or modifying a processing or packaging line; installing new equipment; or adjusting or repairing equipment during production. During construction or line re-configuration, procedures should be established to separate the construction area and to enhance sanitation efforts and environmental monitoring procedures. It is important to thoroughly disassemble, and clean and sanitize (using rigorous procedures for eliminating niches if necessary) used equipment from storage or another plant before it is brought into the processing plant environment (28).

Procedures and schedules for regular visual inspection and maintenance should be developed and implemented to minimize the likelihood that *Listeria* will colonize a piece of equipment, and to reduce the number of unscheduled repairs which could contaminate equipment. When visual inspections reveal that equipment is in poor condition (e.g., damaged, pitted, corroded, or cracked) it should be repaired or replaced. Maintenance personnel should follow the same procedures described earlier for washing hands and changing outer

garments before moving from raw material or other areas of the plant into RTE areas. Tools used for the maintenance or repair of equipment in RTE processing areas should be dedicated for that use and stored in that area. If this is not possible, maintenance or repair tools should be cleaned and sanitized prior to their use in RTE areas. All equipment should be cleaned and sanitized after maintenance or repair work is complete.

Developing effective cleaning and sanitizing procedures

The development and implementation of effective cleaning and sanitation procedures is essential for control of *L. monocytogenes*. Routine cleaning and sanitizing procedures provide the primary defense to eliminate day-to-day *Listeria* contamination from raw materials, people, conveyances, packaging and other sources. Processors should consider the type of activities conducted at each specific location, the nature and volume of the products handled in each area of the plant, and microbiological monitoring data to identify where problems are likely to occur and to help determine the required frequency for cleaning and sanitizing. Routine microbiological testing for *Listeria* can be used to determine trends, to detect a developing sanitation problem, and to demonstrate that sanitation procedures are effective.

Different cleaning and sanitation procedures may be needed for: (1) different areas of the plant such as raw material areas, finished product areas, and drains; (2) equipment such as slicers, conveyors, skinning machines, smoking ovens, coolers, and freezers; (3) conveyances such as smoking racks, trolleys, forklifts, and pallet jacks; and (4) utensils and portable items such as knives, tubs, and totes. Special procedures to clean and sanitize floor mats, as well as the wheels of carts, trolleys, and other conveyances, may also be needed since these items have been identi-

fied as a source of *L. monocytogenes* contamination (26). In addition, intensive rigorous cleaning and sanitizing procedures will be needed to eliminate *L. monocytogenes* that persist in niches where the organism may have developed biofilms or communities that are attached to equipment or other surfaces, which may be difficult to eliminate. Written Sanitation Standard Operating Procedures (SSOPs) will help to ensure that sanitation procedures are adequate and clearly understood by all personnel. Written pre-operational checklists can help to ensure that all daily and periodic sanitation procedures are consistently and effectively completed.

The following specific cleaning and sanitation procedures for *Listeria* control were adapted from Tompkin et al. (41) and FAO Fisheries Report No. 604 (17).

Cleaning and sanitizing steps

Routine cleaning and sanitizing procedures for specific areas of the plant may include the following steps: (1) remove all exposed finished products (2) dry clean to remove excess food debris, sweep, and remove trash as necessary (3) pre-rinse the equipment, (4) visually inspect equipment, (5) foam and scrub equipment, (6) rinse equipment, (7) visually inspect equipment, (8) clean the floors, (9) sanitize equipment and floors, (10) conduct post-sanitation verification, (11) dry the floors, (12) clean and put away supplies. Wet cleaning should never begin until all exposed products have been removed from the area and properly stored. Variations in a basic procedure may be needed for different processing areas (e.g., RTE product handling areas, raw product handling areas, and storage areas) depending on the activities and equipment in each area. These variations may include modifications in the timing of cleaning and sanitizing activities, the types of cleaners

and sanitizers that are used, and special procedures for equipment, utensils or portable items that have a history of contamination problems or pose a higher risk of product contamination. Consistency and attention to detail are important to ensure that cleaning and sanitation procedures are effectively and efficiently controlling *L. monocytogenes* contamination.

Practices to avoid

Because *Listeria* is likely to be present in most plant environments, especially on floors and in areas where raw products are handled, the following activities should be avoided.

- Wet cleaning and sanitizing procedures should never be started before all exposed products are removed from the area. Floors, drains, walls, ceilings should not be cleaned during production. In plants with multiple processing lines, cleaning should not be started if another line is still operating.
- High-pressure hoses should be avoided because they are likely to generate aerosols and spread contamination of *L. monocytogenes* and other pathogens via water droplets.
- Equipment, equipment parts, tubs, racks, screens and other portable items should never be cleaned or sanitized on the floor, since floors should always be considered contaminated.
- Mid-shift wet cleanups should be eliminated, since they are likely to be counter-productive and may increase rather than decrease the risk of *L. monocytogenes* contamination. Mid-shift or periodic wipe-downs may be needed to remove product residue and keep work areas clean.

- Using compressed air to remove debris from equipment during production should also be avoided. Compressed air can be a source of *L. monocytogenes* if in-line filters are not maintained or replaced on a regular basis. If it is necessary to use compressed air to remove product or other residue from equipment like packaging machines, it should be used only at the end of production, after all exposed finished products have been removed, and before cleaning begins.

Cleaning procedures

Effective cleaning procedures using appropriate cleaning agents to remove soil, protein, fat, residues, and smoke or soot need to be developed and implemented. Foam application of cleaning agents can enhance effectiveness, and enzymatic cleaners may be needed to remove organic materials prior to sanitizing. Manufacturers' instructions should be followed when determining the strength, contact time, and any special precautions (e.g., face or skin protection and the potential for equipment corrosion) that may be needed when using cleaning agents. Thorough scrubbing of all surfaces is an essential part of the cleaning process that cannot be overlooked. Consideration should be given to selecting the proper cleaning tools. Brushes, scrapers or other tools should be designed for use in food establishments and be easy to clean and sanitize. Special tools that are properly sized (e.g., long handles, properly sized brush heads) may be needed to ensure that difficult-to-reach areas or parts of equipment can be thoroughly scrubbed during the cleaning process. Special cleaning tools may also be needed for specific uses. Brushes

or other tools used for equipment and food contact surfaces should not be used to clean floors or other more contaminated areas in the processing plant environment. Using color-coded cleaning tools can help facilitate monitoring and decrease the likelihood that cleaning tools could contaminate equipment or surfaces that come into contact with food products. Sponges, mops, rags or other cleaning aids that can become contaminated during production and are difficult to clean and sanitize properly should be avoided. The cleaning and sanitation crew should be trained to ensure that the proper cleaning tools and procedures are used.

Sanitizers for *Listeria* control

Quaternary ammonium compounds (quats) and peracetic acid or peroctanoic acid (peracid) sanitizers, available from a number of different manufacturers, have been found to be effective against *L. monocytogenes*, including when the organisms are present in biofilms (18, 24). Some products (e.g., quats) leave a germicidal film on surfaces, which provides residual sanitation after the initial application. Areas that may need to be sanitized with quats, peracid or other sanitizers specifically formulated for *Listeria* control include drains, floors, floor mats, smoker racks, waste and storage containers, walls, coolers, freezers and condensate drip pans. These sanitizers are also likely to be useful for sanitizing equipment such as slicers, mixers, and de-boners. When possible, nuts, bolts or other parts should be soaked overnight in sanitizer. Caution should be used when soaking equipment parts or cleaning tools in sanitizer for extended periods of time or at higher concentrations since these treatments may cause corrosion or other damage. Rotating different sanitizers periodically can help to ensure that sanitation chemicals continue to be ef-

fective over time. Special attention is required to ensure that cleaning tools such as brushes, squeegees, wipes, etc. are properly cleaned and sanitized after they are used to ensure that they do not become a contamination source. Cleaning tools, especially those tools used for more contaminated areas of the plant such as floors and drains, may need to be sanitized with a stronger concentration of sanitizer (e.g., 600–1000 ppm quat). When higher concentrations of sanitizer are used, cleaning tools should be routinely inspected and replaced as necessary, because they may deteriorate or become pitted or corroded more quickly. After sanitization, cleaning tools should be air-dried and stored properly, or stored in fresh sanitizer until they are used again. The cleaning and sanitation crew should be trained to ensure that sanitizers are used properly at the proper concentration and that sanitation procedures are conducted correctly.

Sanitizing with heat or steam

Hot water or steam sanitation is an alternative to chemical sanitation when equipment is difficult to clean or has been colonized by *L. monocytogenes*. When using heat to sanitize, it is essential that the equipment be thoroughly cleaned first so the heat does not bake the soil, protein, and fat onto the surface, making it more difficult to remove, and potentially creating an additional contamination problem in the future. If steam is used, caution should be taken to avoid the creation of aerosols containing *Listeria* and other microorganisms, which can condense on surfaces. If steam is used as a final sanitation step on equipment that is difficult to clean, the equipment should be covered before injecting steam to protect the surrounding area from contamination. Equipment can also be steamed in an oven or other cham-

ber, and equipment parts can be boiled in water. The equipment and/or parts should reach a temperature of at least 160°F (71°C) throughout for at least one hour. Lower temperatures, from 145 to 160°F (63 to 71°C), may require a significantly longer holding time.

Cleaning and sanitizing equipment

Special consideration should be given to the development of effective procedures for cleaning and sanitizing equipment and portable items that come in contact with products (food contact surfaces). Equipment may need to be disassembled prior to cleaning and sanitizing, and may need to be re-sanitized after re-assembly. It is important that all areas of equipment be thoroughly cleaned and sanitized properly after disassembly to prevent *L. monocytogenes* niches from becoming established. The application of foam detergents to provide adequate contact with equipment surfaces and vigorous scrubbing can facilitate the cleaning process. Special sanitizers may also be needed for equipment that is difficult to clean or has a history of contamination problems. Equipment parts and portable items such as utensils, trays and tubs, can be soaked and scrubbed, rinsed, and sanitized in a multi-compartment sink. Equipment parts and portable items, and utensils should never be placed or stored on the floor after cleaning, since floors are likely to be contaminated. Consideration should also be given to when equipment and portable items that come into contact with food products are cleaned and sanitized, and how and where they are stored to ensure that subsequent cleaning of floors, walls or other areas do not re-contaminate them. In some situations it may be necessary to re-clean and sanitize these items before they are used if subsequent cleaning activities may have re-contaminated them.

Cleaning and sanitizing floors

Special attention should be given to the development and implementation of effective procedures for cleaning, sanitizing, and maintaining floors. Special caustic or hydrogen peroxide-based cleaners may be particularly effective for cleaning floors. Dedicated, color-coded brushes, squeegees, etc. should be used for cleaning floors. After an initial dry cleaning, floors need to be thoroughly rinsed, using a low-pressure hose, and then sanitized. Powdered hydrogen peroxide-based cleaners or citric acid applied to certain areas of the floor (e.g., in RTE product handling areas) can be effective for controlling *L. monocytogenes* during processing, if the floor has been properly cleaned and dried first. If citric acid is used, the surface of the floor should be maintained at pH 5.0 or below for maximum effectiveness. However, these acidic conditions can cause floor deterioration that eventually will necessitate replacing the floor. Hydrogen peroxide-based materials do not have this corrosive effect.

Cleaning and sanitizing floor drains

Research and experience has shown that floor drains can be the most highly contaminated sites in the processing plant environment (20, 21, 26, 33, 39). *Listeria* present in the plant environment in the vicinity of a drain are likely to end up in that drain. In addition, drains are likely to be areas that *Listeria* can colonize and where *Listeria* can persist over time. Floor drains should be cleaned and sanitized in a way that prevents contamination of other surfaces in the room. Floor drains should never be cleaned during production or before all food products have been removed from the area and properly stored. Floor drain brushes should be smaller than the diameter of the drain open-

ing to prevent the brush from splashing as it is removed during cleaning; alternatively, a splashguard could be used. Utensils for cleaning drains must be dedicated to that purpose to minimize potential for contamination of other areas of the plant. Consideration should also be given to determining when to clean drains. If floor drains are cleaned first, it may be necessary to clean and sanitize them again after cleaning and sanitizing adjacent areas. Bactericidal drain rings should be used when feasible to provide additional residual sanitation after cleaning. High-pressure hoses should not be used to clean drains or to clear a backed-up drain. Using high pressure can create aerosols that contain *Listeria* and spread this contamination throughout the processing area. Floor drains should also be designed and maintained to prevent backups. If a drain backup occurs, production must cease, the drain cleared, and the area carefully cleaned, rinsed, and sanitized. The floor should be dry before production resumes.

Cleaning and sanitizing smoker racks and trolleys

Smoked seafood and other RTE processing operations use a large number of portable racks and trolleys to transport products into and from the smoking chambers and from one area of the plant to another. Cleaning, sanitizing and storing these items is a challenge for many plants. Special cleaners formulated to remove protein, fat residue, and soot from the smoking process may be needed. Application of foam cleaners may be required to ensure adequate coverage and contact time. Sanitizing racks and trolleys may also be difficult. Chemical sanitizers can be difficult to apply and foam or fog application may be useful to ensure adequate concentrations and contact times. Manufacturers' instructions should be

followed when using chemical sanitizers. The application of heat may be an alternative to chemical sanitation. When sanitizing racks or other conveyances with heat, a special chamber or rack washer will be needed. Heat can be applied by hot water, steam, or moist heat in a rack washer, cabinet or oven. Sufficient heat should be applied for a sufficient period of time to raise the temperature of the rack to 160°F (71°C) or higher (see Sanitizing with heat or steam). When cleaning carts, trolleys, and other conveyances, additional sanitation measures may be needed for the wheels, as they have been shown to be a source of *L. monocytogenes* and a vehicle for moving contamination around the plant environment (26, 39).

Cleaning and sanitizing coolers and freezers

Infrequent cleaning of coolers used for holding RTE products may increase *L. monocytogenes* contamination problems. Coolers should be emptied and cleaned at least once a week. All exposed RTE products should be removed and/or placed in tightly sealed containers before the cleaning and sanitizing process is started. Simply covering product in the cooler will not provide adequate protection from contamination during the cleaning and sanitizing process. Keeping cooler floors, ceilings, air blower fixtures, and walls dry is also important since splashing water or condensation can be a potential source of *L. monocytogenes* contamination. Drip pans, blowers, racks and other equipment in coolers should also be cleaned and sanitized regularly. Solid forms of sanitizers (e.g., blocks or donuts of quaternary ammonia sanitizer) may be placed in the drip pan to control microbial growth after cleaning. Condensate that accumulates in drip pans of refrigeration

units should be routed to a drain with a hose. Infrequent defrosting, cleaning, and maintenance of freezers used to freeze or store unpackaged product is also a potential source of *L. monocytogenes* contamination. Freezers should be cleaned at least twice a year depending on production volume, use, and maintenance.

Intensive cleaning and sanitizing to eliminate persistent *L. monocytogenes* niches

When bacteria such as *Listeria* have colonized a particular location, they are difficult to remove and are more resistant to common sanitizers. To the extent possible, equipment should be disassembled, including removing parts, nuts, and bolts to ensure that all areas can be cleaned and sanitized. Small parts should be soaked in sanitizer overnight. As noted earlier, special cleaners and quaternary ammonia and hydrogen peroxide-based sanitizers, as well as peracid sanitizers, may be more effective and should be used for eliminating persistent *Listeria* communities that are attached to surfaces, particularly when biofilms have formed. Hot water or steam sanitation is particularly useful for eliminating *L. monocytogenes* from niches (see "Sanitizing with Heat or Steam").

Sanitation personnel and monitoring

Because of the importance of sanitation in *L. monocytogenes* control, trained and reliable personnel should be assigned to conduct sanitation activities, especially in areas where RTE products are handled and packaged. The sanitation crew should receive special training to ensure that they understand the procedures necessary to control *L. monocytogenes* and how to conduct them properly. Routine monitoring of sanitation activities and their effectiveness is nec-

essary to ensure that all procedures are conducted properly and at the appropriate times. Supervisory personnel should themselves conduct routine inspections to ensure that sanitation procedures are effective and conducted properly. At a minimum, such an inspection should be conducted each day before production begins (Pre-Op) to ensure that cleaning and sanitation tasks have been completed and the facility is ready for processing. If deficiencies or problems are found in the Pre-Op inspection, they can be corrected before processing begins and minimize the potential for product contamination. Post-Op inspections, conducted after the cleaning and sanitation crew has completed its tasks, can be used to monitor the performance of the sanitation crew and as a tool to correct procedures or performance. Daily checklists completed by supervisory personnel can also help to facilitate monitoring. Microbiological or other testing procedures can provide objective measurements that can be used to further evaluate the effectiveness of cleaning and sanitation procedures and the performance of the sanitation crew.

SUMMARY

The development and implementation of an effective *Listeria* control program requires a long-term commitment, consistency and tenacity. Elements of a complete *Listeria* control program are likely to include sanitation, employee hygiene and food handling procedures specifically targeted to control *Listeria*, as well as employee training, environmental monitoring and testing, and raw material and finished product controls. Targeted *Listeria* control procedures should ensure that (1) the overall plant design and process flow minimizes the potential for cross contamination; (2) traffic control procedures for people and equipment are in

place to minimize the spread of *Listeria* throughout the plant; and (3) policies and procedures for employee hygiene and food handling practices prevent contamination of finished products; (4) effective cleaning and sanitizing procedures are implemented; and (5) equipment does not contribute or harbor contamination. Smoked seafood processors can use the specific guidelines provided by the Smoked Seafood Working Group in this manuscript to assess their operation, evaluate what control measures are needed for their operation, and implement effective controls.

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Assessing Education of Food Handlers and Prerequisite Programs in Japanese HACCP Plants

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SUMMARY

We conducted a written test on food handlers in food production plants that have implemented the Hazard Analysis Critical Control Point System (HACCP) and plants that have not, questioning the purposes or significance of sanitary operations. The test performance of HACCP plants was significantly better than non-HACCP plants (Chi-square test, $P < 0.05$), suggesting the effectiveness of HACCP implementation from the point of education and training of food handlers. However, the correct response rates for “significance of sanitation standard operating procedures (SSOPs)” and “purposes of record keeping” were low at 63% (239/378) and 64% (243/378), respectively. We next conducted a questionnaire survey in HACCP plants nationwide, investigating the state of “SSOPs” and “recording forms” after a massive outbreak of foodborne disease in 2000 caused by *Staphylococcus aureus* enterotoxin A traced to a food product produced in a HACCP plant of Company Y. Of 162 plants responded, 86% (140/162) reported changing their SSOPs and 95% (154/162) reported changing their recording forms. Over 80% of these plants changed the documents to add sanitary operations. Therefore, almost all the plants have attempted to substantiate the prerequisite programs after the outbreak at Company Y. However, only 67% (109/162) of the plants used their own recording forms in education and training of food handlers. This very low rate indicates an urgent need for using the companies’ own documents in education and training programs.

