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FOOD PROTECTION TRENDS

SCIENCE AND NEWS FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

MAY 2007

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[1] Data on file, Diagnostic Systems, Sparks, MD 21152, USA.

International Association for Food Protection

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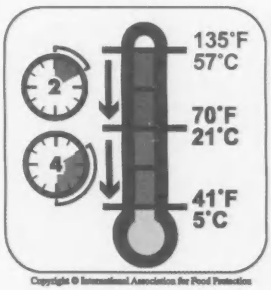
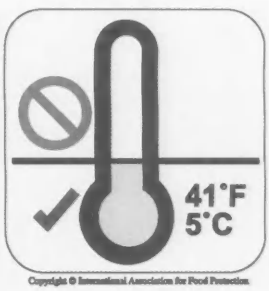
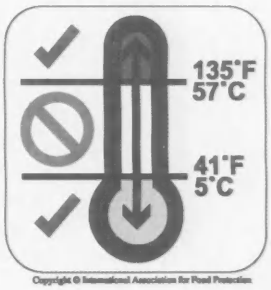


Refrigeration/Cold Holding



Hot Holding

Temperature Danger Zone



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

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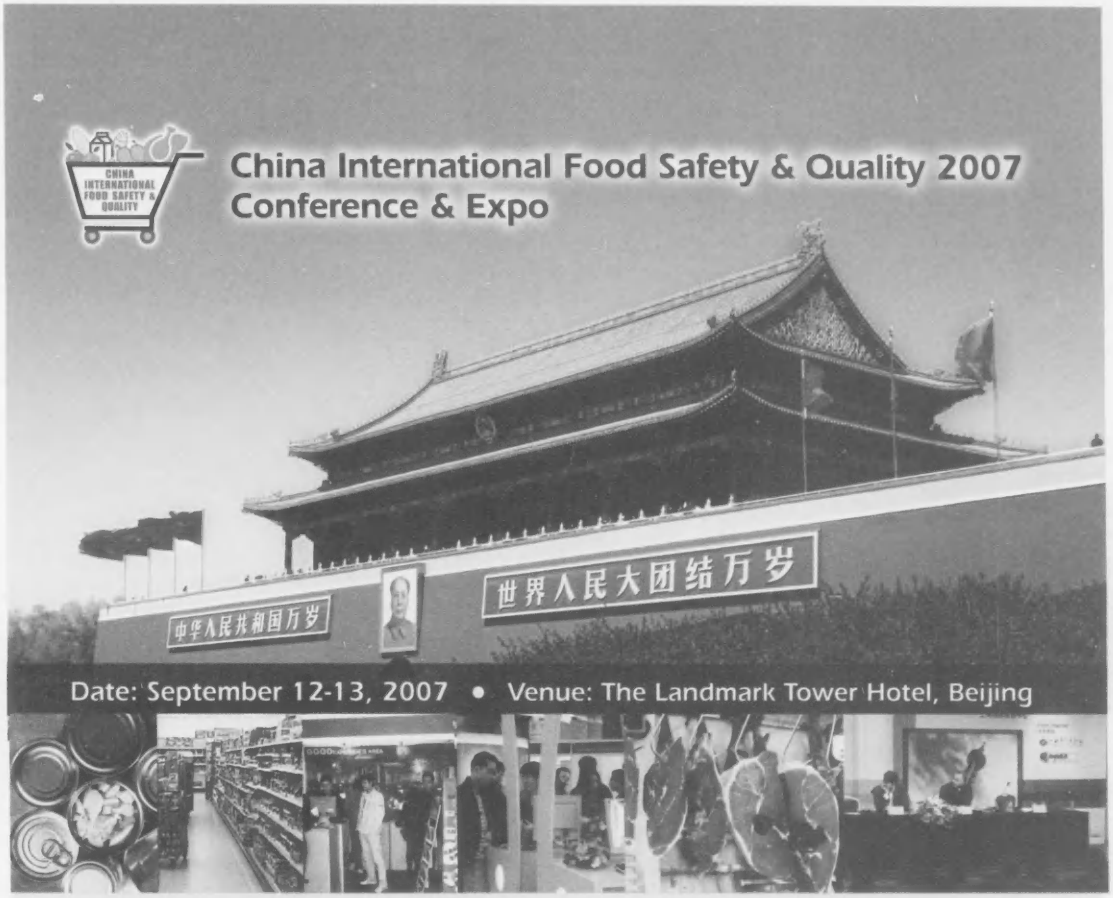

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Message from Wu Yi, Vice Premier, People's Republic of China

"The Chinese government will remain dedicated to the improvement of international cooperation and exchanges on food safety, borrow and share experiences from the international community, and make contribution to the establishment of an effective and harmonious worldwide food safety system."

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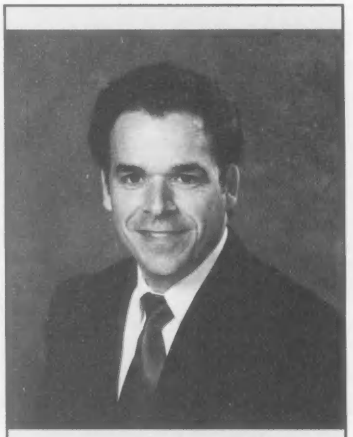


By **FRANK YIANNAS**
PRESIDENT

"I believe that we, as food safety professionals, need to adopt a systems thinking mindset"

Today's professional, committed to improving food safety, can find a host of articles, books, and conferences describing a wide range of activities, which they can consider implementing within their organization or place of employment to further reduce the risk of foodborne disease. Some of the activities published and discussed range from specific food safety training programs to particular food safety standards to the types of methods used to detect certain microorganisms. While all of these topics are very important, one major drawback to approaching food safety in this manner is that it doesn't demonstrate how the many activities an organization may choose to implement to manage food safety risks are linked together or interrelated. It doesn't demonstrate how they might influence each other. It doesn't treat the totality of food safety efforts as a system. It sometimes misses the big picture.

This brings us to the topic of this month's message – systems thinking.

To more effectively reduce the risk of foodborne disease, I believe that we, as food safety professionals, need to adopt a systems thinking mindset. That's right – a systems thinking mindset.

As I have mentioned before, the words we use and how we use them are important. So let's take a moment to review the word system.

According to Webster's dictionary, a system is a regularly interacting or interdependent group of items forming a unified whole. If you think about it, systems are quite common and they're everywhere. They range from simple systems to the more complex systems of life. There are living systems and there are non-living systems. Examples of living systems include a single cell, our central nervous system, a person, an ecosystem, or even an organization. In our case, the unified whole or the system that we're concerned about as food safety professionals is the organization's food safety management system.

While I realize that in the field of food safety today the term food safety management system is commonly used, it is not generally used in the context referred to in this message. The term food safety management system, as commonly used, often refers to a system that includes having prerequisite programs in place, good manufacturing practices (GMPs), a Hazard Analysis Critical Control Point plan, a recall procedure, and so on. It's a very process-focused system. Don't get me wrong, I'm all for well-defined processes and standards. They're critical. But having well-defined processes and standards aren't enough. The system I'm referring to in this message is a different sort of system. It's process focused, but it's also people focused. It's a total systems-based approach based on the scientific knowledge of food safety, human behavior, and organizational culture. I'll refer to it as a behavior-based food safety management system.

Remember, at the end of the day, to improve the food safety performance of an organization, you have to change people's behaviors. You can have the best-documented food safety processes and standards in the world, but if they are not consistently put into practice by people, they're useless. Accordingly, I believe a food safety management system has to address both the science of food safety and the dimensions of organizational culture and human behavior.

As we have acquired scientific knowledge through research and analytical methodologies about the causes of foodborne disease, food safety professionals have advanced food safety through the implementation of specific risk management strategies. At times, specific food safety concerns and strategies have been studied and

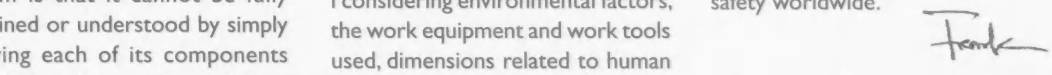
tackled in isolation, as individual components, not as a whole or complete system. Although this sort of linear cause and effect thinking in many instances has served us well, at times it is not fully adequate to address some of the unique challenges we still face in the field of food safety today. This is because many of the issues we still face – especially those involving food workers – involve multiple components or factors that are interrelated.

A critical characteristic of a system is that it cannot be fully explained or understood by simply studying each of its components in isolation. It must be explained by understanding how each part or component interacts and influences other components. Webster's definition of a system used above, where the parts of the system interact and are interdependent, suggests something beyond a simple cause and effect relationship. A system calls for a more complex understanding of relatedness to explain the role of the various components in the system as a whole.

The next time you're developing or reviewing a food safety management system, ask yourself, am I really considering all of the factors that interact to affect a particular outcome? In addition to basic food safety and sanitation principles, am I considering environmental factors, the work equipment and work tools used, dimensions related to human behavior, and the organization's culture? We won't make the types of dramatic improvements in reducing the burden of foodborne disease, especially in certain parts of the food system and world, until we get much better at developing a systems thinking mindset.

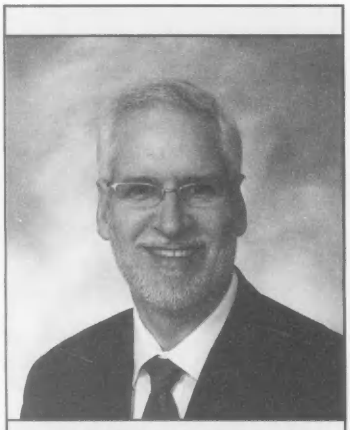
In closing, if you are truly committed to continual learning and reducing the risk of foodborne disease, I encourage you to make plans now (if you haven't already) to attend IAFP 2007 at *Disney's Contemporary* Resort on July 8–11. By all accounts, it looks like we'll have a record-setting Annual Meeting.

Together, we'll learn from one another, further develop a systems-thinking mindset, and advance food safety worldwide.



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

"COMMENTARY"
FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"We hope to build IAFP into an association serving a more International audience"

Recently, I corresponded with a former IAFP Member from Europe and I thought you would find some very interesting reading if I were to excerpt from the correspondence. I will leave out the former Member's name because that is not what is important. What is important is the "image" that IAFP has within Europe and Internationally. Please read on.

Former Member,

I was looking up your Member record in working with... and found that your Membership expired in March of 2006. Was this an oversight or did you knowingly let your Membership lapse?

If the first, you may renew online at: www.foodprotection.org. If you did want to let your Membership lapse, I would be interested in the reason(s).

Regards,
David

I fully expected to receive back a reply of, "I am sorry, I did overlook my renewal. Things have been very busy, but I will take care of it this week." Well, I was surprised to receive the following:

Dear David,

I actually did let my IAFP membership lapse, and I'll be frank about the reason. It is because I do not see clear evidence that the Association is truly "International".

The members of the Executive Committee are predominantly located in North America. The Scientific Editors of the *JFP* are all US academics (there was an opening for a new editor a couple of years ago, which was a good opportunity to expand the geographical representation, but it went to yet another US member). The Editorship of *Food Protection Trends* is wholly North American. The Annual Meetings are all held in North America (mostly in the US). Really, the name of the Association could be changed to the North American AFP, and no-one would see the difference.

In the nearly 9 years I have been involved with the Association, I have seen no real effort towards expanding its organisation outside North America. OK, it has held some small meetings in Europe, but these have been fairly limited, and quite parochial, in scope. This is further disappointing, because when I have attended the Annual Meetings I have always been impressed by the scale and content – they are outstanding conferences.

But until I see a real effort towards more involvement, in the organisation of the Association, of workers from [outside] the North American continent, I will be reluctant to renew my membership...

Regards,
Former Member

I hesitated to make a reply for fear of further upsetting our former Member, but the more I thought about it and the more I discussed it with our office staff, I changed my mind to believe I should substantiate our International progress for our former Member's review. I could also provide some background that would be beneficial for review. So, I prepared a rather lengthy reply and preceded it with an apology for making the reply so long, but I wanted to address each item of concern. Below is a shortened version of my reply.

Former Member,

Thank you for your very direct comments. I am glad you took time to share them with me. ... I'm not sure how much you knew about IAFP and our financial condition over the years you were a Member, so let me start there. IAFP has never faced problems with cash flow or its ability to pay obligations, but when we looked at the General Fund (operating fund) for the Association, we were at a negative fund balance. This meant if we were to close up the association, we would not be able to pay all obligations and return unused member dues to the membership. ... We are making progress, have a positive fund balance, and are in much better health than we were five years ago!

The reason I start with our finances is that this background affected all of IAFP's long-term plans including our International involvement. Because we were "on the edge" financially, the IAFP Board was not willing to take risks that could adversely impact the financial health of the organization. ...decisions over

the past 5 to 8 years included our efforts to hold conferences or symposia outside of the USA. Once the decision was made to hold the symposium in 2005, it was done in conjunction with ILSI Europe to increase the chance for success and to decrease the overall financial exposure.

Having held a successful first symposium in Prague (2005) (even though it was small, with just 70 attendees), we felt it was to our advantage to continue the symposium series in 2006 (in Barcelona). This effort was quite successful and attendance grew to 140 along with eleven sponsors and 18 exhibitors. Our second year proved to be financially successful as we broke even on the event.

...the Board has now committed to holding a yearly event in Europe along with organizing an event annually somewhere else in the world. These are rather bold steps for an Association of our size, even though in the whole, world-wide scheme of things they are rather small. Our first event (non-European and non-North American) will be this September in China. We are partnering with an event organizer in China, World Services, Ltd. and will assist by providing program content and speakers. By doing so, we hope to expand our reach to food microbiologist and food safety professionals in China and Asia-Pacific. For 2008, our sights are set on Brazil for our "International Symposium."

...I always found it strange that we were an International association since 1911, but we had not held scientific meetings or events outside of North America. From your input, I can see you share this viewpoint. ... we hope to build IAFP into an association serving a more International audience. ...we must do this in a planned out, methodical manner so as to always protect IAFP's Member assets.

Before concluding this reply, I do want to address the International nature of our publications. The *Journal of Food Protection* published 430 research papers in volume 69 (2006). Of those papers, 47 percent were authored outside of North America. Spain, Italy, Japan, United Kingdom, Greece and Korea were the leading countries of origin ...When looking at the 2007 Editorial Board for *JFP*; we find that 28 of 150 participants are from outside of North America (or 19%). Our Membership is made up of about 10% to 11% International Members (outside of North America) along with about 8% Canadian or Mexican Members. So, the Editorial Board is well represented by those outside of North America ...

...Now if we look at the *Food Protection Trends* Editorial Board, I agree with you that we need to increase our International representation (and Canadian or Mexican representation). Currently, we have only 3 out of 45 from outside of North America (7%) and none from Canada or Mexico. I'm sure when this is expressed to our Scientific Editor, we will be adding [International Members] to our Editorial Board.

Now, I believe the last issue you raised is the make up of our Executive Board. True, it is mostly North American, but we do have representation from Brazil this year in Maria Teresa Destro, our Affiliate Council Chairperson. You may or may not know during our 2006 Secretary Election; Leon Gorris from the United Kingdom was a candidate. Unfortunately for our International efforts, Leon was not elected by the IAFP Membership at the time. Soon, I am willing to bet we will have a Board Officer from outside of North America! Similar to electing the first woman to the IAFP Executive Board (Ann Draughon, President 1996), sadly, these things take time to evolve.

I hope this has helped to provide perspective to your thoughts about IAFP. We realize other people; both Members and non-members along with potential Members share your concerns. We want to satisfy our Members while attracting new Members and we work hard as an organization to provide solid, science-based information to allow food safety professionals "around the world" to do their best in protecting the world's food supply.

Your input and ideas for additional IAFP International involvement are welcome. Please feel free to forward any ideas you have to me. We hope you will again see the value of being an IAFP Member and that you will join with us to be an active IAFP Member in the near future!

Best regards,
David

As I said, my reply was rather long but I felt it was important to point out our recent International progress. A day or two later, I was elated to receive this reply:

David,

Thank you very much for your open response to my comments. I now have a clearer picture of the situation.

I take your point about being planned out and methodical; I guess expansion will take some time, but is achievable in the long term. From the ...Europe end, I will encourage my colleagues to attend the Annual Meetings. I hope we will also be able to grow our membership, and thus expand our range of activities.

I will look forward to this year's Annual Meeting in Orlando; the preliminary program looks excellent!

I will also renew my full membership at the earliest opportunity.

Best Wishes,
New Member

Not always do things turn out this way, but our "Former Member" had a legitimate concern about IAFP and expressed an opinion. The "Former Member" read my response with an open mind and decided that IAFP was making progress in the International food safety arena. We were so happy to receive the reply that our "Former Member" will now be an active IAFP Member once again!

If you have questions about IAFP or our operations, do not hesitate to contact me or anyone at the IAFP office. We will always respond to your questions and provide a prompt reply. Thanks for your continued Membership!

ARTICLES

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International Association for Food Protection

Salmonellosis Outbreaks in Humans in the United States, 1990–2003: The Contribution of Turkey as a Vehicle

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SUMMARY

Studies have implicated poultry and poultry products in the outbreak of salmonellosis; however, information is lacking on the role of turkey as a vehicle in foodborne outbreaks. We designed this study based on the hypothesis that consumption of turkey carries a comparable risk of acquiring salmonellosis to that associated with other vehicles. To fill this information gap, we described the spatial and temporal occurrence of outbreaks, described occurrence of outbreaks by vehicle, ranked turkey meat associated outbreaks (TMAOs) with salmonellosis outbreaks associated with other vehicles (SOOVs), and evaluated the major *Salmonella* serotypes isolated in TMAOs relative to SOOVs. We used Cox-Stuart and chi-square tests to test for trends in numbers of outbreaks over time and in major serotypes across vehicles, respectively. There were 1,465 salmonellosis outbreaks involving 49/50 states. TMAOs were reported by 24 states, mostly from California and New York. No trend was observed for TMAOs (P=0.2734) and SOOVs (P = 0.1641), and outbreaks peaked in fall and in summer for TMAOs and SOOVs, respectively. Of the 1,465 outbreaks, 1,036 of them had a known vehicle. Turkey was implicated in 43 (4.2%), seafoods in 60 (5.8%), pasta in 86 (8.3%), milk products in 89 (8.6%), chicken in 139 (13.4%), red meats (beef and pork) in 160 (15.4%), eggs in 221 (21.3%), and fresh produce in 238 (23%). Most outbreaks occurred at restaurants and in private homes for TMAOs (23.2% and 21%) and SOOVs (46.9% and 24.1%), respectively. The major serotypes were *S.* Enteritidis, *S.* Heidelberg, *S.* Reading and *S.* Newport from TMAOs, and *S.* Enteritidis, *S.* Typhimurium, *S.* Heidelberg and *S.* Newport from SOOVs, in that order. TMAOs were lower than SOOVs. Understanding factors related to low TMAOs would help in the design of effective salmonellosis control programs.

A peer-reviewed article

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INTRODUCTION

Non-typhoidal salmonellosis is caused by ingestion of any of the 2,300 varieties of *Salmonella* species, while only one species, *Salmonella* Typhi, causes typhoid fever (typhoidal *Salmonella)*. In the United States (US) alone, foodborne pathogens have been known to cause approximately 76 million illnesses in humans annually, of which approximately 14 million are caused by known pathogens *(18)*. The same authors estimated a total of 1.4 million cases that were attributed to non-typhoidal *Salmonella* species alone, based on both sporadic and outbreak- associated cases. Furthermore, they estimated that five pathogens accounted for over 90% of the estimated food-related deaths: *Salmonella* (31%), *Listeria* (28%), *Toxoplasma* (21%), Norwalk-like viruses (7%), and *Campylobacter* (5%).

The US Centers for Disease Control and Prevention (CDC) receives data from all the US states through outbreak reports, and through active as well as passive surveillance programs. The CDC then teases out data for various food items, which in turn receive a great deal of media publication on preventive measures to avoid foodborne illnesses. However, not all food items, including turkey, have been equally analyzed (Robert V. Tauxe, Chief, Foodborne and Diarrheal Diseases Branch of CDC, personal communication, 2005).

There is growing concern over the potential of turkey as an important vehicle of salmonellosis, as evidenced by a few studies and a number of anecdotal reports *(3, 5, 17)*. Turkey is one of the widely eaten meat types in the US, especially during Thanksgiving festivities each year *(5, 27)*, and the large scale operations designed to meet the high demand could compromise the safety of the meat *(24)*.

The United States Department of Agriculture (USDA) testing program, which began in 1998 in slaughter plants and establishments producing raw ground products, to verify that PR/HACCP (Pathogen Reduction; Hazard Analysis Critical Control Point) systems are effective in controlling the contamination of raw meat and poultry products with human disease-causing bacteria, found that 50% of turkeys still tested positive for *Salmonella* after the implementation of the program *(25)*. In addition, specific reports have linked the consumption of turkey to human salmonellosis outbreaks *(3, 10, 17, 20)*. In most of these cases, outbreaks have been associated with the eating of improperly prepared turkey *(3, 5)*, and death due to its consumption was reported in South Carolina in 2005 *(23)*.

Although some studies have implicated poultry and poultry products in outbreaks of disease, information is lacking on the role of turkey as a vehicle in foodborne outbreaks. We designed this study with the hypothesis that the risk of human salmonellosis associated with consumption of turkey is similar to that associated with other vehicles. Similarly, we believed that the *Salmonella* serotypes causing turkey meat-associated outbreaks (TMAOs) are similar to those in salmonellosis outbreaks associated with other vehicles (SOOVs) of transmission. The objectives of this study were: (1) to describe the spatial and temporal occurrence of outbreaks, (2) to describe occurrence of outbreaks by vehicle and to rank TMAOs and SOOVs, and (3) to evaluate the major *Salmonella* serotypes isolated from TMAOs relative to those isolated from SOOVs.

MATERIALS AND METHODS

Data sources

We obtained data on foodborne outbreaks in the US for the period 1990–2003 from the CDC Web site *(8)*. We entered the data in Microsoft Access, and selected variables (serotype, year, month, vehicle, state and venue), which we analyzed by use of SAS, version 9.1 (SAS Institute).

Statistical analysis

We used the Geographical Information Systems (GIS) Arc Info 8 software to map the distribution of outbreaks and incidence rates by state. We tested the effect of month and year by use of a two-way analysis of variance (ANOVA) without interaction to evaluate the temporal patterns in the reported outbreaks. In addition, we tested for the presence of either upward or downward trends in the number of outbreaks for TMAOs and SOOVs over the years, using a one-sided Cox-Stuart test for trend (alpha = 0.1). In addition, we computed pairwise comparisons of significant differences within months and years of outbreak, using Least Significance Differences (LSD, alpha = 0.05). We computed proportions of salmonellosis outbreaks for each venue and vehicle, and compared seasonal outbreaks: winter (December, January, February), spring (March, April, May), summer (June, July, August), and fall (September, October, November) by vehicle and by venue, using a chi-square test for independence (alpha = 0.05). We categorized venue in the analysis as restaurant, private home and other (hotel, workplace, school, daycare/nursing home, prison, hospital, church, camp, and community gathering). In addition to the other tests, we used a chi-square test for homogeneity (alpha = 0.05) to compare the proportions of the major serotypes reported from TMAOs relative to those reported from SOOVs.

