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Food Protection Trends

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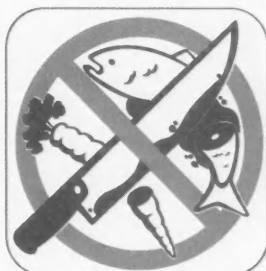
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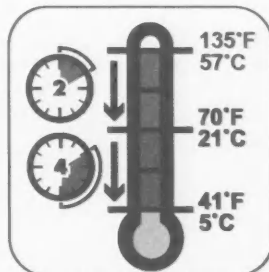
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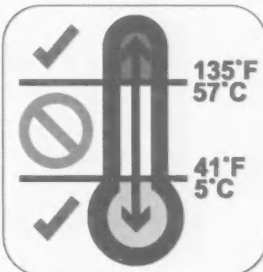
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"LONE STAR PERSPECTIVE" FROM YOUR PRESIDENT



Every now and then I will notice something that piques my interest, but since I have to hurry off to other duties, it gets shoved into my mental "figure out later" stack of things to do. An item that has been on my stack for quite a while has been the IAFP logo. I have always thought it was an attractive, unique logo, but I was unable to remember if it had any specific significance. In case you need a reminder, our logo is made up of what appears to me to be three blue and green incomplete circles combined to make a single circle in what I would describe as an abstract design. Surely something that distinctive has some sort of special meaning for the Association, I thought. Turns out it does. When Jack Guzewich was president in 2000, he explained the new logo in the following quote from his January column.

A commercial artist developed our logo after discussions with our staff in Des Moines and with the Executive Board. Several different concepts were discussed. The one chosen attempts to represent the blue of the sky and water, and the green of the plants on the earth. The colors wrap around each other to show the inter-relatedness and interdependence of the natural environment and how our organization represents a global membership working together to assure protection of the food supply.



By **GARY ACUFF**
PRESIDENT

***"So how important
is it to represent
industry, education
and government
in IAFP?"***

Before I went back and read Jack's column, however, I had already begun to think about what the logo meant. For me, the three incomplete circles represent industry, education and government, but they combine to make one complete circle representing our combined efforts toward the single goal of advancing

food safety worldwide. That's a big job, and one that neither industry, education nor government can do alone. We work together in a near seamless fashion within IAFP to accomplish our goal, which I think is represented in the overall logo.

So how important is it to represent industry, education and government in IAFP? Our association constantly strives to equally represent each of these three sectors of membership. In fact, our Constitution requires that each segment of our membership is continually represented on the Board, so our election for the Executive Board Secretary annually rotates to each of the three membership sectors to assist in this plan for balanced representation.

The importance of this balance really came into focus recently for the Board. When my presidential term began in July 2007, Lee-Ann Jaykus and I represented education, Vickie Lewandowski and Frank Yiannas represented industry and Carl Custer and Stan Bailey represented government. Carl retired from USDA a few months ago and began to do some consulting, shifting him to the industry, but according to the Constitution, everything was fine because we still had Stan representing government. At the beginning of 2008, however, Stan also retired from USDA and began employment with bioMérieux, shifting his representation to industry as well. We found ourselves without official representative for our government members and began working on a solution to this situation.

Of course, the easiest thing to do would have been to leave

everything alone, because we were scheduled to elect a government representative for Secretary this year and this problem would be self-correcting by the time the annual awards banquet concluded. However, the Constitution specifically states that there must be representation for all three sectors of the membership at all times. According to the Constitution, Stan was required to vacate the office of President-Elect, and the Board was to appoint someone from government to replace him. But the big problem for IAFP was that Stan had nearly three years of experience on the Board that would all be wasted if he did not move into the presidency. Besides, it would be very difficult for someone appointed to replace Stan to assume the presidency in just a few months. As you can see, we had a significant problem needing a simple solution. Unfortunately, simple solutions are often unavailable.