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TABLE 1. Number of plants in which test was conducted and time of test

Company	No. of plants		Time of test (year.month)
	HACCP-implementing	Non-HACCP-implementing	
A	1	1	2001.1
B	1	1	2001.5
C	1	2	2001.12
Total	3	4	

TABLE 2. Number of persons responding to the test and mean age

Company	No. of respondents	Mean age (years)	
A	HACCP plant	83	47.8
	Non-HACCP plant	61	52.9
	Total	144	49.9
B	HACCP plant	47	51.0
	Non-HACCP plant	41	Unknown
	Total	88	Unknown
C	HACCP plant	30	42.3
	Non-HACCP plant	116	46.6
	Total	146	45.7

INTRODUCTION

Implementation of a Hazard Analysis and Critical Control Point system (HACCP) (12) as a risk management system for production or preparation of food products has been reported to be effective for the prevention of foodborne diseases (2, 4, 5). In HACCP, the structure of the control system is based on seven principles. First, food safety hazards are analyzed; then important points, steps or procedures are determined as critical control points (CCPs). This is followed by continuous monitoring of parameters such as temperature, time and physical dimensions

to prevent food safety hazards. However, the operation of HACCP requires implementation of prerequisite programs, which include sanitary management of equipment and facility, education and training of food handlers, traceability and recall of products, and pest control. The sanitary operations are implemented in accordance with sanitation standard operating procedures (SSOPs), and the results are recorded as necessary (12, 13).

In 1995, Japan's Food Sanitation Law was amended. A system was started under which food manufacturing or processing plants that implement Comprehensive Sanitation-

controlled Manufacturing Process (CSMP), which is equivalent to HACCP, were approved by the Minister of Health and Welfare (currently Minister of Health, Labour and Welfare) (3). As a result of this policy, food production plants in Japan began to implement HACCP and the approval became a matter of high status in the food production industry. In 1995, the European Union (EU) prohibited importation of fishery products from Japan (7, 8). As a result, fishery products processing plants in Japan also began to implement HACCP. During this period, the objective of implementing HACCP in food manufacturing or processing plants was to bring the level of food hygiene in line with the international standard. From May 1996, Japan experienced many outbreaks of enterohemorrhagic *Escherichia coli* O157:H7 infection (11). Because of these incidents, the Japanese food industry began to recognize the effectiveness of HACCP as a measure to prevent foodborne diseases. In December 1999, the number of CSMP-approved dairy product plants, which were the first to become approved, reached 294 (16).

However, in June 2000, an outbreak involving 14,780 cases caused by *Staphylococcus aureus* enterotoxin A occurred in Plant O of Company Y, which was CSMP-approved (1, 6). Because of this outbreak, evaluation of the efficacy of HACCP implementation was demanded in Japan. The foodborne outbreak was attributed to inadequate prerequisite programs and not to a defect in CCP management (6). In Japanese food manufacturing or processing plants, the prerequisite programs required before the implementation of HACCP had not taken root (8).

The most important item in the prerequisite programs is education and training of food handlers. We therefore conducted a written test on food handlers working in HACCP and non-HACCP plants, questioning the

TABLE 3. Comparison of test performance between HACCP and non-HACCP plants

Company	HACCP plant				Non-HACCP plant			P value by (Chi-square test)
	No. of respondents	No. of correct responses	Correct response rate		No. of respondents	No. of correct responses	Correct response rate	
A	498	464	93%	>	366	318	87%	0.0040
B	329	261	79%	>	287	208	73%	0.0464
C	180	166	92%	>	696	481	69%	< 0.000
Total	960	855	89%	>	1,308	970	74%	< 0.000

TABLE 4. Test results of each question for all respondents (N=378)

Content of question	No. of correct responses	Correct response rate
1. Significance of procedures taken before entering plant	305	81%
2. Reason for aseptic handling of food	357	94%
3. Reason for keeping the floor dry	357	94%
4. Reasons for the ways of handling uncovered food	324	86%
5. Significance of SSOPs	239	63%
6. Purposes of record keeping	243	64%

purposes or significance of sanitary operations described in the SSOPs, and compared the results. The results allow us to evaluate whether education and training increase the effectiveness of HACCP implementation.

Microbiological methods have been used for validation and verification of HACCP implementation (9, 10, 14, 15). Because these methods assess the hazardous substances qualitatively or quantitatively, they are regarded as highly effective. However, it is also important to attempt to evaluate the degree of food handlers' understanding of sanitary operations. In particular, since HACCP is implemented by a top-down approach, it is possible that food handlers in HACCP plants conduct sanitary operations without understanding their significance. Therefore, conducting the test in itself was an

education and training exercise. The results of this test showed poor performance on questions about "purpose of record keeping" and "significance of SSOPs". Therefore, we next conducted a survey on all the HACCP food plants in Japan regarding the state of SSOPs and the recording forms before and after the outbreak at Company Y.

MATERIALS AND METHODS

Test on food handlers in HACCP and non-HACCP plants

An objective written test was administered to food handlers working in HACCP and non-HACCP plants of Companies A, B and C in Japan. Table 1 shows the number of plants in which the test was conducted and

the time of testing. The HACCP plant of Company A was under application for approval as a fishery product processing plant that would export to the United States (US). The HACCP plant of Company B was a CSMP-approved plant. The HACCP plant of Company C was under application for CSMP approval.

The results of the test were analyzed statistically.

Questionnaire survey of HACCP plants nationwide

A questionnaire survey was conducted in 289 CSMP-approved plants of 173 companies, regarding the state of SSOPs, recording forms, and documents related to CCPs. The questionnaire was sent by mail on April 30, 2002, and responses received by August 2, 2002 were analyzed.

TABLE 5. Number of plants responding to questionnaire, by food product (N=162)

Food products	Number of plants ^a	Percent ^a
Dairy products ^b	124	77%
Meat products ^c	15	9%
Fish meat paste products ^d	12	7%
Pouch-packed food products ^e	8	5%
Soft drinks	6	4%

^aincluding plants with duplicated products

^bproducts of cow's milk, skimmed milk, liquid milk containing reconstituted milk, cream, ice cream, condensed milk, fermented milk, lactic acid bacteria drink, and milk drink

^cproducts of ham, sausage, bacon, and similar products

^dproducts of kamaboko, surimi products, fish meat ham, fish meat sausage, and similar products

^eproducts packed into containers/packages, closed tightly and then thermally processed under pressure

RESULTS

Test on food handlers in HACCP and non-HACCP plants

Table 2 shows the number of persons responding to the test and the mean age.

Table 3 compares the test performance between HACCP and non-HACCP plants. In the plants implementing HACCP, performance was significantly better than in the non-HACCP plants (Chi-square test, $P < 0.05$).

Table 4 shows the results of each question for all respondents. The correct response rates for "significance of SSOPs" and "purposes of record keeping" were lower than for the other items.

Questionnaire survey of HACCP plants nationwide

Of 299 plants sent the questionnaire, 162 plants responded, for a response rate of 56.1%. Of the plants that responded, 51.9% (84/162) were plants with less than 100 food handlers.

Table 5 shows the number of plants responding to the questionnaire by food product. The most common food product among dairy products was cow's milk, occupying 54.3% (88/162) of all responding plants.

Table 6 shows the number and percentage of plants that have changed their SSOPs, recording forms and documents relating to CCPs after the outbreak at Company Y, as well as the contents of changes. 86% (140/162) of the plants surveyed reported changing SSOPs, and 95% (154/162) reported changing recording forms. A very large number of these plants changed the documents to add sanitary operations and record keeping. Sixty-one percent (99/162) of the plants surveyed reported changing documents relating to CCPs, a much lower figure than for the other types of documents.

Table 7 shows the relevant parties that prepared the documents for CSMP approval initially, as well as the relevant parties that proposed changes after the outbreak at Company Y. The HACCP teams prepared all the documents in almost all the

plants and proposed changes in the majority of the plants.

Table 8 shows the number and proportion of plants using their own documents in education and training of food handlers. Only 67% (109/162) of the plants used their own recording forms in education and training.

DISCUSSION

As shown in Table 3, comparison of test performance between HACCP and non-HACCP plants of Companies A, B and C suggests that implementation of HACCP was effective from the point of view of the quality of food handlers. This achievement may be a result of improved quality of education and training or increased frequency of education and training opportunities through implementation of HACCP. The fact that more food handlers in HACCP plants understand the significance of sanitary operations may imply that more food handlers in HACCP plants are motivated to practice sanitary operations compared to non-HACCP plants. By establishing systems of approval of CSMP and approval of EU or US export fishery products processing plants, the Ministry of Health, Labor and Welfare has attempted to promote nationwide implementation of HACCP. Because these measures have improved the quality of food handlers, this policy can be evaluated as effective.

Table 4 shows that performance on questions about "significance of SSOPs" and "purposes of record keeping" was poor. We suspect that many food handlers regard SSOPs as a sort of formality and do not utilize SSOPs actively, and that many food handlers regard record keeping as agonizing sanitary operations. The cause for the low performance may be a lack of education and training opportunities on the significance, contents and methods of applying SSOPs and recording forms in the food handlers' own plants.

TABLE 6. Changes of documents after outbreak at Company Y (N=162)

SSOPs			Recording forms			Documents relating to CCPs		
Change of documents	No. of plants ^a	Percentage ^a	Change of documents	No. of plants ^a	Percentage ^a	Change of documents	No. of plants ^a	Percentage ^a
Changes have been made	140	86%	Changes have been made	154	95%	Changes have been made	99	61%
Added sanitary operations	130	80%	Added record keeping	143	88%	Added sanitary operations	80	49%
Corrected careless mistakes	76	47%	Changed entering space	102	63%	Corrected careless mistakes	61	38%
Expressed in concrete terms	54	33%	Changed record keeping	65	40%	Deleted sanitary operations	29	18%
Deleted sanitary operations	41	25%	Deleted record keeping	60	37%	Expressed in concrete terms	25	15%
Added figures	33	20%	Entered words in margin	46	28%	Deleted sanitary operations	32	20%
Changed sanitary operations	27	17%	Corrected careless mistakes	40	25%	Changed location	9	6%

^aIncluding plants giving multiple responses

TABLE 7. Relevant parties that prepared documents initially and proposed changes after outbreak at Company Y (N=162)

Documents	Relevant party	Preparing initial documents ^a		Proposing changes ^a
SSOPs	HACCP team	160 (99%)	→	140 (86%)
	Food handlers	47 (29%)	→	46 (29%)
	Headquarter, parent company, distributor	17 (11%)	→	34 (21%)
	Administration	8 (5%)	→	54 (33%)
Recording forms	HACCP team	160 (99%)	→	149 (92%)
	Food handlers	58 (36%)	→	55 (34%)
	Headquarter, parent company, distributor	17 (11%)	→	46 (28%)
	Administration	2 (1%)	→	49 (30%)
Documents relating to CCPs	HACCP team	160 (99%)	→	100 (62%)
	Food handlers	32 (20%)	→	6 (4%)
	Headquarter, parent company, distributor	25 (15%)	→	45 (28%)
	Administration	11 (7%)	→	70 (43%)

^aPercentage of total number in parenthesis

TABLE 8. Number of plants using their own documents in education and training of food handlers (N=162)

Documents	No. of plants	Percentage
SSOPs	124	77%
Recording forms	109	67%
Documents relating to CCPs	149	92%

Table 6 shows that the outbreak at Company Y was followed by a nationwide trend to change the SSOPs and recording forms in HACCP plants. It is likely that many HACCP plants conducted HACCP validation following the outbreak at Company Y and eventually changed their operations to supplement the prerequisite programs. Regarding the contents of changes after the outbreak, a very large number of plants responded "added sanitary operations or record keeping" for SSOPs or recording forms. This finding implies that before the outbreak, many plants throughout Japan did not have comprehensive SSOPs and recording forms, or did not implement essential sanitary operations and record keeping. Conversely, more plants than expected responded "deleted sanitary operations or record keeping". To keep sanitary control efficient, it was essential that certain unnecessary sanitary operations and documentary operations be discontinued. It is inferred from the present results that, triggered by the outbreak at Company Y, Japanese manufacturers are making attempts to improve the prerequisite programs rather than to enhance CCP management in their own plants.

Table 7 shows that the HACCP team prepared and changed these documents in almost all the plants. According to the HACCP, the HACCP team has the right to decide all matters concerning food hygiene in the plant (12). Therefore, this result is expected, and indicates that the HACCP teams are functioning in

almost all the plants. On the other hand, food handlers were involved in the preparation and changes of the documents in approximately 30% of the plants, which was higher than expected. In order to select appropriate items of sanitary operation and record keeping, and to prepare user friendly SSOPs and recording forms, it is essential that not only the HACCP team but also food handlers should be involved in the preparation and proposal of the documents.

The fact that administration was not involved in the initial preparation of the documents is due to the government's policy of promoting autonomous sanitary management. However, subsequently the administration, headquarter, parent company, customer and consultant were all proposing changes in an increasing number of plants, probably because the outbreak at Company Y was perceived as very serious.

As shown in Table 8, not all the plants used their own documents for education and training of their food handlers. Because these documents are used in the actual sanitary operations, it is mandatory that instructions for their use be explained in education and training sessions. In CSMP-approved plants, the rate of using these documents in training should reach 100%. In particular, few plants used the recording forms. This is the most important problem, and it is urgent that the use of these documents in education and training be implemented.

In conclusion, the results of the test on the purposes or significance of

sanitary operations suggested that HACCP implementation was effective in that education and training improved the quality of food handlers. Before the outbreak at Company Y, the SSOPs and recording forms were inadequate in many plants. After this incident, improvement of prerequisite programs has become the focus of sanitary management, now that the HACCP teams are functioning. Many plants urgently need to use their own documents, especially the recording forms, in education and training.

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Chlorine Depletion in Sanitizing Solutions Used for Apple Slice Disinfection

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SUMMARY

Current processing schemes for fresh-cut apple slices normally include a sanitary treatment consisting of a chlorinated water dip. The antimicrobial effectiveness of this treatment is questionable because of solute quenching of the sanitizing solution. The purpose of this research was to assess the effect of chlorinated water dips on the microbiology of stored apple slices and to examine the fate of chlorine in a sodium hypochlorite sanitizing solution. Dipping of apple slices in the solution had no effect on the size and composition of spoilage microflorae after 14 days of storage at both 5 and 10°C. Evidence of spoilage due to fungal growth occurred sporadically on the surface of the packaged slices. Chlorine depletion was rapid in the sanitizing solution, and residual-free chlorine was reduced to < 2 ppm by the addition of twenty slices to 4 l of solution. These results indicate that more effective means are required for the removal or destruction of microorganisms from fresh-cut apple slices.

INTRODUCTION

Demand for fresh-cut produce continues to increase in North America. The bulk of this market consists in cut vegetables (such as lettuce and/or carrots) for use in mixed salads. Fresh-cut fruit is seen as a means of producing additional value-added products, and is the next logical step for growth in the industry (16). Unfortunately, the technological challenges inherent to processing and distribution of fruit in this format are more complex than for fresh cut vegetables. Rapid changes in color, appearance or sensory quality caused by physiological changes and spoilage due to microbial growth can severely restrict shelf life. Control over such alterations is particularly critical for the maintenance of quality in fresh cut apple slices. Several approaches have been proposed to delay browning and sensory changes in stored apple slices (8, 11, 14, 20). Control

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INTRODUCTION

Demand for fresh-cut produce continues to increase in North America. The bulk of this market consists in cut vegetables (such as lettuce and/or carrots) for use in mixed salads. Fresh-cut fruit is seen as a means of producing additional value-added products, and is the next logical step for growth in the industry (16). Unfortunately, the technological challenges inherent to processing and distribution of fruit in this format are more complex than for fresh cut vegetables. Rapid changes in color, appearance or sensory quality caused by physiological changes and spoilage due to microbial growth can severely restrict shelf life. Control over such alterations is particularly critical for the maintenance of quality in fresh cut apple slices. Several approaches have been proposed to delay browning and sensory changes in stored apple slices (8, 11, 14, 20). Control of microbiological decay has relied mainly on storage under refrigeration temperatures. Microbial populations on fresh-cut produce are typically dominated by psychrotrophic *Pseudomonas* spp. derived from soil and Enterobacteriaceae from the plant phyllosphere in densities between 10^1 to 10^6 CFU/g at the outset (7, 10, 12, 13). In contrast, initial microbial loads on fresh-cut fruit tissues are lower, and selective pressures (pH, high sugar concentrations) normally lead to the development of spoilage flora dominated by psychrotrophic yeast, fungi and bacteria tolerant of lower pH, including lactic acid bacteria (5, 13). The extensive release of cellular components from cut and injured tissues provides a complex and abundant source of substrates for growth of these microorganisms. Alternative preservation systems to limit their proliferation have been proposed (8) but effective sanitation during processing to reduce initial microbial loads remains the key factor in fresh cut apple processing.

Washing in cold chlorinated water is the most common method employed to reduce microbial loads on fresh-cut products (18). Chlorine concentrations vary but tend to range between 50 and 150 ppm total chlorine (2, 3, 4, 6). The antimicrobial activity of chlorine is derived from the strong oxidizing nature of the hypochlorite ion, which readily undergoes chemical reactions with organic compounds. Such reactions tend to hamper antimicrobial efficacy, however, particularly when wash water contains high concentrations of dissolved organic materials. The products of reactions with organic compounds have little to no antimicrobial activity and deprive the solution of chlorine available for disinfection. Paring and slicing of fruit releases large quantities of solutes that may include a wide variety of organic compounds, including sugars, organic acids, protein and starches (15, 19). Solute released from apple slices may seriously limit the effectiveness of chlorinated wash water. The purpose of this research was to examine the effectiveness and fate of chlorine in solutions used for washing of fresh cut apple slices.

MATERIALS AND METHODS

Apples were obtained from Brewster Heights Packing Company in Brewster, Washington; CMI in Yakima, Washington; and BC Fruit Packers Co-op in Summerland, British Columbia. The varieties tested included Gala, Granny Smith and Red Delicious, as indicated for individual experiments. Individual apples were sliced with a Dito Dean Food Prep bench top slicer (Rocklin, CA) and the remaining tissue was removed with a paring knife. Chlorine solutions were prepared by dilution of commercial grade NaOCl (6% w/v) with distilled water. Chlorine concentrations were verified with a HACH test kit (Loveland, CO, USA, model CN-66). Browning control was

achieved with the antibrowning agent NatureSeal AS1 (Mantrose-Hauser Company, Attleboro, MA).

Antimicrobial efficacy of chlorinated water

Red Delicious apple slices prepared as described above were dipped either in distilled water or a 100 ppm chlorine solution for 1 min and were then transferred to a 6% (w/v) solution of the antibrowning agent. After a 2 min dip, the slices were drained in a colander and were blotted with absorbent paper. Four slices were placed in each of several PD941 bags (Cryovac Corp., Mississauga, ON, Canada; oxygen transmission rate: $16.544 \text{ ml O}_2/\text{m}^2/24 \text{ h}$) and vacuum sealed by use of a Swissvac sealer (Swissvac Maschinen AG, Luzern, Switzerland). Bags from each treatment were stored in the dark at 5° and 10°C for up to 21 days.

Samples were removed for microbiological analysis after 0, 7, and 14 days in storage. The slices were aseptically transferred from the bags to a sterile work surface in a laminar flow hood and were cut crosswise into sections that included both flesh and skin. Three-twenty 5g samples of randomly selected sections were placed in 225 ml of 0.1% peptone in a Lab Stomacher (Colworth, UK) for homogenization (60 s). Suitable dilutions prepared in 0.1% peptone were spread onto Plate Count Agar (PCA, Difco, MI) and incubated for 48 h at 30°C for estimation of total microbial populations; onto Dichloran-rose-bengal-chloramphenicol (DRBC) and incubated for 48 h at 30°C for estimation of yeast and mold populations; and onto Mac Conkey agar (Becton-Dickson, Sparks, MD) and incubated at 35°C for 48 h for estimation of Enterobacteriaceae populations. The experiment was performed twice.