RESULTS

Occurrence of salmonellosis outbreaks by state

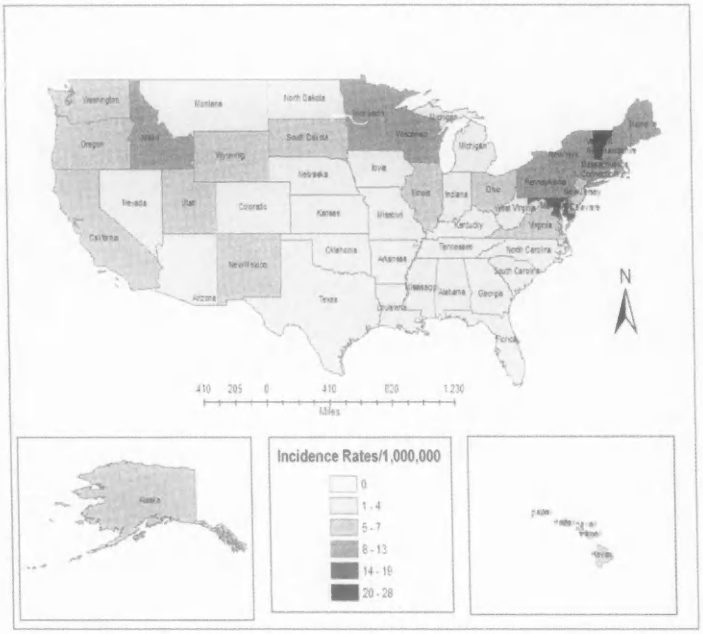
During the period under study (1990–2003), 1,465 human salmonellosis outbreaks from both TMAOs and SOOVs were reported in 49 of the 50 states in the US (Rhode Island did not report any outbreak during the period). More than half of the states (59%; 29/49) reported a total of 43 TMAOs. California and New York reported the majority (4 outbreaks each) of TMAOs.

Overall, for both TMAOs and SOOVs, the states with the most outbreak reports were California 193 (13.2%), New York 182 (12.4%), Pennsylvania 101 (6.9%), Maryland 93 (6.3%), Illinois 71 (4.8%), and Massachusetts 69 (4.7%). Because the states with the highest number of outbreak reports are among the most populated in the US, we controlled for population size by calculating incidence rates. The state of Vermont had the highest incidence rate, 28 outbreaks per 1 million people (28/1,000,000), followed by Maryland, (with 17/1,000,000). The states of New York, Massachusetts, New Hampshire, Delaware, Maine, Wisconsin, Minnesota, Pennsylvania, and Idaho reported rates in the range of

TABLE 1. Comparison of seasonal salmonellosis outbreaks by venue in the US: 1990–2003

Season	Restaurant (%)	Private homes (%)	Other (%)	Total (%)
Winter	76 (11.9)	49 (15.0)	72 (12.6)	197 (12.8)
Spring	144 (22.6)	65 (19.9)	117 (20.5)	326 (21.2)
Summer	278 (43.6)	122 (37.3)	228 (40.0)	628 (40.9)
Fall	140 (21.9)	91 (27.8)	153 (26.8)	384 (25.0)
Total	638	327	570	1535

FIGURE 1. Incidence rates of non-typhoidal salmonellosis outbreaks in the US: 1990–2003



8/1,000,000 to 13/1,000,000 (Fig. 1). Other states with relatively high incidence rates were Oregon, California, Washington, Utah, Wyoming, New Mexico, South Dakota, Illinois, Ohio, New Jersey, Virginia, Alaska, and Hawaii. Half of all states had very low incidence rates, ranging from 1 to 4 outbreaks per million people.

Occurrence of salmonellosis outbreaks by venue and season

Data on eating venues were available in 88.5% of the reported outbreaks, with some outbreaks implicating more than one venue. Most outbreak venues were restaurants and private homes for TMAOs (23.2% and 21%), and SOOVs (46.9% and 24.1%), respectively. Overall, the outbreak venues reported were: restaurant (41.6%), private home (21.3%), community gathering (5.8%), daycare center and nursing home (4.6%), workplace (3.1%), school (3.1%), church gathering (3%), prison (2.1%), hotel (1.6%), camp (1.4%), and hospital (1%). Also, the chi-square test of independence, calculated from data in Table 1, shows no evidence of a dependence between venue and season in the occurrence of outbreaks (P value = 0.1717).

Occurrence of salmonellosis outbreaks by time

We tested the number of outbreaks reported per year by use of ANOVA and found them to be significantly different (P = 0.0224) from year to year during the period studied. The years with the highest occurrence of TMAOs were 1990, 1991, and 1994, while those with the largest number of SOOVs were 1990, 1991, and 1999, as shown in Fig. 2. Pairwise comparisons of the difference between years show that for both TMAOs and SOOVs, 1990 and 1991 had higher occurrences than the rest of the years studied. After this period, outbreak reports fluctuated from around 1992 to 2001 and stabilized up to 2003. Both TMAOs (P = 0.2734) and SOOVs (P = 0.1641), show no upward or downward trend when a one-sided Cox-Stuart test was used for trend. Additionally, TMAOs were consistently lower than SOOVs for the study period.

Comparison by month showed that there were significant differences (P < 0.0001) in the number of monthly outbreaks reported during the study period. Pairwise comparisons of the difference in monthly outbreaks by use of the LSD (alpha = 0.05) show that for the SOOVs, summer months (June, July and August) had significantly higher numbers of reports of outbreaks than the rest of the months. Contrary to this observation, however, TMAOs peaked in the month of November, as shown in Fig. 3. Winter months (December, January and February) had significantly fewer reports of outbreaks than the rest of the months for both TMAOs and SOOVs.

Occurrence of salmonellosis outbreaks by vehicle

More than one vehicle was implicated in some of the outbreaks. Of the total of 1,659 vehicles in 1,465 outbreaks 1,036 (62.4%) were known and 623 (37.6%) unknown. Of the 1,036 outbreaks (43 TMAOs and 993 SOOVs) with a known vehicle, turkey was implicated in 43 (4.2%), seafoods in 60 (5.8%), pasta in 86 (8.3%), milk and milk products in 89 (8.6%), chicken in 139 (13.4%), red meats (beef and pork) in 160 (15.4%), eggs in 221 (21.3%), and fresh produce in 238 (23%). TMAOs were significantly fewer than all the other vehicles except seafoods (P = 0.0939). Additionally, based upon the results of a chi-square test of independence (P = 0.2761) the vehicles of transmission were not associated with particular seasons of the year; rather, the vehicles implicated in salmonellosis occurred randomly throughout the year.

FIGURE 2. Comparison of annually reported turkey meat-associated salmonellosis outbreaks andsalmonellosis outbreaks associated with other vehicles in the US: 1990-2003

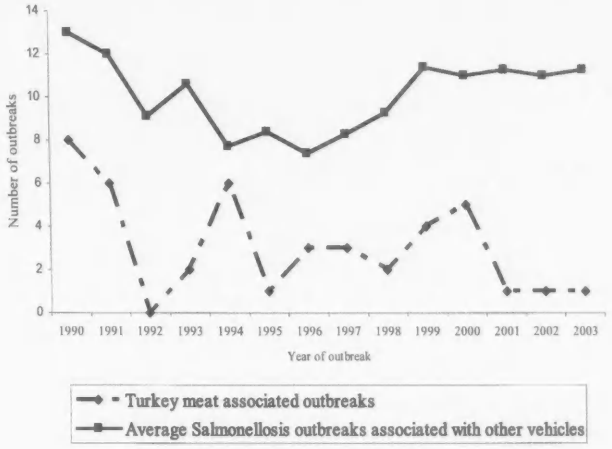
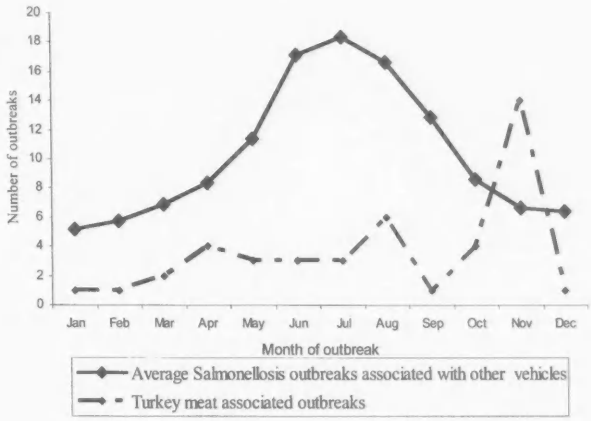


FIGURE 3. Comparison of monthly reported turkey meat associated outbreaks and salmonellosis outbreaks associated with other vehicles in the US: 1990–2003



Occurrence of *Salmonella* serotypes from TMAOs relative to SOOVs

More than one serotype was isolated in some of the outbreaks. A total of 1,465 outbreaks yielded 1,481 serotype occurrences, of which 90.2% (1,337/1,481) were identified. Of the sixty-three serotypes in total from both TMAOs and SOOVs, the four major ones, which accounted for 77.7% of the outbreaks, were *S.* Enteritidis 718/1,337 (53.7%), *S.* Typhimurium 144/1,337(10.8%), *S.* Heidelberg 113/1,337 (8.5%) and *S.* Newport 64/1,337 (4.8%). A chi-square test for homogeneity ($\alpha = 0.05$) showed that the proportions of the four major serotypes (*S.* Enteritidis, *S.* Typhimurium, *S.* Newport and *S.* Heidelberg) differed with respect to different vehicles of transmission ($P = 0.0001$). More than one serotype was isolated in some of the TMAOs. A total of 43 outbreaks yielded 44 serotype occurrences, of which 84% (37/44) were identified. Of the thirteen serotypes in total from TMAOs, the 4 major ones were *S.* Enteritidis 16/37(43.2%), *S.* Heidelberg 4/37(10.8%), *S.* Reading (8.1%) and *S.* Newport 2/37 (5.4%). More than one serotype was isolated in some of the SOOVs (1,006 serotype occurences in 993 outbreaks). The four major serotypes from SOOVs were ranked as follows: *S.* Enteritidis 511/1,006 (50.8%), *S.* Typhimurium 88/1,006 (8.7%), *S.* Heidelberg 84/1,006 (8.3%) and *S.* Newport 48/1,006 (4.8%). The proportion of the four major serotype isolated from TMAOs were similar to those isolated from each of other vehicles except in red meats ($P = 0.0109$) and eggs ($P = 0.0115$).

DISCUSSION

TMAOs were few compared with other vehicles but occurred in almost 60% of all the states in the US, with the states of California and New York reporting higher outbreak occurrences than the rest. Overall, for both TMAOs and SOOVs, the states with comparatively higher incidence rates (Maryland, Minnesota, California, Oregon, New Mexico and New York) were members of FoodNet, a collaborative project of the CDC, ten Emerging Infections Program (EIP) sites, the USDA, and the Food and Drug Administration (FDA), an indication that these states probably had better reporting systems than other states had. FoodNet routinely monitors seven foodborne bacteria including *Salmonella* and two parasites. Non-member states might want to consider joining FoodNet to improve their reporting system.

Restaurants and private homes were the most reported venues for both TMAOs and SOOVs in this study. The large number of reports of outbreaks associated with private homes could reflect a greater tendency to seek medical care when various members of a family have the same symptoms; however, the large number of reports associated with res-

taurants could be attributed to the large number of people who eat away from home, which in turn requires a large number of workers to handle food *(14)*. Many *Salmonella*-infected food handlers have been documented as reservoirs in foodborne salmonellosis outbreaks *(11, 15)*; moreover, it takes only one food handler to render many people ill. Also, investigations of salmonellosis outbreaks in restaurants have frequently cited handling of food by an infected person or carrier and bare-hand contact with food *(2, 12)* as a causal factor. *Salmonella* can survive on the fingertips for several hours, and food can be contaminated through contact with fingertips inoculated with < 100 organisms *(22)*. Thus, slight breaches in hand hygiene by those infected, resulting in even minute amounts of fecal contamination of fingertips, could result in a salmonellosis outbreak. These factors are similar in situations involving preparation of food for large groups, namely prisons, schools, daycare centers, nursing homes, hospitals and other community gatherings.

The annual salmonellosis outbreaks show that there were no TMAOs reported in the year 1992 in all the states under the study, and no upward or downward trend was detected for either TMAOs or SOOVs during the study period (1990–2003). However, data from the FoodNet survey carried out in selected sites in the US show considerable temporal variations for the three of the four common *Salmonella* serotypes (*S.* Typhimurium decreased, *S.* Enteritidis did not change significantly, *S.* Newport increased), resulting in a significant decrease of 15% in incidence rates of salmonellosis in the period 1996–2001 *(7)*. In another report by the same authors, the breakdown shows that the overall incidence of salmonellosis decreased by 15% from 1996 to 1998; however, the incidence increased by 20% from 1998 to 1999 *(6)*.

Overall, the proportion of outbreaks due to TMAOs during the study period was consistently lower than that of any other SOOVs. This could be due to the fact that in the United States, around Thanksgiving festivities, the press emphasizes food safety tips, targeting turkey handling and preparation *(26)*. Despite all this preparation, however, TMAOs peaked in November, which could be a reflection of aggregated risk associated with the tradition of increased turkey consumption nationwide on Thanksgiving. Noteworthy is the fact that whereas TMAOs peaked in November, the rest of the months, namely September and October, categorized under fall (as a season) actually had few outbreaks. In agreement with other published reports *(9, 16)*, results from this study show that SOOVs peaked in summer months. This temporal distribution of salmonellosis outbreaks has been attributed to community gatherings (picnics, weddings and parties) that are associated with undercooked barbecue food and the types of food that are favorites at this time of year, namely, salads and buffets that are sometimes left standing around for long periods of time at abusive temperatures *(21)*. It has also been suggested that improper hand washing of infected food handlers may account for a proportionately high incidence of salmonellosis outbreaks *(16, 19)*.

The four major *Salmonella* serotypes commonly isolated in humans in the US are *S.* Enteritidis, *S.* Typhimurium, *S.* Heidelberg and *S.* Newport *(7)*; three of these serotypes (*S.* Enteritidis, *S.* Heidelberg and *S.* Newport) were the most commonly implicated in both TMAOs and SOOVs. Additionally, *S.* Reading was frequently isolated in TMAOs in this study. This observation is in agreement with results of other studies *(1, 4, 13)* that have cited *S.* Reading as a common serotype in turkeys. In one outbreak of salmonellosis *(4)*, an acute-care hospital in Connecticut reported isolating *S.* Reading from three stool samples: two isolates were from patients and one was from a hospital food-service employee. Additionally, stool cultures were obtained from all 82 food-service employees, all 26 symptomatic nonfood-service employees, and a convenience sample of 24 asymptomatic nonfood-service employees. *S.* Reading was isolated from 20 (24%) food-service employees, four (8%) symptomatic nonfood-service employees, and three (4%) hospital inpatients. Analysis of stool-culture findings and a food-preference questionnaire administered to food-service employees implicated consumption of turkey as the likely source of salmonellosis. Of the 29 food-service employees who reported eating turkey regularly in the hospital cafeteria, stool cultures from 19 (66%) yielded *S.* Reading, compared with one from the 53 (2%) employees who ate turkey infrequently (relative risk = 34.7; 95% confidence interval 4.9–246.3). The three hospital inpatients and the four nonfood-service employees who were culture-positive all reported eating turkey in the hospital during pre-outbreak time. Turkey salad, turkey sandwiches, and chef's salad with turkey were served in the hospital cafeteria and were on the inpatient menu every day. Frozen 18–20-pound turkey breasts were routinely cooked in a slow roaster oven for 5 hours at 250°F (121°C), then for 10 hours at 160°F (71°C); however, core temperatures were not measured. After cooking, turkey dishes were kept refrigerated for up to 72 hours. After the outbreak, the hospital instituted proper cooking procedures for turkey (i.e., thawing frozen turkey before cooking in a standard oven to a core temperature of 165°F (74°C)) and no additional cases of *S.* Reading infection were reported.

In another study *(1)* eleven *(11) Salmonella* strains were recovered from 11 (8.2%) out of 134 turkey meat samples in Albania, during the time period 1996–1998. The percentage of *Salmonella*-positive turkey meat samples varied, with 5% in 1996 (3 out of 60), 14.7% in 1997 (5 out of 34) and 7.5% in 1998 (3 out of 40). Five (5) different serotypes were encountered; *Salmonella* Enteritidis (4 isolates), *Salmonella* Agona (3 isolates), and *S.* Saint-Paul, *S.* Reading and *S.* Blockley, with only one isolate each. One *Salmonella* strain, belonging to serogroup B, was not completely serotyped. Also, it is interesting to note that *S.* Reading and *S.* Heidelberg were among the serotypes recovered from turkey farms and their environment *(13)*, where-as *S.* Heidelberg was isolated more frequently in both humans and turkeys than *S.* Reading.

In conclusion, TMAOs and SOOVs have been reported widely in the US, possibly because of surveillance programs initiated by CDC through its collaborating agencies. FoodNet member states

reported more outbreaks; therefore, states that are not members may consider joining the program to improve their foodborne outbreak reporting or increase their outbreak research and enhance reporting through an aggressive education and funding drive. There was no upward or downward trend for either TMAOs or SOOVs. Also, TMAOs peaked in November, whereas SOOVs peaked in the summer months. However, TMAOs and SOOVs were not dependent on season or venue. In addition, the risk of salmonellosis infections associated with TMAOs was lower than that associated with SOOVs. A great deal is published in the popular press around Thanksgiving time about safe handling of turkey and about the meal in general. It is possible that these educational messages are positively correlated with the lower numbers of illnesses attributed to turkey. Also, the four major serotypes that were isolated from TMAOs were similar to those isolated from SOOVs, except in red meats and eggs.

Further research is warranted to fully understand factors related to the low salmonellosis incidence rates associated with turkey consumption. This information is be vital to the design of effective salmonellosis prevention and control programs in humans. Enforcing these control methods on turkey, especially during Thanksgiving festivities, would further reduce the number of salmonellosis outbreaks in the United States.

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In Memory of...

Alex von Holy
Gauteng, Republic of South Africa

IAFP would like to extend our deepest sympathy to the family and friends of Alex von Holy, who passed away in March 2007.

IAFP will always have sincere gratitude for his contributions to the Association and the profession.

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Consumer Decisions on Storage of Packaged Foods

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SUMMARY

We investigate the causes of consumer uncertainty regarding storage of packaged foods by examining the characteristics of the consumers, the type of food products and packaging, and where the product was stored at purchase. Consumers' self-reported refrigeration practices from the 1998 Food Safety Survey are analyzed descriptively and by logistic regression. Eleven percent of the 2,001 respondents reported difficulty during the past three months in deciding whether to refrigerate a packaged food. When consumers do have difficulty, it is likely that the products either are new to them or need to be stored in an unexpected way. Those most likely to report uncertainty about whether to refrigerate were people of middle age and people likely to be more attuned to food safety issues — those who have some college or higher education, who look at many sources of food information, and who thought that a household member had a recent foodborne illness. The results suggest that additional education may be needed to inform consumers about proper refrigeration and that storage information on packages is particularly important for foods that are stored at room temperature until opened but that then need refrigeration.

INTRODUCTION

Proper storage of food at home is an important practice for preventing foodborne illness. Improper cooling and a lapse of 12 or more hours between preparing and eating food were found to be the fourth and fifth leading factors contributing to 345 outbreaks of foodborne illness caused by mishandling and/or mistreating foods in homes in the United States between 1973 and 1982 *(3)*. Proper storage of packaged foods is also essential; at least three cases of botulism have been reported that were probably contracted because of failure to refrigerate a packaged food. One of the cases was from an improperly stored bean dip and the other two from improperly stored clam chowder *(4, 11)*.

Although many factors related to consumer food safety behaviors have been described, including at which consumers keep their refrigerators, temperature cooling practices for cooked foods, and storage times for refrigerated foods *(8)*, this is the first study to investigate consumer storage decisions for packaged foods.

After purchasing food, consumers must decide where to store each product — in the refrigerator, in the freezer, or at room temperature. Although in the past this may have been an easy decision, new preserving and packaging technologies have extended the life of some foods that

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TABLE 1. Percent of consumers who reported having difficulty deciding how to store a packaged food by demographic characteristics

Characteristic	Difficulty deciding
	%
Total sample	11
Race	
White	11
Black	14
Other	14
	$\chi^2_{df=2} = 3.2$ $P = 0.2$
Gender	
Female	13
Male	10
	$\chi^2_{df=1} = 3.33$ $P = 0.07$
Age	
18–25	9
26–39	14
40–60	12
60+	7
	$\chi^2_{df=3} = 15.51$ $P < 0.01$
Education	
< High School	7
High school	10
Some college	13
College grad +	15
	$\chi^2_{df=3} = 13.05$ $P < 0.01$
N=2,001	

Based on weighted data

need refrigeration *(5, 9)*. Some of these foods may be in a form that confuses consumers. The type of packages involved in the three cases of botulism may have contributed to the confusion *(4)*. Also, consumers may not know that some other types of foods, such as mayonnaise and ketchup, need to be refrigerated after opening *(12)*.

This study examines consumer storage decisions in terms of the characteristics of people who are uncertain as to how to store a packaged product; the types of products and packaging most likely to be confusing; and where the product was stored at purchase.

MATERIALS AND METHODS

Sample

Data are from the Food and Drug Administration's 1998 Food Safety Survey (FSS). A total of 2,001 adults aged 18 and over participated in this national, random digit dial telephone survey. Telephone numbers were selected using the GENESYS list-assisted method *(2)*, and the respondent from each household was selected by the last birthday method. The data were weighted for both design weight (the number of adults in the household and number of phone lines) and population weight (to adjust the sample to 1998 Census proportions on race, education, and gender).

Variables

The 1998 version of the Food Safety Survey contained a set of questions about storage of packaged foods. Participants were asked if they had trouble deciding whether to refrigerate a packaged product in the past three months. Those who said "yes" were asked a series of follow-up questions: what type of food was problematic, how it was packaged, how it was stored when purchased, and whether the consumer had trouble deciding how to store it before or after opening the package. Those who said "no" were asked only how they decide whether a packaged food needs to be stored in the refrigerator after opening.

Variables from other parts of the survey were also used in this analysis, including such demographic variables as education, race, gender, and age. An information sources index was created from questions that asked consumers about the sources of their information on safe food handling. A factor analysis showed that five sources loaded together: cookbooks, newspapers and magazines, news programs, food labels, and grocery store handouts. Therefore, only these five sources were included in the index. This index had a Cronbach alpha of 0.64.