The Board sought advice from the Constitution and Bylaws Committee, and although there were some minor differences in opinion, most of the members interpreted the Constitution similarly and recommended the following measures to address this unique situation. Upon moving to industry employment, Stan should temporarily vacate his position of President-Elect. The Board could then appoint someone such as a recent Past President to fill that

position until the end of the 2008 Annual Meeting. This appointment would allow the new appointee to sit as a voting member of the Board, and Stan could continue to attend Board meetings to stay informed on current issues. Once the Annual Meeting was concluded, our new Secretary representing government members would be in place, and Stan could assume the office of President without violating the Constitution.

Does that sound like a complicated solution? We thought it did as well, but the Board determined that it was more important to follow the direction of the membership, as defined by the Constitution, than to look for the easiest solution. However, during our attempt to follow the Constitution, Frank came up with a simple solution. He resigned from the Board. As one of our industry representatives, his resignation made it possible to replace him with an appointed member who would represent government until the end of his term. We selected Jeff Farber to fill Frank's position as Past President. Jeff is a perfect choice for the position since he is employed by Health Canada and has previously served on the Executive Board. And, besides, Jeff is a trooper and we knew he would do anything necessary to assist the Association.

Now, Frank's resignation was not my first choice for solving this

situation, but it was certainly a more simple solution. He saw an Association need that he could address, and Frank proposed that solution for the good of IAFP. Frank will continue to serve on the Board in a non-voting ex officio capacity, so his invaluable experience and input is still available to the Board, but I feel the disruption in organization is troubling, just the same. Maybe this situation needs addressing through a change in the Constitution, but that is up to the Constitution and Bylaws Committee and the membership to decide, not the Board. We serve at the pleasure of the membership and strive to follow your direction.

So after all this disruption in Board membership, I am reminded of our logo. Three incomplete circles combined to form one complete circle—representatives from industry, education and government providing incomplete expertise as individuals, but working in concert with colleagues to present a unified and complete effort toward advancing food safety worldwide.

How important is equal representation? Well, as always, I am interested in hearing from you on any topic, but I would be especially interested in commentary from you on how you think our Constitution handled this particular situation. You can E-mail me at gacuff@tamu.edu.

“COMMENTARY” FROM THE EXECUTIVE DIRECTOR

Well, it has been another busy month for IAFP! As I write this column in advance of publication, we can review events that took place in January and items that are planned for March and beyond.

In January, two noteworthy events took place. One was IAFP's Timely Topics Symposium titled, "Prepared, But Not Ready-to-Eat Foods—What You Need to Know." This symposium was truly "timely" in its development and hit the mark for the more than 115 attendees. Presentations by experts in the field of partially cooked and microwavable foods stimulated the interest of representatives from both large and small food companies, government representatives and those from academia. Pictures and a summary report are available in this issue of *Food Protection Trends* beginning on page 204. We sincerely thank our sponsors for financially assisting this program. A list of sponsors is also included with the report.

Also in January, President Gary Acuff traveled to Chicago to present the IAFP President's Lifetime Achievement Award to Dr. Samuel Palumbo. The presentation took place at the National Center for Food Safety and Technology at the Illinois Institute of Technology's Moffett Campus. More than 30 of Sam's colleagues at the Center joined for the celebration of his lifetime of contributions to improve the safety of our food. Pictures and a summary appear on page 205. I was fortunate enough to be able to attend this presentation to see the gratitude and high esteem that Sam's colleagues hold for him.



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

***"If you haven't
already done so,
make your plans
NOW to be with us
for IAFP 2008"***

Have you made your hotel reservations for IAFP 2008 in Columbus? The reports received from our hotel properties indicate there is very strong interest in this year's Annual Meeting! Our host hotel, the Hyatt Regency Columbus is near capacity, but additional rooms are available at the Crown Plaza and Drury Inn & Suites. Both hotels are very close to the Hyatt where our meeting events will be held. To reserve the room you prefer, click the hotel reservations

link from our Annual Meeting page on the IAFP Web site.