Fate of chlorine during washing

Four apple slices were added to 4 l of a 100 ppm NaOCl solution for 60 s. Total and free chlorine content were measured before addition and after removal of the slices. The pro-

TABLE 1. Microbial populations (log CFU/g) on Red Delicious apple slices stored at 5 and 10°C after a one-minute dip in tap water (water wash) or 100 ppm sodium hypochlorite (Cl wash), followed by a two-minute dip in an antibrowning solution

Storage time (d)	Mesophilic Aerobes			Yeast & Mold			Enterobacteriaceae		
	0	7	14	0	7	14	0	7	14
Treatment									
10°C, Cl wash	1.2 ± 0.3 ^a	4.4 ± 0.6	5.3 ± 0.3	< 1.0	2.7 ± 0.7	4.5 ± 0.2	< 1.0	< 1.0	< 1.0
10°C, water wash	1.3 ± 0.5	4.2 ± 0.5	4.0 ± 1.2	1.8 ± 0.1	2.5 ± 0.6	2.4 ± 0.5	< 1.0	2.2 ± 0.4	< 1.0
5°C, Cl wash	< 1.0	2.6 ± 0.6	4.4 ± 0.5	< 1.0	< 1.0	2.4 ± 0.5	< 1.0	< 1.0	< 1.0
5°C, water wash	< 1.0	2.5 ± 0.6	4.2 ± 0.4	< 1.0	< 1.0	2.1 ± 0.5	< 1.0	< 1.0	< 1.0

^aEach value is the mean of three samples analyzed for two replicate experiments ± standard deviation.

FIGURE 1. Stored Red Delicious apple slices showing areas of discoloration due to microbial growth



cess was repeated using fresh slices until chlorine was undetectable. The chlorine capacity of the water was tested by repeated (every 5 min) measurement of residual concentrations in a 150 ppm free chlorine solution for 20 min.

RESULTS AND DISCUSSION

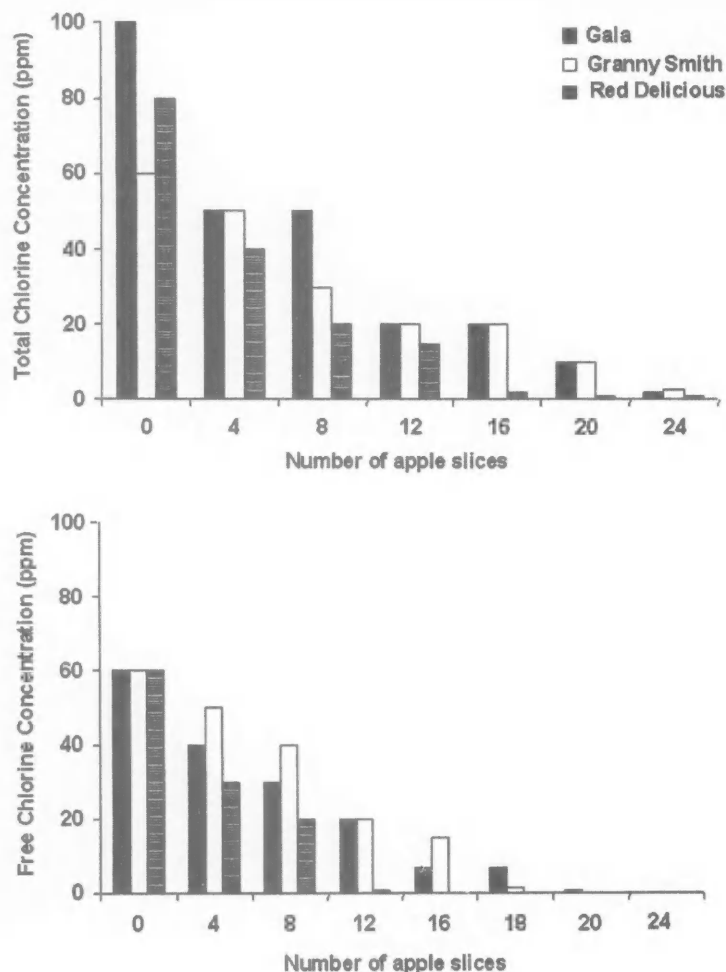
Red Delicious apple slices were stored refrigerated after dipping in water or a 100 ppm sodium hypochlo-

rite solution and treatment with an antibrowning solution. Table 1 shows estimates of total microbial, yeast and mold and Enterobacteriaceae populations on the slices at both storage temperatures. Dipping in the hypochlorite solution prior to application of the antibrowning treatment had no effect on the size and composition of the spoilage microflora after 14 days of storage at both 5° and 10°C. Enterobacteriaceae were detected in only one sample out of the three replicate experiments. Yeast

and mold enumerations yielded low population estimates on slices stored at 10°C and densities below detectable levels in slices stored at 5°C, indicating that aerobic bacteria accounted for the bulk of the microflora. The samples were generally free of evident microbial defects after 14 days in storage. However, evidence of spoilage in the form of random, localized zones of discolored tissue was occasionally noted, particularly in samples stored at 10°C (Fig. 1). In some cases, green or grey areas typical of colors associated with fungal fruiting bodies were visible to the naked eye. Because sporadic visual defects of this nature would severely hinder consumer acceptability of the product, fungal growth may be of greater significance for apple slice quality than growth of bacteria, which made up the bulk of the microflora. Furthermore, dipping of the slices in a 100 ppm sodium hypochlorite solution prior to storage did not prevent the appearance of the problem. It is therefore doubtful that chlorinated water dips could ensure the control of defects associated with fungal growth on packaged apple slices.

Apple slices from three varieties were dipped in 100 ppm sodium hypochlorite solution to establish the fate of chlorine in a simulated batch commercial process. An immediate and rapid reduction in chlorine concentration was evident in all trials, and

FIGURE 2. Residual total and free chlorine concentrations in a solution used for repeated dipping of fresh-cut apple slices



residual free chlorine was reduced to < 2 ppm by the addition of just twenty slices to four l of solution (Fig. 2). The rapid loss of chlorine was probably due to reactions with solutes leaching from the cut apple tissues and could account in part for the limited efficacy of the sanitizing solution for the control of microorganisms on apple slices. The cut surface could also provide protective microenvironments where microbial cells avoided exposure to chlorine, as has been reported in the case of *Salmonella* Montevideo inoculated onto tomatoes (22) and spinach (1). According to the Food Processors Institute (9) free

residual chlorine concentrations between 2 and 7 ppm are required to ensure complete destruction of microorganisms in process water. The high chlorine demand of water used for dipping apple slices would seriously limit the effectiveness of the sanitizing solution. For example, assuming 100 l of a 100 ppm sodium hypochlorite solution was used for dipping and that each apple yields on average eight slices, processing of just 62 apples would deplete the residual chlorine to < 2 ppm. Processing under these conditions would necessitate the constant and frequent addition of sodium hypochlorite just to

maintain levels required to ensure destruction of microorganisms in the wash water. Given that much higher free chlorine concentrations did not remove microorganisms or eliminate fungal growth on stored apple slices, it is evident that dipping in chlorinated water is of little value as a sanitizing treatment for this commodity. In addition, the need for relatively high chlorine concentrations just to achieve disinfection of the solution is problematic due to concerns about the potential toxicity, carcinogenicity and mutagenicity of chloroorganic compounds formed by reaction with food components (13, 21).

Clearly, more effective means for the removal of microorganisms from fresh-cut apple slices and control of their growth in the package are required. The development of appropriate techniques will require consideration of strategies for the removal, destruction or control of fungi, since the latter appear to be responsible for the appearance of primary visual defects in packaged product.

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Spot the Mistake: Television Cooking Shows as a Source of Food Safety Information

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SUMMARY

Consumers receive information on food preparation from a variety of sources. Numerous studies conducted over the past six years demonstrate that television is one of the primary sources for North Americans. This research reports on an examination and categorization of messages that television food and cooking programs provide to viewers about preparing food safely. During June 2002 and 2003, television food and cooking programs were recorded and reviewed, using a defined list of food safety practices based on criteria established by Food Safety Network researchers. Most surveyed programs were shown on Food Network Canada, a specialty cable channel. On average, 30 percent of the programs viewed were produced in Canada, with the remainder produced in the United States or United Kingdom. Sixty hours of content analysis revealed that the programs contained a total of 916 poor food-handling incidents. When negative food handling behaviors were compared to positive food handling behaviors, it was found that for each positive food handling behavior observed, 13 negative behaviors were observed. Common food safety errors included a lack of hand washing, cross-contamination and time-temperature violations. While television food and cooking programs are an entertainment source, there is an opportunity to improve their content so as to promote safe food handling.

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INTRODUCTION

Foodborne illnesses are a continuing concern in North America and around the world (12, 14, 15). Proper food handling practices are an integral component of any strategy to reduce the incidence of foodborne illness from farm to fork. Although many health and food safety professionals are aware of the unsafe practices that lead to foodborne illness, consumers often lack familiarity with safe food handling.

Food safety messages, which are intended to reduce the risk of foodborne illness, should address the factors that lead to the highest incidence of foodborne illness and the most serious consequences (14). Practices that are commonly associated with foodborne illness include inadequate heating, cooking and cooling; obtaining food from unsafe sources; poor personal hygiene; cross contamination; and improper storage of food (3, 14, 18).

Past research has demonstrated that at least one major food safety violation occurs in 75 percent of households; the most frequent critical violations were cross-contamination and neglect of hand washing (22). Other behaviors that might con-

tribute to foodborne illness included misuse of common cloths/sponges/towels and insufficient thermometer use (12, 14, 16). These findings indicate that errors in food handling are common (14), emphasizing the question, where are consumers receiving information about handling food safely?

Television plays a large part in the lives of North Americans, both as an entertainment source and as a source of information. Numerous North American studies have demonstrated that consumers receive food safety information from television (5, 10, 21, 22, 23), and more specifically from television cooking shows (9, 21). The Canadian Food Inspection Agency's (5), 1998 Safe Food Handling Study found that 22 percent of Canadians learn about the proper way to cook, store and handle food from television and radio. A wide range of food safety topics are covered in offerings ranging on television, from news reports to commercial advertisements. However, because of their popularity, uniqueness and availability, television cooking shows serve as a particularly good site for assessing food safety information.

The objectives of this study were two-fold: (1) to determine what information television cooking shows provide about handling food, and (2) to determine the frequency of positive and negative food handling practices on television cooking shows.

MATERIALS AND METHODS

Recording procedures in 2002 and 2003

From June 23 to June 30, 2002, the Food Safety Network recorded television cooking programs. The recorded content consisted of 47 programs from the Food Network Canada, one program from Television Ontario and eight programs from the

United States Public Broadcasting System. Each program was either 30 minutes or one hour in length, and a total of 34 hours of recording was completed.

The recording procedure was repeated between June 17 and June 24, 2003. Because of time constraints and the available programming, television cooking programs were recorded from the Food Network Canada only during the second recording session. The recorded programs consisted of 40 different programs, and a total of 43 hours of recording was completed.

Viewing procedures

As part of a class assignment for a graduate course taught at the University of Guelph, all television cooking programs were viewed by food safety students to help researchers develop an idea of the positive and negative food handling behaviors that occur during cooking shows. The definition of food handling behavior used in the study was: any task or operation that a cooking show host could perform in the process of purchasing, storing, preparing or serving food or cleanup of food preparation areas (14).

Two trained researchers re-watched 30 hours of the recorded material and analyzed the content of the television cooking shows in 2002 and 2003. Given that Canadians watch between 15.5 and 33.5 hours of television per week (19), 30 hours was randomly chosen to represent a snapshot of what some Canadians may be watching on a weekly basis. Researchers analyzed the data independently and prepared for content analysis in two ways. First, they became familiar with positive and negative food handling practices. This included reading journal articles that discuss food handling practices leading to cross contamination in a kitchen environment and ultimately foodborne

outbreaks (2, 3, 4, 6, 7, 8, 11, 13, 14, 16, 18, 20, 24, 25, 26). Second, the analysts clearly defined the basic unit of analysis as a 30-min segment of a television cooking program that represented one or more positive or negative food handling practice. Each 30-minute segment was either an entire program or part of a cooking show. A total of 60 segments in 2002 and 56 segments in 2003 comprised the raw data for the content analysis.

Content analysis

Content analysis employs either deductive or inductive procedures to organize raw data into interpretable and meaningful themes and categories (1). In this research, a deductive approach was applied by using a predetermined set of categories into which observed food handling practices were organized. After the organization was complete, the data were ready for statistical analysis of relationships involving the predetermined categories.

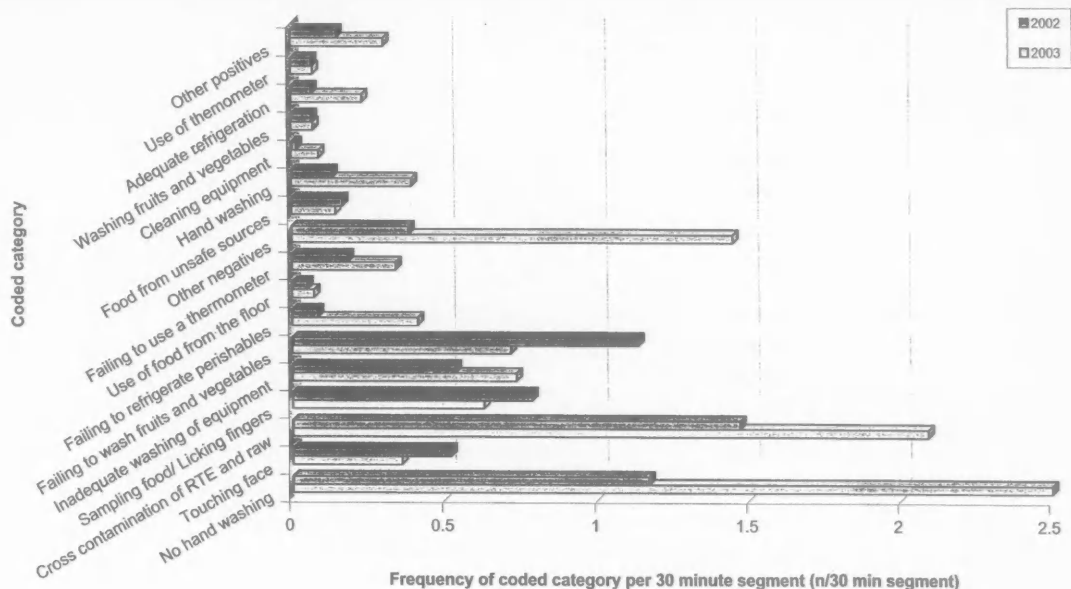
The coded categories were determined based on the five critical food handling behaviors: practice personal hygiene, cook food adequately, avoid cross contamination, keep foods at safe temperatures and avoid unsafe food (14). There were 17 different coded categories, making up 6 positive and 11 negative food-handling themes. Before analysis, the coding scheme was reviewed by members of the Food Safety Network to verify accuracy and completeness. Table 1 displays the coding scheme and definitions of the codes that were used in analysis of the video clips.

While viewing the cooking programs, researchers were aware that many of the necessary steps for meal preparation had been completed before the cooking program was recorded and were implied during the program. The researchers tried to account for this by coding only for

TABLE 1. Coding scheme used to code for positive and negative food handling procedures in television cooking shows

Code Themes	Code Number	Code Definition	Reference(s)
Failure to practice personal hygiene	1	Failing to wash hands under running water, using liquid soap and to dry hands on a paper towel/hand towel before commencing cooking or after handling raw food during cooking	(14, 18, 24)
	2	Touching or wiping face or hair with hands and failing to wash hands afterwards	(8, 24)
	3	Licking fingers or sampling food while cooking and failing to wash hands afterwards	(8, 24)
Cross contamination	4	Failing to separate ready-to-eat food from raw food	(8, 14, 15, 16, 18)
	5	Use of unwashed kitchen equipment (i.e., knives, cutting boards) or inadequate washing of contaminated equipment before use	(8, 14, 15, 18, 25, 26)
	6	Failing to wash fresh fruits and vegetables for RTE meals	(8, 14, 18)
	7	Use of food after it has fallen on the floor or on contaminated counter tops	(8, 15, 18)
Failing to keep food at safe temperatures	8	Failing to refrigerate high risk foods that have been sitting out for extended periods of time	(14, 16)
Failing to cook/cool food adequately	9	Recommending visual cues for doneness or failing to tell cooking temperature and end point temperature	(11, 14, 16)
Use of unsafe food	10	Advising viewer to use food that may possibly cause harm, such as sprouts, raw oysters, unpasteurized liquids and cheeses	(14, 18)
Other negative food handling practices	11	Any other food handling behavior that could possibly cause the food to become unsafe	
Practice personal hygiene	12	Hands are washed in a sink under running water using liquid soap and dried using a paper towel or hand towel	(14, 16)
Prevent cross contamination	13	Cooking utensils and cutting boards are washed using soap and water and dried using a paper towel or tea towel other than the one the chef carries around	(14, 16)
	14	Noticeable washing of fruits and vegetables	(14, 16)
Keeping food at safe temperatures	15	Refrigeration of high risk foods	(14, 16)
Adequate heating	16	Demonstrating or suggesting the use of a meat thermometer during cooking to ensure doneness	(14, 16)
Other positive food	17	Observed or mention of proper food handling	

FIGURE 1. Frequency of observed coded categories in 2002 and 2003



obvious practices or instructions. Once coding was complete, the frequency of each coded category was determined.

RESULTS

The content analysis of 116, television cooking show video segments (30 minutes each) from 2002 and 2003 demonstrates that unsafe food handling practices were occurring frequently and that the rate remained consistent between the two years, as illustrated in Table 2. Observed safe food handling practices increased between 2002 and 2003. Reviewed television cooking shows demonstrate approximately 13 unsafe food handling practices for each safe food handling practice. The most common unsafe food handling practices included inadequate hand washing, cross contamination between raw and ready-to-eat food, failure to wash fresh fruits and vegetables, and inadequate washing of cooking utensils and cutting boards (Fig. 1).

The 17 different food handling behaviors used for coding purposes comprised 6 positive and 11 negative food handling themes. Table 2 displays the frequency of the food handling themes, demonstrating that poor personal hygiene, which occurred approximately four times per 30 minute segment, and cross contamination, which occurred approximately twice per 30 minute segment, were the two most commonly observed food handling behaviors.

DISCUSSION

Personal hygiene

In this study, hand washing was the main behavioral observation made for the theme of personal hygiene. Proper hand washing and drying have been shown to effectively remove contaminating microorganisms from hands so as to reduce the spread of foodborne illness (14, 15). This practice was found to be the most commonly neglected food handling behavior. Poor hand washing practices were observed in 75 percent of the

30-minute segments in 2002 and in 96 percent of the 30-minute segments in 2003. Noticeable attempts to wash hands were observed more frequently in 2003 than in 2002; nonetheless, inadequate hand washing was also more apparent in 2003. In one 30-minute segment, a cooking show host acknowledged that he or she had not washed his or her hands and tried to justify this by saying, "It [failure to wash hands] is okay if no one is looking." Only one host discussed the importance of hand washing and took the time to demonstrate proper hand washing techniques. Despite the fact that the sinks on cooking show sets are often nonfunctional, it is important that cooking show hosts acknowledge the necessity of hand washing, especially before beginning meal preparation and after handling raw meat and poultry.