Risk sensitivity variables included respondents' perceptions of how commonly they believe people get a foodborne illness from foods prepared at home, whether the respondent believes that someone in the household recently experienced foodborne illness, and whether the respondent reports eating at least one of four raw foods from animals (raw clams, raw oysters, raw fish, or steak tartare). A personal risk perception variable was created from questions about how likely respondents think it is that they would get sick from four specific food-handing errors: forgetting to wash hands before beginning to cook, allowing contact between vegetables to be eaten raw and raw meat or chicken, eating a piece of chicken that is not thoroughly cooked, and leaving food unrefrigerated for more than 2 hours after it is cooked.

Cooking experience variables included whether the respondent prepares the main meal in the household either most or some of the time and a cross-contamination prevention index. The cross-contamination prevention index consisted of five separate questions about food-handling behaviors in the home: washing hands before cooking and after touching raw meat or chicken and seafood, and washing cutting boards after cutting raw meat or chicken and raw fish.

FIGURE 1. Distribution of food types that caused refrigeration uncertainty in consumers (N=237)

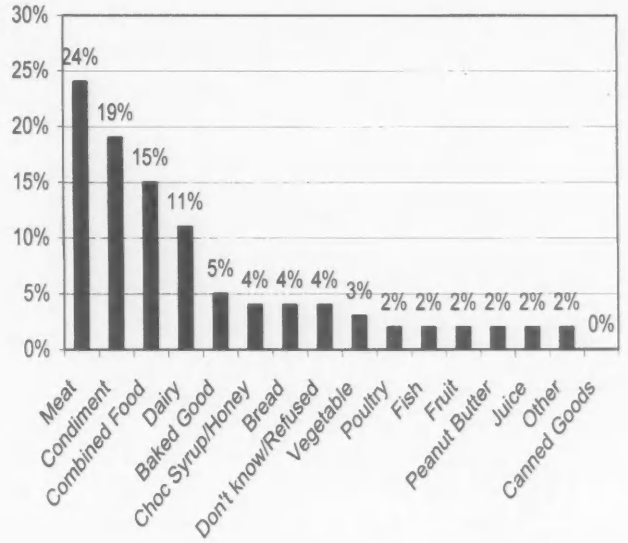
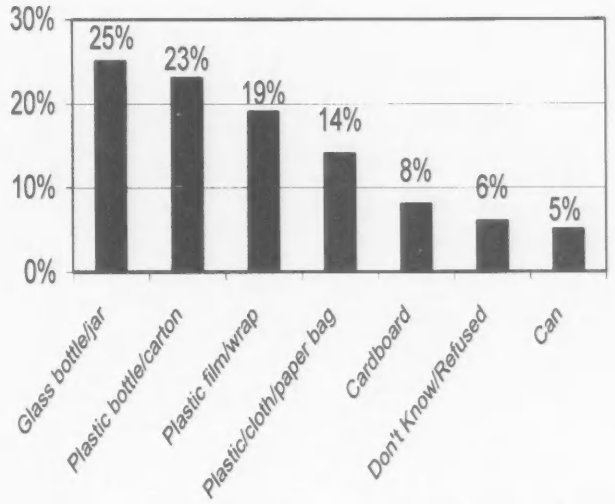


FIGURE 2. Distribution of packaging types for foods that caused refrigeration uncertainty in consumers (N=237)



Data analysis

The storage response distributions and cross tabulations were analyzed to describe the respondents' demographic characteristics, the types of products that are most problematic, and how the respondents decide where to store food. Logistic regression was conducted to characterize demographic, risk sensitivity, and cooking experience variables associated with respondent uncertainty. All analyses were conducted with weighted data and all were performed in SAS for Windows V8 *(10)*.

RESULTS

Descriptive statistics

Of the 2,001 participants in the survey, 11% reported having trouble deciding whether to refrigerate a product in the past three months. Table 1 lists the percent of each demographic group that had trouble with storage decisions. Particularly likely to have trouble were those aged 26 to 60, the more highly educated, and females. Race appears not to be a factor.

Meat (including bacon and cured sausage), condiments (such as catsup, and pickles), combined foods (such as soup, salad dressing, and dip), and dairy products were the foods that caused the most difficulty for consumers. No other category constituted more than 5% of the total number of problematic foods (Fig. 1). Over 50% of the problematic products were bought in either a plastic bottle or carton or in a glass bottle or jar (Fig. 2).

It is possible to determine how food product packaging causes respondent uncertainty by looking jointly at the type of food and how the food was packaged when purchased. The top six categories, accounting for 47% of all cases, were: meat in plastic wrap or film (13%), condiment in glass bottle or jar (10%), condiment in plastic bottle or carton (7%), meat in plastic, cloth or paper bag (6%), combined food in glass bottle or jar (6%), and dairy products in plastic bottle or carton (5%) (data not shown). Although it is impossible to identify specific products that are the most problematic, it seems that some categories of meats most commonly cause consumers indecision regarding storage.

Two factors are important for identifying a correct or incorrect storage decision: when respondents had trouble deciding to refrigerate a product and where the product was found at the store. The majority of the time, respondents had trouble deciding how to store food after opening it when the product was found on a shelf, rather than refrigerated, at the store (Fig. 3). When only the instances with these characteristics were considered, the most common type of products were combined foods (soup, stew, salad dressing, dip) and condiments found in plastic or glass bottles, jars, or cartons.

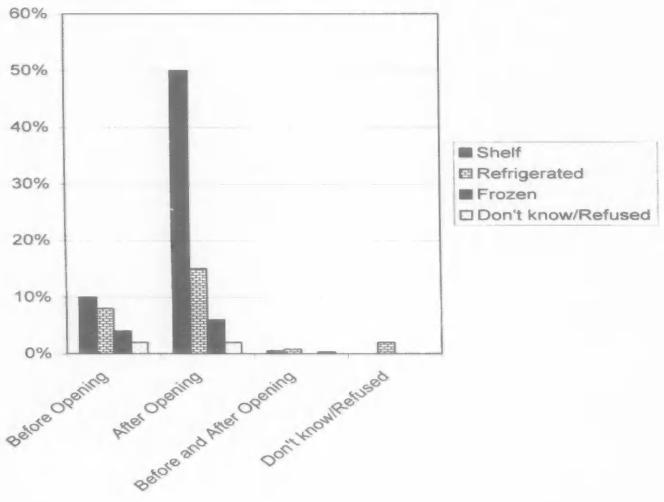
About 25% of the products that caused uncertainty for respondents were

TABLE 2. Education and label use: Percent of respondents who reported using the label and considering the type of food in deciding where to store a food product

How decided	Education Level					
	Total Sample %	Less than HS %	HS %	Some college %	College grad %	
Had trouble (n=237)						
Used label	19	7	18	14	29	$\chi^2_{df=2}=7.1$ $P < .05$[a]
Consider type of food	49	70	43	53	42	$\chi^2_{df=2}=5.5$ $P < .07$
No trouble (n=1,764)						
Used label	55	44	52	61	62	$\chi^2_{df=2}=31.9$ $P < .0001$
Consider type of food	37	39	37	36	34	$\chi^2_{df=3}=1.7$ $P = .65$

[a] Because multiple responses were allowed, a separate Chi Square test had to be conducted for the dichotomies "used label versus not used label" and "considered the type of food versus not considered the type of food."

FIGURE 3. Association between how foods were stored at purchase and time when consumers had difficulty deciding to refrigerate the product (N=237)



refrigerated at the store when purchased. This result is noteworthy because the three cases of botulism caused by improper refrigeration were from products that were bought refrigerated but appeared to be shelf stable and hence were improperly stored at home *(11)*. The most common of these products was meat found in plastic film or wrap, making up 20% of the products found refrigerated.

When respondents had trouble deciding whether to refrigerate a product, most of them decided to refrigerate, freeze, or eat the product immediately, or throw it away, rather than storing it without refrigeration. Only 34 respondents out of the 237 who reported uncertainty did not refrigerate the product. It is impossible to know which of these cases represent a true failure, because we lack specific information about the food product. We estimated whether the storage decision was probably safe by cross tabulating the type of food product, when the respondents had trouble deciding (before or after opening), and where it was found when purchased. Most of these instances (24 of the 34) seem to have been unsafe decisions to not refrigerate products that should have been refrigerated.

Most often, respondents who had trouble deciding whether to refrigerate a product decided how to store it by reading the label or considering the type of food. We compared these figures with responses from respondents who did not have trouble deciding whether to refrigerate packaged products (n = 1764). The most common answers for this group were also to read the label and to consider the type of food (Table 2). People who had no trouble deciding how to store food were more likely to use the label in making storage decisions than those who did have trouble.

Because reading labels requires both literacy and motivation to engage in information seeking, we analyzed these questions by education. Education was positively related to reading the label among both those who did and those who did not have trouble deciding how to store a product. Respondents with less than a high school education were less likely to use the label and more likely to use "common sense" to determine where to store a product than those with a high-school education or higher (Table 2).

TABLE 3. Likelihood of difficulty deciding where to store a packaged food by demographic characteristics, risk sensitivity, and food-related behaviors

Variable	Adjusted Odds Ratio
Gender	
Female	1.3
Male	1.0 (ref)[a]
Race	
White	1.0 (ref)
Black	1.2
Other	1.3
Age	
18–25	1.1
26–39	1.6*
40–60	1.5
> 60	1.0 (ref)
Education[b]	1.2**
Information sources[c]	1.1*
Home Risk[d]	1.7**
Had foodborne illness[e]	2.1**
Eat raw[f]	1.5**
Practice-specific risk[g]	1.1
Cook main meal[h]	1.0
Cross-contamination[i]	1.0

Model fit: Likelihood Ratio $\chi^2_{df=14}$ 77.7 $P < .001$; percent correctly classified = 67%

*Significantly associated with storage indecision at $P < .10$

**Significantly associated with storage indecision at $P < .05$

[a]Reference category

[b]A continuous variable for level of education

[c]Number of sources of food safety information and quantity per source (range 0 to 10)

[d]Believes that it is very common for people to get sick by food prepared at home

[e]Believes that someone in the household had gotten foodborne illness in the past year

[f]Has consumed at least one raw food from animals in the past year

[g]Personal belief of how likely it is to get sick from four specific food handling errors

[h]Cooks the main meal at least some of the time

[i]Cross-contamination prevention practices (washing hands and cutting board). This variable is a combination of washing hands before cooking, after cracking raw eggs, and after touching raw meat or chicken and raw fish, and washing cutting boards after cutting raw meat or chicken and raw fish. The variable ranges in value from -6 to +6. Each variable was scored as safe (+1) or unsafe (-1). Those who did not engage in the behavior were given a score of safe. Those who engaged in the behavior but answered "don't know" or "refused" were scored as unsafe

Logistic regression results

The logistic regression, which adjusted each variable for all others in the equation, showed that people who were more likely to be uncertain about storage had these characteristics: age 26 to 39 years, higher levels of education, receive food safety information from more sources, think that it is very common to get a foodborne illness as the result of the way food is prepared at home, report that they or a household member had a foodborne illness in the past year, and eat raw foods from animals (Table 3).

DISCUSSION

The results show that respondents rarely have trouble deciding where to store packaged products. When they do have trouble, it is likely that the products either are new to them or need to be stored in an unexpected way. The latter seems to have been the case for the three aforementioned cases of food botulism. Even though these foods were refrigerated at purchase, the victims did not refrigerate them at home *(11)*. Food storage labels may be particularly important for such products. Storage statements on food labels are also important when the same person who does the shopping does not put away the food after it is brought home. Even if the food had been refrigerated at purchase, this information may not be communicated to the person putting the food away.

When respondents reported having trouble deciding where to store a product, most chose a safe option — store in the refrigerator, freeze, eat immediately, or throw away — but some (14% of those who reported having trouble deciding) make decisions not to refrigerate products that probably are unsafe to store at room temperature. This estimate of the percent of uncertain respondents who make unsafe decisions may serve as an approximate estimate for the total population. Those who were uncertain about storage are the more highly educated and the most sensitive to food safety information; for example, they used more sources for food safety information, believed that illness from home prepared food was more common, and were more likely to believe that a family member had recently been sick from food. These highly sensitized people

may be more aware of the consequences of unsafe foods and thus more likely to think about refrigeration decisions. Those who do not report having trouble with storage decisions are probably a diverse group that includes both those who always know what to do (and who store food safely) and those who do not realize that proper food storage in an important issue. The latter in particular may make critical mistakes when storing a product.

The food label, which gives product-specific information, is one of the two most important sources of storage information for both those who do and those who do not have trouble deciding how to store a particular food. Label use, however, is reported nearly three times as often by those who do not have trouble deciding on storage. The other frequently used source is common sense, which works only if the consumer is familiar with the storage requirements of the specific food in the specific type of package. We found a positive association between education level and label use. It is possible that those with a very low education are unable to read the storage information on the label or that finding such information is more burdensome for them.

These results highlight the importance of the presence on food labels of storage statements that can be easily found and understood by consumers. Storage statements for foods that need to be refrigerated for safety are intended to prevent the user from consuming an unsafe product and being harmed. In this sense, storage statements for safety serve some of the same purposes as warning labels. Some characteristics of a good warning label include: standardized placement, size, color, and wording of the statements, wording that is clear and understandable, and inclusion of a signal word that indicates that a warning is to follow *(13)*. Sometimes symbols can be useful to signify a warning, such as the need to refrigerate a product for safety. Unlike words, symbols can often be interpreted by people with limited language proficiency or non-native speakers. Also, symbols can be easily recognized and easier to use than words *(6)*. For a symbol to be effective, however, it must be easily identified and understood by consumers. Additional consumer research would be needed to determine the effectiveness of any proposed symbol that might accompany a storage statement.

The Food and Drug Administration (FDA) has provided guidance on refrigeration labeling. The Agency grouped foods into three categories depending on whether the food needs to be refrigerated for safety or for quality and whether the product needs to be refrigerated before or only after it is opened. The first groups of foods are those that need to be refrigerated at all times for safety reasons. The Agency recommends that these foods display the label:

IMPORTANT Must Be Kept Refrigerated To Maintain Safety

The second group of foods must be refrigerated after opening to maintain safety and should have the label:

IMPORTANT Must Be Refrigerated After Opening To Maintain Safety

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Finally, the third group of foods needs refrigeration to maintain quality and should be labeled as "Refrigerate for Quality" *(4)*.

To help with ease of reading, FDA suggested that for foods in the first two groups the statement be set off by hairline marks and have these type characteristics: (1) Be on a contrasting background; (2) utilize a single, easy-to-read style and size; (3) have at least one point leading (space between two lines of text); and (4) ensure that letters never touch.

The food industry has issued slightly different recommendations about how foods that need refrigeration should be labeled. They recommend the use of two categories. Group A consists of "Highly perishable, packaged, processed foods that must be refrigerated for safety reasons" and Group B of "Products intended to be refrigerated that do not pose a safety hazard if temperature abused" *(7)*. Industry recommends that Group A foods have the label, "* IMPORTANT * MUST BE KEPT REFRIGERATED" in a box on the food package and that Group B foods have the label, "Keep Refrigerated."

Data from the Food Label and Package Survey (FLAPS) conducted by FDA in 1999 shows that although some type of storage information is often found on the label, the format is not the same for all products, even those in a single category. In addition, the 1999 results show that none of the products that FDA classified in the first group (needing refrigeration for safety before and after opening) and only one of the products in the second group used the exact language prescribed in the FDA Guidance *(1)*. Combining the results of both the Food Safety Survey and FLAPS, we conclude that the current storage information available on packaged products is not meeting the needs of all consumers.

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Congratulations

In March 2007, the International Association for Food Protection participated at Food Safety and Security Summit in Washington, D.C. While exhibiting we offered a drawing for a one-year Membership and a free registration to IAFP 2007. We are pleased to announce the following winners of the drawing:

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International Association for Food Protection

Spinach and the Media: How We Learn about a Major Outbreak

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ABSTRACT

The media was the main source of information as the investigation of *E. coli* O157:H7 spinach outbreak of August and September 2006 unfolded. The final total was 205 cases in 26 states. Numerous experts representing different groups speculated as to the cause of the outbreak, its impact, and possible preventative and control measures for the future. On a daily basis, the public was informed through short news items in which the opinions of spokespersons and self-declared experts were stated but sometimes differed. Comments included trust in the spinach industry, organic spinach production, environmental contamination sources, processing decontamination strategies, tracking leafy green products, improvements to foodborne surveillance and the government oversight system, and the impact of this information on consumers' attitudes to spinach. Two issues arising from these media statements in retrospect are (1) what qualifies an expert to speak on these issues, and (2) how do journalists extract critical statements that are newsworthy and still convey the experts' main messages. In major outbreaks such as this one, official government reports are not going to be completed until well after the heightened awareness of the event. Thus, the role of industry spokespersons, appropriate government officials, and the media in communicating information to the public is critical to help consumers make informed decisions for themselves and their families without demonizing or exonerating those most immediately involved. Unfortunately, in this outbreak the means of transmission to the spinach was not determined, although the investigation identified a cattle farm, a wild pig and surface water as sources of the implicated *E. coli* O157:H7 strain. Six months after the outbreak, the industry has agreed to create a uniform approach to good agricultural practices to anticipate and prevent future contamination of leafy greens, and at the same time try and recoup losses by promoting their products in an attempt to win back public acceptance. In addition, spinach and lettuce growers may have to deal with stricter state and federal governments standards, which will be an additional financial burden.

A peer-reviewed article

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THE BACKGROUND

What have we learned from months of media-derived stories about spinach and the *E. coli* O157:H7 outbreak? Of interest are the ways in which the story unfolded in the print media during this period. The messages were derived from both government spokespersons and various experts, usually in academia, and included comments from industry, trade associations and lobby groups. From September 15 to November 15, there were comments or quotes from at least 34 assistant, associate and full professors at universities; eight federal and four Californian government agency spokespersons and officials from Monterey, two other states and Ontario; four elected representatives; 14 national, five Californian, and two county representatives of associations and farm bureaus, as well as five from Canadian and Texas institutions; nine Californian and one Minnesotan representing spinach and other produce industries; nine national special interest groups, three lawyers, four journalists and seven individuals from California and elsewhere. The comments ranged from a few words to paragraphs. This material and subsequent media comments gave us the only perspective on the outbreak and its aftermath apart from short government reports relaying information on the progress of the investigation and advice to consumers, until an official government publication was published in March, 2007 *(1)*. The final CDC outbreak update was released on October 6 *(2)*. The information in that report was that 199 people, in 26 states became ill with *E. coli* O157:H7 infection after eating bagged fresh spinach, and that 31 cases of hemolytic uremic syndrome (HUS), 102 hospitalizations and three deaths occurred. In addition, one woman in Ontario contracted *E. coli* O157:H7 infection in September after eating the implicated spinach. These numbers were eventually revised upwards in the final investigative report of March 21, 2007*(1)*. The US Food and Drug Administration (FDA) indicated the first illness connected to this outbreak began on August 2, 2006, although most illnesses reported clustered around August 26 – September 9, but the link with bagged spinach was not made until September 13. The FDA, the State of California, the Centers for Disease Control and Prevention (CDC) and the United States Department of Agriculture (USDA) investigated the cause of this outbreak, but the FDA was the lead agency because the outbreak was national in scope. The contaminated spinach was eventually traced to several farms in California, and on September 14, consumers were advised to avoid all bagged Californian fresh spinach that may have been contaminated with the *E. coli*. Once this decision was made, spinach recalls were issued rapidly. No one became ill from eating contaminated spinach after September 25. Pinpointing the exact source was painstaking and slow, but it was eventually concluded that probably the irrigation water was contaminated with *E. coli* O157:H7 that originated from one or more cattle ranches. On September 29, the FDA announced that the source had been narrowed to one large producer, Natural Selection Farms. The genetically identical *E. coli* O157:H7 strain that had caused the illnesses was isolated from 13 opened packages provided by patients in 10 states. Later, the pathogen source was linked to four fields on four cattle ranches, with the genetically identical outbreak strain of *E. coli* O157:H7 isolated from cattle feces on one of these four ranches. By late October, samples from cattle and manure on this ranch contained this same *E. coli* strain. Twenty-seven brands of bagged spinach were implicated, and products from these brands had been shipped to Canada, Mexico, Taiwan, Hong Kong, and Iceland. Only one case is known to have occurred outside of the United States and that was in Ontario, Canada.

One additional point is that the organism that caused all the illnesses, labeled EXHX01.0124, was a much more virulent strain than those normally encountered (< 1% of the *E. coli* O157:H7 strains reported each year). Half of those made ill by the bacteria were hospitalized, kidney failure rates in children were more than triple the normal rate for O157:H7, and three persons died. One reason for its severe effects may be because it carries the Shiga Toxin Type 2 gene alone, in contrast to most strains that carry only Type 1 or both Type 1 and Type 2 genes; Type 2 toxin is more potent in causing morbidity than Type 1.

The first publication in a scientific journal, was by Dennis Maki in the New England Journal of Medicine *(4)*. However, this article is more a perspective discussing the information already released in the context of *E. coli* O157:H7 illnesses in general.

INFORMATION DERIVED FROM THE MEDIA ON THE SPINACH OUTBREAK INVESTIGATION

The following information is an attempt to consolidate and discuss the different news items on the outbreak and its subsequent investigation. Most of these items supplied information that started to piece together what had happened but also touched on the broader picture of the consequences beyond the spinach growers and those ill. However, not all of the news items could be considered scientifically accurate, but reflected the thoughts of those contributing, either voluntarily as interested persons including experts or involuntary as official spokespersons.

Large market operations

Various explanations were proposed as to how the spinach became contaminated with *E. coli* O157:H7. First, as consumer demand for year-round food products and salads have increased, retailers have exerted pressure on producers to match the demand by cultivating more fields, leading to increased consolidation and centralization of the spinach industry. The spinach industry has grown rapidly over the past few decades, changing from a cooked side dish to a salad item. Spinach production in the United States has tripled since 1990; this rapid increase is the result of several interrelated socio-economic forces in the agrifood sector including, but not limited to, consumers' demand for year-round variety; the health community's dietary recommendation for increased consumption of fresh produce; and retailers' demand for foods packaged for convenience (e.g., ready-to-eat bagged salads). National sales of pre-washed salads rose from $1.7 billion to $2.6 billion annually. Spinach commerce rose from $111 million to $286 million. Earthbound Farms began production in 1984 and started selling spinach at a roadside stand in 1986. Since then, it has grown into a $360 million industry and became a subsidiary to Natural Selection Farms, with spinach now being 20% of Natural Selection's business. Their motto is "Food to Live By". Fresh Express, the largest maker of packaged salads in the United States, supplying 40% of the market from 49 growers in California (particularly Salinas Valley), Colorado, Arizona and Mexico, was not implicated in the outbreak. However, the combination of industry consolidation, increase in size and centralized production was raised as a possible risk factor, because any contamination problem can be magnified many times as production volumes go up and distribution widens.

In a large production system, spinach is collected in the field and taken to

a central facility, where it is mixed with spinach from other fields during processing. Spinach and lettuce are then triple washed and disinfected. The leaves are first put into a water bath, then into chlorine and citric acid baths before spinning and drying, and then sealed in bags. However, pathogens occasionally survive this process and may be found in the product at retail, as occurred following this spinach recall. It is not clear if this is because the pathogen adheres strongly to the leaf surfaces and crevices or because it is internalized through the roots or cuts in the growing plant. Research has also shown that pathogens can penetrate the vascular system of leafy plants through root tips or cuts in the tissue. Although this process has not been proven to occur in field-grown crops, it is considered a likely source of the spinach contamination. Bagged spinach was considered a higher risk product than individual heads of spinach, because the former is made up of parts of many plants. Although the rationale for this was not enunciated, the assumption is that if one plant is contaminated, commingling of the leaves of that plant with leaves of other plants into multiple bags would result in more contaminated product. Although the level of the *E. coli* in each bag would be proportionally less, the outcome would be more bags of contaminated product.

Cattle as a source

One letter to a newspaper editor expressed the opinion that the intensive confinement system of industrialized animal agriculture creates a problem of more than one billion tons of manure each year in the United States — the weight of 10,000 Nimitz-class aircraft carriers. A single cow can excrete 100 billion fecal bacteria each day, which may include various pathogens. *E. coli* O157:H7 is frequently excreted by cattle in their feces, but not in large numbers, and statements were made that the grain-fed cattle in the Salinas Valley would produce manure containing more of this strain than grass-fed cattle. This controversial point was raised in several articles. A 1998 peer-reviewed study indicated that grain being digested in the cow's rumen could allow *E. coli* to survive longer in animals and their feces. However, this study considered only generic *E. coli*, not the O157 strain, and more recent work has shown little difference in excretion rates for the pathogen, whether the cattle are grass or grain fed, and whether strains are more acid resistant or not. The more general argument that grass-fed, antibiotic and hormone-free cattle have a better immune system and rumen to inhibit pathogen development was also raised but does not appear to be supported by published reports. Based on the current scientific literature, there is no clear association between diet and growth of *E. coli* O157:H7 in cattle.

Water as a source

A second explanation is based on the fact that total control of pathogens is impossible on farms. Cattle manure is usually composted for use on leafy crops, but there is no guarantee that this process is 100% effective in destroying bacterial pathogens. The pathogenic *E. coli* from cattle ranching can enter the spinach-growing environment through waterways or possibly windblown soil containing manure. The waterways are heavily contaminated from runoff, with ≥12,000 *E. coli*/100 ml, and some of this may get into the groundwater, the main source of potable water for washing and disinfecting produce; it is possible that some of these *E. coli* are of the O157:H7 strain. Ninety-seven percent of irrigation water is from private wells in the Salinas Valley. Although the wells were tested and found to be free of fecal organisms prior to the outbreak, the same spinach is grown in fields prone to flooding, which could carry fecal organisms originating in manure from adjacent farms. Flooding occurs early in the growing season, however, and was not considered as great a threat to the crops as was the irrigation water. The source of the contamination of irrigation water could be the spinach farm sewage disposal system; this system had frequently been overloaded because the recycled wastewater from the spinach processing was far more extensive than was originally permitted. Natural Selection Foods has two wastewater systems – one for human sewage and one for washwater. The normal practice is to flush the recycled and chlorine-treated wastewater into an unlined holding pond for use in irrigation. However, the volume of wastewater has exceeded the limits of the holding pond, which increased the risk of overflow. The Monterey Regional Water Pollution Control Agency considers tertiary treated sewage safe for irrigation, and necessary because recharging of the aquifer used for irrigation with clean fresh water is required to prevent saltwater intrusion into the water table. The pond is tested monthly and to date fecal coliforms have not been detected. However, it was found that the pond had exceeded its disposal limit set by the County, and a new waste water system was supposed to be installed. Despite government funding, this project has not been completed.

Contamination in the fields by humans or animals

A third explanation is contamination of spinach by workers. The argument is that workers might contaminate the fields unintentionally because they may not have adequate access to toilet and hand washing facilities. Alternatively, workers may be under pressure to complete their shifts, especially if they are paid by volume of spinach picked, and when the facilities are far away from where they are working, and so they may defecate in the fields. For this explanation to be plausible, these workers would have to be either ill with *E. coli* O157:H7 infection or asymptomatic carriers of the strain.

A fourth explanation is that wild animals may be the source of contamination. For example, birds could fly over the crops after feeding on manure piles, and their droppings land on the spinach. Wild pigs are frequently known to break down fences and enter spinach fields to root around the crops. Samples taken from a wild pig, stream water and cattle on the ranch have all tested positive for the outbreak strain of *E. coli*. The movement of wild pigs could explain how the *E. coli* spread from cattle on the ranch to the spinach field less than a mile away. However, the wild pig story was somewhat discounted as a key element, since there has been no government statement on how the pig was obtained and analyzed, and whether it may have ingested previously contaminated spinach. In fact, it was argued that the pig story deflected attention away from the Valley's large dairy cattle operations, which produce large quantities of manure. Fecal bacteria deposited in fields could survive for some time; generic *E. coli* can persist for more than 45 days in soil. It was found in up to 25% of lettuce and leafy greens harvested in Minnesota and Wisconsin over a two-year period, indicating that fecal contamination of

these crops is likely a widespread problem, although these results indicated only the potential for pathogens to be present. In addition, the unusually hot summer weather may have been a factor encouraging rapid growth of *E. coli* O157:H7 in the spinach; temperatures in the Salinas Valley were above 99°F for 10 days two months before harvest.

Organic produce as a risk factor

The fact that organic spinach was named as part of the large recall raised questions on the relative safety of organic produce versus conventionally raised produce. Proponents of organic agriculture indicate that their soil is more beneficial and will fight off pathogenic *E. coli* better than soil treated with chemical fertilizers and pesticides. Anti-organic farming statements tended to be non-specific about comparable risks, with comments such as that produce can be dangerous through potential pathogen contamination and that crops need all the chemical protection that is permitted. One organic grower claimed that taste-testing his product before it was released was a sufficient method. Many organic farmers, however, are concerned about safety and test manure to ensure that it is properly composted. Another expert stated that since cattle are the main source of *E. coli* O157:H7, consumers should move to a vegetarian diet, ending the problem of pollution from factory farms as well as reducing the risk of foodborne illness and diet-related diseases.

A related aspect of organic farming is small versus large operations, with the latter being claimed to be more risky because any one incident could create widespread contamination. Organic farmers have traditionally been small operations that sell at local markets. Their customers tend to be consumers who prefer to support the local economy and/or prefer to have a relationship with the grower. However, with the increasing demand for organic products among mainstream shoppers, many grocers are turning to larger suppliers for crop uniformity. As a consequence, there is an ever-increasing distance to market and a widening of distribution. Furthermore, the source companies may have started small, like Fresh Express, but now they rely on many growers to provide the necessary volume of product that is packaged under their name. Earthbound Farms has become a conglomerate of 185 different growers owned by Natural Selection Foods, with 24,000 certified organic acres in the United States, Mexico and New Zealand. For some organic spinach consumers, it was unpleasant news that organic products from distant production areas could be implicated. In the future, some of these consumers may see local production as more important than organic farm origin. There was no discussion, however, of the fact that illnesses associated with small operations may occur but are likely to go undetected when there are relatively few cases. It is possible that similar outbreaks associated with spinach occurred in the past, when operations were smaller, but were not identified because of lack of suitable methodology. This gave the industry a false sense of confidence. In fact, since 1995, 19 *E. coli* O157:H7 outbreaks originated from fresh-cut lettuce or spinach, with eight of them linked to the Salinas Valley *(3)*, and the 26th reported outbreak of *E. coli* O157:H7 infection that has been traced to contaminated leafy green vegetables since 1993 *(4)*.

Actions taken to reduce risks

Few solutions were presented to reduce or eliminate the contamination. The growers claim to monitor irrigation water and conduct third-party audits, but their records need to be checked by the authorities more often. More efficient washing, wetting and disinfection agents for the spinach were suggested. The disinfection could be biological, in the form of a bacteriophage targeted toward *E. coli*, or chemical, in the form of organic acids or ozone, to replace or supplement the current chlorine or chlorine dioxide treatment. At the very least, increased testing for *E. coli*, perhaps of every batch, was recommended. However, as the participants at an International Association for Food Protection workshop on October 6, 2006 agreed, once contamination has occurred on a leafy product, it is very difficult to wash it off, and there is almost nothing anyone can do at home to make a significant difference. They indicated, not very comfortingly, that when people feel safe again, they would return to eating those vegetables. Irradiation was mentioned as a possibility, but there was little initial discussion on this type of terminal decontamination, although it seemed to be feasible in principle *(2)*. The members of the Western Growers Association are now assessing existing regulations, including regulations on manure, composting, leaking septic tanks, farm worker access to portable toilets, handwashing facilities, and flooded fields.

Regulatory oversight

One question repeatedly raised, even by government spokespersons, was whether the oversight system was working for this industry. It is unclear how adequate the regulations or guidelines are for safe production of leafy greens throughout the food chain, including the farm and processor, and whether or not there is adequate inspection and control by local, state, and federal agencies. It appears that oversight is inadequate, in view of the many outbreaks in past years associated with lettuce and leafy greens produced in California. This may partly reflect the fact that the FDA, the key agency responsible for regulation of fruits and vegetables, has had decreased budgets over many years. The FDA currently has 800 inspectors to conduct about 20,000 food safety inspections per year, allowing them to visit a processing plant on average only once every few years. This is in contrast to the USDA Food Safety Inspection Service (FSIS), which has staff in more than 6,000 processing plants nationwide daily.

The FDA has had not only budgetary cutbacks but also reallocation of resources to address new concerns such as bioterrorism. In addition, the FDA is responsible for managing most of the United States food supply (excluding meat, poultry and egg products), but has far fewer resources than FSIS to do so. Furthermore, the FDA has no authority to go on farms unless there is an outbreak, and although most food industries comply with FDA recommendations, the agency cannot force companies to recall contaminated products. As a consequence, the FDA usually relies on the fruit and vegetable industries to self-police, with the relevant state agency having oversight and enforcement. History has shown that the lettuce and spinach industries appear not to have responded rapidly to FDA warning letters, because past outbreaks did not bring about change, although the industry has denied this. The FDA devoted extensive

resources, including 24 investigators, to identify the source of this outbreak, which remained unknown in the other 19 lettuce and spinach outbreaks. However, this meant cutting back or delaying action on other national food safety issues. Most food safety experts feel that until there is more direct control by adequately funded and staffed state and federal agencies, and until a cooperative state-federal-industry relationship is maintained, these types of problems will continue. In fact, for some experts this is just one example demonstrating how the United States. food safety system is broken and needs a major overhaul. There have been repeated calls for a single agency by the General Accounting Office and the National Academy of Sciences; however, Congress is ultimately responsible for the national food supply. Various elected officials have introduced legislation that would unify the federal food safety agencies into a single legal authority that would provide a focal point for government responsibility and accountability. It is claimed that a unified food safety authority would make better use of existing food safety resources and would reduce the social and economic burden of foodborne illness. At present, it seems that the existing structure, which-has been in place for 100 years, may be too entrenched to pursue change by both the federal bureaucracy and the food industries, even though there may be long-term benefits. Thus, there has to be a wider forum to force a discussion on this beyond government committee hearings and pronouncements. There are models in Europe, Australia and Canada to be considered. However, any new agency needs not only to be well structured but also to have the necessary authority and resources to ensure the safety of the United States food supply, which includes the ability to carry out outbreak investigations and recalls more quickly and efficiently.

Because of the publicity surrounding the spinach outbreak and irrigation water that tested positive for generic *E. coli* on Nunes Co., a Salinas Valley lettuce farm, Mexico banned all lettuce imports from the United States on October 9, 2006, and then two days later narrowed it to apply only to Californian lettuce. On October 19, it reopened its borders to lettuce imports from California after United States authorities reported that tests for *E. coli* on irrigation water and lettuce were negative. This ban might not have occurred if the industry had not been undergoing such public scrutiny. Unfortunately, this secondary ripple effect is not unusual with such an outbreak, and these typically have adverse economic consequences for a much larger segment of the food industry.

The investigation of the *E. coli* O157:H7 outbreak

Most of the media statements considered that the rapid local public health response was made possible by vigilant epidemiologists in some states and the use of the CDC PulseNet DNA finger-printing system that enabled health officials to track the illness back to Californian spinach. Nevertheless, others noted that at least 200 people became ill, many cases with severe illnesses, and three people died. The first case occurred in early August and the public warning was more than a month later, on September 14. Although the spinach was widely distributed across the United States and three other countries, some states had no documented *E. coli* illnesses that could be linked to the spinach; this may be fortuitous or it may be due to misdiagnosis. These outcomes suggest that improvements are needed in surveillance and investigation in the future. Agreed, we have to take into account the incubation period for the *E. coli* infection (average 3 to 7 days), and that sporadic cases over a wide area are more difficult to detect and attribute a food source to than clusters of cases in one community. In addition, the process of securing a stool specimen, sending it to a lab, having an organism isolated, and then fingerprinting it to be compared with strains from other states by CDC takes many days.

Another often unmentioned point is the everyday tracking of the spinach. The *E. coli* outbreak highlighted the need for lot traceability and an early warning system in the produce industry. Recent outbreaks of foodborne illness associated with fresh fruits and vegetables have emphasized the necessity to provide immediate access and traceability to the origin and history of food items to reduce consumer exposure. Unlike the traceability of most commercially packaged products that have a paper trail or electronic tracking system to determine its source, traceability of produce has lagged behind. This is further complicated by the commingling of spinach leaves from different fields in the same bag of salad greens. Another difficulty is that the bagged spinach was sold under many different labels, some organic and some not, and that meant that more product was recalled than necessary. Growers felt that they have had a reasonably good safety track record since the industry began until recently, and they and the consumer have considered produce items to be generally safe, even if the product undergoes little processing. Thus, tracking product to a company or field for recall purposes seemed not to be a high priority by the industry. Even so, this sophisticated industry that has fine-tuned its production practices to maximize efficiency and quality should be able to do the same for the safety of its marketed items. In retrospect, it may be that relatively few of the bags were contaminated and that these came from one or at most a few fields from a farm in the Salinas Valley, but the recall for all Californian spinach was massive and the public confidence in leafy vegetables was shaken. Because the tracking system has not been discussed in any detail, we still do not know why the investigation to link the contaminated bags to some fields took so long. Some retailers have instituted electronic tracking systems such as RFID (radio frequency identification) that permits the tracking of produce from single fields to retail, as opposed to the use of stickers on boxes by the spinach industry. The RFID system relies on storing and remotely retrieving data with radio waves, using RFID tags or transponders. However, the RFID-tagged products need to be tracked throughout the entire supply chain to carry out a large-scale recall in a timely manner. In this outbreak, the shipment data shared by supply-chain partners on the tags would have identified the specific products that needed to be recalled, thereby eliminating the need to remove all products from stores and warn consumers to discard all bagged spinach. This would have speeded up the recall, reduced immediate economic loss, and had less detrimental impact on consumer trust in the salad industry as a whole.

The future of the spinach industry

What is the future for Natural Selection Foods and the spinach industry as a whole? Earthbound Farm and Dole may have to pay as much as $110 million to settle cases, and they are currently paying

all of the out-of-pocket medical expenses for those ill following the outbreak. The key to keeping costs down is to settle claims quickly. The company is also instituting tests to check plants from growers' fields for *E. coli* with methodology similar to that used by the beef industry. These expenses, and the potential loss of sales over an uncertain period of time, may force Natural Selection Foods, the parent company of Earthbound Farm, and the largest grower-shipper of organic produce in the country, to file for bankruptcy. In 2003, 600 customers of the Tex-Mex restaurant chain Chi-Chi's contracted hepatitis A virus that was linked to salsa; three of the victims died. The company paid nearly $40 million in damages and was never able to recover. Outback Steakhouse Inc. bought the chain for $42.5 million in August 2004 and transformed it into a new restaurant chain, Cheeseburger in Paradise. This was unlike the *E. coli* Jack in the Box outbreak, in which victim claims were negotiated quickly after more than 600 people were sickened and four children died. The restaurant chain, the meat suppliers and others pooled their insurance to cover the victims' claims, and Jack in the Box remains a thriving business today. In contrast, the spinach industry was seen not to respond quickly enough to those ill or send a public message of cooperation with the investigating authorities. It remains to be seen if this will have a major effect on the industry's survival. After a large public outbreak involving a frequently eaten food, bankruptcies typically occur in small operations both locally and nationally. In addition, typically after a food scare and deaths, more regulations tend to be introduced by the responsible agency, which are resented at first but are finally accepted by the large producers. Small producers that cannot meet the new regulations may go out of business or become consolidated into larger units. Thus, there is an increasing trend towards large companies and with concerns over a supersized food production industry.

WHAT CONCLUSIONS CAN WE COME TO?

First of all, farmers in general do have the trust of the public, especially if they are known personally, but this trust is ephemeral and can be lost quickly. By mid-October, sales at Natural Selection Foods were down 70 percent for conventional salad and down 10 percent for the company's organic Earthbound Farm label. The company laid off 164 employees, including some full-time employees. In the short term, responding to a crisis is something that every industry should be able to do and should be seen to do truthfully, effectively, and compassionately. This has to be combined with the ability to better track their products so that items recalled include only those items that are contaminated or potentially contaminated. Over the long term, the food industries need to retool their production and distribution systems. Salad items in bags eventually were on retail shelves again and the industry will probably have only a few more opportunities to get it right before the government and public consider this a risky item to be either avoided, labeled as potentially unsafe, or decontaminated before consumption. We have seen a similar scenario unfold with alfalfa and bean sprouts (*E. coli* O157:H7 and *Salmonella*), hamburger (*E. coli*) and deli meats (*Listeria*). Thus, it is in each food industry's best interest to work with public and private researchers, and with state and federal agencies, as well as among themselves, to enhance existing control measures and to develop new approaches to food safety.

Second, even though a farm or field may be identified as a source, we may never know the actual contamination route; at best, it could be one of several possibilities. So, how do industry and government respond? Unfortunately, outbreaks are usually caused by a number of errors or events occurring simultaneously, or sequentially which allow sufficient pathogens to be ingested to cause illness. Since these are usually rare situations, continual monitoring for pathogens at all potential sources and stages in the food chain is not economically feasible even if it were possible. The present strategy for responding to any foodborne disease risk is to identify and act on factors that contribute to these outbreaks. These actions are threefold: prevent contamination by pathogens, eliminate the agent if it is present, or reduce the opportunities for its growth. Since there are many possible factors that have been identified over many decades in the food industry, a control strategy has to be considered for each one. Fortunately, most food processes, from farm to fork, have some steps that are more critical than others and these are where the control efforts are being placed. This understanding led to the HACCP concept that has been widely adopted by many segments of the food processing industry. However, HACCP does not work as well in other food and agricultural settings because of either system complexity or uncontrollable external exposure to hazards. There are, for instance, various environmental contamination possibilities for produce, and a final decontamination step is possible for only some of these commodities. One advantage of a complete outbreak investigation is that it provides an opportunity to analyze hazardous situations that would otherwise be very difficult to predict, such as pathogens surviving on alfalfa seeds or penetrating tomatoes in the washing and disinfection baths. Thus, it may take long-term collaboration between government, industry and academia to understand and respond to sporadic contamination of leafy salad items in the Salinas Valley.

However, there are many things in general that the industry can do to reduce the likelihood of contamination, and this process can be initiated by use of a risk assessment approach to identify the riskiest scenarios first. One positive note is that Natural Selection Foods is now claiming to have completely overhauled the way it tests and packages leafy greens, and feels that it can detect pathogens regardless of the source of contamination. Also, in late October a group of major produce buyers asked the Produce Marketing Association, United Fresh Produce Association, and Western Growers Association to work together quickly to develop new, enforceable food safety standards so that consumer and buyer confidence in fresh produce is restored. This second approach would include standardizing food safety requirements with input from industry and academic scientists, developing a process for updating the requirements, and conducting consumer outreach and education. Encouraging consumer acceptance of green salads will also be done by several growers like Nunes Co., who had the lettuce recall in October, through television commercials over several months.

Third, all information about the spinach outbreak focused on the contaminant and its potential route to the product. Identifying the point of contamination, such as wild animals, and revising guidelines or introducing new regulations,

although important, do not address all of the reasons for factors contributing to outbreaks. In the previous 19 lettuce and spinach outbreaks, it is possible that a number of scenarios initiated the contamination, including manure and water sources. For instance, organic standards require producers to compost animal manure to eliminate possible pathogens, and similar rules should apply to growers of conventional produce. How industry practices affect safety, what motivates workers to use safer practices, and how effective government policies are in achieving their objectives, are factors that warrant closer examination. Even with science-based regulations and guidelines in place, compliance by both management and employees is not guaranteed. Furthermore, food safety research tends to focus mainly on agents and their relationship with food, rather than on understanding the structure of the agri-food industry that may lead to the contamination of the food. Seeing the industry and its problems through different eyes than a food microbiologist's might be revealing; some social scientists pointed out the impact on consumers, such as the immediacy of the illness as a result of infection, the vividness of their possible suffering, and benefits vs. cost of buying other products compared with spinach.

Can cattle ranches and vegetable farms co-exist together? Although no Californian regulatory agency requires any distance between cattle fields and leafy produce crops, some ranchers are fencing off their cattle from water systems. Others are designating watering holes for cattle so they do not drink from creeks that flow through farms, and creating buffer zones that keep the animals away from water that could later be used to irrigate crops. Fresh Express, which produces 40% of the packaged salads bought in most of the supermarkets in the United States, requires that spinach or lettuce fields be at least several hundred feet from pastures to decrease the chance that *E. coli* in manure could be spread to fields by cattle, wildlife or water. However, there needs to be a national strategy for guidelines for the physical locations of these two industries to minimize contamination, taking into account the shrinking land use for agriculture because of expanding subdivisions.

Fourth, this outbreak and its investigations open the door once more for a discussion of the effectiveness and efficiency of the food safety system in the United States. As already stated, the FDA has warned the lettuce industry, *(3)* and by association the spinach industry, that changes are required, but FDA does not have enforcement power. This discussion is an opportunity not to be lightly dismissed. Although rates of some foodborne diseases seem to be going down, we may be reaching a plateau below which our current control system will not take us. The most recent estimate of annual foodborne illness is based on data that is more than a decade old. Thus, while it is possible that we have fewer than the often-quoted 76 million cases *(5)*, it is doubtful that the true figure is substantially lower. The United States imports much of its food supply, including fresh produce, and the resources to inspect these imports are so scanty that the nation must rely on the food control systems of foreign governments, company paper trails, and sanitation and HACCP records of companies. The United States agencies with responsibility for food safety occasionally have different management strategies to similar issues (e.g., chemical contaminants). The differing approaches taken — although scientifically established — are confusing not only to the general public, but also to the regulatory managers, food industries and politicians. Differing agency approaches and priorities are why other countries have adopted a single food agency structure. From what has been demonstrated so far, consolidated agencies appear to be effective, because there has been no reversal back to a multi-agency approach. Science, rather than turf-defending policies, needs to be applied to the United States situation to determine if improvements in the safety record of the food supply would occur and create increased public confidence. Although this episode and similar outbreaks in the past, involving, for instance, green onions, hamburgers and apple juice, raised public awareness and resulted in changes to the regulatory system, outbreaks occur much more frequently in foodservice settings and show no signs of diminishing. Norovirus is considered the leading cause of foodborne disease in the United States, but there have been no major industry or government initiatives to reduce infections by these agents, except through education on better hygiene and frequent handwashing. Foodservice operations are inspected and outbreaks are investigated at the local and sometimes state level, but with varying degrees of commitment by the appropriate agencies. One area to be resolved is how a single agency would work in collaboration with local and state authorities; for instance, what strategies could be developed for managers to prevent ill or asymptomatic employees from coming to work and contaminating food items or food contact equipment? What are the best ways for foodservice establishments to report foodborne illnesses so they are controlled as soon as possible?