Cross contamination

The theme of cross contamination is broad and involves a number of different behaviors. Direct and indirect cross contamination behaviors

TABLE 2. Frequency of observed food handling themes in each 30-minute segment

Theme	Percentage of total observed behaviors in 2002* (N=60)**	Percentage of total observed behaviors in 2003 (N=56)
Poor personal hygiene	75.0 (45)	96.4 (54)
Cross contamination	71.7 (43)	85.7 (48)
Keeping food at unsafe temperatures	8.3 (5)	25.0 (14)
Failing to cook foods adequately	16.7 (10)	17.9 (10)
Failing to avoid unsafe food	15 (9)	14.3 (8)
Other negative	28.3 (17)	57.1 (32)
Practice personal hygiene	6.7 (4)	32.1 (18)
Prevent cross contamination	8.3 (5)	14.3 (8)
Keeping food at safe temperatures	6.7 (4)	17.9 (10)
Adequate heating	6.7 (4)	7.1 (4)
Other positives	13.3 (8)	23.2 (13)

*Percentages total more than 100% because some segments displayed more than one theme

** Actual counts in parentheses

were observed in 72 per cent of the 30-minute segments in 2002 and in 86 per cent of the segments in 2003. The most common form of cross contamination observed was failure to separate raw and ready-to-eat foods. These observations indicate a potential risk of transfer of pathogenic organisms from raw food to ready-to-eat foods and kitchen surfaces, which could lead to foodborne illness. Another commonly observed form of cross contamination was inadequate washing of cooking utensils. Other cross contamination observations include the use of raw meat wrappings to wipe off a cutting board that was then used for ready-to-eat food; the use of raw meat contaminated ingredients to make a ready-to-eat sauce; and the use of a spoon to taste test food and then reuse of the spoon, without washing, to add ingredients. The failure to acknowledge and demonstrate the necessary steps to prevent cross

contamination while cooking reinforces the need to improve food safety behaviors and messages on television cooking shows.

Observed temperature control

Assessing the temperature control behaviors of cooking show hosts was a difficult task; therefore, safe temperature control was considered to be the use of a thermometer to determine doneness or the suggestion that a thermometer be used for determining the internal temperature of cooked food. Unsafe temperature control was considered to be advising viewers to use visual indicators (such as color or texture of the meat) as an indicator of doneness of meats and poultry. Previous observational studies have demonstrated that consumers tend to undercook some meat and chicken, and it has been noted that consumers have been observed to rely on visual indicators to determine

doneness (16). This study demonstrates that temperature control also represents a problem with cooking show hosts. While the use of a meat thermometer to determine doneness was observed a total of eight times in all 120 cooking show segments, the advice to use color as an indicator of doneness was three times more commonly observed.

Avoiding unsafe food

It was difficult to determine whether or not chefs were avoiding food from unsafe sources because most of the food was pre-purchased and prepared before the show was aired. However, researchers were able to observe whether or not hosts avoided foods that are considered unsafe. Although avoiding unsafe food occurred infrequently, some hosts advised viewers to use food that is considered unsafe. Foods such as

bean sprouts, raw oysters, raw fish, unpasteurized apple cider and kava, an herbal ingredient associated with liver toxicity, were mentioned (4). During one segment the cooking show host prepared a meal of raw oysters and raw fish for a group of young children under the age of 10. If cooking shows wish to use ingredients that could cause health problems, viewers should be made aware of the potential problems associated with foods such as sprouts and raw oysters and informed of proper handling practices, including proper hand washing, refrigeration storage and prevention of cross contamination (18).

“Other” category

The purpose of the negative and positive “other” categories was to account for any noteworthy food handling behaviors not described by any other coded category. Behaviors that fell into the negative “other” category included the use of a knife as a fly swatter, hang drying of ready-to-eat food on the kitchen faucet and use of teeth to squeeze a lemon. Although many of the behaviors in the negative “other” category are extreme, if they are practiced, a high risk potential of foodborne illness can be associated with many of them. The positive “other” category included behaviors such as hosts being scolded for double-dipping off-camera and the demonstration of the proper way to preserve food at home.

Although it is not possible to compare the results of this study directly to the results of consumer food handling behavioral studies, the food handling mistakes commonly observed on television are commonly made by consumers as well. This study demonstrates that the mistakes most frequently made by cooking show hosts include inadequate hand washing and possible cross contamination from the failure of chefs to wash and separate equipment and to

separate raw from ready-to-eat food. Consumer studies demonstrate that common food handling mistakes include inadequate hand washing and cross contamination from consumers failing to separate their equipment, to separate raw from ready-to-eat foods, and to clean cooking utensils adequately (8, 18). This similarity suggests not only that cooking show personalities display food handling mistakes similar to those of consumers (their potential viewers), but that there is a possibility that some consumers are developing poor food handling behaviors based on the instructions from television cooking programs (although this cannot be determined from the present study).

CONCLUSIONS

The purpose of this study was to assess the frequency and accuracy of direct and indirect food safety messages provided by a sample of television cooking shows. Based on this limited sample of televised cooking shows, the results suggest that food handling behaviors on cooking programs could be improved. The frequency of cross contamination and lack of hand washing emphasizes this need for improvement.

Because these programs are a source of not only information but also entertainment, it is understood that many safe food handling practices may be neglected because of time constraints or because some may feel that such practices make the program less interesting to watch. With regard to time, food safety messages need not always come in the form of an observed practice. A simple reminder to wash hands after handling raw meat may be just as effective as an actual demonstration of hand washing.

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Gary R. Acuff

Elected IAFP Secretary



The International Association for Food Protection welcomes Gary R. Acuff to the Executive Board as Secretary. Dr. Acuff will take office at the conclusion of the Awards Banquet at IAFP 2004, the Association's 91st Annual Meeting in Phoenix, Arizona. By accepting this position, he made a five-year commitment to the Association and will begin his term as President in 2007.

Dr. Acuff currently holds the title of Professor of Food Microbiology and serves as the Section Leader for Food Science in the Department of Animal Science at Texas A&M University. He has been a member of the faculty for 18 years, and in 2001 was designated a Faculty Fellow for research leadership in the Texas Agricultural Experiment Station.

Dr. Acuff's research has focused on improving the microbiological quality and safety of beef in all areas of production and utilization, including cattle feeding and holding, slaughter/processing, fabrication, cooking, packaging, retail distribution, and consumer handling.

Additional research interests have included characterizing the presence of *Campylobacter jejuni* in turkey processing, improving shelf life of Texas Gulf shrimp, evaluating the heat resistance of *Escherichia coli* O157:H7 in hamburger patties, determining the significance of *Helicobacter pylori* in food and, recently, several research projects have investigated microbiological hazards associated with fresh produce in Texas and Mexico. Dr. Acuff has authored or co-authored over 80 research publications in refereed scientific journals and 10 chapters in various references and textbooks. He recently served on the Editorial Committee of the 4th edition of the *Compendium of Methods for the Microbiological Examination of Foods*.

Since joining the food science teaching faculty at Texas A&M University, Dr. Acuff has taught graduate and undergraduate food microbiology courses and has participated as a team instructor in courses on the Hazard Analysis Critical Control Point (HACCP) system. He served as Chair of the Intercollegiate Faculty of Food Science from 1994 to 1997. In the 13 years that he has been teaching undergraduate food bacteriology, over 3,500 students have taken his class (and most have passed!). Dr. Acuff currently supervises several graduate students, and over his career has served as major professor for 20 students seeking a Master of Science and 8 students pursuing a Doctor of Philosophy.

Dr. Acuff was appointed to the National Advisory Committee on Microbiological Criteria for Food (NACMCF) in 1992 and continued to serve as a member for six years. He is an active member of the American Society for Microbiology and was elected to chair the Food Microbiology Division (Division P) in 1999. Dr. Acuff is also a member of the Institute of Food Technologists and the Society for Applied Microbiology. He has been a member of IAFP since 1982, has served on the Program Committee since 2001, and is currently the Program Committee Chair for the 2004 Annual Meeting in Phoenix, Arizona. He also is a member of the Meat and Poultry Safety and Quality Professional Development Group (PDG). Dr. Acuff has participated as a member of the Editorial Board of the *Journal of Food Protection* since 1994.

Dr. Acuff obtained his B.S. in Biology from Abilene Christian University in 1980 and his M.S. and Ph.D. in Food Science and Technology, specializing in Food Microbiology, from Texas A&M University in 1982 and 1985, respectively.

Congratulations!



Call for Symposia

IAFP 2005

August 14-17, 2005

Baltimore, Maryland

The Program Committee invites International Association for Food Protection Members and other interested individuals to submit a symposium proposal for presentation during IAFP 2005, August 14-17, 2005 in Baltimore, Maryland.

WHAT IS A SYMPOSIUM?

A symposium is an organized, 3 1/2 hour session emphasizing a central theme relating to food safety and usually consists of six 30-minute presentations by each presenter and a 30-minute break. It may be a discussion emphasizing a scientific aspect of a common food safety and quality topic, issues of general interest relating to food safety and quality, a report of recent developments, an update of state-of-the-art materials, or a discussion of results of basic research in a given area. The material covered should include current work and the newest findings. Symposia will be evaluated by the Program Committee for relevance to current science and to Association Members. Proposals may be prepared by individuals, committees, or professional development groups.

SUBMISSION GUIDELINES

To submit a symposium, complete the Symposium Proposal form in its entirety. When submitting a proposal, the presenters do not need to be confirmed, only identified. Confirmation of presenters takes place after acceptance of your symposium.

SYMPOSIUM PROPOSAL DEADLINE

Proposals may be sent to the Association office no later than August 2, 2004 or be presented to the Program Committee at its meeting on Sunday, August 8, 2004 in Phoenix, Arizona.

The Program Committee will review submitted symposia. Organizers will be notified as to the status of their proposal by September 2004. Symposia will be accepted for further development or rejected. Accepted symposia are required to be finalized and sent to the IAFP office by January 11, 2005. The Program Committee has the final decision whether the finalized symposia will be accepted for presentation at IAFP 2005. The organizer will be notified of the final results by February 2005.

PRESENTERS WHO ARE NOT MEMBERS

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

ASSOCIATION FOUNDATION SPONSORSHIP

The International Association for Food Protection Foundation has limited funds for travel sponsorship of presenters. After formal acceptance of the symposium, symposia organizers may make requests in writing to the Program Committee Chairperson. Requests are reviewed on an individual and first-come-first-served basis. The maximum funding grant will be \$500 per symposium. Organizers are welcome to seek funding from other sources and the Association will provide recognition for these groups in our program materials. Organizers are asked to inform the Association if they obtain outside funding.

HAVE AN IDEA BUT YOU ARE UNABLE TO ORGANIZE IT?

Many Association Members have excellent suggestions for symposia topics, but are unable to organize the session. Such ideas are extremely valuable and are welcome. If you have an idea for a symposium topic, please contact Bev Brannen. Symposia topics are among the most valuable contribution an Association Member can make to enhance the quality of our Annual Meeting.

WHO TO CONTACT:

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Symposium Proposal

IAFP 2005

August 14-17, 2005

Baltimore, Maryland

Title: _____

Organizer's Name: _____

Address: _____

Phone: _____ Fax: _____ E-mail: _____

Topic – Suggested Presenter, Affiliation

(Example: 1. HACCP Implementation – John Smith, University of Georgia)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Suggested Convenors:

Description of Audience: _____

Signature of Organizer: _____

Submit by August 2, 2004 to:

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Submit in person on August 8, 2004 to:

Program Committee – IAFP 2004
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Canadian Food Inspection Agency
Vancouver, British Columbia

Rebecca A. Guy
University of Toronto at Mississauga
Mississauga, Ontario

Dan Richen
Health Authority 5
Drumheller, Alberta

David Tseng
Canadian Springs Water Co.
Richmond, British Columbia

GERMANY

Erwin Maertlbauer
Ludwig-Maximilians Universitat
Munich

Manfred Metzler
University of Karlsruhe
Karlsruhe

JAPAN

Takanao Kanki
International Reagent Corp.
Kobe, Hyogo

Yukifumi Konagaya
Niigata University of Pharmacy
and Applied Life Sciences
Niitsu, Niigata

NEW ZEALAND

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Food Tech Solutions Ltd.
Howick, Auckland

SOUTH KOREA

Sun-mi Han
Panmun Food Laboratory
Seoul

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Oxoid Ltd.
Basingstoke, Hants

Peter J. Stephens
Oxoid Ltd.
Basingstoke, Hampshire

UNITED STATES

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Wal-Mart Stores, Inc.
Bella Vista

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US Army
APO, AE

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Central Valley Meat
Hanford

Kristen Dahl
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Odwalla
Dinuba

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State of California
San Dimas

Glenn E. Hatcher
Pacific Cheese
Hayward

Ryan T. Mills
Rockview Farms
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John T. Sakai
AMCO Incorporated
Burlingame

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GEORGIA

Jennifer M. Scott-Ward
Church's Chicken
Atlanta

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Wheaton

Patrick J. Krakar
ConAgra Foods
Downers Grove

Paul A. Traci
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Naperville

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A. Scott Gillian
Indiana Environmental Health
Association
Indianapolis

Charles R. Santerre
Purdue University
West Lafayette

KANSAS

Amit V. Apte
Kansas State University
Manhattan

NEW MEMBERS

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Tony D. White
Mercer Co. Health Dept.
Harrodsburg

MARYLAND

Joan B. Lewis
JBL Nutrition Services
District Heights

MISSOURI

Michele M. Senne
Sara Lee Bakery Group
St. Louis

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Toshie Sakuma
University of Nevada-Reno
Reno

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James L. Budd
Prepckek Food Safety
Seaville

Yun Hee Chang
Myong Ji University
Edison

Benito Falco
Florham Park

NEW YORK

Michael J. Cambridge
New York State Dept. of Health
Troy

Amanda J. LaCoste
Kraft Foods
Tarrytown

Yeu-Harn L. Tsai
Cornell University
Ithaca

NORTH CAROLINA

Somphavanh Phetsomphou
North Carolina A & T State University
Greensboro

NORTH DAKOTA

Anuradha Boddeda
North Dakota State University
Fargo

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David Hammond
Chemserve Inc.
Lincoln University

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Sherry B. Davis
Sealed Air Corp.
Duncan

SOUTH DAKOTA

Richard A. Jochum
BPI Technology, Inc.
Dakota Dunes

TEXAS

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Supply Systems
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William S. Sparks
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Clemence Technical Services
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Jill Losinski
Gold'n Plump
Middleton

UPDATES

New Third-party Verification Program Highlights Historic Year for 3-A Sanitary Standards

The Board of Directors of 3-A Sanitary Standards, Inc. recently elected Mr. David Tharp (International Association for Food Protection) vice chair for 2004. Mr. Greg Marconnet (Kraft Foods) was elected treasurer and Dr. Warren S. Clark, Jr. (3-A Symbol Administrative Council) was elected secretary. Dr. Stephen Perry (International Association of Food Industry Suppliers) will continue as chair for 2004.

The officers for 2004 were announced during a meeting of the Board of Directors on March 3 in Alexandria, VA. The elected leaders will build on a foundation of accomplishments during the first full year of operation of the new organization. During the first year of operation, 3-A SSI launched a new Third Party Verification (TPV) program and a related credentialing program for independent equipment inspectors, known as Certified Conformance Evaluators (CCEs). A total of 30 CCEs attained the new credential since last July and a growing number of independent equipment inspections are now underway in the new TPV program.

The new TPV program opened a new era in the acceptance and integrity of the 3-A Symbol, which is widely recognized by regulatory sanitarians, equipment fabricators and processors as the "benchmark" for hygienic equipment design and cleanliness. Equipment built to 3-A Standards is used in a wide range of dairy and food processing applications. Since the 3-A symbol was introduced in 1956, the use of the

symbol was based on a system of self-certification. Moving the 3-A Symbol to a new system of third party inspection was a major mission objective of the 3-A SSI Founding Member Organizations in 2003. In 2003, 3-A SSI also initiated the first major expansion of 3-A Standards outside of the dairy and food processing industries with a major project to develop new Pharmaceutical Equipment (P3-A) Standards.

Looking ahead in 2004, 3-A SSI will focus on the first full year of implementation of the TPV program. The integration of all equipment groups in the 3-A Symbol program is scheduled through 2006. Other key objectives for 3-A SSI in 2004 are the modernization of 3-A standards development procedures and expanded recognition and acceptance of 3-A Standards and Accepted Practices.

Chr. Hansen Appoints Two New Directors of Sales for Food and Beverage and Meat and Prepared Foods

Hurl Minnig joins Chr. Hansen, Inc. as director of sales for food and beverage. He will direct the company's efforts in driving sales of the entire Chr. Hansen product portfolio to the beverage, bakery, cereal and confectionery market segments in the United States.

Mr. Minnig has over 28 years of sales and marketing management and direct sales experience, with 15 of those years in the industrial food ingredient business. He comes to Chr. Hansen from Sensient Flavors, Inc. where he was the director of sales for the US dairy industry segment. Prior to that he worked for FMC Corporation, Dexter Corporation and Astaris,

LLC, a joint venture between FMC Corporation and Solutia. Mr. Minnig has a BA in psychology from Auburn University.

Teresa Supnet-Rosa joins Chr. Hansen as director of sales for meat and prepared foods. She will direct the company's efforts in advancing sales of the entire Chr. Hansen product portfolio to the meat and poultry, soup and sauce, snack, and food service market segments in the US.

Ms. Supnet-Rosa has been in sales management and direct sales within the food ingredients industry for 12 years, with an additional seven years in product development. She joins Chr. Hansen from Kerry, Inc., where she was the director of sales for their specialty ingredients division, and responsible for the sales of ingredients to the industrial, private label, branded label, and food service segments of the US food industry. Prior to that, she worked for McCormick & Company, Inc., as account manager and senior food technologist. She holds a BS in nutrition and food science from the University of California-Berkeley, and an MBA from St. Mary's College in Moraga, CA.

Additionally, Chr. Hansen promotes three members of their Food and Beverage and Meat and Prepared Foods sales teams. Karen Spartz, Al Giannantonio and Todd Strahm are promoted to senior account managers.

Dr. Robert Delmore, Jr. Joins California Polytechnic State University

Dr. Robert Delmore, Jr. has joined the faculty in the animal science department at California Polytechnic State University at San Luis Obispo.

New EU Centre for Disease Prevention and Control Adopted

The Council of Ministers agreed on the Commission's proposal to create a new European Centre for Disease Prevention and Control (ECDC). This is the final step in the process which began in July 2003 when the commission presented the draft law to create the ECDC (see IP/03/1091). Parliament and Council recognized the importance of the new agency and put the law on a legislative fast track. The two institutions have worked with the commission to enable the law creating the ECDC to be adopted after just one reading in the European Parliament. Work will start later this year on creating a management board for the agency. The ECDC is on course to become operational in 2005. The EU summit in December 2003 decided that the ECDC will be based in Sweden and the Swedish government has chosen Stockholm for its location.

Health and Consumer Protection Commissioner David Byrne said, "I am very pleased that we have all been able to move forward quickly to provide European citizens with better protection for any future epidemics. The lessons we learned during the outbreaks of SARS in 2003 and bird flu this year have been acted upon. Infectious diseases can pose a deadly threat—and they do not respect national borders. This new EU agency will enable Europe to be better prepared for future epidemics. The fact that this legislation was agreed in record time of just eight months

shows that Europeans can act quickly and effectively when called on. There is strength in unity."