Fifth, although the United States surveillance system is one of the best in the world, we have to explore ways to improve it, to rapidly detect not only the more common enteric pathogens, but also the more exotic and virulent strains that may be introduced into the food supply. Since the first responders are local health departments, hospital emergency departments, and family physicians, they need the tools and resources to recognize something out of the ordinary. These include continuing education focused on foodborne disease, analytical laboratories to assist in the diagnosis of foodborne illness, and access to the responsible state departments with the capacity to disseminate information to appropriate parties. It is important that systems function across all states and in many counties; the PulseNet system demonstrates that this can be done with federal leadership. Data sharing across agencies could allow an electronic monitoring system to recognize an unusual event rapidly and trigger an investigation.

Syndromic surveillance, which looks for cases with similar syndromes, e.g., severe or bloody diarrhea beyond the baseline level, might be able to detect small clusters of cases sooner. If the same effort could be put into syndromic surveillance, which is still in its infancy, as has occurred for laboratory-based methods over many decades, we might have an effective nationwide system to look for the anomalies in case loads sufficient to launch investigations to determine the source and stop the illnesses sooner.

Sixth, the media relies heavily on experts, but how are these determined? Some who have discussed the spinach outbreak are experienced scientists from recognized food safety centers, but they have little knowledge of the way spinach

is produced and marketed. Others may be less well qualified academically but may be very familiar with some aspect of the spinach industry and current situation. Some are self-proclaimed and others appointed. Do food safety experts perceive risk differently from agricultural production experts, policy makers and regulators, or the general public? Perhaps more importantly, how do the media approach the experts and use their material? What we see in print, hear on the radio, or see on television may be attributed to an expert or trusted source, but these words, often in quotes, may be carefully excised from a long conversational interview and thus taken out of context. Furthermore, there are few media experts who specialize in food production, science, safety or other relevant areas. Scientists typically want to be cautious in their statements, understanding there are qualifiers to every situation. At the same time, it is a reporter's job to filter a story in order to portray relatively few clear messages to their audiences, but also to have a slant to the topic that will make the readers or hearers interested. This is important, as the public perceives most science stories through the mass media. Research has shown that the more the visualization of a severe enteric disease with a risk of death (hemolytic uremic syndrome) and the closer to home the issue is (spinach was in consumers' homes), the more public concern there is. If individuals can substitute a similar product for the risky one, such as arugula for spinach, it may be only the implicated industry that suffers. But if there is a perception of total mistrust in the leafy green and lettuce industry, as seems to have been the case for several weeks following the outbreak, then the economic and social impact is much greater. Thus, risk communication messages have to be assessed to understand the most effective ways to inform the public about food safety issues, because, ultimately, the public decides the food safety policies of a country.

GOVERNMENT FINAL REPORT

The final investigative report was released on March 21, 2007 *(1)*, with more detailed information on the spinach production practices and likely sources of contamination. The final number of cases had risen to 205 with 103 hospitalized and 31 with HUS and 3 deaths, which is slightly different from the numbers in the final CDC update in October *(2)*. The peak appearance of cases occurred between August 30 and September 1, 2006. Forty-four bagged spinach packages from consumers in 14 states were analyzed for *E. coli* O157:H7 and all 13 *E. coli* positive packages were labeled Dole brand Bay Spinach, produced by Natural Selection Foods. According to this final report, the spinach was taken from the fields using mechanical harvesters with blades set 0.25–1.5 inches above the ground. The cut leaves were put on the harvesters' conveyor belts and sprayed with water containing variable amounts of chlorine mainly to prevent wilting. The leaves were then blown to another conveyor belt with fans to remove foreign objects and undersized leaves. The spinach was then transported in plastic totes or bins from the field in refrigerated trucks to the receiving area where a sample from each load was inspected for grading. If the load was acceptable, each pallet was affixed with a tracking tag containing grade, product type, grower, lot number, harvest date, weight and expiration date. Some but not all of the operation had barcodes. The product was then cooled in a vacuum cooling process to 41°F. After a storage period, the processing continued with a mixing line on a conveyor belt and observation for visible quality and foreign object contamination. Each mixing line was fed into chilled wash flumes, which were chlorinated and pH-adjusted with addition of chlorine or citric acid as needed. The water in the flumes was recirculated during the day and then drained. The product was subsequently dewatered and centrifuged before going on to the packing line. Here the product was weighed and deposited into retail bags without any modified atmosphere. After cold storage, the bags in boxes were shipped out to customers. The implicated packages linked to the illnesses (identified as P227A) were harvested on August 15 and shipped to Dole distribution centers in CA and OH by the next day. From there the bags were distributed throughout the US and Ontario. The main hazards of concern in the HACCP plan was the presence of pathogens including *E. coli* O157:H7, to be controlled by the chlorination of the wash water, and foreign material (e.g., wood, plastic, metal, feces) to be removed by inspection. Daily logs for Standard Sanitation Operating Procedures (SSOP) were maintained but there were discrepancies between sanitation schedules and frequency of cleaning and sanitation in certain areas. Adenosine triphosphate (ATP) testing was done to verify sanitation. Microbiological testing showed high total plate counts ($>10^6$ CFU/g) of raw and finished spinach on occasion, but the limited pathogen tests were negative. Routine testing of the water supply showed absence of coliforms and *E. coli*, and also met the standards for disinfectant residual in the systems using chlorine or chloramines. Samples taken of the wastewater and sediment on September 21 and 22 were negative for *E. coli* O157:H7.

E. coli O157:H7 was found in the environmental samples collected near each of four fields that provided the spinach for the P227A production. However, the only field with the *E. coli* indistinguishable from the outbreak strain was on the Paicines Ranch, a large grass-fed beef operation in San Benito County, CA. The spinach field was leased for ready-to-eat crop production to Mission Organics that was contracted with Natural Selection Foods to grow spinach. Although organic practices were used to grow the spinach, the product was sold as conventional produce because the leased area was in the transition phase to become qualified for organic certification. The implicated strain was isolated from river water, cattle and wild pig feces less than a mile from the spinach field, and feral pigs had been rooting around both in the cattle pastures and in the row crops on the ranch. Because the water table in the fields had fallen below the San Benito riverbed by July, there was a potential for this surface water to percolate into the groundwater. In summary, although there were credible sources for the contamination of the spinach, there was no conclusive evidence that irrigation water or animal feces were directly involved. In addition, there were no gross errors in harvesting and processing that could be singled out as the cause of the *E. coli* O157:H7 entering the system and surviving to reach the bags of spinach. High microbial counts of finished spinach, however, indicates that if the *E. coli* was on the leaves, it could be present in the bagged product.

CONCLUDING REMARKS

This spinach outbreak generated considerable attention, forcing the government and the produce industry to attempt to determine the cause. The finding that feral pigs could be a major contributor to leafy green contamination identifies

a source not previously considered. The investigation, however, highlighted many of the same issues identified in the past and still not resolved. These include better tracking of product from farm to home, effective ways to decontaminate produce items, establishment of land use policies to allow different food operations to co-exist without increasing the risk of contamination, creation of a single effective national food safety oversight program, continual improvement of foodborne disease surveillance at all levels of government, and development of more timely and clearer risk communication strategies for both industry and government. When consumers learn of food scares though the media, how do they establish where the blame lies and where to put their trust for resolving the problems? They may be confused over the ethics, profit-margin, and accountability of the industry with regard to production of safe food at reasonable prices. They learn their information through the opinions of spokespersons and experts who often differ in their conclusions. In the articles following the spinach outbreak, many experts contributed to the discussion. How then does the public determine which items to buy, and how much weight do they put on the science behind the statements that urge caution? If government is generally not considered trustworthy, agency recommendations may be ignored. If consumers are told that the leafy greens and lettuces they have eaten for years without adverse effect are now risky, what confidence do they have in the safety of the rest of the food supply? The role of the media in communicating information is critical to help consumers make informed decisions for themselves and their families. This includes understanding the nature of risk when choosing products that have value from a nutritional and cultural perspective. One interesting point raised as our knowledge increased about the potential sources of contamination was changing the question from "how could this have happened?" to "why doesn't it happen all the time?" This question perhaps can be raised in several other food settings. The final report adds considerable information to the production methods and the most likely sources of contamination. However, the link to the Mission Organics operation is not absolutely conclusive, and the precise source of contamination of the bagged spinach was not determined, despite a very intensive investigation by multiple agencies. Unfortunately, this sense of incompleteness in solving the exact route of contamination that led to the illnesses leaves in the minds of the public, industry and government a certain degree of uncertainly as to when the next problem and possible outbreak will occur.

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Lee-Ann Jaykus Elected IAFP Secretary

The International Association for Food Protection welcomes Dr. Lee-Ann Jaykus to the Executive Board as Secretary. Dr. Jaykus will take office at the conclusion of the Awards Banquet at IAFP 2007, the Association's 94th Annual Meeting in Lake Buena Vista, Florida. By accepting this position Dr. Jaykus has made a five-year commitment to the Association and will begin her term as President in 2010.

Dr. Jaykus is a Professor of Food Science and Microbiology at North Carolina State University (NCSU) in Raleigh. She earned a B.S. degree in Food Science (1979) and an M.S. degree in Food Microbiology (1982), both from Purdue University. Her background is somewhat unique for an academician, as she worked in industry for six years prior to pursuing the Ph.D. In her first industrial experience, Dr. Jaykus served as a quality control manager (1981–1983) for Frito Lay, Inc. She later joined Dairy and Food Laboratories, Inc., in Modesto, CA, as their microbiology department manager. It was during her time in California, which coincided with a large listeriosis outbreak associated with the consumption of Hispanic-style cheese, that Dr. Jaykus became interested in the interface between food microbiology and public health. In 1988, she entered a Ph.D. program in the School of Public Health at the University of North Carolina at Chapel Hill to study foodborne viruses, molecular biology, epidemiology, and risk assessment. After completing her degree (1993), Dr. Jaykus joined the faculty of the Food Science Department at NCSU.

In her role as a professor, Dr. Jaykus is responsible for teaching the undergraduate course in Food Microbiology and graduate level courses in Microbial Food Safety. She has been instrumental in initiating a graduate food safety minor at NCSU and currently serves as chair of the NCSU Food Safety faculty. Over the last 13 years, she has had the opportunity to interact with over 400 students in the classroom, and she finds it particularly rewarding to mentor these young people as they mature, both personally and professionally.

Dr. Jaykus' research expertise lies in food virology, the development of rapid molecular methods for pathogen detection, and microbial risk assessment. She has served roles as lead investigator and collaborator on several large multi-institutional projects addressing the safety of fresh produce items and molluscan shellfish. Dr. Jaykus' research philosophy is collaborative, and she enjoys bringing together professionals from diverse disciplines to form teams which take on complex food safety problems. She currently supervises over 10 graduate students, post-doctoral researchers, and staff; to date, she has mentored the complete programs of 17 graduate students (several of whom have received IAFP Developing Scientists awards), 5 post-doctoral research associates, and various visiting scientists. She and her students/staff have authored over 60 peer-reviewed research publications, 14 book chapters, and numerous special interest papers.

In addition to IAFP, Dr. Jaykus' many professional affiliations include membership in the Institute of Food Technologists, the American Society for Microbiology, and the Society for Risk Analysis. She has served each of these organizations, most notably by participation in a variety of colloquia and as a member of expert panels. Recently, Dr. Jaykus has also been involved with the Council for Agricultural Science and Technology, for whom she chaired a working group on microbial risk analysis, and as a member of the Best Practices in Microbiological Methods working group of the Association of Official Analytical Chemists. She is currently serving her third term as a member of the National Advisory Committee on Microbiological Criteria for Foods (NACMCF).

Dr. Jaykus has been committed to the goals of IAFP since joining the Association in 1993, at which time she was the recipient of a Developing Scientist Award. Since then, she has organized and convened numerous symposia and has served as a speaker and participant in workshops. She was a founding member of the Foodborne Virus and Parasitic Protozoa PDG (chair, 1995–1999; 2002–2004) and the Microbial Risk Analysis PDG (chair, 1998–1999). She also served as a member of the *Journal of Food Protection* Management Committee (1998–2001) and editorial board (1997–present); chair of the Nominations Committee (2004); and judge (2005, 2006) and chair (2006) for the Developing Scientist Competition Committee. In 2006, Dr. Jaykus was the recipient of the IAFP Educator Award and she is currently serving as chairperson of the 2007 IAFP Program Committee.

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UPDATES

ConAgra Names Paul Hall Vice President of Global Food Safety

As part of its commitment to enhance consumer safety and health, ConAgra Foods has established a leadership position, vice president of Global Food Safety, to bring additional focus and leadership to developing and implementing programs that continuously improve product safety and design. The company has hired Paul A. Hall, a leading expert with more than 30 years of experience in microbiology, food safety and food quality, to fill this position. Mr. Hall joins ConAgra Foods from Matrix MicroScience, Inc. Previously, he held product safety and quality-related positions of increasing responsibility at Kraft Foods. Mr. Hall stated, "I am looking forward to helping ConAgra Foods become the recognized industry leader in food safety."

Mitchell Named Vice President of Conventions and Meetings

The American Frozen Food Institute (AFFI) has promoted Jenny Mitchell to the position of vice president of conventions and meetings. Previously, Ms. Mitchell led the conventions and meetings department as director of conventions and meetings.

In making the announcement, Leslie G. Sarasin, Esq., CAE, AFFI's president and chief executive officer, said, "Under Jenny's leadership, AFFI has produced several landmark advancements over the past year. The Institute launched the 'Our 48 Hours' Frozen Food Executive Forum and re-branded and enhanced its flagship event, the AFFI Frozen Food Convention. This well-deserved promotion recognizes Jenny's contributions, and those of the entire team with her direction, to the value the Institute provides to members."

Ms. Mitchell oversees preparations for AFFI's events, including the AFFI Frozen Food Convention, Distribution and Logistics Conference, Government Action Summit and "Our 48 Hours" Frozen Food Executive Forum. Ms. Mitchell also is responsible for coordinating the Food Industry Environmental Council's (FIEC) Annual Food Processing Environmental Conference, the Texas-Mexico Frozen Food Council's Frozen Food Fiesta and the National Frozen Pizza Institute's Annual Conference. In addition to managing registrations, housing and meeting room assignments for Institute events and those of affiliated organizations, she is involved in the selection of host cities for future AFFI events.

Ms. Mitchell is a graduate of Hendrix College in Conway, AK, where she earned her undergraduate degree in theatre arts. Prior to joining AFFI, Ms. Mitchell worked at the Cabe Theatre in Conway, AK, where she served as costume crew head. In this role, she was responsible for the execution of costumes.

Johnson Hires New Employees – Including National Sales Manager

Al Miller, a former employee of Johnson Truck Bodies, has returned after being away from the company for 15 months. Mr. Miller will be working in a newly created position as national sales manager.

Additional recent new hires include: Donald Breault and Donna Cherry, buyers in the purchasing department; James Wallin, safety specialist; and Shanna Smith, human resource generalist.

NEWS

FAO/WHO – Food Safety Risk Analysis: A Guide for National Food Safety Authorities

This guide has been developed to assist food safety regulators' understanding and use of risk analysis in national food safety frameworks, and provides essential background information, guidance and practical examples. The primary audience is food safety officials at the national government level. The publication is currently available in English, with French and Spanish versions forthcoming in mid-2007.

3-A SSI Announces Authorized 3-A Symbol Holders

3-A Sanitary Standards, Inc. (3-A SSI) recently updated its public Web site information on current 3-A Symbol authorizations to assist regulatory sanitarians, processors and equipment fabricators. The new information shows the most current database of authorized 3-A Symbol holders. A separate list of discontinued 3-A Symbol holders also appears on the 3-A SSI Web site. This information lists the reason for discontinuation, such as equipment is no longer in production, the equipment was consolidated in another 3-A Symbol authorization resulting from a change in company ownership, or the failure of the holder to maintain the authorization in accordance with the terms and conditions for use of the 3-A Symbol.

According to 3-A Chair Greg Marconnet (Kraft Foods), "Interest in products holding 3-A Symbol authorization is now higher than ever because most licensees have obtained a Third Party Verification (TPV) inspection required to maintain their authorization. Due to industry consolidation, product withdrawals, and other reasons, many products no longer maintain a 3-A Symbol authorization and the new information helps interested parties understand why some licenses have been discontinued."

The lists of current and discontinued 3-A Symbol holders are available on the 3-A SSI Web site at http://www.3-a.org/symbol/holders.htm.

New Salami Standard Proposed from the New Zealand Food Safety Authority

The New Zealand Food Safety Authority (NZFSA) is looking to develop a New Zealand standard for producing Uncooked Comminuted Fermented Meats (UCFM), such as salami.

The move comes after NZFSA identified a number of instances where butchers and processors were unaware of essential manufacturing procedures that ensure the microbial safety of UCFM products.

UCFM products primarily contain beef and pork meat, salt, nitrite, glucose, spices, seasonings and ideally a starter culture (to assist fermentation).

The ingredients are mixed and comminuted (reduced in size) to produce a batter. The mixture is then stuffed into a casing, fermented and dried (and sometimes smoked) to create the end product.

If the fermentation, maturation and drying steps are not undertaken correctly, there are risks of contamination with harmful microbial pathogens.

NZFSA recently assessed existing data and information on the way UCFM products are made and whether procedures adequately controlled microbial pathogens, in particular shiga toxin-producing *Escherichia coli* (STEC).

STEC can be found in raw meat used in UCFM product – although in New Zealand these STEC levels are generally low. The assessment showed that, in a small number of butcher and processor premises, the control levels may be insufficient.

Tim Knox, director of NZFSA's New Zealand Standards Group, says, "New Zealand has not had any notified human illness cases attributed to eating UCFM products and the likelihood of a food safety issue occurring is relatively low. However, the consequences of STEC infection – particularly for susceptible groups like young children – can be severe."

Overseas foodborne illness outbreaks of STEC have been linked to UCFM products. In 1995 one person died and more than 20 children were hospitalized after eating contaminated product in Australia.

The proposed standard will be in keeping with overseas trends in salami manufacturing and would help ensure that New Zealanders are getting a safe product.

Although this is the first proposed standard for UCFM production, NZFSA believes many New Zealand producers are already using the existing Australian standard or the New Zealand Pork Quality Improvement Process (PQIP) Code of Practice.

The introduction of a standard would not be a problem for these producers but could affect smaller producers who may not have a HACCP (Hazard Analysis Critical Control Point) system in place.

However, working to an agreed New Zealand standard would enable UCFM manufacturers to demon-

strate that they produce a safe product. They would need to show that the fermentation, maturation and drying processes reduce the microbial load in the final product to a safe level.

The public discussion document and the proposed standard is being distributed for comment to UCFM producers, including wholesale processors, retail butchers and dual operator butchers, as well as industry associations and other relevant government agencies.

Copies can be downloaded from the website: www.nzfsa.govt.nz.

FDA Issues Final Guidance for Safe Production of Fresh-cut Fruits and Vegetables

The US Food and Drug Administration (FDA) has published a draft final guidance advising processors of fresh-cut produce how to minimize microbial food safety hazards common to the processing of most fresh-cut fruits and vegetables, which are often sold to consumers in a ready-to-eat form.

The document "Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables" suggests that fresh-cut processors consider a state-of-the-art food safety program such as the Hazard Analysis Critical Control Point (HACCP) system, which is designed to prevent, eliminate, or reduce to acceptable levels the microbial, chemical, and physical hazards associated with food production.

The guidance complements FDA's regulations of manufacturing practices and incorporates comments received in response to its draft issued in March 2006. The current version will not be final until the White House Office of Management and Budget completes an authorization step required by the Paperwork Reduction Act, and the agency announces that the guidance is final.

"Ensuring the safety of the American food supply is one of this Agency's top priorities," said Andrew C. von Eschenbach, MD, commissioner of food and drugs. "Americans are eating more fresh-cut produce, which we encourage as part of a healthy diet. But fresh cut-produce is one area in which we see foodborne illness occur. Offering clearer guidance to industry should aid in the reduction of health hazards that may be introduced or increased during the fresh-cut produce production process."

Dr. von Eschenbach testified before a hearing by the Agriculture, Rural Development, and Related Agencies Subcommittee of the Senate Committee on Appropriations, which will address the processes in place and improvements being made regarding food safety, specifically the safety of fresh produce and vegetables. The hearing took place in Madison, WI, on March 12, 2007.

Processing produce into fresh-cut product increases the risk of bacterial contamination and growth by breaking the natural exterior barrier of the produce by peeling, slicing, coring, or trimming the produce with or without washing or other treatment before the produce is packaged for consumers. Examples of fresh-cut products are shredded lettuce, sliced tomatoes, salad mixes (raw vegetable salads), peeled baby carrots, broccoli florets, cauliflower florets, cut celery stalks, shredded cabbage, cut melons, sliced pineapple, and sectioned grapefruit.

Consumers can reduce their risk of illness from fresh-cut produce by following safe-handling practices such as refrigerating the product after purchase; using only clean hands, utensils or dishes in preparing the product; and discarding the product when the "use by" date has expired.

The Guide complements FDA's Current Good Manufacturing Practice regulations for food (21 CFR 110) and provides a framework for identifying and implementing appropriate measures to minimize the risk of microbial contamination during the processing of fresh-cut produce. Specifically, it discusses the production and harvesting of fresh produce and provides recommendations for fresh-cut processing in the following areas: (1) personnel health and hygiene, (2) training, (3) building and equipment, (4) sanitation operations, and (5) fresh-cut produce production and processing controls from product specification to packaging, storage and transport. The Guide also provides recommendations on recordkeeping and on recalls and tracebacks.

The Guide also recommends that processors encourage the adoption of safe practices by their partners throughout the supply chain, including produce growers, packers, distributors, transporters, importers, exporters, retailers, food service operators, and consumers. These practices include:

- Establishing a company policy that employees report any active case of illness to supervisors before beginning work and training;
- Training supervisors to recognize typical signs/symptoms of infectious disease; maintain the proper first aid to protect and cover any wound; and not allow an employee to work with any aspect of fresh or fresh-cut produce, processing equipment or tools until the wound has healed and/or the infectious disease has been treated.

The Guide is accessible on the FDA Web site at: http://www.cfsan.fda.gov/guidance.html.

Experts Assess United States Food Security

The qualities that have made the American food supply system so efficient—bulk production, just-in-time deliveries, fast turnover of stocks, rapid shipping to many different locations — are the same qualities that make the system attractive for a terrorist attack, a leading food protection specialist said at a March 13 briefing for journalists.

Francis F. Busta, director of the National Center for Food Protection and Defense at the University of Minnesota, said the nation's food supply system is "a very good delivery system for intentional contamination." He spoke at a news briefing organized jointly by the Center for Media and Security and the AAAS Center for Science, Technology and Security Policy.

There has been progress in identifying and eliminating vulnerabilities in the food system since the 9/11 terrorist attacks, Dr. Busta said. But he noted that a government accountability office report in January identified the food system as "a high-risk area for homeland security" and a recent RAND report found that food processing and packing plants are especially at risk.

One in six jobs in the United States is involved with the food and agriculture system, Dr. Busta said, and there are many points in that system—from the farms and food processing plants to the transportation vehicles, distribution warehouses and retail outlets—where terrorists could attempt to contaminate products.

Accidental events involving the food supply, such as the recent bacterial contamination of bagged spinach and a *Salmonella* outbreak linked to a leading brand of peanut butter, suggest how disruptive a terrorist attack could be, Dr. Busta said.

The accidental incidents typically involve low concentrations of a disease organism or toxin, but the result still can leave many people sickened and large economic impacts due to product recalls. A determined effort to deliberately contaminate the food supply likely would involve higher concentrations of pathogens, Dr. Busta said, with much more significant effects. Some scenarios project as many as 50,000 dead over a matter of weeks, he said.

Dr. Busta declined to discuss threats and vulnerabilities in detail but said he worries about agents for which there are no antidotes and illnesses that could overwhelm the public health system.

One concern is the botulism toxin, a highly lethal agent that could be introduced into the food system, even in a crude form, Dr. Busta said. The toxin, which can produce paralysis of the respiratory muscles and death, is a protein produced by the bacterium *C. botulinum*. It is one of the most poisonous naturally occurring substances in the world.

Researchers are working on ways to counter such potential threats to the food supply. Dr. Busta mentioned the work of David Beebe and Eric Johnson at the University of Wisconsin. They have developed a "lab on a chip" sensor that can detect the botulism toxin in liquids, such as milk, water or juice, as they flow past the sensor. The detection method is much quicker than conventional lab tests that take several days.

Specialists also are developing computer models that can highlight patterns in disease outbreaks and help identify those that may be intentional rather than accidental. David Hennessy, professor of economics with Iowa State University's Center for Agriculture and Rural Development, said that during an intentional attack of foot-and-mouth disease, a highly contagious viral disease of cattle and pigs, "one might see it in several different places around the country at the same time, just to cause havoc." It might occur in hogs in North Carolina and Iowa, for example, and in beef cattle in Great Plains states.

Shaun Kennedy, deputy director of the Minnesota center, said an intentional outbreak of foodborne illness likely would be more rapid in onset and cause more severe symptoms in victims than a natural outbreak. Terrorists also might try to trigger several different types of foodborne illness in multiple locations, he said.

One key to better defense, Mr. Kennedy said, is better surveillance and early warning. Such surveillance is done by state and local health departments. "Some states are a lot better at it than others just because of the level of investment in the public health sector. If we could just get all the states to the same level as the best states," he said, "that would significantly improve our ability to identify outbreaks earlier."

Mr. Hennessy said "it is difficult for economists to estimate the potential costs of a successful terrorist attack on the food system. Consumers may turn to other products, as they did during the accidental contamination of bagged spinach, and non-affected growers might profit. The most readily measured impacts would be the production losses for the affected farms or livestock operations."

A fairly severe outbreak of foot-and-mouth disease in livestock in the United States might cost $5 billion to $18 billion, he said, though such numbers are speculative and depend on where an outbreak occurs, the direction of the wind (since the virus particles can be spread through the air) and the rapidity of the response by authorities.

Farmers can lose huge amounts of money during a foot-and-mouth epidemic, when large numbers of animals are destroyed and revenues from milk and meat production plummet. Mr. Hennessy said "a foot-and-mouth outbreak in Britain in 2001 also had a dramatic impact on rural tourism due to travel restrictions in affected areas."

"One of our challenges is to educate consumers without scaring them," Dr. Busta said. "Consumers can play their own role in food system surveillance," he said, "by reporting unusual events — such as everyone in the same family becoming ill at the same time — to health authorities."

FDA and CDC Remind Consumers of the Dangers of Drinking Raw Milk

The US Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) are reminding consumers of the dangers of drinking milk that has not been pasteurized, known as raw milk. Raw milk potentially contains a wide variety of harmful bacteria – including *Salmonella*, *E. coli* O157:H7, *Listeria*, *Campylobacter* and *Brucella* – that may cause illness and possibly death. Consuming raw milk may be harmful to health. From 1998 to May 2005, CDC identified 45 outbreaks of foodborne illness that implicated unpasteurized milk, or cheese made from unpasteurized milk. These outbreaks accounted for 1,007 illnesses, 104 hospitalizations, and two deaths.

The actual number of illnesses was almost certainly higher because not all cases of illness are recognized and reported. Consumers who become ill after consuming raw milk, and pregnant women who believe they consumed contaminated raw milk or cheese made from raw milk, should see a doctor or other health-care provider immediately. Symptoms of illness caused by raw milk vary depending on which harmful bacteria are present. Symptoms may include but are not limited to: vomiting, diarrhea, abdominal pain, fever, headache and body ache. Most healthy people will recover from illness caused by harmful bacteria in raw milk or in foods made with raw milk within a short period of time. But some individuals can develop symptoms that are chronic, severe, or even life-threatening. Illnesses caused by pathogens found in raw milk can be especially severe for pregnant women, the elderly, infants, young children and people with weakened immune systems. Since 1987, in order to better protect consumers from such risks, FDA has required all milk packaged for human consumption be pasteurized before being delivered for introduction into interstate commerce. Pasteurization, a process that heats milk to a specific temperature for a set period of time, kills bacteria responsible for diseases such as listeriosis, salmonellosis, campylobacteriosis, typhoid fever, tuberculosis, diphtheria and brucellosis. FDA's pasteurization requirement also applies to other milk products, with the exception of a few aged cheeses. Proponents of drinking raw milk often claim that raw milk is more nutritious than pasteurized milk and that raw milk is inherently antimicrobial, thus making pasteurization unnecessary. Research has shown that these claims are myths. There is no meaningful nutritional difference between pasteurized and raw milk, and raw milk does not contain compounds that will kill harmful bacteria. In fact, raw milk, no matter how carefully produced, may be unsafe. The CDC, the American Medical Association, the American Academy of Pediatrics, the National Conference on Interstate Milk Shipments, the National Association of State Departments of Agriculture, the Association of Food and Drug Officials and other organizations have endorsed the pasteurization of milk and restriction of the sale of products containing raw milk. Because even pasteurized milk contains low levels of nonpathogenic bacteria that can cause food to spoil, it is important to keep pasteurized milk refrigerated.

Proper Packaging and Carbon Dioxide Keeps the Color, Protects the Meat

Processors who package meat want it to be free of pathogens and to have an attractive color in the display case. Use of the right elements for packaging can assist processors in reaching that goal with some research findings by a Food Safety Consortium team at Iowa State University.

The group, led by animal science and food science professor Joseph Sebranek, started with pork products in modified atmosphere packaging, which changes the composition of the air within the film-covered package. The researchers sought to determine if inhibitory improvement against pathogens might be achieved by packaging pork loins and boneless ham muscles that were injected with potassium lactate and sodium diacetate.

Lactate and diacetate are already being used to reduce microbial growth. Scientists developed a hypothesis that a modified atmosphere of 99.5 percent carbon dioxide and 0.5 percent carbon monoxide would make the antimicrobials more effective.

Mr. Sebranek said the research showed that the high carbon dioxide levels did not appear to increase the effectiveness of the ingredients injected into the meats. A lower level of carbon dioxide – above 40 percent with the approximately 0.5 percent carbon monoxide level added to prevent discoloring – will help inhibit bacteria but appears to do so independently.

"There is still merit to the idea of using high carbon dioxide in modified atmosphere packaging because there are concerns about those particular microbial inhibitors such as diacetate," Mr. Sebranek said. "Some processors are beginning to back away from it because it has a bit of an acidic taste and a little sensory impact. The modified atmosphere would offer the opportunity to inhibit the organisms without the use of diacetate."

"You would probably not want to go as high as 99 percent," Mr. Mr. Sebranek said. "There can be a disadvantage to very high carbon

dioxide, which is that meat systems will absorb a considerable amount if it's in the atmosphere."

Carbon dioxide by itself has already been recognized for a significant effect of inhibiting pathogens, but concentrations over 30 percent or 40 percent usually result in discoloration of fresh meat. But in combination with carbon monoxide, the color is greatly improved.

"For fresh meat products, carbon monoxide gives you beautiful color," Mr. Sebranek said. The low levels of carbon monoxide will maintain stable, cherry red color and allows greater levels of carbon dioxide for extending the shelf life.

With cooked, cured, processed products, the higher levels of carbon dioxide are acceptable. It doesn't discolor those products as it does fresh meats such as ground meat or pork chops, where the use of carbon monoxide now offers significant color improvement.

Although combining modified atmosphere packaging with lactate and diacetate didn't add any significant benefit, the use of modified atmosphere packaging on its own still provides industry an important option. "The big advantage is the use of carbon monoxide in fresh meat from the color standpoint," Mr. Sebranek said. "That's something that's only recently been available."

FDA Proposes to Allow the Use of Alternative Temperature-indicating Devices for Processing Low-acid Canned Foods

The Food and Drug Administration (FDA) has issued a proposed rule which, if finalized, would benefit both consumers and the food industry by enabling manufacturers of heat-processed low-acid canned foods to modernize their equipment by using alternative temperature-indicating devices (TIDs). Under the proposal, these devices, which are the state-of-the-art equipment for measuring and recording temperatures, may be used instead of, or in addition to, conventional mercury-in-glass thermometers (MIGs).

If finalized, the proposed rule would amend 's current regulations for the processing of low-acid canned foods such as beans, corn, peas, and potatoes, and clarify such requirements as recordkeeping and the rules for measuring and recording temperatures during processing. The proposal also includes metric equivalents of avoirdupois (US) measurements.

"This proposal is designed to benefit both consumers and the food industry," said Robert E. Brackett, Ph.D., director of FDA's Center for Food Safety and Nutrition. "It enables manufacturers to rapidly adopt technologically advanced temperature-indicating devices. And we believe that the proposed rule, after being finalized, would ensure that these devices are accurate."

The agency will allow low-acid canned food manufacturers who follow the proposed rule to change immediately from the currently required MIGs to alternative TIDs. Although these TIDs remain out-of-compliance until the proposal is finalized, FDA will consider, on a case-by-case basis, exercising its enforcement discretion if the new devices are used in a manner consistent with the proposed rule. Processors who choose this option must comply with any revised requirements when the final rule becomes effective.

Pitting Microbe against Microbe for Safer Foods

Before fresh fruit is cut, it's important that the outer skin be kept free from foodborne pathogens. That's because food-contaminating microbes on the surface of a peel or rind could piggyback onto a cutting knife and be dragged into the fruit's flesh.

Agricultural Research Service (ARS) scientists have led a team that tested a combination of bacterial enemies that effectively controlled *Listeria monocytogenes* on fresh-cut honeydew melon pieces during exposure tests.

L. monocytogenes is a foodborne human pathogen–widely distributed in nature–that tolerates environmental stress, multiplies at low temperatures and survives refrigeration. It can cause serious infections. And federal agencies have established a zero-tolerance for *L. monocytogenes* in processed, fresh-cut fruits and vegetables.

William Conway, with the ARS Produce Quality and Safety Laboratory at Beltsville, MD, and Wojciech Janisiewicz, with the ARS Appalachian Fruit Research Station at Kearneysville, WV, led the study. They worked in cooperation with Baltimore, MD-based Intralytix, Inc.

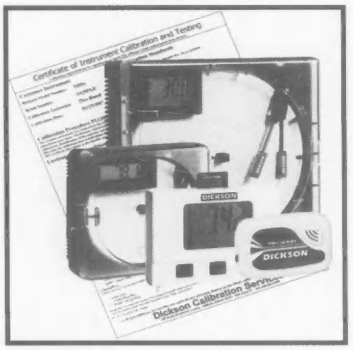
To test bacteria-fighting potential, the researchers treated honeydew melon pieces with three different protective solutions: either an oxidative bacterium known as *Gluconobacter asaii*, a mixture of six *L. monocytogenes*-specific bacteriophages or a combination of both.

The *G. asaii* bacteria are naturally present on the surface of some fruits, such as apples and pears, and are nontoxic to humans. Bacteriophages are viruses that, while nontoxic to humans, kill specific human bacterial pathogens.

After artificially contaminating the test honeydew pieces with *L. monocytogenes*, the team found that the combination of phages and *G. asaii* bacteria was the most effective treatment. It reduced *L. monocytogenes* populations by more than 99.9 percent.

Read more about the research in the March 2007 issue of *Agricultural Research* magazine, available online at: http://www.ars.usda.gov/is/AR/archive/mar07/listeria0307.htm.

INDUSTRY PRODUCTS



Dickson Company

Automatic Calibration Reminder Service for NIST-certified Instruments Announced by Dickson Company

To comply with US FDA, HACCP, USDA and other global food regulations, food manufacturers, distributors and retailers seeking to meet the highest standards of temperature and humidity control by using NIST-certified instruments can now be assured that their chart recorders, data loggers, and calibrations are current through Dickson Company's automatic enrollment of NIST-certified instruments in the Dickson Calibration Club.

Dickson Company, which sponsors the Calibration Club, offers the widest selection of temperature, humidity and pressure recorders and data loggers available in the world. Automatic enrollment of NIST-certified instruments obtained from the Dickson Company in the Calibration Club was announced for 2007. Members of the Dickson Calibration Club are able to create an online database for all of their instruments and assets such that they receive an e-mail notification when instruments or assets are due for calibrations.

Unlike generic instruments that only state that calibrations are within specifications, Dickson NIST-certified temperature and humidity recorders and data loggers specify a particular unit's serial number along with the date of original calibration, the calibration reading, and the specific instrument used to calibrate the unit. The Dickson Calibration Club service is designed to help those with NIST-certified instruments ensure their instruments retain their original calibration specifications. NIST-certified instruments are often the preferred models for those with the highest quality standards.

Dickson Company
630.543.3747
Addison, IL
www.dicksonweb.com

Pneumatically Driven Vacuums from Nilfisk-Advance America Provide Thorough Cleaning Without Electricity

A building under construction needs debris removed; the work crew has a diesel-powered air compressor for its tools but no on-site electric. A marina's floating pier, littered from a dockside boat repair, must be cleaned but standing water on the boards and splashing from all sides make an electric vacuum a dubious choice. These are just two scenarios where pneumatically driven vacuums are the answer. The CFM A15 and CFM A17 vacuums from Nilfisk-Advance America operate entirely without electricity yet provide all of the suction, filtration and durability for which the company's products are known.

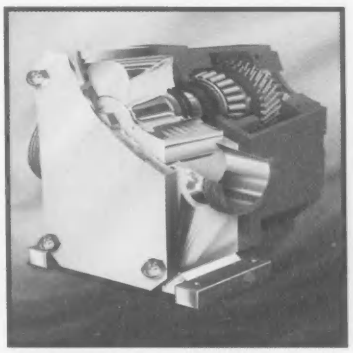
The CFM A15 and CFM A17 connect to any compressed-air system and use air pressure driven through a venturi to create suction powerful enough to handle even large debris in applications such as metalworking, construction and manufacturing.

The CFM A15 is compact and maneuverable, well suited to confined spaces and transportation to remote locations. The larger CFM A17 can handle heavy-duty chores and features a large 26-gallon tank. Because the venturi has no moving parts, this unit is very low maintenance, making it suitable for continuous-duty applications, such as powder coating production lines. The A17 is also available in an explosion-proof model with conductive wheels and non-sparking, conductive accessories.

Both the CFM A15 and A17 have external filter shakers to prevent premature clogging. Both are available in stainless steel and can be fitted with optional HEPA filters and an array of anti-static filters and accessories.

"Companies don't need to accept substandard, manual cleaning – and the safety risks that can result – just because they can't use an electric vacuum," said Jessica Letscher, marketing communications manager for Nilfisk-Advance America. "The CFM A15 and A17 give users cleaning performance in wet environments, in remote locations and in other areas where electricity either shouldn't be used or simply isn't available."

Nilfisk-Advance America
610.232.5448
Malvern, PA
www.pa.nilfisk-advance.com



Viking Pump Inc.

Viking Pump Releases New High-speed RTP20 Series

Viking Pump recently released a new addition to its proven high-speed rotary transport pumps, the RTP20. Offering configuration flexibility and ease of maintenance, the RTP20 (1.0 liter/rev) is built with all the features of the proven RTP30 (1.28 liter/rev) design as well as provides an additional size with exceptional performance, advanced durability, application flexibility, and ease of installation to help users achieve enhanced productivity for a lower total cost of ownership. "We are very pleased to be introducing the RTP20 series to work alongside the highly successful RTP30 series," said John Stillman, director-global OEM sales of Viking Pump. "When it comes to providing topnotch fluid-handling systems for our customers, Viking® has the engineering expertise to provide the best possible solutions with the most cutting-edge technology available."

The series' tri-lobe design, customizable per customer specifications, is compact and light-weight and features removable feet and multiple mountings for easy vertical or horizontal adaptation. Flexible for a variety of operational needs, the RTP20 series is also available with ACME threaded or tri-clamp ports as well as many other port connection types.

Both the RTP20 and RTP30 series efficiently fill rotor voids, allowing for faster and quieter operation on viscous liquids. In addition, with a longer sealing land at rotor tips, the series provides enhanced efficiency when working with lower viscosity products. The RTP20 offers a capacity to 264 GPM (1,000 L/M / 60 M3/H), pressure to 145 PSI (10 Bar), viscosity to 250,000 SSU (55,000 cSt), and operates in temperatures to +230°F (+110°C). The RTP30 offers a capacity to 340 GPM (1,283 L/M / 77 M3/H), pressure to 175 PSI (12 Bar), viscosity to 250,000 SSU (55,000 cSt), and operates in temperatures to +300°F (+150°C).

Viking Pump Inc.
319.273.8430
Cedar Falls, IA
www.vikingpump.com

Silliker, Alchemy Team to Distribute Innovative Food Safety Training Product

Silliker, Inc. has entered into a strategic partnership with Alchemy Systems, a privately held professional development solutions company, to develop and distribute food safety training programs utilizing the Standard Industry Skills Training and Educational Media (SISTEM™) product.

Developed by Alchemy, SISTEM™ is highly interactive and is specifically geared to food manufacturing production workers, with all courses available in both Spanish and English. Workers use simple remote controls to demonstrate mastery of training material, with results automatically documented in an easy-to-use online reporting system.

The application allows up to 32 students to be trained at one time and offers companies a more effective alternative for conducting compliance training. The SISTEM™ product is currently used to train more than 85,000 workers in food processing and food service sectors in the US.

Under the partnership, Silliker will work with Alchemy to create custom food training programs to

expand Alchemy's current course library. The programs will be designed to improve the food safety knowledge and skills of in-plant personnel.

"Our partnership with Alchemy is a key part of our mission to provide the food industry with dynamic training tools that embrace state-of-the-art technologies and provide quantifiable results," said C. J. Reynolds, director of education for Silliker, Inc. "SISTEM™ has tremendous value and upside for companies, and it will be incorporated into customized GMP/ Food Safety courses we conduct for production workers in English and Spanish."

"Alchemy is excited to partner with Silliker to drive adoption of SISTEM™ in the food industry," remarked David I. Perl, chief operating officer of Alchemy. "Proven Silliker expertise in food safety and quality solutions will also result in the creation of additional training material that addresses the critical challenges facing America's food manufacturers."

Good Manufacturing Practices, plant sanitation, food allergens, workplace safety, HACCP and mandated training are some of the topics that will be featured in the Silliker-Alchemy training programs. Highly cost-effective, a 15-minute training module utilizing SISTEM™ equates to an hour of traditional classroom training.

Silliker, Inc.
708.957.7878
Homewood, IL
www.silliker.com

New High-speed Checkweighing Systems Introduced by Gainco

New checkweigher systems from Gainco, Inc. provide accurate high-speed, in-motion weighing of both bagged and boxed poultry and red meat products against a variety of pre-set "accept" or "reject" parameters. The rugged equipment is specially designed to withstand the rigors of heavy use in virtually all processing environments, and the system can process up to 60 bags or boxes per minute, depending on unit size.

With a box unit capacity up to 50 lbs, the precision weighing capabilities of Gainco checkweighers are accurate to +/- 0.04 lbs, with "gap error" warnings embedded in the software.

Constructed of heavy-duty type 304 stainless steel tubing, Gainco checkweighers feature a hermetically-sealed loadcell design with 8-point overload protection and NEMA 4 controller enclosure to prevent damage to "smart" components from harsh washdown and production processes. The ultra-reliable controller features increased uptime, reduced maintenance costs and user-friendly operator screens. Hardware and software packages are custom-configured to meet specific customer throughput and accuracy requirements.

Gainco's checkweigher equipment also features a reject arm that diverts products quickly yet carefully, thereby optimizing quality and appearance of the product prior to rework. Highly durable plastic belting is also employed for reliability and enhanced sanitation. The three-frame design isolates the weigh unit from the heavy-duty infeed and outfeed frames, and an optional reject chute is also available.

Gainco's Dataman® Data Collection System, available for use with checkweighers and other yield management systems, is a software/hardware combination allowing for the integration of all remote units on the production floor. Operators can set parameters for individual pieces of equipment, monitor yield and throughput and create customized reports – all from a single location. The data can be provided to plant managers and corporate executives via a network interface. The raw data can then be moved to popular databases like Oracle, SQL Server and DB2.

Gainco, Inc.
770.534.0703
Gainesville, GA
www.gainco.com

Handheld, Six Channel Particle Counter from GrayWolf

GrayWolf Sensing Solutions introduces a new, portable, six channel particle counter, supplied with exclusive data transfer and graphing software. Unique, automated report generation software is also available, as well as an interface to mobile PCs which significantly enhances on-site documentation of particle count surveys.

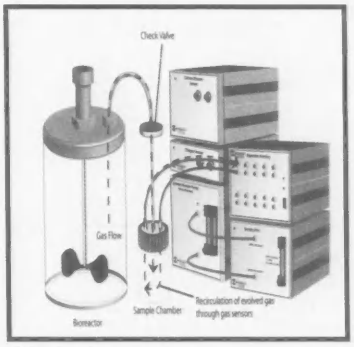
Offering six channels of simultaneous particle counting, the PC-GW3016 displays both cumulative

and differential particle count data on its easy-to-read 3.8" (9.65 cm) touch screen. This is a handheld, 2.2 lb (1 kg) meter capable of logging 3000 sets of measurements on-board (or a virtually unlimited number of readings when interfaced to a mobile PC). Display 6 size ranges simultaneously; 0.3 µm, 0.5 µm, 1.0 µm, 2.5 µm, 5 µm, 10.0 µm are standard, alternative size ranges are also available.