Though the EU has a system for the Europe-wide epidemiological surveillance of infectious diseases (see: MEMO/03/155) cooperation on investigating and controlling disease is largely ad hoc. For example, the small EU team sent to help the WHO investigate avian influenza in Vietnam (see IP/04/165) is part of an EU project to train disease investigation experts. The EU expert group on SARS created during the outbreak in spring 2003 was put together under the European Communicable Disease Network. While these have been good short term solutions, they are not sustainable in the long term. The ECDC will enable Europe to pool its disease control expertise more effectively, allowing EU disease outbreak investigation teams to be put together quickly and efficiently. The Centre will ensure the results of their investigations are available to the public health authorities around the EU. And it will produce authoritative advice and recommendations to guide EU and national decision makers.

There is already a wealth of scientific expertise in the Member States' public health institutes. The aim of the proposed ECDC is to network this expertise and to facilitate coordination between the Member State institutes. The Centre itself will have a relatively small core staff (probably around 30 to 40 to start off with).

However, it will tap into, and draw together the expertise of hundreds of scientists around Europe. The core of this network is already in place. Europe's communi-

cable disease network already links experts monitoring specific diseases or following specific issues such as antimicrobial resistance (see MEMO/03/155).

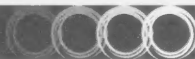
As the Centre takes over the operation of these networks, it will make use of the expertise and working relationships they have already established. The ECDC will also assist the work on monitoring and preparedness planning against bioterrorist attacks that has been pursued by the EU's Health Security Task Force (see MEMO/02/122).

The initial focus of the Centre will be on communicable diseases and outbreaks of disease of unknown origin. After it has been operating for three years the work of the Centre will be reviewed by an external evaluator. Following this review, and also future reviews of the Centre's work, the EU may decide to extend the ECDC's remit to cover other activities in the field of public health, such as health monitoring.

Preparatory work on the creation of the Centre will start later this year. A management board, composed of member state, commission and European Parliament representatives, will need to be established and the search for a director of the agency begun. The Centre is on course to become operational in 2005.

The European Council in Brussels in December decided that the ECDC will be based in Sweden and the Swedish government has chosen Stockholm for its location.

For further information, see http://europa.eu.int/comm/health/ph_overview/strategy/ecdc/ecdc_en.htm.



FDA Releases Acrylamide Data and Final Acrylamide Action Plan

The Food and Drug Administration (FDA) has released new data on acrylamide levels in more than 750 new food samples. These data expand the agency's ability to assess the extent to which this chemical is present in the food supply and its public health impact. In addition, the FDA has made available the final version of its action plan to evaluate the risk associated with acrylamide and examine ways to potentially reduce levels of acrylamide in food.

The chemical acrylamide was reported in food in April 2002 by Swedish scientists. Acrylamide is a natural byproduct in certain carbohydrate-rich foods that forms when these foods are fried, baked, or roasted at high temperatures. Although initial reports of acrylamide's presence in some foods raised concerns because of possible links with increased risk of cancer in some laboratory animals, it was largely unknown how pervasive it was in the food supply, and its true public health significance for humans. To date, acrylamide is known to cause cancer and reproductive problems in animals at high doses and is a neurotoxin in humans at high doses. Based on the current understanding of the science, FDA continues to advise consumers to eat a balanced diet, choosing a variety of foods that are low in trans and saturated fat and rich in high fiber grains, fruits and vegetables.

Since 2002, FDA has released an Action Plan to guide activities on acrylamide; performed research in the areas of methodology, toxicology, and acrylamide formation; and

periodically released new data on acrylamide levels in food. These new data results almost triple FDA's database of acrylamide levels in food. The new data are consistent with previous findings showing higher levels of acrylamide in potato-based and other carbohydrate-rich products processed at high temperatures and lower levels of acrylamide in dairy foods and infant formulas. The novel finding in the most recent sampling is the presence of acrylamide in black olives, prune juice and Postum, a powdered beverage.

"Acrylamide is an issue that FDA has followed very closely and has made rapid progress in understanding the science. The action plan and the new samples illustrate FDA's proactive stance with the issue of acrylamide in food, which until recently was relatively unknown in foods," said FDA Deputy Commissioner Lester M. Crawford, D.V.M., Ph.D.

FDA is expanding its acrylamide testing program and plans to conduct tests on approximately 40 new infant formula samples. Although results from other infant formula samples tested by FDA indicated the products contain no acrylamide or trace amounts of acrylamide, the FDA will conduct further tests because of the importance of formula as a sole source food for many infants.

Most of the new data were taken from samples used as part of the FDA's FY03 Total Diet Study (TDS) survey. The TDS is an ongoing FDA program that determines levels of various contaminants and nutrients in more than 200 core foods (ready-to-eat) in the US diet. Foods are collected from grocery stores and fast food restaurants and prepared table ready (i.e., cooked if required by TDS recipe) for analysis. Looking at the level of acrylamide in

these foods will more accurately assess exposure to the US consumer.

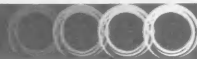
The final version of the Action Plan for Acrylamide in Food reflects the progress of research on acrylamide at FDA and the recommendations from a 2003 Food Advisory Committee meeting. In response to the committee's recommendations, the action plan contains more details about planned toxicology and epidemiology studies, risk communication activities, and coordination of acrylamide research. Specifically, the action plan addresses details on study timelines; the rationale for the use of brand-name data versus blinded data; and plans to incorporate factors such as ethnic and geographic groups into future exposure assessments.

FDA will share its expanded insights on acrylamide with the scientific community through the publication. In contribution to the acrylamide research community, the FDA is also citing publication of two recent research papers on FDA's methodology for measuring acrylamide and analytical issues associated with measuring acrylamide in coffee, a technically challenging food matrix. In addition, FDA's National Center for Toxicological Research (NCTR) has completed the first two of a series of studies, to support FDA's risk assessment, in its research initiative on acrylamide toxicology.

FDA's final action plan for acrylamide in food and new sampling data can be found at <http://www.cfsan.fda.gov/~lrd/pestadd.html#acrylamide>.

Test Detects *Brucella* Bacteria in Goat Milk

Goat milk sold in the United States may soon be better protected against brucellosis-causing bacteria, thanks to



recent research conducted by two US Department of Agriculture agencies in Ames, IA. A test for detecting the bacteria *Brucella melitensis* in bulk goat milk has been developed by research chemist Louisa Tabatabai of the Agricultural Research Service's National Animal Disease Center (NADC), Barbara Martin of the Animal and Plant Health Inspection Service's (APHIS) National Veterinary Services Laboratories, and graduate student Nathan Funk of Iowa State University. The test relies on an adaptation of an enzyme-linked immunoassay (ELISA) that Tabatabai helped develop in 1984 for testing cattle for *B. abortus*, *B. melitensis*, one of six known species of *Brucella* bacteria that induce abortions in animals, mainly infects sheep and goats. In humans, *B. melitensis* infection causes Malta fever, which is characterized by fever and headaches.

Few cases of this infection in goats have occurred in the United States since 1972. But it is essential that vigilance be maintained to prevent introductions of the bacteria into the country. *B. melitensis* is particularly common in Latin America, central and southwest Asia, and the Mediterranean region.

Dairy goat milk is slowly gaining popularity due to its high protein and low cholesterol levels, as well as its compatibility for people with intolerance to cow's milk. About 1 million goats are raised for milk and cheese production in the United States.

In the studies, the assay which detects *B. melitensis* antibodies identified one goat with a high concentration of infection in a herd of more than 1,600 animals, and one goat with a low concentration in a herd of 50 animals. It also correctly

identified all 13 positive and 134 negative bulk milk samples tested. The researchers recommend that herds be sampled in groups of 50 animals or less for bulk milk testing. Tabatabai is in the NADC's Respiratory Diseases of Livestock Research Unit. ARS is the USDA's chief scientific research agency, while APHIS protects and promotes US agricultural health.

Safefood Delivers Some Chilling News for Irish Consumers

Safefood, the Food Safety Promotion Board will launch a nationwide advertising and direct marketing campaign with the specific aim of distributing fridge thermometers to households across the island of Ireland. The decision to implement this novel campaign came as preliminary data from safefood-commissioned research indicated that over half the domestic fridges surveyed were operating above the maximum recommended temperature of 5°C.

Speaking about the initiative, Martin Higgins, chief executive, Safefood said, "It's often difficult to tell precisely what temperature your fridge is, because so few appliances incorporate thermometers. We hope that this initiative will encourage the public to set their fridges to operate at 5°C or below and in turn reduce the risk of poisoning themselves or their families. We are inviting members of the public to contact Safefood for their free thermometer. Consumers can in turn, do us a favor by letting us know how they are getting along with the thermometers we send them. This will allow us to create, on a mass scale, a clear picture of actual domestic fridge temperature.

In the meantime consumers can use the devices to keep themselves and their families safe from food poisoning."

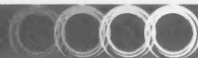
The thermometer give-away is a joint initiative with Food Group Glanbia, who are happy to work with Safefood in ensuring that the thermometers are distributed widely to households across the island.

Salmonella in Eggs Down, Survey Shows

Salmonella levels in UK-produced eggs are now a third of what they were in 1996, a Food Standards Agency published survey shows. Dr. Judith Hilton, head of microbiological safety at the FSA, said, "This is very reassuring and good news for the consumer. Basically, if you're buying UK-produced eggs from shops and markets, the possibility of any *Salmonella* contamination is very low indeed and significantly lower today than in the mid-1990s."

"The UK egg industry is to be congratulated on the excellent progress made." According to the survey, which sampled UK-produced eggs on sale in shops and markets, one in every 290 boxes of six eggs on sale has any *Salmonella* contamination, compared with one in 100 in a 1995/96 survey. All types of retail eggs were included in the latest survey. Eggs from chickens in cages accounted for 50% of total eggs sampled, free-range eggs 16.9%, barn eggs 16.5% and organic eggs 16.6%.

There were no statistically significant differences in the number of contaminated boxes from England, Northern Ireland, Scotland and Wales, or between eggs from the different production types or



schemes. As the survey shows, although the chances of eggs being contaminated are now very low, eggs cannot be guaranteed to be *Salmonella*-free, whatever the source or type.

This is particularly important for vulnerable groups, such as older people, babies and toddlers, pregnant women, and people who are already unwell and more vulnerable to infection. These groups should continue to ensure that the eggs they eat are cooked thoroughly to minimize the risk of food poisoning. Cooking eggs properly will kill any bacteria.

Edible Film Protects Poultry from *Campylobacter*

To knock down the advance of the pathogen *Campylobacter jejuni* on raw chicken, Food Safety Consortium scientists Marlene Janes at the Louisiana State University Agricultural Center and Michael Johnson at the University of Arkansas have found that a coating of an invisible edible film on the chicken's surface significantly reduces the level of contamination. The edible film is most effective when it consists of a combination of three antimicrobial agents: two proteins — zein and nisin — and the compound EDTA, which does the lion's share of the work in killing the pathogens. EDTA (ethylene diamine tetraacetate) is a chelating agent, which means it binds to many different metal ions and prevents them from reacting with any other chemical that might be present. It is often used to clean

people's arteries of toxic metals in the bloodstream

"Zein by itself, EDTA by itself and nisin by itself has some benefit," explained Johnson, a food science professor at the UA Division of Agriculture. "But when the three compounds are combined you have your most effective treatment at refrigerator temperatures. It's like putting multiple blockers out there in football to keep the bacteria from ever getting out."

Janes' and Johnson's experiments showed that the EDTA treatment delivered the most killing power to the cocktail. Zein on its own doesn't have much killing power, but adding zein to the mix provided the way to deliver the killing agent.

"It's a food coating to give prolonged contact with the food surface," Johnson said. "We're using edible films to wrap chicken and provide a way for the delivery of antimicrobial treatments."

Raw poultry is susceptible to bacterial contamination during raw processing and this contamination can persist when such products are refrigerated at temperatures just above freezing, about 2 to 4°C. *Campylobacter jejuni*, the leading cause of bacterial diarrhea, is a leading source of contamination in these circumstances.

Janes, who is now an assistant professor at LSU's Ag Center food science department, said individual companies that want to use the cocktail's ingredients already approved for use in other food products can receive approval to extend it to raw poultry by filing a petition with the US Department

of Agriculture Food Safety and Inspection Service. "Companies are looking at this as a control measure," Janes said. "They see that it's something they can easily do."

Much of the poultry market today consists of value-added chicken that only needs to be heated in the oven. Adequate cooking will kill pathogens. Raw poultry, however, is still a popular item in kitchens. If it comes out of the refrigerator with *Campylobacter jejuni* on the surface, heat will kill the pathogens in the oven, but there remains the danger of cross-contamination while the uncooked product is on the counter being prepared for the oven.

"We have to beware of people being careless in the kitchen with the raw chicken," Johnson said. "They may fully cook the chicken, but did they disinfect their hands after handling the raw chicken and before making the salad or handling the rolls? If the consumer didn't take the precautions, raw poultry that has been treated with the invisible film and EDTA would be a safer bet to help avoid foodborne illness from this pathogen."

Previous research by Janes and Johnson has found ways to use similar antimicrobial wrappers of zein and nisin to protect ready-to-eat cooked poultry from *Listeria monocytogenes*, a deadly pathogen for which federal regulators have declared zero tolerance.

"But *Listeria* isn't a major threat on raw poultry as it is on ready-to-eat products. *Listeria* thrives best where it doesn't have much competition from other bacteria and it likes cold places like the refrigerator," Johnson said.

INDUSTRY PRODUCTS



Advanced Instruments, Inc.

Spiral Biotech Introduces Color QCount™ Colony Counter

Spiral Biotech, a company in microbiology solutions for food, dairy, and environmental sciences, has introduced the Color QCount colony counter. The new system provides rapid color bacterial colony screening without the additional cost of purchasing color-differentiated counting systems.

The Color QCount unit incorporates a high-resolution digital CCD camera and advanced software to identify and colorize even the most difficult bacterial strains to count, such as *Streptococcus pneumoniae* and *Listeria* species.

"This high-performance, high-throughput instrument is ideally suited for food testing laboratories counting *E. coli* and *Listeria* and for pharmaceutical labs detecting *Strep pneumo* on blood agar," said Anthony Pappas,

product manager, Spiral Biotech. "With total plate analysis time, including overlapping colony clusters of less than one second, a laboratory can easily process and count up to 400 plates per hour."

Other instrument features include:

- Innovative lighting configuration that assures uniform illumination and enhanced colony contrast
- Patented Advanced Image Analysis that detects colonies by examining subtle shifts in colony or cluster tone
- Autothresholding Software that automatically determines the threshold of agar background color
- Flexible data management that compiles GLP-compliant data and saves it to a spreadsheet or CD-ROM to satisfy regulatory and auditing requirements
- Editing capability that saves each plate image in a database for printing or re-analysis

"The Color QCount colony counter exemplifies our commitment to aggressive product development and represents the first step in a new platform of analytical instruments," said Pappas. "This introduction strongly positions Spiral Biotech for future product line expansion and growth."

Advanced Instruments, Inc.
Norwood, MA
800.225.4034
www.spiralbiotech.com

ATS RheoSystems Has Introduced Its NEW Stresstech HR Rheometer

The New Stresstech HR Rheometer is equipped with novel UV Cure Monitoring Accessory and proprietary Fast Oscillation Data Acquisition Software.

The instrument utilizes the integrated light triggering capability and data collection rates greater than 100 points/s, along with combined shrinkage measurements for monitoring the real-time cure profiling of light activated DNS materials. The information is critical to optimizing formulations and processing conditions, and predicting product performance and acceptance.

Reology, the science of dealing with the flow and deformation of materials, provides a link between the chemistry of the samples and its processing and performance qualities, including line speed, cure time, shrinkage, and ultimate mechanical strength.

The new rheometer utilizes Fast Oscillation Data Analysis which allows for real-time UV cure profiling and shrinkage determination by providing the ability to capture the rapid, transient changes in the material.

The Stresstech HR Rheometer along with the RheoExplorer V5 software is designed to allow accurate measurements of DNS materials which typically exhibit shrinkage of 10-15% while curing.

ATS Rheosystems
Bordertown, NJ
609.298.2522

www.atsrheosystems.com

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

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Arrowsight Video Auditing Service Aims to Improve Safety, Security and Employee Compliance at Food Processing Plants

Arrowsight, a developer of remote viewing services and software, has introduced a new video auditing service that promises to dramatically improve safety, security and employee compliance at food processing plants.

The Arrowsight Video Auditing Service monitors the performance of employees at the critical control points within a food processing plant and sends managers weekly e-mail "score cards" summarizing each individual location's performance on a pass/fail basis. These reports contain pass/fail hyper links to video clips and still images, providing visual documentation of the events uncovered by the auditing service.

E-mailed video audit reports help managers identify whether critical food safety regulations in food plants have been followed, and whether plant security procedures are being met.

"Video auditing can improve food safety and ensure the viability of a company and its products," said Dr. Al Baroudi, president, Food Safety Institute, international and food safety, auditing and animal welfare consultant to Hidden Villa Ranch, Yum Brands!, Vons (division of Safeway) and other companies.

Arrowsight's software incorporates Hazard Analysis Critical Control Point (HACCP), sanitation and food safety criteria and integrates a plant's existing security and food monitoring systems, including digital video recorders and food processors. The service provides access to video from any Intellex® digital video recorder on a corporate network.

Customers are provided with a secure Web site where they can view

live or recorded video, control digital video recorders and cameras, save video to local hard drives and share video by e-mailing links and comments.

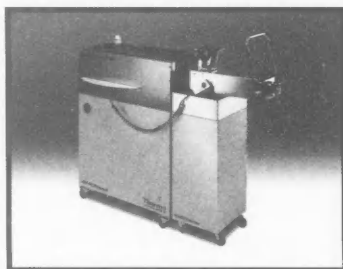
Arrowsight's Video Auditing Service has been successfully used at retail, grocery and fast-food locations to monitor drive-thru wait times, food waste and employee productivity.

Arrowsight

New York, NY

212.869.8282

www.arrowsight.com



Thermo Electron Corporation

Rheomex Ptw24p Emulates Virtually Any Processing Task

Thermo Material Characterization introduces the new Thermo Haake Rheomex Ptw24p. This 24 mm parallel twin-screw extrusion system is designed to be used with the Thermo Haake PolyLab Torque Rheometer. It can handle continuous compounding tasks in both laboratories and pilot plants. Flexibility in barrel layout, screw geometry, and post extrusion ancillaries allow the Ptw24p to emulate virtually any processing task. The clamshell-opening feature makes cleaning quick and easy.

When combined with the measurement and data handling capabilities of the Thermo Haake PolyLab System, it can provide rheological information, processing parameters,

and sample preparation — all of which speed scale-up, improve quality, and lower costs.

The Ptw24p has a bore diameter of 24 mm and the clamshell-designed, segmented extruder barrels are configurable in lengths of 40, 28, and 24 l/d designs. The screw speed range is 0-400 rpm. The temperature range is up to 400°C and the extrusion pressure is up to 100 kg/cm² (1500 psi). An extensive toolkit is also supplied with the system.