The PC-GW3016 may be used as a stand-alone display unit and data-logger, to record the 6 particle size channels, and optionally to measure %RH and temperature with the available PC-GW6-RHCF plug-in probe. Readings may be downloaded to GrayWolf's WolfSense PC™ transfer, graph generation and data analysis software. Optionally use GrayWolf's WolfSense Advanced Report Generator™ software to dump readings right into a report template. Automated reports are fully customizable and include tables, graphs, repeated text blocks and promoted text. Detail report generation has never been more efficient.

Additionally, the PC-GW3016 may be interfaced to a mobile PC (Windows Mobile Pocket PC™ or XP/Vista™ notebook) for display and logging on the mobile PC. On-board sensor tips provide information about particles, including those typically encountered when conducting Indoor Environmental Quality surveys. On-site mobile PC note taking allows text notes audio notes, Word™ templates, photo files and more to be attached to the particle count data files.

GrayWolf Sensing Solutions
203.416.0005
Trumbull, CT
www.WolfSense.com



Columbus Instruments

Bio Gas Monitor from Columbus Instruments

Columbus Instruments "Oxymax-BGM" Bio Gas Monitor is intended for the research and evaluation of processes that yield biogas. More than just an off-gas monitor, Oxymax-BGM derives volumes of gas evolved by the employment of Micro-Oxymax™ closed loop respirometer technology. Briefly, Oxymax-BGM detects changes in gas composition within a sealed test environment and derives volumes based on the detected changes. Oxymax-BGM technology adapts to client reaction vessels for the measurement of biogas generation. The Oxymax-BGM is a unique product in the research of processes that evolve biogas. It is applicable to either aerobic or anaerobic processes and does not impact on process performance or efficiency.

Unique to Oxymax-BGM is its volumetric assessment sensitivity: 1 µL/Hour. This allows bench-top evaluation of processes that can be implemented with small amounts of constituents. Oxymax-BGM can be up-scaled by orders of magnitude to provide continued service as a monitor during further development through pilot level and full-scale process implementation.

Oxymax-BGM supports up to 80 channels of concurrent multi-vessel monitoring. Gases supported by Oxymax-BGM include, but are not limited to, H_2, CH_4, H_2S, CO_2, O_2. Oxymax-BGM provides gas evolution rate figures for each measurement interval and tabulates the figures accordingly into a running total of gas yield. As a fully automated system, Oxymax-BGM requires no user-intervention following system initialization and can operate unattended for weeks.

Columbus Instruments
800.669.5011
Columbus, OH
www.respirometer.com

IAFP 2007 • 94th Annual Meeting • July 8–11 • Lake Buena Vista, Florida

Ivan Parkin Lecture

Sunday, July 8

6:00 p.m.

Reflections on 41 Years as a Food Microbiologist

Mr. Carl S. Custer
Food Microbiologist
Bethesda, Maryland

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

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

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

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

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

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

IAFP 2007 • 94th Annual Meeting • July 8–11 • Lake Buena Vista, Florida

John H. Silliker Lecture

Wednesday, July 11

4:00 p.m.

Trends in Food Safety Management

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

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

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

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

IAFP 2007 PRELIMINARY PROGRAM

SUNDAY, JULY 8

Opening Session – 6:00 p.m. – 7:00 p.m.

Ivan Parkin Lecture – *Reflections on 41 Years as a Food Microbiologist*
Carl S. Custer, Food Microbiologist, Bethesda, Maryland

MONDAY, JULY 9

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

S1 Foodborne Disease Update
S2 Vaccination Strategies to Control Foodborne Pathogens from Farm-to-Table
S3 Food Defense Research and Application
S4 Outreach Programs to Promote Dairy Products and Their Safety Around the World

Roundtable Topics

RT1 Using HACCP to Innovate New Processes in Retail Food Operations
RT2 The Management and Control of Chemical Hazards in Food

Technical Session

T1 Laboratory Methods

Poster Session

P1 Dairy, Seafood, Produce and Education

Afternoon – 1:30 p.m. – 5:00 p.m.

Symposium Topics

S5 Measuring and Motivating Safe Food-handling Practices at Home, Retail and Food Service
S6 Long-term Sequelae of Pathogens with Recognized or Potential Transmission by Food
S7 The DaVinci Code of Auditing: Reaching the Holy Grail of One Global Standard
S8 Recent Pivotal Decisions of the National Conference on Interstate Milk Shipments

Roundtable Topic

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

Technical Session

T2 Produce and Seafood

Poster Session

P2 Meat and Poultry

TUESDAY, JULY 10

All Day – 8:30 a.m. – 8:00 p.m.

Interactive Session

A Mystery Outbreak–What to Do When It Happens to You!

Session 1: 8:30 a.m. – 10:00 a.m.
Session 2: 10:30 a.m. – 12:00 p.m.
Session 3: 1:30 p.m. – 3:00 p.m.
Session 4: 3:30 p.m. – 5:00 p.m.
Session 5: 6:30 p.m. – 8:00 p.m.

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

S9 What's the Future of Foodborne Pathogen Detection?
S10 The Impact of Emerging Food Trends on Food Safety
S11 Food Allergies: A Growing Food Safety Concern
S12 The Wrath of Vibrio's "Past, Present and Future"

Special Interest Session

Salmonella Growth, Persistence and Survival in Low Moisture Foods and Their Environments – Strategies for Control

Technical Session

T3 Antimicrobials, Sanitation and Non-Microbial Food Safety

Poster Session

P3 Epidemiology and Risk Assessment, Novel Laboratory Methods, and Applied Laboratory Methods

Afternoon – 12:15 p.m. – 1:00 p.m.

IAFP Business Meeting

Afternoon – 1:30 p.m. – 5:00 p.m.

Symposium Topics

S13 Pre-Harvest Food Safety: Another Critical Consideration for Assuring the Safety of the Food Supply
S14 Critical Issues in the Investigation of Outbreaks of Foodborne Illness Involving Food Workers
S15 Balancing Cultural and Religious Norms and Food Safety
S16 Microbial Biofilms and Biofilm Control

Technical Sessions

T4 Dairy
T5 Pathogens

Poster Session

P4 Beverages and Water, Antimicrobials, Sanitation and Non-Microbial Food Safety

WEDNESDAY, JULY 11

Morning – 8:30 a.m. – 12:00 p.m.

Symposium Topics

S17 Lettuce and Leafy Greens: Problems, Actions and Issues
S18 Preparing Scientists for the Legal Aspects of a Crisis: Step into an Interactive Mock Trial and Learn How to Become an Expert Witness
S19 Applications of "omics" Technologies for Food Safety and Security
S20 Food Safety @ the Speed of Thought – Creating Virtual Networks

Roundtable Topics

RT4 With Over 100 Years of Experience in Food Safety, We Think…
RT5 Panel on the Science Behind Temperature Control of Potentially Hazardous and High Risk Food

Technical Session

T6 Meat and Poultry

Poster Session

P5 Food Defense, Pathogens and General Microbial

Afternoon – 1:30 p.m. – 3:30 p.m.

Symposium Topics

S21 Spoilage and Its Control in Meat Products
S22 Mitigating Spoilage Risks in Ready-to-Drink Beverages
S23 Emerging Issues Affecting Dairy Product Quality and Safety

Roundtable Topic

RT6 Food Safety Laws: Politcal Science or Food Science

Technical Sessions

T7 Epidemiology and Risk Assessment
T8 Education

4:00 p.m. – 4:45 p.m.

John H. Silliker Lecture – *Trends in Food Safety Management,*
Terry A. Roberts, Ph.D., Food Safety Hygiene Consultant, Reading, England

Note: Unauthorized video, still photography or audio recording will not be allowed.

Subject to chang

IAFP 2007 NETWORKING OPPORTUNITIES

IAFP FUNCTIONS

AFFILIATE EDUCATIONAL SESSION
Saturday, July 7 • 4:00 p.m. – 5:00 p.m.

Affiliate Officers and Delegates plan to arrive in time to participate in this educational session. Watch for additional details.

WELCOME RECEPTION
Saturday, July 7 • 5:00 p.m. – 6:30 p.m.

Reunite with colleagues from around the world as you socialize and prepare for the leading food safety conference. Everyone is invited!

COMMITTEE MEETINGS
Saturday, July 7 • 3:00 p.m. – 4:30 p.m.
Sunday, July 8 • 7:00 a.m. – 5:00 p.m.

Refreshments sponsored by Springer

Committees and Professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on committees or PDGs. Everyone is invited to attend.

STUDENT LUNCHEON
Sunday, July 8 • 12:00 p.m. – 1:30 p.m.

Sponsored by Texas A&M Agriculture, Department of Animal Science, Food Safety

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

EDITORIAL BOARD RECEPTION
Sunday, July 8 • 4:30 p.m. – 5:30 p.m.

Editorial Board Members are invited to this reception to be recognized for their service during the year.

OPENING SESSION AND IVAN PARKIN LECTURE
Sunday, July 8 • 6:00 p.m. – 7:00 p.m.

Join us to kick off IAFP 2007 at the Opening Session. Listen to the prestigous Ivan Parkin Lecture delivered by Carl S. Custer.

CHEESE AND WINE RECEPTION
Sunday, July 8 • 7:00 p.m. – 9:00 p.m.

Sponsored by Kraft Foods

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

IAFP JOB FAIR
Sunday, July 8 through Wednesday, July 11

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

COMMITTEE AND PDG CHAIRPERSON BREAKFAST (By invitation)
Monday, July 9 • 7:00 a.m. – 9:00 a.m.

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

EXHIBIT HALL LUNCH
Monday, July 9 • 12:00 p.m. – 1:00 p.m.

Sponsored by JohnsonDiversey

Tuesday, July 10 • 12:00 p.m. – 1:00 p.m.

Sponsored by SGS North America

Stop in the Exhibit Hall for lunch and networking on Monday and Tuesday.

EXHIBIT HALL RECEPTIONS
Monday, July 9 • 5:00 p.m. – 6:00 p.m.

Sponsored by DuPont Qualicon

Tuesday, July 10 • 5:00 p.m. – 6:00 p.m.

Join your colleagues in the Exhibit Hall to see the most up-to-date trends in food safety techniques and equipment. Take advantage of these great networking receptions.

PRESIDENT'S RECEPTION (By invitation)
Tuesday, July 10 • 6:00 p.m. – 7:00 p.m.

Sponsored by Fisher Scientific

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

PAST PRESIDENTS' DINNER (By invitation)
Tuesday, July 10 • 7:00 p.m. – 9:30 p.m.

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

BUSINESS MEETING
Tuesday, July 10 • 12:15 p.m. – 1:00 p.m.

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

JOHN H. SILLIKER LECTURE
Wednesday, July 11 • 4:00 p.m. – 4:45 p.m.

The John H. Silliker Lecture will be delivered by Dr. Terry A. Roberts.

AWARDS BANQUET
Wednesday, July 11 • 7:00 p.m. – 9:30 p.m.

Bring IAFP 2007 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Frank Yiannas, M.P.H. to Incoming President, Dr. Gary R. Acuff.

IAFP 2007
Event Information

EVENING EVENTS

American Adventure at *Epcot*®
Monday, July 9 • 6:30 p.m. – 10:00 p.m.
Sponsored by DuPont Qualicon

Travel backstage *Epcot*® where you will be escorted to the American Adventure Rotunda. Relive America's glorious past in the beautiful setting of a classic 18th century American Rotunda. A reception-style dinner will be offered as you enjoy the magnificent setting. The finale of the evening takes you outside to an exclusive dessert party in a viewing area overlooking the World Showcase Lagoon. Here, experience the premier night-time spectacular at *Epcot*®, *IllumiNations: Reflections of Earth*. This one-of-a-kind show tells its story and touches the spirit by combining video technology, water fountains, lasers, special lighting effects, and pyrotechnics, all programmed to an original musical score. A perfect finish to your *Epcot*® Adventure.

IAFP Foundation Fundraiser – Adventurers Club at Downtown Disney®
Tuesday, July 10 • 6:30 p.m. – 9:30 p.m.

This will be a night to remember! You will be transported to Downtown Disney® and escorted through the streets of Pleasure Island to the Adventurers Club. The entertainment here is outrageous as the world's most eccentric explorers welcome you to their legendary club of the 1930s. Swap tall tales with a marvelously mad professor, a dashing daredevil pilot, a frisky French maid, and other characters while you enjoy live shows featuring everything from talking masks and a floating head to a ghostly piano. A reception-style buffet will be offered while the show happens all around you. At the conclusion of the event you will have the option to remain at Downtown Disney® and experience all of the clubs of Pleasure Island or return to the *Contemporary* Resort.

GOLF TOURNAMENT

Golf Tournament at *Disney's Magnolia* Golf Course
Saturday, July 7 • 6:30 a.m. – 12:30 p.m.

Join your friends and colleagues for a relaxing round of golf before IAFP 2007. Step onto the first tee and into the shoes of champions. These beautifully manicured links, designed by Joe Lee, are named for an abundance of fragrant Magnolias. Elevated tees, spacious greens and tranquil water hazards immerse you in a natural setting fit for a fulfilling round of championship golf. Enhance your on-course experience with the latest GPS Technology in each golf cart. *Disney's Magnolia* has provided a backdrop for the PGA Tour's elite for over 30 years. A classic Florida golf course, complete with a Mickey Mouse bunker!

Price includes transportation, greens fees with cart, range balls, lunch and prizes.

DAYTIME TOURS

Kennedy Space Center
Saturday, July 7 • 8:30 a.m. – 4:30 p.m.

Each year, millions of visitors make the trek to Kennedy Space Center, NASA's launch headquarters, where many of mankind's greatest accomplishments take place. Your exploration starts with a world-renowned tour where you see many NASA landmarks, including the massive launch pads, the gigantic Vehicle Assembly Building, the awe-inspiring Apollo/Saturn V Center and the International Space Center. View 10-story high rockets from all eras of space exploration in the Rocket Garden, walk through a full-size Space Shuttle mock-up, enjoy IMAX Theater space films on gigantic five-story screens and see an actual Gemini program capsule on display. You will also have lunch with an astronaut. Share in the excitement of space exploration through the eyes and personal stories of one of NASA's best while enjoying a buffet meal. You will have an inspiring day at Kennedy Space Center!

NOTE: Government-issued photo identification is required.

Merritt Island Airboat Excursion
Sunday, July 8 • 9:00 a.m. – 3:00 p.m.

Merritt Island National Wildlife Refuge is certified as the greatest endangered wildlife experience in North America. Our first stop is at the visitors' center for a 20-minute orientation film. Then, take an easy one-hour nature walk through one of the diverse, critical hardwood hammock habitats. Infused with wildlife, more than 1,000 species of plants are found throughout the refuge. Enjoy a picnic lunch at the refuge before heading to the Manatee over-look area. Then it's off to St. John's River for refreshments and gator tail. Certified eco-guides and Coast Guard captains will then take you on a 30-minute airboat tour through central Florida's everglades. Binoculars will be supplied for your viewing pleasure.

***Disney* Behind-the-Scenes Tour – Innovation in Action**
Monday, July 9 • 9:00 a.m. – 12:00 p.m.

When most people hear the name "Walt Disney," they think of *Mickey Mouse*, classic movies, and theme parks. What they often don't think of, or even know about, are his many innovative ideas that eventually led to the creation of the *Walt Disney World*® Resort. Innovation in action highlights Walt's many accomplishments and takes you on an unforgettable journey where you will see, first-hand, how Disney makes "magic"! Tour places most Guests never get to see including:

- *The Walt Disney World*® Nursery and Tree Farm – See how Disney horticulturists create world-famous topiaries.
- Textile Services – Visit the new state-of-the-art laundry facility, one of the largest in the world.
- Main Street, U.S.A.® – Discover how Walt's life and film career heavily influenced this turn-of-the-century location.
- The "Utilidor" System – Journey beneath the *Magic Kingdom*® Park to visit support systems located in the "tunnel."

NOTE: You must be 16 years old and carry a government-issued photo identification. There is walking involved, so comfortable shoes are recommended and attire should be suitable for current weather conditions.

***Disney* Behind-the-Scenes Tour – Gardens of the World**
Tuesday, July 10 • 9:00 a.m. – 12:00 p.m.

Everywhere you look at the *Walt Disney World*® Resort, the trees, shrubs and flowers play a vital role in setting the stage for recreation, entertainment, and beauty. Disney landscaping has become a recognized show in itself, providing color and enjoyment throughout the year. Your horticulture instructor turns *Epcot*® into a living classroom, using facilities "on stage" to describe the basic process of plant design and how it is incorporated in the landscape for the World Showcase pavilions. In addition, you will learn how you can apply many of these design elements to theme your home garden.

NOTE: You must be 16 years old and carry a government-issued photo identification. There is walking involved, so comfortable shoes are recommended and attire should be suitable for current weather conditions.

***Disney* Cooking Class – Now That's a Panini**
Wednesday, July 11 • 10:30 a.m. – 1:30 p.m.

The sights, sounds and wonderful aromas of a Disney cooking demonstration will make your mouth water! A Disney Chef will share some great ideas for creating magical meals on your grill at home. A sample of items include: cigar shrimp, jerk skewered chicken, balsamic glazed portobello mushroom skewers, tequila and lime beef quesadillas and pizzas sweet and savory. You will not go away hungry!

FIELD TOURS

Food Safety is Magical, But It Doesn't Magically Happen
Saturday, July 7 or Thursday, July 12
9:00 a.m. – 12:00 p.m.

During this tour, you will learn about the world-class food safety program at the *Walt Disney World*® Resort. This tour will include a presentation on the theory and operational aspects of Disney's food safety program, followed by a walking tour of one of the largest food service operations on property to illustrate the application of principles.

Behind the Seeds Tour
Saturday, July 7 or Thursday, July 12
9:00 a.m. – 12:00 p.m.

Get "up close and personal" with plants, insects and fish to explore and discover how scientists are working on innovative technology to support the future of food production. You will learn about the use of aquaculture in production of fish and shellfish, innovative plant-growing techniques and the use of predator insects to control pests.

Reedy, Set, Go – Behind the Scenes of Environmental Services
Thursday, July 12 • 9:00 a.m. – 12:00 p.m.

Go behind the scenes of the Reedy Creek Improvement District Environmental Services lab. This tour will include an overview of the history of the Reedy Creek Improvement District, a discussion of the essential role they play in monitoring the environment on and around the *Walt Disney World*® Resort property and a tour of the environmental services laboratory operations.

Food Irradiation Facility Tour
Thursday, July 12 • 8:30 a.m. – 11:30 a.m.

This is your opportunity to tour the Food Technology Service, Inc. facility. Food Tech was constructed as the nation's first commercial food irradiation company. Since 1992, the facility has been the leader in processing irradiated produce, poultry, and meat products for processors, retailer, and foodservice companies.

Food Tech has a long history of partnering with its customers to educate, introduce and implement irradiation as a food safety tool. Don't miss this exciting opportunity to see a working gamma food irradiation plant and learn more about this technology.

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

MEETING INFORMATION

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

Full Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- John H. Silliker Lecture
- Exhibit Hall Lunch (Mon.-Tues.)
- Awards Banquet
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception (Mon.-Tues.)
- Program and Abstract Book

4 EASY WAYS TO REGISTER

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

Online: www.foodprotection.org

Fax: 515.276.8655

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

Phone: 800.369.6337; 515.276.3344

The early registration deadline is June 5, 2007. After this date, late registration fees are in effect.

CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by June 22, 2007. No refunds will be made after June 22, 2007; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 16, 2007.

Event and tour tickets purchased are nonrefundable.

International Association for Food Protection®

EXHIBIT HOURS

Sunday, July 8, 2007	7:00 p.m. – 9:00 p.m.
Monday, July 9, 2007	10:00 a.m. – 6:00 p.m.
Tuesday, July 10, 2007	10:00 a.m. – 6:00 p.m.

DAYTIME EVENTS

Saturday, July 7, 2007	8:30 a.m. – 4:30 p.m.
Kennedy Space Center (Lunch included)	
Sunday, July 8, 2007	9:00 a.m. – 3:00 p.m.
Merritt Island Airboat Excursion (Lunch included)	
Monday, July 9, 2007	9:00 a.m. – 12:00 p.m.
Disney Behind-the-Scenes Tour–Innovation in Action	
Tuesday, July 10, 2007	9:00 a.m. – 12:00 p.m.
Disney Behind-the-Scenes Tour–Gardens of the World	
Wednesday, July 11, 2007	10:30 a.m. – 1:30 p.m.
Disney Cooking Class – Now That's a Panini (Lunch included)	

EVENING EVENTS

Sunday, July 8, 2007	
Opening Session	6:00 p.m. – 7:00 p.m.
Cheese and Wine Reception *Sponsored by Kraft Foods*	7:00 p.m. – 9:00 p.m.
Monday, July 9, 2007	
Exhibit Hall Reception *Sponsored by DuPont Qualicon*	5:00 p.m. – 6:00 p.m.
Monday Night Social – American Adventure at *Epcot*® *Sponsored by DuPont Qualicon*	6:30 p.m. – 10:00 p.m.
Tuesday, July 10, 2007	
Exhibit Hall Reception	5:00 p.m. – 6:00 p.m.
IAFP Foundation Fundraiser – *Disney's* Adventurers Club	6:30 p.m. – 9:30 p.m.
Wednesday, July 11, 2007	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

FIELD TOURS

Saturday, July 7, 2007 (Limited number of tickets available)	
Food Safety is Magical, But It Doesn't Magically Happen	9:00 a.m. – 12:00 p.m.
Behind the Seeds Tour	9:00 a.m. – 12:00 p.m.
Thursday, July 12, 2007 (Limited number of tickets available)	
Food Safety is Magical, But It Doesn't Magically Happen	9:00 a.m. – 12:00 p.m.
Behind the Seeds Tour	9:00 a.m. – 12:00 p.m.
Reedy, Set, Go – Behind the Scenes of Environmental Services	9:00 a.m. – 12:00 p.m.
Food Irradiation Facility Tour	8:30 a.m. – 11:30 a.m.

GOLF TOURNAMENT

Saturday, July 7, 2007	
Golf Tournament at *Disney's Magnolia* Golf Course	6:30 a.m. – 12:30 p.m.

HOTEL INFORMATION

Hotel reservations can be made online at **www.foodprotection.org**.

International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337 •
515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

IAFP 2007 Registration Form

Member Number: _____

First name (as it will appear on your badge) _____ Last name _____

Employer _____ Title _____

Mailing Address (Please specify: ❒ Home ❒ Work) _____

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

Telephone _____ Fax _____ E-mail _____

❒ Regarding the ADA, please attach a brief description of special requirements you may have.