Thermo Electron Corporation

Waltham, MA

781.622.1000

www.thermo.com

Ecolab Exxelerate™ Program Provides Reduction in Water, Cleaning Time, and Overall Costs

Fluid milk processors have reason to choose Ecolab's Exxelerate program to increase their milk production while reducing their total cost per gallon. The Exxelerate program has been very successful in the cheese manufacturing industry, helping processors to increase production capacity by reducing cleaning times, plus saving water and energy.

Exxelerate CIP, a premium liquid, chlorinated detergent with a unique chlorine-stable surfactant cleans and rinses faster than traditional detergents, tolerates harder water conditions and reduces sodium content and alkalinity of effluent. Exxelerate allows processors to increase production by reducing total cleaning time and improving operational efficiencies, thus reducing total cost per gallon.

Exxelerate 320, an alkaline additive that is used to remove minerals

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

INDUSTRY PRODUCTS

during the alkaline wash step, can provide in phosphate surcharges for effluent discharge while helping to control sanitation costs. In a plant study, Exxelerate 320 was proven to reduce phosphate surcharges by an annual cost of \$28,000, reduce sanitation costs by \$26,000 annually and reduce cleaning time by more than four hours a week. This result created more capacity and the processor was able to meet increased demand.

Ecolab Inc.
St. Paul, MN
651.293.2549
www.ecolab.com

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

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

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

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

as well or better than culture methods on juice, cider and raw ground beef samples. Further, the time-to-result was reduced by half on ground beef enriched with proprietary BAX® system media.

"As food safety concerns continue to grow around the world, customers are asking for the most efficient and effective science-based tools to protect their products and their brands. The BAX® system allows any quality assurance laboratory to work with sophisticated technology that transforms the most advanced molecular biology concepts into the simplest, fastest food analysis method available," said Kevin Huttman, president of DuPont Qualicon.

The DNA-based BAX® system detects target bacteria in raw ingredients, finished food products and environmental samples. In addition to *E. coli* O157:H7, assays are also available for detecting *Salmonella*, *Enterobacter sakazakii*, *Listeria* and *L. monocytogenes*. The automated system is user-friendly and fits easily onto a laboratory bench top.

DuPont Qualicon
Wilmington, DE
302.695.5211
www.qualicon.com

Walchem pH and ORP Sensors with Field-proven Differential Design

Walchem Corporation introduces the WDS Series differential pH and ORP sensors. Designed for long-lasting and reliable industrial applications, the WDS has a replaceable salt bridge for long life and transmits signals up to 3,000 feet (915 meters). It is also resistant to ground loop problems.

Walchem's WDS sensors are easily replaced if the reference solution becomes contaminated or the salt



Walchem Corporation

bridge becomes clogged. Reliability of WDS is enhanced since the glass electrode is not prone to chemical attack as a silver/silver chloride reference electrode is.

The differential measurement technique uses two electrodes, one for process measurement and the other for reference measurement. Each electrode is measured differentially with respect to a third metal electrode. The reference electrode is constructed from pH glass and is embedded in pH 7 buffer within the sensor behind a porous, replaceable salt bridge. Offered are Walchem's preamplifier models which are compatible with Walchem controllers and conventional preamplifier models which are compatible with GLI and AquaMetrix (Lisle Metrix) controllers.

Walchem Corporation
Holliston, MA
508.429.1110
www.walchem.com

Onset Introduces Stainless Steel Temperature Data Logger for Industrial Applications

Onset Computer Corporation, introduces the HOBO U12 Stainless Temp Logger, a stainless steel, food-grade data logger designed for food and beverage, pharmaceutical, autoclave, and other industrial applications where high-accuracy temperature data is critical. The logger, which

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INDUSTRY PRODUCTS

fits into a standard-sized beverage bottleneck, measures and records temperatures from -40 to 125°C and can withstand process conditions from pasteurization to flash freezing and wash down.

"In applications such as food processing, beverage pasteurization, and pharmaceutical storage, there's a great need for high-accuracy temperature at a low cost," said Joanna Phillips, product marketing manager for Onset. "Our new Stainless Temp Logger provides the ideal combination of performance and ruggedness at a significantly lower price than comparable logging solutions."

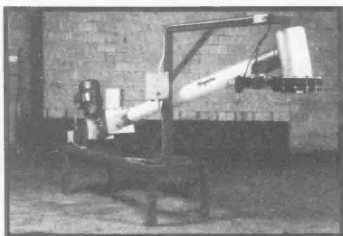
In addition to offering high accuracy, the U12 Stainless Temp Logger provides highly stable readings by virtue of an internal glass bead thermistor. The logger also offers a direct USB interface for high-speed data offloading, a 43K measurement capacity, and a pressure rating of 2200 psi for autoclave and underwater applications.

For plotting and analyzing data, Onset offers its easy-to-use GreenLine™ software package. GreenLine enables users to launch and readout the loggers with point-and-click simplicity, and offers real-time monitoring capability on a PC. The software also offers a number of other convenient features, such as the ability to view multiple channels from a single logger on one graph, and one-click conversion of data for easy upload into Microsoft™ Excel software.

Onset Computer Corporation
Bourne, MA
800.564.4377
www.onsetcomp.com

Low Profile Flexible Screw Conveyor from Flexicon Corporation

A new Low Profile Flexible Screw Conveyor from Flexicon Corporation positions the motor drive at the inlet end of the conveyor tube, allow-



Flexicon Corporation

ing the discharge end to fit within limited headroom areas typically encountered above weigh hoppers or other receiving vessels.

The enclosed, dust-free conveyor can reportedly move material vertically, horizontally or at any angle, through small holes in walls or ceilings, and can handle products ranging from sub-micron powders to large pellets, including those that pack, cake, plug, seize, smear or fluidize, with no separation of blended products.

The only moving part contacting material is a flexible inner screw said to maximize reliability while reducing maintenance. The removable screw and tube interior are smooth and crevice-free, allowing rapid, thorough cleaning.

Low Profile Flexible Screw Conveyors are offered in diameters from 2-5/8 to 8 inches (64 to 203 mm) in stationary and mobile configurations to industrial, food, dairy and pharmaceutical standards, with optional hoppers, flow promotion devices, sensors, controllers and interchangeable screw designs to satisfy wide-ranging material and process requirements.

The company also manufactures pneumatic conveying systems, bulk bag dischargers, bulk bag fillers, bag dump stations, drum dumpers, weigh batching systems and plant-wide bulk handling systems with automated controls.

Flexicon Corporation
Bethlehem, PA
888.353.9426
www.flexicon.com

Sigma Introduces Restorase™, New DNA Polymerase That Repairs Damaged DNA

Sigma has launched a new DNA polymerase, called Restorase (product code is R1028), combining Sigma's long and accurate enzyme with a small amount of a unique DNA repair additive. The optimized blend will initiate the repair and further amplification of damaged DNA templates greater than 800 bp.

DNA can be damaged by a number of ways, including improper storage/handling, aging, or exposure to acid, heat or light. This damage blocks the progression of DNA amplification (PCR). Restorase was developed for researchers unable to achieve amplification of damaged DNA templates when using other thermostable DNA polymerases. Restorase enables these researchers to work with damaged templates that would otherwise be abandoned. It has also been shown to increase yield on undamaged templates, making Restorase a powerful enzyme blend for all usages.

"Restorase DNA polymerase is the culmination of ideas from various areas and experiences at Sigma-Aldrich," said Sigma Market Segment manager Tony Favello. "The inventor's genomics background contributed the idea for an enzyme to amplify old, archived DNA samples. Another R&D scientist contributed knowledge from the forensics market to address environmentally damaged templates, and marketing provided input on the need for improved methods of transgenic and knockout verification. A broad range of experiences and knowledge was provided to produce an enzyme with a broad range of applications."

Sigma-Aldrich Corporation
St. Louis, MO
800.521.8956
www.sigma-aldrich.com

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



International Association for
Food Protection®

6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2864, USA

To All IAFP Members:

Today I want to encourage your involvement in the Committees and Professional Development Groups (PDGs) of the International Association for Food Protection. Each of these groups serves a vital function in providing guidance, direction and information for the Association and our fellow Members. Your experience and expertise is welcome and needed! You may volunteer to serve on multiple Committees or PDGs at one time, so don't be shy. If you have participated on our Committees or PDGs in the past, I commend you for your service and encourage you to continue. I also ask that you consider personally inviting a colleague to join you.

Committees and PDGs meet during the Annual Meeting and may meet throughout the year via conference call or E-mail. Even if you are not able to attend IAFP 2004 in Phoenix, your involvement is still possible. Please review the Committees and PDGs listed on the following pages to find a group that is of special interest to you. If you have questions, call or E-mail the Chairperson listed to learn more about the function of the group. Then, if it sounds interesting to you, volunteer your time and efforts to serve the Association in this way. Through active participation, you can establish a network of contacts and help better the profession while strengthening your leadership skills.

Your input and ideas are always welcome. So accept the challenge today; contact the IAFP office and let us know of your interest in sharing your knowledge and expertise with other IAFP Members. If you have questions about any Committee or PDG activity, you may contact the Chairperson of that group.

I look forward to seeing your name on our next Committee listing!

Sincerely,

Jeffrey M. Farber
Vice President
IAFP

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

Phone: 515.276.3344 • Fax: 515.276.8655 • E-mail: info@foodprotection.org • Web site: www.foodprotection.org

Committee Chairpersons, Professional Development Groups, and Affiliate Council

STANDING COMMITTEES

FPT Management Committee

Fred Weber
Phone: 609.584.7677 Fax: 609.584.8388
E-mail: fweber@weberscientific.com

JFP Management Committee

Isabel Walls
Phone: 202.659.3306 x134 Fax: 202.659.3617
E-mail: iwalls@ilsa.org

Program Committee

Gary R. Acuff
Phone: 979.845.4402 Fax: 979.845.9354
E-mail: gacuff@tam.u.edu

SPECIAL COMMITTEES

3-A Committee on Sanitary Procedures

Sherry Roberts
Phone: 972.938.7639 Fax: 972.937.3120
E-mail: rsher9@aol.com

Audiovisual Library Committee

Thomas A. McCaskey
Phone: 334.844.1518 Fax: 334.844.1519
E-mail: mcasta@auburn.edu

Awards Committee

Eugene Frey
Phone: 717.397.0719 Fax: 717.399.9430
E-mail: efrey@landolakes.com

Black Pearl Selection Committee

Anna M. Lammerding
Phone: 519.826.2371 Fax: 519.826.2367
E-mail: anna_lammerding@hc-sc.gc.ca

Committee on Communicable Diseases Affecting Man

Ewen Todd
Phone: 517.432.3100 Fax: 517.432.2310
E-mail: toddewen@cvm.msu.edu

Constitution and Bylaws Committee

Michael H. Brodsky
Phone: 416.816.9837 Fax: 905.889.2276
E-mail: mhbrodsky@rogers.com

Developing Scientist Awards Committee

Catherine W. Donnelly
Phone: 802.656.8300 Fax: 802.656.0001
E-mail: catherine.donnelly@uvm.edu

Fellows Selection Committee

Anna M. Lammerding
Phone: 519.826.2371 Fax: 519.826.2367
E-mail: anna_lammerding@hc-sc.gc.ca

Foundation Fund Committee

Robert T. Marshall
Phone: 573.882.7355 Fax: 573.882.0596
E-mail: marshallr@missouri.edu

Nominating Committee

Samuel A. Palumbo
Phone: 708.563.8287 Fax: 708.563.1873
E-mail: palumbo@iit.edu

Past Presidents' Committee

Jack J. Guzewich
Phone: 301.436.1608 Fax: 301.436.2717
E-mail: john.guzewich@fda.gov

Jenny Scott
Phone: 202.639.5985 Fax: 202.639.5991
E-mail: jscott@nfpa-food.org

Tellers Committee

Mark W. Carter
Phone: 847.646.4613 Fax: 847.646.4820
E-mail: mark.carter@kraft.com

PROFESSIONAL DEVELOPMENT GROUPS

Applied Laboratory Methods PDG

Timothy C. Jackson
Phone: 41.21.785.9231 Fax: 41.21.785.8553
E-mail: tim.jackson@us.nestle.com

Dairy Quality and Safety PDG

Gaylord B. Smith
Phone: 518.370.0288
E-mail: gbsmohawk@juno.com

Food Safety Network PDG

Sid Camp
Phone: 770.938.3823 Fax: 770.493.5953
E-mail: ascamp3@msn.com

Food Sanitation PDG

Mark A. Moorman
Phone: 616.961.6235 Fax: 616.961.6923
E-mail: mark.moorman@kellogg.com

Fruit and Vegetable Safety and Quality PDG

Philip Blagoyevich
Phone: 925.820.3558 Fax: 925.820.4141
E-mail: blagoyevich@msn.com

Meat and Poultry Safety and Quality PDG

Carl S. Custer
Phone: 202.690.6645 Fax: 202.690.6364
E-mail: carl.custer@usda.gov

Microbial Risk Analysis PDG

Richard C. Whiting
Phone: 301.436.1925 Fax: 301.436.2632
E-mail: rwhiting@cfstan.fda.gov

Outreach Education PDG

Veneranda Gapud
Phone: 404.459.4491 Fax: 404.459.4546
E-mail: vgapud@afce.com

Retail Food Safety and Quality PDG

Joseph D. Eifert
Phone: 540.231.3658 Fax: 540.231.9293
E-mail: jeifert@vt.edu

Seafood Safety and Quality PDG

Brian H. Himelbloom
Phone: 907.486.1529 Fax: 907.486.1540
E-mail: ffbhh@uaf.edu

Student PDG

Michelle D. Danyluk
Phone: 530.752.2826 Fax: 530.752.4759
E-mail: mddanyluk@ucdavis.edu

Viral and Parasitic Foodborne Disease PDG

Lee-Ann Jaykus
Phone: 919.513.2074 Fax: 919.515.7124
E-mail: leeann_jaykus@ncsu.edu

Water Safety and Quality PDG

Susan K. McKnight
Phone: 847.291.7674 x207 Fax: 847.291.7679
E-mail: smcknight@qualityflow.com

AFFILIATE COUNCIL

Steven C. Murphy
Phone: 607.255.2893 Fax: 607.255.7619
E-mail: scm4@cornell.edu

Congratulations

In March 2004, the International Association for Food Protection participated at the Food Safety Summit in Washington, D.C. While exhibiting, we offered a drawing for a one-year Membership with our Association and a free registration to our Annual Meeting. We are pleased to announce the following winners of the drawing:

IAFP Membership

Bill Ferry
AutoJet Technologies
Wheaton, Illinois

IAFP Annual Meeting Registration

Tamara Bond
Applied Biosystems
Concord, Ontario, Canada



**Come Early for
some FUN!**

Golf Tournament

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

**Sedona and
Verde Valley Tour**

Saturday, August 7
8:00 a.m. – 4:00 p.m.

**Diamondbacks
Baseball Game**

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

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

Announcing

The inaugural "John H. Silliker Lecture"



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

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

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

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

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

Ivan Parkin Lecture

Sunday, August 8, 2004

7:00 p.m. – 8:00 p.m.

Presented by

Dr. Martin B. Cole

Chief Research Scientist
Food Science Australia
North Ryde, New South Wales, Australia



Dr. Martin B. Cole is the Deputy Chief Executive of Food Science Australia, Australia's premier food science organization. He has held a number of senior positions within the food industry, including Head of Microbiology for Unilever, located in UK and The Netherlands, as well as Group Director of Food Safety, Microbiology & Chemistry for Nabisco in the USA. He has presented and published over 80 papers on many aspects of food microbiology including predictive modeling, risk assessment and novel food preservation technology.

Dr. Cole has over 10 years experience within the CODEX Food Hygiene Committee where he has been a member of a number of different country delegations including the United States and more recently Australia. He is frequently asked to be a contributing expert to national and international consultations on a wide range of food safety issues. Within Australia, Dr. Cole is the Co-Director of the Australian Food Safety Centre of Excellence, a Fellow of Food Standards Australia and New Zealand (FSANZ) as well a Visiting Research Professor at the University of Tasmania. Internationally, he is the Chairman of the International Commission for the Microbiological Specifications of Foods (ICMSF), a member of the Editorial Board of *Innovative Food Science & Emerging Technologies* and a member of the Editorial Advisory Board for *Food Safety Magazine*.

IAFP 2004 Preliminary Program



Sunday, August 8, 2004 – 7:00 p.m.

- Opening Session
- Ivan Parkin Lecturer — Martin B. Cole, Food Science, Australia

Monday, August 9, 2004

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Molecular Subtyping of Foodborne Pathogens: Tying It All Together
- Retail Food Safety Risks: Protecting Public Health and Changing Behaviors
- Validation and Verification of Pathogen Interventions in Meat and Poultry Processing
- Extending the Shelf Life of Fluid Dairy Products

Technical Session

- Don't be Sonoran (Antimicrobials and Produce)

Poster Session (9:00 a.m. – 1:00 p.m.)

- Antimicrobials and Foods of Animal Origin

Afternoon — 1:30 p.m. – 5:00 p.m.

Symposium Topics

- Postprocessing Intervention Technologies
- Water's Role in Food Contamination
- Recent Developments in *Listeria monocytogenes* Research
- Integrating Genomic Data into Quantitative Risk Assessments
- Sanitary and Hygienic Design, Construction and Fabrication of Dairy and Food Equipment

Technical Session

- General Microbiology and Sanitation

Poster Session (2:00 p.m. – 6:00 p.m.)

- Rattlesnake Roundup (General Microbiology and Sanitation, Methodology, and Toxicology)

Tuesday, August 10, 2004

Morning — 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Food Safety for Immunocompromised Populations
- Chatterbugs: Quorum Sensing and Food Safety
- Transfer and Spread of Pathogens in Food Environments
- Indicator Organisms and Testing — Where's the Value?

Technical Session

- Foods of Animal Origin

Poster Session (9:00 a.m. – 1:00 p.m.)

- Saguaro Soiree (Risk Assessment, Education, and Pathogens)

Afternoon — 1:30 p.m. – 3:30 p.m.

Symposium Topics

- Update on Foodborne Disease Outbreaks
- Everything You Wanted to Know about Adopting New Methods... But Were Afraid to Ask!
- Food Toxicology 101: Basics for the Food Safety Professional
- *Salmonella* Control in Broiler Chickens: What Can We Learn from the Scandinavian Experience

Technical Sessions

- Education
- Risk Assessment

Plenary Session — 3:45 p.m. – 4:30 p.m.

John H. Silliker Lecturer

- R. Bruce Tompkin, ConAgra Refrigerated Prepared Foods (Retired)

Business Meeting – 4:45 p.m. – 5:30 p.m.

Wednesday, August 11, 2004

Morning — 8:30 a.m. – 12:00 p.m.

Symposium Topics

- Credibility in Science
- Risk and Control of *Enterobacter sakazakii*
- Impact of Environmental Viral and Parasitic Contamination on Food Safety
- Safety of Raw Milk Cheeses — The State of the Science
- Packaging Innovations, Safety Concerns and Seafood
- Heat Resistant Spoilage Microorganisms in the Juice and Beverage Industry

Poster Session (8:00 a.m. – 12:00 p.m.)

- Pathogens

Afternoon — 1:30 p.m. – 5:00 p.m.

Symposium Topics

- Sanitation — Because You Have to be Clean to be Safe
- The Global Food Safety Initiative
- Optimizing Data and Minimizing Risk
- Biofilms and Their Impact on Food Safety

Technical Sessions

- Chips and Salsa (General Food Microbiology and Methods)
- Pathogens

Poster Session (1:00 p.m. – 5:00 p.m.)

- Prickly Pear Potpourri (Dairy, Produce, and Other Commodities)

Visit our Web site for updated information at www.foodprotection.org

IAFP 2004 Networking Opportunities



IAFP FUNCTIONS

NEW MEMBER RECEPTION

Saturday, August 7, 2004 • 4:30 p.m. – 5:30 p.m.

Sponsored by Kluwer Academic Publishers

If you recently joined the Association or if this is your first time attending an IAFP Annual Meeting, welcome! Attend this informal reception to learn how to get the most out of attending the Meeting and meet some of today's leaders.

AFFILIATE RECEPTION

Saturday, August 7, 2004 • 5:30 p.m. – 7:00 p.m.

Reception sponsored by Capitol Vial

Speakers sponsored by Weber Scientific

Affiliate Officers and Delegates plan to arrive in time to participate in this educational reception. This year's topic is "How to Add Fun Recreational Programs to Your Meeting/Event." See what ideas you can take back to spice up your next Affiliate Meeting.

COMMITTEE MEETINGS

Sunday, August 8, 2004 • 7:00 a.m. – 5:00 p.m.

Committees and Professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on any number of committees or PDGs. All meetings are open.

STUDENT LUNCHEON

Sunday, August 8, 2004 • 12:00 p.m. – 1:30 p.m.

Sponsored by Nestlé USA, Inc.

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP. Sign up for the luncheon to help start building your professional network.

OPENING SESSION

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

Join us to kick off IAFP 2004 at the Opening Session. Listen to the prestigious Ivan Parkin Lecture delivered by Martin B. Cole, Chief Research Scientist, Food Science Australia, North Ryde, Australia.

CHEESE AND WINE RECEPTION

Sunday, August 8, 2004 • 8:00 p.m. – 10:00 p.m.

Sponsored by Kraft Foods, Inc.

An IAFP tradition for attendees and guests. The reception begins immediately following the Ivan Parkin Lecture on Sunday evening in the Exhibit Hall.

IAFP JOB FAIR

Sunday, August 8 through Wednesday, August 11, 2004

Employers, take advantage of recruiting the top food scientists in the world! Post your job announcements and interview candidates.

COMMITTEE AND PDG CHAIRPERSON

BREAKFAST (By invitation)

Monday, August 9, 2004 • 7:00 a.m. – 9:00 a.m.

Chairpersons and Vice Chairpersons are invited to attend this breakfast to report on the activities of your committees.

EXHIBIT HALL RECEPTION

Monday, August 9, 2004 • 5:00 p.m. – 6:30 p.m.

Sponsored by DuPont Qualicon and Oxoid, Inc.

Join your colleagues in the exhibit hall to see the latest trends in food safety techniques and equipment. Discuss with exhibitors their latest products or use this time to view the poster presentations. Grab a drink and take advantage of this great networking reception.

JOHN H. SILLIKER LECTURE

Tuesday, August 10, 2004 • 3:45 p.m. – 4:30 p.m.

This plenary session will feature R. Bruce Tompkin, Retired Vice President — Product Safety, ConAgra Refrigerated Prepared Foods. He will deliver a presentation titled "Guess Who's Come to Stay — The Resident Pathogen Issue."

BUSINESS MEETING

Tuesday, August 10, 2004 • 4:45 p.m. – 5:30 p.m.

You are encouraged to attend the Business Meeting to keep informed of the actions of YOUR Association.

PRESIDENT'S RECEPTION (By invitation)

Tuesday, August 10, 2004 • 5:30 p.m. – 6:30 p.m.

This by invitation event is held each year to honor those who have contributed to the Association during the year.

PAST PRESIDENTS' DINNER (By invitation)

Tuesday, August 10, 2004 • 6:30 p.m. – 10:00 p.m.

Past Presidents and their guests are invited to this dinner to socialize and reminisce.

AWARDS BANQUET

Wednesday, August 11, 2004 • 7:00 p.m. – 9:30 p.m.

Bring IAFP 2004 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Dr. Paul Hall to Incoming President Dr. Kathy Glass.

IAFP 2004 Event Information



EVENTS

MONDAY NIGHT SOCIAL AT RAWHIDE WESTERN TOWN

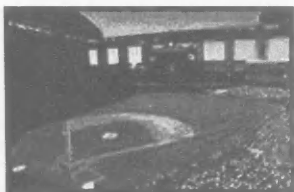
Monday, August 9, 2004 • 6:30 p.m. – 10:00 p.m.
Sponsored by Roche Applied Science



Step back in time to the days when the West ran wild! This is the Wild West of good guys, bad guys, balladeers, shoot-outs, saloon girls, and delightfully crooked card dealers. Upon arrival at Rawhide, you will have the opportunity to stroll down Main Street, browse in the numerous shops and boutiques, witness a blacksmith at work and watch Rawhide's street entertainers. Satisfy your appetite by stopping in the Steakhouse and Saloon for a "Chuckwagon Feast". Grab your partners, jump on the bus and get ready for a rip-roarin good time — YEE HA!

DIAMONDBACKS BASEBALL GAME

Saturday, August 7, 2004 • 12:00 p.m. – 4:00 p.m.



Enjoy a afternoon at the ballpark as the Arizona Diamondbacks take on the Atlanta Braves at Bank One Ballpark. From its signature swimming pool to its retractable roof, Bank One Ballpark has become one of the game's most recognizable landmarks. Since the air-conditioned facility first opened its doors, fans have enjoyed the opportunity to watch the Arizona Diamondbacks without worrying about Phoenix's summer heat. Ticket price includes admission to the game and transportation to and from the JW Marriott Desert Ridge Resort.

GOLF TOURNAMENT



GOLF TOURNAMENT – Arnold Palmer Signature Course at Wildfire Golf Club
Saturday, August 7, 2004 • 6:00 a.m. – 11:00 a.m.

Everyone is invited to play in this best-ball golf tournament on the Arnold Palmer Signature Course at Wildfire Golf Club. A desert-style course of championship length, with generous fairways and large, bent-grass greens, the Palmer Course is challenging to all levels of golf skill. Begin IAFP 2004 with a round of golf playing before a backdrop of the Camelback Mountains!



DAYTIME TOURS

SEDONA AND VERDE VALLEY TOUR

Saturday, August 7, 2004 • 8:00 a.m. – 4:00 p.m.



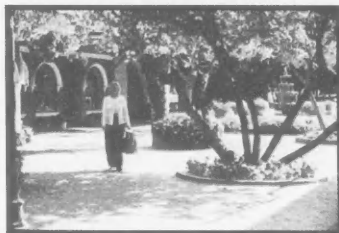
Known worldwide for its brilliant red rock mountains, breathtaking scenery and quaint artisan shops, Sedona is a "must see" destination for visitors to Arizona.

During the drive north, you will travel through the diverse terrain of the Sonoran Desert, Verde Valley and Camp Verde. Along the way, the guide will provide interesting narration about the area and answer questions.

Prior to reaching Sedona, we will stop at Montezuma's Castle, a twelfth century cliff dwelling built by the Sinagua Indians. This is considered one of the best-preserved cliff dwellings in the Southwest. Upon arrival in Sedona, your guide will point out the numerous red rock formations for which Sedona is famous — Snoopy Rock, Bell Rock, Chapel Rock, Submarine Rock and others. Lunch will be served at a quaint local eatery. Guests will have time to explore the galleries and shops of Main Street and Tlaquepaque.

CITY TOUR AND OLD TOWN SCOTTSDALE

Sunday, August 8, 2004 • 10:00 a.m. – 3:00 p.m.



With amazing sunsets and spectacular mountain views, Arizona is a site to behold! The City Tour meanders through the amazing aspects of the

valley. Each tour is unique in that the guide will stop along the way at several of the most beautiful sites and private homes in the valley.

The Wrigley Mansion is well known for its unique architecture, the Biltmore Resort has had the pleasure of Frank Lloyd Wright's touch and the State Capitol is majestic against the blue sky backdrop of the city. This tour provides an opportunity to stop and enjoy the unique shopping experiences of Old Town Scottsdale as well as a delicious lunch. Old Town encompasses over a square mile of themed shopping streets. Walking the sidewalks of this section of Scottsdale, one can find everything from Native American jewelry and artwork to western clothing.

DESERT BOTANICAL GARDEN AND HEARD MUSEUM TOUR

Monday, August 9, 2004 • 8:00 a.m. – 1:00 p.m.

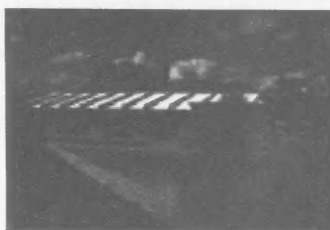


Two of the Southwest's most unique visitor attractions, The Desert Botanical Garden and Heard Museum, have teamed up to present an unbeatable tour designed to acquaint visitors with the diversity of the region and the resourcefulness of its Native American people. This tour includes visits to both attractions

plus lunch at the Heard Museum Cafe. Your visit begins at the Desert Botanical Garden which displays more than 10,000 desert plants in a spectacular outdoor setting. Plants and People of the Sonoran Desert, a three-acre permanent exhibit with authentic historic and prehistoric structures, shows how Sonoran Desert dwellers have used native plants for thousands of years for food, construction, fiber, and medicines. Continuing on you will visit the amazing Heard Museum, a museum of Native American cultures and art. The Heard Museum is internationally recognized for its collections of Native American artifacts and contemporary fine art.

FRANK LLOYD WRIGHT – TALIESIN WEST TOUR

Tuesday, August 10, 2004 • 8:00 a.m. – 12:00 p.m.



Taliesin West in Scottsdale is considered one of Frank Lloyd Wright's greatest architectural masterpieces. From its inception, the buildings

at Taliesin West astounded architectural critics with their beauty and unusual form. Taliesin West still serves as a living, working educational facility with an on-site architectural firm. By touring Taliesin West visitors are able to broaden their appreciation of architecture and Wright's continuing contribution to it through his theories of organic design.

If you're interested in an in-depth, intimate look at Taliesin West, this exclusive experience is a must! Visit the Cabaret Cinema, Music Pavilion, Seminar Theater and Wright's private office — all linked by dramatic terraces, gardens and walkways overlooking the rugged Sonoran Desert and Valley below. You'll have the chance to talk to a Wright associate, have leisurely mid-morning refreshments in the colorful Taliesin Fellowship dining room and explore the dramatic Taliesin West living room — called the "Garden Room" by Wright. You'll sit in Wright-designed furniture and experience firsthand the drama of being a guest in Wright's famous Garden Room.

SOUTHWESTERN COOKING CLASS

Wednesday, August 11, 2004 • 10:30 a.m. – 1:00 p.m.

This hands-on class explores the magic and mysteries of tamales, one of the great culinary traditions of the America's. While making tamales you will learn the secrets of choosing a filling and flavoring them with different types of wrappers, from cornhusks to banana leaves. You will also learn how to choose and make a complementary salsa to create a more satisfying and dynamic taste experience. This class is a total immersion into tamales and salsas that provides you with all the knowledge and skills to create your own tamales at home! Following the class you will enjoy lunch at Blue Sage.

HOSPITALITY ROOM

Register your spouse/companion and they will have access to the hospitality room where a continental breakfast and afternoon snacks are provided Sunday through Wednesday.



IMPORTANT! Please read this information before completing your registration form.

MEETING INFORMATION

Register to attend the world's leading food safety conference.

Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception
- Program and Abstract Book


4 EASY WAYS TO REGISTER

Complete the Attendee Registration Form and submit it to the International Association for Food Protection by:

 **Online:** www.foodprotection.org

 **Fax:** 515.276.8655

 **Mail:** 6200 Aurora Avenue, Suite 200W,
Des Moines, IA 50322-2864, USA

 **Phone:** 800.369.6337; 515.276.3344

The early registration deadline is July 7, 2004. After this date, late registration fees are in effect.

REFUND/CANCELLATION POLICY

Registration fees, less a \$50 administration fee and any applicable bank charges, will be refunded for written cancellations received by July 23, 2004. No refunds will be made after July 23, 2004; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 16, 2004. **Event and tour tickets purchased are nonrefundable.**



EXHIBIT HOURS

Sunday, August 8, 2004	8:00 p.m. – 10:00 p.m.
Monday, August 9, 2004	9:30 a.m. – 1:30 p.m. 3:00 p.m. – 6:30 p.m.
Tuesday, August 10, 2004	9:30 a.m. – 1:30 p.m.

DAYTIME TOURS

Saturday, August 7, 2004	
Sedona and Verde Valley Tour (Lunch included)	8:00 a.m. – 4:00 p.m.
Sunday, August 8, 2004	
City Tour and Old Town Scottsdale (Lunch included)	10:00 a.m. – 3:00 p.m.
Monday, August 9, 2004	
Desert Botanical Garden and Heard Museum Tour (Lunch included)	8:00 a.m. – 1:00 p.m.
Tuesday, August 10, 2004	
Frank Lloyd Wright – Taliesin West Tour	8:00 a.m. – 12:00 p.m.
Wednesday, August 11, 2004	
Southwestern Cooking Class (Lunch included)	10:30 a.m. – 1:00 p.m.

EVENTS

Saturday, August 7, 2004	
Diamondbacks Baseball Game	12:00 p.m. – 4:00 p.m.
Sunday, August 8, 2004	
Opening Session	7:00 p.m. – 8:00 p.m.
Cheese and Wine Reception <i>Sponsored by Kraft Foods North America</i>	8:00 p.m. – 10:00 p.m.
Monday, August 9, 2004	
Exhibit Hall Reception <i>Sponsored by DuPont Qualicon and Oxoid, Inc.</i>	5:00 p.m. – 6:30 p.m.
Monday Night Social at Rawhide Western Town <i>Sponsored by Roche Applied Science</i>	6:30 p.m. – 10:00 p.m.
Wednesday, August 11, 2004	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

GOLF TOURNAMENT

Saturday, August 7, 2004	
Golf Tournament Nick Faldo-designed Championship Golf at Wildfire Golf Club	6:00 a.m. – 11:00 a.m.

HOTEL INFORMATION

For reservations, contact the hotel directly and identify yourself as an IAFP 2004 attendee to receive a special rate of \$139 per night, single/double or make your reservations online. This special rate is available only until July 7, 2004.

JW Marriott Desert Ridge Resort
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Attendee Registration Form



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Web site: www.foodprotection.org

Name (Print or type your name as you wish it to appear on name badge) _____ Member Number: _____

Employer _____ Title _____

Mailing Address (Please specify: Home Work) _____

City _____ State/Province _____ Country _____ Postal/Zip Code _____

Telephone _____ Fax _____ E-mail _____

Regarding the ADA, please attach a brief description of special requirements you may have. Member since: _____

IAFP occasionally provides Attendees' addresses (excluding phone and E-mail) to vendors and exhibitors supplying products and services for the food safety industry. If you prefer NOT to be included in these lists, please check the box.

PAYMENT MUST BE RECEIVED BY JULY 7, 2004 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:

Registration (Awards Banquet included) _____
 Association Student Member (Awards Banquet included) _____
 Retired Association Member (Awards Banquet included) _____
 One Day Registration: * Mon. Tues. Wed. _____
 Spouse/Companion* (Name): _____
 Children 15 & Over* (Names): _____
 Children 14 & Under* (Names): _____
 *Awards Banquet not included

MEMBERS	NONMEMBERS	TOTAL
\$ 365 (\$415 late)	\$ 555 (\$605 late)	_____
\$ 75 (\$ 85 late)	Not Available	_____
\$ 75 (\$ 85 late)	Not Available	_____
\$ 200 (\$225 late)	\$ 305 (\$330 late)	_____
\$ 55 (\$ 55 late)	\$ 55 (\$ 55 late)	_____
\$ 25 (\$ 25 late)	\$ 25 (\$ 25 late)	_____
FREE	FREE	_____

EVENTS:

Golf Tournament – Arnold Palmer Signature Course (Saturday, 8/7) _____
 Diamondbacks Baseball Game (Saturday, 8/7) _____
 Student Luncheon (Sunday, 8/8) _____
 Monday Night Social at Rawhide Western Town (Monday, 8/9) _____
 Children 14 and under _____
 Awards Banquet (Wednesday, 8/11) _____

# OF TICKETS	TOTAL
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

DAYTIME TOURS:

(Lunch included in daytime tours except on Tuesday)
 Sedona and Verde Valley Tour (Saturday, 8/7) _____
 City Tour and Old Town Scottsdale (Sunday, 8/8) _____
 Desert Botanical Garden and Heard Museum Tour (Monday, 8/9) _____
 Frank Lloyd Wright – Taliesin West Tour (Tuesday, 8/10) _____
 Southwestern Cooking Class (Wednesday, 8/11) _____

# OF TICKETS	TOTAL
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

PAYMENT OPTIONS:



Check Enclosed
 Credit Card # _____
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 Signature _____

TOTAL AMOUNT ENCLOSED \$ _____
US FUNDS on US BANK

Expiration Date _____

JOIN TODAY AND SAVE!!!
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Check box if you are a technical, poster, or symposium speaker.

EXHIBITORS DO NOT USE THIS FORM

IAFP 2004 Workshops



Sponsored by
International Association for
Food Protection

Workshop I — August 6-7

Your Data, Your Job: Quality Systems for Microbial Food Analysis

This workshop will present principles for understanding and implementing microbial control in a food production environment by providing skills to address limitations in your current laboratory testing and documentation. You will learn, in an interactive environment, how to perform environmental and statistically sound food sampling for microbial testing that can be implemented into your standard operating procedures and will conform to today's QA and ISO requirements. Workshop participants will review and discuss material from practical case studies and present their findings to the group in an informal presentation that will facilitate open discussion. Workshop includes a binder of tools and reference materials to reinforce the practical experience gained from the workshop.

Workshop Topics

- Microbial control: where and how raw ingredient and finished product testing fit into the big picture
- Microbial control: where and how environmental/investigational sampling fit into the big picture
- Outsourcing/Auditing: What should you expect from an outside food-testing laboratory relative to quality systems and capabilities
- Using data management and trend analysis techniques to drive continuous improvement
- Practical approaches to incorporating rapid methods into the laboratory
- Food Safety Testing in the 21st Century by PCR
- Laboratory quality assurance and preparing your laboratory to address ISO 17025

Instructors

- Jay Ellingson, Ph.D., Marshfield Clinic Laboratories, Madison, WI
W. Payton Pruett, Jr., Ph.D., ConAgra Foods, Inc., Omaha, NE
Cindy Ryan, Nestlé USA, Dublin, OH
Michael Sole, Canadian Food Inspection Agency, Ottawa, Ontario, Canada

Organizers and Instructors

- Jeff Kornacki, Ph.D., Kornacki Food Safety Associates LLC, McFarland, WI
Patricia Rule, bioMérieux, Inc., Hazelwood, MO

Who Should Attend?

Laboratory managers, supervisors, scientists and technicians responsible for product sampling, as well as performing and documenting microbial tests in a food production environment and quality control laboratories.