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

PAYMENT MUST BE RECEIVED BY JUNE 5, 2007 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES	MEMBERS	NONMEMBERS	TOTAL
Registration	$ 405 ($ 455 late)	$ 615 ($ 665 late)	_____
Association Student Member	$ 90 ($ 90 late)	Not Available	_____
Retired Association Member	$ 80 ($ 90 late)	Not Available	_____
One Day Registration* ❒ Mon. ❒ Tues. ❒ Wed.	$ 220 ($ 245 late)	$ 340 ($ 365 late)	_____
Spouse/Companion* (Name): _____	$ 60 ($ 60 late)	$ 60 ($ 60 late)	_____
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	_____
Children 14 & Under* (Names): _____	FREE	FREE	_____
*Awards Banquet not included			
Additional Awards Banquet Ticket – Wednesday, 7/11	$ 50 ($ 60 late)	$ 50 ($ 60 late)	_____
Student Luncheon – Sunday, 7/8	$ 10 ($ 15 late)		_____

DAYTIME EVENTS		# OF TICKETS	
Golf Tournament – Saturday, 7/7 (Lunch included)	$ 165 ($ 175 late)	_____	_____
Kennedy Space Center – Saturday, 7/7 (Lunch included)	$ 99 ($ 109 late)	_____	_____
Merritt Island Airboat Excursion – Sunday, 7/8 (Lunch included)	$ 110 ($ 120 late)	_____	_____
Disney Behind-the-Scenes Tour–Innovation in Action – Monday, 7/9	$ 105 ($ 115 late)	_____	_____
Disney Behind-the-Scenes Tour–Gardens of the World – Tuesday, 7/10	$ 104 ($ 114 late)	_____	_____
Disney Cooking Class – Now That's a Panini – Wednesday, 7/11	$ 50 ($ 60 late)	_____	_____

EVENING EVENTS			
Monday Night Social – American Adventure at *Epcot*® – Monday, 7/9	$ 45 ($ 55 late)	_____	_____
IAFP Foundation Fundraiser – *Disney's* Adventurers Club – Tuesday, 7/10	$ 150 ($ 160 late)	_____	_____

FIELD TOURS			
Saturday, 7/7 (Limited number of tickets available)			
Food Safety is Magical, But It Doesn't Magically Happen	$ 10	_____	_____
Behind the Seeds Tour	$ 10	_____	_____
Thursday, 7/12 (Limited number of tickets available)			
Food Safety is Magical, But It Doesn't Magically Happen	$ 10	_____	_____
Behind the Seeds Tour	$ 10	_____	_____
Reedy, Set, Go – Behind the Scenes of Environmental Services	$ 10	_____	_____
Food Irradiation Facility Tour	$ 10	_____	_____

PAYMENT OPTIONS: ❒ VISA ❒ MasterCard ❒

❒ Check Enclosed

TOTAL AMOUNT ENCLOSED $ _____
US FUNDS on US BANK

Credit Card # _____

Expiration Date _____

Name on Card _____

Signature _____

Refunds subject to cancellation policy

JOIN TODAY AND SAVE!!!
(Attach a completed Membership application)

❒ Check box if you are a technical, poster, or symposium speaker.

EXHIBITORS DO NOT USE THIS FORM

IAFP 2007 WORKSHOPS

WORKSHOP 1	WORKSHOP 2	WORKSHOP 3	WORKSHOP 4
Environmental Sampling of Food and Water – Wet Lab	**Creating a Food Safety Management System (FSMS)**	**Predictive Microbiology as a HACCP Validation and Support Tool**	**Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop**
Friday and Saturday, July 6–7	Saturday, July 7	Saturday, July 7	Saturday, July 7
8:00 a.m. – 5:00 p.m.	**8:00 a.m. – 5:00 p.m.**	**8:00 a.m. – 5:00 p.m.**	**8:00 a.m. – 5:00 p.m.**

Workshop 1 – Environmental Sampling of Food and Water – Wet Lab – Friday and Saturday, July 6–7

Organized in cooperation with the Applied Methods PDG

This course is designed for laboratory technical staff, laboratory managers, supervisors and quality assurance managers and others responsible for making decisions about sampling plans and corrective actions in response to data retrieved in food production facilities. Topics of discussion and demonstrations include food and ingredient sampling plans, sample compositing schemes, and environmental swabbing and sampling in a production facility, to include air and water testing. The workshop program will include demonstration by vendors and opportunity for laboratory hands-on experience. The workshop will provide a close networking environment for discussion with instructors and other participants as well as a binder of information to reinforce the practical experience gained during the workshop.

Topics:

- Principles and Applications of Sampling for Foods and Food Environments: Challenges and Opportunities
- New and Novel Approaches to Sampling the Environment with Method Demonstrations
- Environmental Sampling Plans, Compositing Methodology, Frequency and Corrective Action
- Pathogen Specific vs. Standard Hygiene Monitoring
- ATP and Allergen Testing Discussions and Demonstrations
- Laboratory Hands-on Experience Including Related Methodologies via Vendor Demonstration

Intended Audience

Microbiologists, quality assurance and laboratory personnel, especially professionals in small- to medium-sized laboratories or companies

Instructors:

Bruce Bradley, Microbial-Vac, Jerome, ID, USA
Larry Cohen, Kraft Foods, Inc., Glenview, IL, USA
Tim Freier, Cargill, Minneapolis, MN, USA
Charles Gerba, University of Arizona-Tempe, Tuscon, AZ, USA
Elliot Ryser, Michigan State University, East Lansing, MI, USA
Jeff Kornacki, Kornacki Microbiology Solutions Inc., McFarland, WI, USA
Purnendu C. Vasavada, University of Wisconsin-River Falls, River Falls, WI, USA

Organizers:

Jeff Kornacki, Kornacki Microbiology Solutions Inc., McFarland, WI, USA
Purnendu C. Vasavada, University of Wisconsin-River Falls, River Falls, WI, USA

Laboratory Host:

Roseann S. White, University of Central Florida, Orlando, FL, USA

Workshop 2 – Creating a Food Safety Management System (FSMS) – Saturday, July 7

Ongoing public concerns regarding the safety of the food supply have not abated. Stimulated by a steady stream of food safety incidents and resultant media attention, today's consumers have lost confidence in some sectors of the food supply. Consumers want assurances the food they buy is safe to eat, regardless of where it was grown, raised, or manufactured. They are asking questions about the integrity of the food supply – how is food safety maintained? Who is providing the assurance? Who is validating and verifying the systems implemented?

Retailers and food service corporations, sensitive to the demands of their customers, now require their food suppliers implement better and more consistent food safety and quality management systems (and this is not to be confused with "just having an audit").

The purpose of this workshop is to raise awareness of the need for food suppliers to implement credible food safety management systems. Information will be provided on the different food safety management systems that suppliers can choose from. The content will cover the importance of gaining management commitment, outline how to develop and implement a food safety management system and finally how to validate and verify the food safety controls implemented. Further instruction will be provided on how to conduct internal audits (self assessment) and to prepare for the external audit.

A panel session at the end of the day will enable participants to further discuss the topics covered.

Topics:

- Why Do You Need a FSMS?
- Choosing the Food Safety Standard That Meets Your Business Needs and the Needs of Your Customer
- Where are You and Where Do You Want to Be?
- Documenting and Implementing Your FSMS – A Case Study
- Validating and Verifying the FSMS – Internal and External Audits

Intended Audience

Retailers, manufacturers/ processors, food service companies, primary producers, food safety professionals (auditors, trainers, consultants), food regulators

Instructors:

Richard Baines, Management Systems Food Safety and Environment, Royal Agricultural College, Cirencester, Gloucestershire, UK
Larry Hood, JohnsonDiversey Consulting, Bridgewater, NJ, USA
Marjorie Jones, SGS Consumer Testing Services, Fairfield, NJ, USA
Paul Ryan, Food Marketing Institute, Arlington, VA, USA

Organizer:

Paul Ryan, Food Marketing Institute, Arlington, VA, USA

Workshop 3 – Predictive Microbiology as a HACCP Validation and Support Tool – Saturday, July 7

How severe is this cooling deviation? How long does it take for pathogens to grow at low temperatures such as 50°F? What can the HACCP team do to justify the rationale behind chosen critical limits? Does my heat treatment provide sufficient lethality? What are the boundaries for microbial growth that I can use for product formulation? Increasingly, both regulatory agencies and food industry scientists and managers are placing a renewed emphasis on HACCP validation for important pathogens such as *C. perfringens*, *B. cereus*, *S. aureus*, *Salmonella*, and *L. monocytogenes*, just to name a few. This workshop will serve as an introduction to the practical application of predictive microbiology as a tool to help answer such questions. Scientific and regulatory perspective on using predictive microbiology will be presented, along with an overview and demonstration of growth, survival and inactivation models in programs such as the Pathogen Modeling Program, ComBase Growth Predictor, and the Integrated Lethality Spreadsheet. Half a dozen case studies will be presented and discussed, including a hands-on working group exercise to illustrate the use (and how to avoid misuse) of various models to address real life problems.

Topics:

- Scientific Perspective on Predictive Microbiology and Its Relationship to HACCP Validation
- Fundamentals of Predictive Microbiology
- Overview and Demonstration of Software Tools
- Regulatory Perspective of FSIS and FDA on the Use of Predictive Microbiology
- Case Study and Working Group Exercises

Intended Audience

Food industry professionals responsible for HACCP validation; food safety and quality assurance professionals; and regulatory agency officials and academic food microbiologists with a special interest in predictive microbiology

Instructors:

Richard Whiting, Food and Drug Administration, College Park, MD, USA
Donald Schaffner, Rutgers University, New Brunswick, NJ, USA
Yuhuan Chen, GMA/FPA, Washington, D.C., USA
Jenny Scott, GMA/FPA, Washington, D.C., USA

Organizers:

Yuhuan Chen, GMA/FPA, Washington, D.C., USA
Donald Schaffner, Rutgers University, New Brunswick, NJ, USA

Workshop 4 – Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop – Saturday, July 7

While the number of recalls due to *Listeria monocytogenes* contamination on ready-to-eat meat and poultry products have decreased, the pathogen is still a challenge to control for meat and poultry processors, especially the small processors. There have been several efforts to control this pathogen for the past decade, but recent USDA-FSIS regulations have prompted the RTE meat and poultry industry to take a fresh look and institute controls to reduce the risk of this pathogen. There is an increasing volume of research being conducted on control strategies for this pathogen, especially in RTE meat and poultry products. These strategies include improved sanitation methods to eliminate the pathogen from the RTE meat and poultry processing environment, post-lethality treatments to reduce the populations as well as a myriad of antimicrobial agents to control growth during subsequent refrigerated storage. This workshop is intended to train the trainers such as extension personnel at land grant universities, food safety personnel at meat processing establishments and other food safety consultants who work with processors routinely.

This train-the-trainer workshop is partially funded by a grant from the National Integrated Food Safety Initiative (Special Emphasis Grant No. 2005-51110-03278) of the Cooperative State Research, Education, and Extension Service, US Department of Agriculture to Colorado State University, Cornell University, University of Nebraska-Lincoln, Kansas State University and The Ohio State University. The project focused on the development of methods and technologies to reduce the risk of *L. monocytogenes* in RTE meat and poultry products. The workshop is designed to provide state-of-the-art knowledge on control of *L. monocytogenes* and reducing its risk to the processors as well as the consumers.

Topics:

- Communicating with an Adult Audience – Relevance to Extension Education Programs
- *Listeria monocytogenes*: Is It Still an Issue in RTE Meat and Poultry Products?
- *Listeria monocytogenes* – Ecology of an Elusive Foodborne Pathogen in RTE Processing Environment
- Regulations Pertaining to RTE Meat and Poultry Products – Current Perspective
- Post Lethality Treatments to Reduce *Listeria monocytogenes* on RTE Meat and Poultry Products – An Update
- Antimicrobial Agents to Control *Listeria monocytogenes* on RTE Meat and Poultry Products – An Update
- Strategies to Control *Listeria monocytogenes* on RTE Meat and Poultry Products – A Small Processor Perspective

Intended Audience

Extension specialists in the areas of food safety, microbiology and meat processing as well as food safety and QA personnel from the RTE meat and poultry industry

Instructors:

Dennis E. Burson, University of Nebraska, Lincoln, NE, USA
Pat Kendall, Colorado State University, Fort Collins, CO, USA
Randall Phebus, Kansas State University, Food Science Institute, Manhattan, KS, USA
John Sofos, Colorado State University, Fort Collins, CO, USA
Harshavardhan Thippareddi, University of Nebraska, Lincoln, NE, USA
Martin Wiedmann, Cornell University, Ithaca, NY, USA

Organizer:

Harshavardhan Thippareddi, University of Nebraska, Lincoln, NE, USA

IAFP 2007 WORKSHOP REGISTRATION FORM

First Name (will appear on badge) _____

Last Name _____

Company _____ Job Title _____

Address _____ City _____

State/Province _____ Country _____ Postal Code/Zip +4 _____

Area Code & Telephone _____ Fax _____

E-mail _____ Member # _____

❒ Check Enclosed ❒ VISA ❒ ❒ ❒

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

Account Number _____ Expiration date _____

Signature _____

*** REGISTRATION ***
Payment must be received by June 15, 2007 to avoid late registration rates.

WORKSHOP 1	Early Rate	Late Rate
IAFP Member	$575.00	$650.00
NonMember	$675.00	$750.00

WORKSHOP 2	Early Rate	Late Rate
IAFP Member	$375.00	$450.00
NonMember	$475.00	$550.00

WORKSHOP 3	Early Rate	Late Rate
IAFP Member	$360.00	$435.00
NonMember	$460.00	$535.00

WORKSHOP 4	Early Rate	Late Rate
Extension Specialist	$150.00	$225.00
Other	$350.00	$425.00

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

For student rates, call the Association office.

Refund/Cancellation Policy
Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by June 22, 2007. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 16, 2007. The workshop may be cancelled if sufficient enrollment is not received by June 15, 2007.

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

*** 4 Easy Ways to Register ***

Register online or complete the Workshop Registration Form and submit it to the International Association for Food Protection by:

Online: www.foodprotection.org
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655
Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2864, USA

Contribute to the Tenth Annual IAFP Foundation Silent Auction Today!

The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2007, the Association's 94th Annual Meeting in Lake Buena Vista, FL, July 8–11, 2007. The Foundation supports:

- Student Travel Scholarships
- Ivan Parkin Lecture
- John H. Silliker Lecture (Funded through a contribution from Silliker, Inc.)
- Travel support for exceptional speakers at the Annual Meeting
- Audiovisual Library
- Developing Scientist Competition
- Shipment of *JFP* and *FPT* journals to developing countries through FAO

Support the Foundation by donating an item today. A sample of items donated last year included:

- Taste of Chicago Gift Card
- New York Maple Syrup
- Galileo Thermometer
- Team Canada Hockey Jersey
- Ipod Shuffle
- Waterford Crystal Wine Bottle Coaster
- Purdy's Chocolates Gift Basket
- *Food Microbiology: An Introduction*
- Ontario Ice Wine
- "Six Nations" Rugby Shirt
- Cow Parade Figurines
- Brazil Vacation Package

Complete the form and send it in today.

Description of Auction Items _____

Estimated Value _____

Name of Donor _____

Company (if relevant) _____

Mailing Address _____

(Please specify: ❒ Home ❒ Work)

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-mail _____

Return to:

Donna Gronstal
International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
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- **4–6, Texas Association for Food Protection's 26th Annual Meeting,** Omni Southpark, Austin, TX. For more information, contact Howard Depoy at 936.756.6455; E-mail: hwdepoy@milkproductslp.com.
- **7–8, Food Mycology 2007: Emerging Mold Problems and Spoilage in Food and Beverages,** Westin Key West, Key West, FL. For more information, contact BCN Research Laboratories at 800.236.0505; E-mail: emilia.rico@bcnlabs.com.
- **15, Brazil Association for Food Protection Annual Meeting,** University of São Paulo, São Paulo, Brazil. For more information, contact Maria Teresa Destro at 55.11.3091.21.99; E-mail: abrappa@abrappa.org.br.
- **15–22, XXVII International Workshop/Symposium on Rapid Methods and Automation in Microbiology,** Kansas State University, Manhattan, KS. For more information, contact Daniel Y.C. Fung at 785.532.1208; E-mail: dfung@ksu.edu.
- **16–20, 111th AFDO Annual Conference,** Crown Plaza Hotel, Riverwalk, San Antonio, TX. For more information, call 717.757.2888; E-mail: afdo@afdo.org.
- **18–21, National Environmental Health Association Conference,** Atlantic City, NJ. For more information, go to www.neha.org.
- **18–22, 2007 United Fresh 2007 Produce Inspection Course,** USDA Fresh Products Branch Training Center, Fredericksburg, VA. For more information, contact Beth Berman at 202.303.3405 or go to www.unitedfresh.org.
- **20, New Zealand Association for Food Protection Annual Meeting,** Town Hall, Wellington, NZ. For more information, contact Roger Cook at 64.4.463.2523; E-mail: roger.cook@nzfsa.govt.nz.
- **26–27, In-Plant Control of Microbial Contamination in Refrigerated and Processed Foods,** University of Georgia, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.

JULY

- **6–7, IAFP 2007 Workshops,**
  Workshop 1 – Environmental Sampling of Food and Water – Wet Lab
  Workshop 2 – Creating a Food Safety Management System (FSMS)
  Workshop 3 – Predictive Microbiology as a HACCP Validation and Support Tool
  Workshop 4 – Controlling *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products: A Train-the-Trainer Workshop
  For more information, contact Julie Cattanach at 800.369.6337; E-mail: jcattanach@foodprotection.org. See our registration form on page 353.
- **8–11, IAFP 2007,** *Disney's Contemporary* Resort, Lake Buena Vista, FL. For more information, contact Julie Cattanach at 800.369.6337; E-mail: jcattanach@foodprotection.org. See our registration form on page 349.
- **10–12, Meat and Poultry Marination Short Course,** University of Georgia Food Science, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.com.
- **11–13, National Assn. of County & City Health Officials Annual Conference,** Hyatt Regency Columbus, Columbus, OH. For more information, call 202.783.5550 or go to www.naccho.org.
- **28–Aug. 1, Institute of Food Technologists Annual Meeting and Food Expo,** Chicago, IL. For more information, call 312.782.8424; E-mail: info@ift.org.

AUGUST

- **7–9, Using SPC for HACCP Verification in Poultry and Food Industry,** University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.

SEPTEMBER

- **12–13, China International Food Safety and Quality Conference and Expo,** The Landmark Tower Hotel, Beijing, China. *Program assistance provided by IAFP.* For more information, go to www.chinafoodsafety.com.
- **16–20, AOAC Annual Meeting and Expo,** Anaheim, CA. For more information, call 301.924.7077 or go to www.aoac.org.
- **18–20, New York State Association for Food Protection 84th Annual Conference,** E. Syracuse, NY. For more information, contact Janene Lucia at 607.255.2892; E-mail: jgg3@cornell.edu.
- **19–21, Washington Association for Food Protection Annual Meeting,** Campbell's Resort and Conference Center, Lake Chelan, WA. For more information, contact Stephanie Olmsted at 206.660.4594; E-mail: Stephanie.Olmsted@safeway.com.

OCTOBER

- **7–10, AACC International Annual Meeting,** San Antonio Convention Center, San Antonio, TX. For more information, go to http://meeting.aaccnet.org.
- **21–24, UW-RF 27th Annual Food Microbiology Symposium and Workshop,** *Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology,* University of Wisconsin-River Falls, River Falls, Wisconsin. For more information, call 715.425.3704 or go to www.uwrf.edu/food-science, click on workshops, then the link to the food microbiology symposium.
- **24–27, Worldwide Food Expo,** McCormick Place, Chicago, IL. For more information, call 703.934.5514 or go to www.worldwidefoodexpo.com.

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JULY 8-11, 2007
Lake Buena Vista, Florida

AUGUST 3-6, 2008
Columbus, Ohio

JULY 12-15, 2009
Grapevine, Texas

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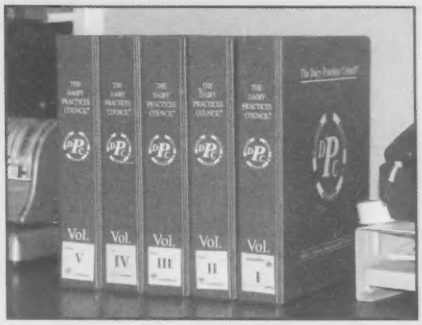

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56 Dairy Product Safety (Pathogenic Bacteria) for Fluid Milk and Frozen Dessert Plants
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IAFP has agreed with The Dairy Practices Council to distribute their guidelines. DPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout the United States. In addition, its membership roster lists individuals and organizations throughout the world.

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The DPC Guidelines are written by professionals who comprise six permanent task forces. Prior to distribution, every guideline is submitted for approval to the state regulatory agencies in each member state. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

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- ❒ F2090 Food Safety: An Educational Video for Institutional Food Service Workers
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- ❒ F2102 Tape 3 – Food Safety for Food Service: Personal Hygiene
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- Food Safety for Food Service Series II
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- ❒ F2152 Tape 2 – Personnel and Personnel Facilities
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- ❒ F2155 Tape 5 – Production and Process Controls
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- ❒ F2161 Tape 1 – Definitions
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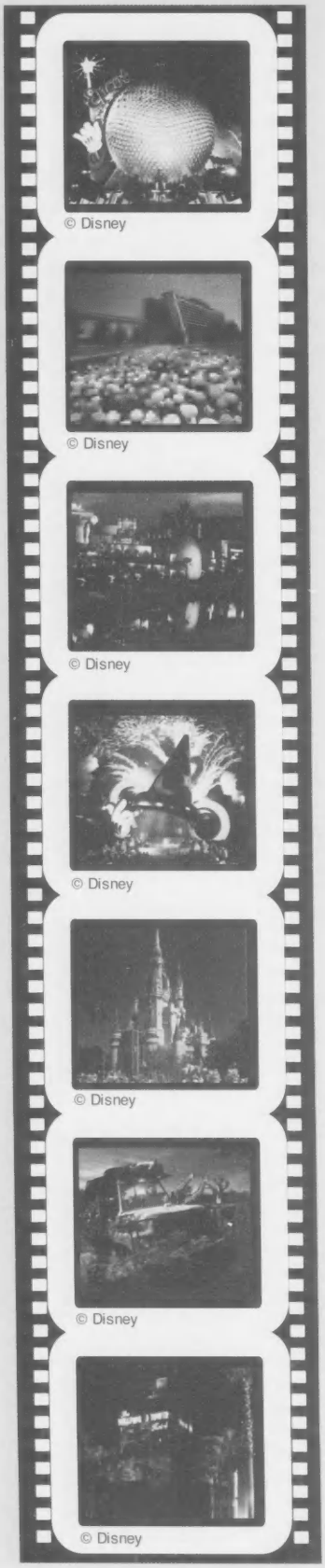

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