Hours for Workshop

Friday August 6, 2004	Saturday August 7, 2004
Registration – 7:30 a.m. Continental Breakfast	7:30 a.m. Continental Breakfast
Workshop – 8:00 a.m. – 5:00 p.m. (Lunch Provided)	Workshop – 8:00 a.m. – 4:00 p.m. (Lunch Provided)

Workshop II — August 7 Best Practices for Safe and High Quality Aquaculture Products

Aquacultured seafoods are an increasingly important component of global trade in seafoods. Overexploitation of natural harvests has created a growing interest in aquaculture to provide seafoods to a demanding public. Because

aquaculture is a controlled enterprise, inventory control, quality, and safety issues are very different than wild catch products. This workshop is designed to give attendees an overview of practices necessary to deliver high quality and safe aquacultured products to today's discriminating consumer. The afternoon session will include an interactive field trip to Desert Sweet Shrimp Farm in Gila Bend, AZ.

Workshop Topics

- Shellfish (Crustacean and Mollusks)
- Finfish warm water
- Finfish cold water
- What works for the industry
- Interactive field trip

Instructors

Linda Andrews, Mississippi State University,
Biloxi, MS

Andrew Kaelin, ASI Aqua Foods, Inc., Arroyo Seco, NM

Lisbeth Truelstrup Hansen, Canadian Institute
of Fisheries Technology, Dalhousie University,
Halifax, Nova Scotia, Canada

Organizer and Instructor

Douglas L. Marshall, Mississippi State University,
Mississippi State, MS

Who Should Attend?

Seafood processors, seafood retailers, and food service.

Hours for Workshop

Saturday, August 7, 2004

Registration –

7:30 a.m. Continental Breakfast

Workshop –

8:00 a.m. – 5:30 p.m.
(Lunch Provided)

Workshop III — August 7

Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection

Take advantage of the new Grade A HACCP program for dairy plants that was adopted by the 2003 National Conference on Interstate Milk Shipments (NCIMS) and became effective on January 1, 2004. The guidelines for this new Grade A HACCP program are outlined in Appendix K of the Pasteurized Milk Ordinance (PMO). NCIMS HACCP is an alternative to the traditional inspection/rating program for Grade A Dairy

Processors that allows dairy plants to develop their own "PMO".

This workshop will give an overview of the NCIMS Voluntary HACCP Program with emphasis on the differences with the traditional PMO-based regulatory inspection system. Participants will hear perspectives of industry and regulatory participants involved in the 4 year pilot studies used to develop the program. Hands-on exercises will be provided to give participants a better understanding of what is required to document Prerequisite Programs, conduct a Hazard Analysis, develop a HACCP Plan and build a HACCP records system. An FDA presentation on state and FDA HACCP audits with comparisons to traditional inspections will conclude the program.

Workshop Topics

- Transition to the NCIMS Voluntary HACCP Program
- NCIMS HACCP implementation perspectives
- Hands-on HACCP program development for dairy plants
- Prerequisite Program, Hazard Analysis and HACCP Plan
- Practical recommendations for State and Federal NCIMS oversight of dairy plant HACCP
- Auditing of dairy plant HACCP Systems
- Hands-on HACCP dairy plant auditing

Instructors

Kristin Phillips, Publix Super Markets, Lakeland, FL

Greg Lockwood, Vermont Department of
Agriculture, Montpelier, VT

Bill Sveum, Kraft Foods NA, Madison, WI

Lloyd Kinzel, FDA, North Wales, PA

Steve Sims, FDA, College Park, MD

Stephanie Olmsted, Safeway Foods, Bellevue, WA

Doug Pearson, Utah Department of Agriculture,
Salt Lake City, UT

Organizers and Instructors

Steven Murphy, Cornell University, Ithaca, NY

Allen Sayler, International Dairy Foods Association,
Washington, D.C.

Who Should Attend?

Grade "A" Dairy Processors, State and Federal Regulatory Personnel, Dairy Plant Suppliers, and Academicians.

Hours for Workshop

Saturday, August 7, 2004

Registration –

7:30 a.m. Continental Breakfast

Workshop Registration Form



Friday-Saturday, August 6-7, 2004

Workshop 1: Your Data, Your Job: Quality Systems for Microbial Food Analysis

Saturday, August 7, 2004

Workshop 2: Best Practices for Safe and High Quality Aquaculture Products

Workshop 3: Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection

First Name (will appear on badge) _____

Last Name _____

Company _____

Job Title _____

Address _____

City _____

State/Province _____

Country _____

Postal Code/Zip + 4 _____

Area Code & Telephone _____

Fax _____

E-mail _____

Member # _____

Check Enclosed



Total Amount Enclosed
(US Funds on US Bank) \$ _____

Account Number _____

Signature _____

Expiration date _____

Register by July 16, 2004 to avoid late registration fees

Registration

	Early Rate		Late Rate			Early Rate		Late Rate	
WORKSHOP I: Your Data, Your Job: Quality Systems for Microbial Food Analysis					WORKSHOP II: Best Practices for Safe and High Quality Aquaculture Products				
IAFP Member	\$450.00	\$525.00	IAFP Member	\$375.00	\$450.00	IAFP Member	\$320.00	\$395.00	
NonMember	\$550.00	\$625.00	NonMember	\$475.00	\$550.00	NonMember	\$420.00	\$495.00	

GROUP DISCOUNT:

Register 3 or more people from your company and receive a 15% discount. Registrations must be received as a group.

Refund/Cancellation Policy

Registration fees, less a \$50 administrative charge, will be refunded for written cancellations received by July 23, 2004. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 16, 2004. The workshop may be cancelled if sufficient enrollment is not received by July 16, 2004.

For further information, please contact the Association office at 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@foodprotection.org.

4 Easy Ways to Register

To register, complete the Workshop Registration Form and submit it to the International Association for Food Protection by:



Online: www.foodprotection.org



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*Thank
You*

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as of April 5, 2004



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USDA - Food Safety and Inspection Service
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Promotional Opportunities

We invite you to participate as a sponsor for IAFP 2004. Sponsorship participation provides an excellent opportunity to position your company or organization as a supporter of the Association.

Please review the event listing to select the one that will best position your organization. Reservations will be taken in order received for any open sponsorship events. A waiting list for events with a right of first option will be established.

Sponsorship Event List

Amount	Event	Amount	Event
\$17,000	Monday Evening Social Roche Applied Science (1/2 sponsor)	\$3,500	Coffee Break (Wednesday Morning)
\$16,000 Sponsored	Opening Reception Kraft Foods North America	\$3,000	Coffee Break (Wednesday Afternoon)
\$15,000 Sponsored	Exhibit Hall Reception DuPont Qualicon, Oxoid, Inc.	\$3,750 Sponsored	Notepads with Sponsor's Logo Bio-Rad Laboratories
\$12,000 Sponsored	Conference Program Bag bioMérieux, Inc.	\$3,500	Spouse/Companion Hospitality Room
\$10,000	President's Reception	\$3,500 Sponsored	Student PDG Luncheon Nestlé USA, Inc.
\$8,000 Sponsored	Badge Holders w/Lanyards Strategic Diagnostics, Inc.	\$3,000 Sponsored	Affiliate Educational Reception Capitol Vial, Weber Scientific
\$6,000 Sponsored	Exhibit Hall Pastries and Coffee Deibel Laboratories, Inc. (Monday Morning)	\$2,500 Sponsored	IAFP New Member Orientation Kluwer Academic Publishers
\$6,000 Sponsored	Exhibit Hall Pastries and Coffee Nice-Pak Products, Inc. (Tuesday Morning)	\$2,000 Sponsored	Awards Banquet Flowers PepsiCo
\$3,500 Sponsored	Exhibit Hall Coffee Break NSF International (Monday Afternoon)	\$1,750	Committee Day Refreshments
\$3,500 Sponsored	Coffee Break BD Diagnostic Systems (Tuesday Afternoon)	\$1,500	Exhibitor Move-in Refreshments
		\$1,000	Speaker Travel Support Warren Analytical Laboratory
			Other Sponsorships Available

Partial sponsorship for the above events is available.

Contact David Larson for details.

Phone: 515.440.2810

Fax: 515.440.2809

E-mail: larson6@earthlink.net

Sponsorship Participant

Name _____

Company _____

Address _____

City _____ State or Province _____

Country _____ Postal Code/Zip + 4 _____

Phone _____ Fax _____

E-mail _____

Desired Event to Sponsor _____

Amount Paid \$ _____

U.S. Funds on U.S. Bank

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Des Moines, IA 50322-2864

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The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2004, the Association's 91st Annual Meeting in Phoenix, Arizona, August 8-11, 2004. The Foundation Fund supports:

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- ❖ Audiovisual Library
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- ❖ Shipment of volumes of surplus *JFP* and *FPT* journals to developing countries through FAO in Rome

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- ❖ Walt Disney World Theme Park Tickets
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MAY

- **2-4, United 2004 Produce Expo and Conference**, McCormick Place, Chicago, IL. For more information, call 202.303.3400; or go to www.uffva.org.
- **3-7, Diploma in Food Hygiene and Safety**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **4-5, Plant Operations Conference**, Hilton Chicago Hotel and Tower, Chicago, IL. For more information, call 202.737.4332; or go to www.idfa.org.
- **4-6 HACCP for Juice Processors**, Atlanta, GA. For more information, call 800.355.0983; E-mail: fpi@nfpa-food.org.
- **4-6 South Dakota Environmental Health Association Annual Educational Conference**, Holiday Inn City Center, Sioux Falls, SD. For more information, contact Mark Schuttloff at 605.367.8783; E-mail: mschuttloff@siouxfalls.org.
- **9-12, NEHA Annual Educational Conference and Exhibition**, Anchorage, Alaska. For more information, call 303.756.9090; E-mail: staff@neha.org.
- **12, Ontario Food Protection Association Annual Spring Meeting**, Mississauga Convention Centre, Mississauga, Ontario, Canada. For more information, contact Gail Evans Seed at 519.463.5674; E-mail: seed@golden.net.
- **13-14, HACCP II: Developing Your HACCP Plan**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **13-14, ISO 9001 Internal QMS Auditor**, Long Beach, CA. For more information, call 800.466.9953; E-mail: esales@Bizmanualz.com.
- **15-20, IFFA Delicat**, Frankfurt, Germany. For more information, contact Dirk Ebener at 770.984.8016; E-mail: info@usa.messefrankfurt.com.
- **17-21, 3-A Sanitary Standards Inc. Annual Meeting**, Four Points Sheraton Milwaukee Airport, Milwaukee, WI. For more information, call 703.790.0295; Web site: www.3-a.org.

- **18-19, Cultured Dairy Products Conference**, Hyatt Regency, Minneapolis, MN. For more information, call 202.737.4332; or go to www.idfa.org.
- **18-19, Pennsylvania Association of Milk, Food and Environmental Sanitarians Annual Meeting**, Nittany Lion Inn, State College, PA. For more information, contact Gene Frey at 717.397.0719.
- **18-20, Ingredients & Ingredient Functionality Workshop**, University of Nebraska Food Processing Center, Lincoln, NE. For more information, contact Pauline Galloway at 402.472.9751; E-mail: pgalloway2@unl.edu.
- **19, Dairy HACCP Workshop**, University of Wisconsin-Madison, Madison, WI. For more information, contact Marianne Smukowski at 608.265.6346 or go to www.wisc.edu/foodsci/.
- **25-26, Dairy Cost Accounting Workshop**, Sofitel Chicago O'Hare, Rosemont, IL. For more information, call 202.737.4332; or go to www.idfa.org.
- **26, Metropolitan Association for Food Protection Annual Spring Meeting**, Rutgers, Cook College, New Brunswick, NJ. For more information, contact Carol Schwar at 908.689.6693; E-mail: cschwar@entermail.net.
- **31, Microbiology VI: Salmonella Control**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.

JUNE

- **2, Developing a Listeria Action Plan for Regulatory Compliance and Consumer Safety Workshop**, Wisconsin Association for Food Protection, Holiday Inn East, Madison, WI. For more information, contact Neil Vassau at 608.833.6181; E-mail: nevassau@aol.com.
- **7-8, Food Microbiology Short Course**, Penn State Berks-Lehigh Valley College, Reading, PA. For more information, contact Dr. Hassan Gourama at 610.396.6121; E-mail: hxg7@psu.edu.

- **7-11, 5th World Congress Foodborne Infections and Intoxications**, Berlin, Germany. For more information, call 49.30.8412.1939; E-mail: officewk5@bfr.bund.de.
- **8-9, Wisconsin Cheese Grading Short Course**, University of Wisconsin-Madison, Madison, WI. For more information, contact Scott Rankin at 608.263.2008 or go to www.wisc.edu/foodsci/.
- **9-11, Sanitation Short Course**, Penn State Berks-Lehigh Valley College, Reading, PA. For more information, contact Dr. Luke LaBorde at 814.863.2298; E-mail: llf5@psu.edu.
- **16, Developments in Sanitation & Waste Management**, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **18-20, Food Allergens: Issues and Solutions for the Food Product Manufacturer**, Hotel Sofitel, O'Hare, Chicago, IL. For more information, contact Pauline Galloway at 402.472.9751; E-mail: pgalloway2@unl.edu.
- **18-25, International Workshop/Symposium on Rapid Methods and Automation in Microbiology XXIV**, Kansas State University, Manhattan, KS. For more information, contact Debbie Hagenmaier at 800.432.8222; E-mail: debbieh@ksu.edu; outside USA call 785.532.5575.
- **19-23, AFDO 108th Annual Educational Conference**, Hilton Pittsburgh, Pittsburgh, PA. For more information, call 717.757.2888; or go to www.afdo.org.

IAFP UPCOMING MEETINGS

AUGUST 8-11, 2004
Phoenix, Arizona

AUGUST 14-17, 2005
Baltimore, Maryland

AUGUST 13-16, 2006
Calgary, Alberta, Canada

COMING EVENTS

- **23-24, IDFA's Washington Conference**, Washington Court Hotel, Washington, D.C. For more information, call 202.737.4332; or go to www.idfa.org.
- **24, Food Irradiation**, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **24-25, Lead Auditor**, ASI Food Safety Consultants, Orlando, FL. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.

JULY

- **12-13, HACCP I: Documenting HACCP Prerequisites**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **13-16, IFT Annual Meeting**, Las Vegas Convention Center, Las Vegas, NV. For more information, contact www.amfe.ift.org.
- **14-15, 10th Annual Hawaii Lodging, Hospitality and Foodservice Expo**, Neal Blaisdell Center, Honolulu, HI. For more information, call 800.525.5275; E-mail: kanter@lava.net.
- **14-16, HACCP II: Developing Your HACCP Plan**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.
- **22-23, Food Safety Training**, ASI Food Safety Consultants, St. Louis, MO. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **31-Aug. 2, Louisiana Foodservice Expo**, Morial Convention Center, New Orleans, LA. For more information, call 800.256.4572 or go to www.lra.org.

AUGUST

- **IAFP 2004 Workshops**, JW Marriott Desert Ridge Resort, Phoenix, AZ.
- **6-7, Workshop I - Your Data, Your Job: Quality Systems for Microbial Food Analysis**

- **7, Workshop 2 - Converting to the NCIMS Voluntary HACCP System from Traditional Dairy Inspection**
- **7, Workshop 3 - Best Practices for Quality Aquacultural Products**
See page 368 of this issue for additional information.
- **8-11, IAFP 2004, the Association's 91st Annual Meeting**, JW Marriott Desert Ridge Resort, Phoenix, AZ. For more information, see page 365 of this issue for additional information or contact Julie Cattanaich at 800.369.6337; E-mail: jcattanaich@foodprotection.org.
- **19-20, Principles of HACCP**, ASI Food Safety Consultants, Baltimore, MD. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **26-27, Lead Auditor**, ASI Food Safety Consultants, Chicago, IL. For more information, contact Jeanette Huge at 800.477.0778 ext. 113; E-mail: jhuge@asifood.com.
- **30-31, Forensic Food Microscopy**, GFTC, Guelph, Ontario, Canada. For more information, contact Marlene Inglis at 519.821.1246; E-mail: minglis@gftc.ca.

SEPTEMBER

- **1-3, Food Safety and HACCP in the 21st Century: From Theory to Practice**, Conrad Hotel, Bangkok, Thailand. Co-sponsored by IAFP. For more information, contact Chris Jones at 44.161.736.9172; E-mail: www.who.int/en.
- **12-15, International Symposium on Problem of Listeriosis (ISOPOL)**, Uppsala, Sweden. For more information, go to www-conference.slu.se/isopol.
- **22-23, Fifth Annual Illinois Food Safety Symposium**, Hotel Pere Marquette, Peoria, IL. For more information, contact Jayne Nosari at 217.785.2439; E-mail: jnosari@idph.state.il.us.
- **28, Washington Association for Food Protection Annual Conference**, Campbell's Resort, Chelan, WA. For more information, contact Bill Brewer at 206.363.5411; E-mail: billbrewer1@juno.com.

- **28-29, Wisconsin Association for Food Protection Annual Meeting**, Ho-Chunk Casino & Hotel Convention Center, Wisconsin Dells, WI. For more information, contact Randy Daggs at 608.837.2087; E-mail: rdaggs@juno.com.
- **28-Oct. 2, World Dairy Expo 2004**, Madison, WI. For more information, go to www.worlddairyexpo.com.
- **29-Oct. 1, Wyoming Environmental Health Association Annual Educational Conference**, Great Divide Lodge, Breckenridge, CO. For more information, contact Roy Kroeger at 307.633.4090; E-mail: roykehs@laramiecounty.com.
- **29-Oct. 1, Bev Expo 2004**, Tampa Convention Center, Tampa, FL. For more information, go to www.bevexpo.com.

OCTOBER

- **5-7, ASTM Committee E27 on Hazard Potential of Chemicals**, Omni Shoreham, Washington, D.C. For more information, contact Scott Orthey at 610.832.9730; E-mail: sorthey@astm.org.
- **12-14, Applied Extrusion Workshop**, University of Nebraska Food Processing Center, Lincoln, NE. For more information, contact Pauline Galloway at 402.472.9751; E-mail: pgalloway2@unl.edu.
- **17-20, UW-River Falls 24th Food Microbiology Symposium**, "Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology," University of Wisconsin-River Falls, WI. For more information, call 715.425.3704; E-mail: foodmicro@uwrf.edu.
- **19-21, 2nd International Symposium on Spray Drying of Milk Products**, Maryborough House Hotel, Maryborough Hill, Douglas, Cork, Ireland. For more information, call 353.25.42237; E-mail: spraydrying2004@moorepark.teagasc.ie.
- **25-29, Dairy Technology Workshop**, Birmingham, AL. For more information, call 205.595.6455; E-mail: us@randolphconsulting.com.

CAREER SERVICES SECTION

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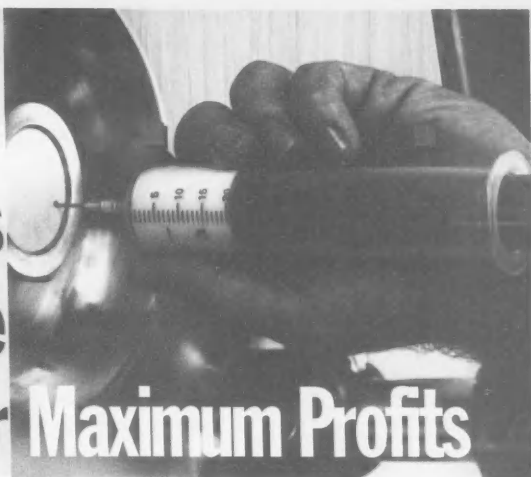
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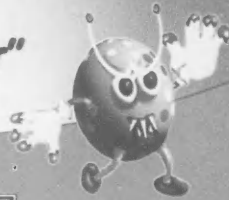
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