During February, the Program Committee met to review submitted abstracts and to finalize symposia. It is guaranteed to be another banner year of information shared through oral and poster presentations. In addition, exhibitor interest has been keen as we are nearing capacity. If you haven't already done so, make your plans NOW to be with us for IAFP 2008 from August 3 to 6 in Columbus!

Alongside our planning for IAFP 2008, we have been working on our first ever, Latin American Symposium on Food Safety. This symposium will be held from May 26 through May 28 in Campinas, São Paulo, Brazil. Campinas is in the state of São Paulo, just north of the city of São Paulo. Maria Teresa Destro at the University of São Paulo, along with her colleagues has prepared the majority of the program. By now, you should be aware of this symposium through E-mail communication and other mention in previous issues of *Food Protection Trends*.

This symposium is expected to attract more than 500 attendees from Latin America. It is organized in conjunction with the Brazil Association for Food Protection and the International Commission on Microbiological Specifications for Foods (ICMSF) with scientific support from the International Life Sciences Institute, Brazil (ILSI-Brazil). We look forward to our experience in Latin America!

There are a couple of reminders to leave you with for this month. First, the Student Travel Scholarship

Applications are due to be received in the IAFP office not later than Friday, March 14. If you know of a student who is interested in having their expenses paid to attend IAFP 2008, encourage them to submit an application immediately. The second reminder is about our

Secretary Election. As has been stated before, it is being conducted electronically this year. You should have received an E-mail message at the end of January and some follow up reminders, but now the deadline to vote is Monday, March 17. If you have not voted yet, do so today.

That wraps up another month for IAFP. As always, feel free to contact me or any of our IAFP staff with questions when we can be of assistance to you. We are here to help bring food safety professionals together to continue "Advancing Food Safety Worldwide!"



SYMPOSIUM ON FOOD SAFETY
26 - 28 May 2008 | Campinas | SP | Brazil

IAFP (International Association for Food Protection)
in collaboration with BAFF (Brazil Association for Food Protection)
and ICMSF (International Commission on Microbiological
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Microbial Food Safety:
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5. Trends in food safety management
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Including exhibits and technical posters.

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Raw Milk Consumption Beliefs and Practices Among New York State Dairy Producers

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SUMMARY

To determine attitudes and practices regarding raw milk consumption among New York State dairy farmers, a survey on milk consumption practices was mailed to 336 Cornell University dairy industry extension clientele. Of the 150 respondents, 68 (45.3%) had consumed raw milk in the previous year, while 82 (54.7%) had consumed only pasteurized milk during the same period, although 68.3% of the latter group previously had been raw milk drinkers. The primary reasons reported for consuming raw milk were taste, convenience and cost. The primary reason for not consuming raw milk was concern about the potential for contracting bacterial illnesses. Concerns linking raw milk consumption with human health problems were expressed by 38.2% of the raw milk consumers and 73.2% of the pasteurized milk consumers. The most frequently cited concern for both groups was the possibility of contracting bacterial illnesses, with infections from *E. coli* and *Salmonella* spp. specifically mentioned. Thirty-nine farms reported providing raw milk to community members outside of their own household. Of these 39 raw milk providers, 10 respondents reported consuming only commercially processed milk within their own household. Despite stated concerns regarding the potential for bacterial illnesses, raw milk consumption is a common practice among New York State farm families.

INTRODUCTION

Anecdotal observations linking consumption of unpasteurized ("raw") milk with the spread of disease led physicians and scientists to investigate the role of milk consumption in foodborne disease as early as the turn of the twentieth century. Consumption of unpasteurized milk was determined to be associated with many serious diseases, including diphtheria, typhoid fever, tuberculosis, and brucellosis (13). Illnesses of this nature were frequently a consequence of human consumption of milk that had been obtained under unsanitary conditions or from unhealthy cows. Reports from the 1920s provided evidence that control of milk-borne diseases would require application of effective animal health management and sanitation measures at all points in the dairy food system, from the farm to the consumer (25).

Whereas dairy products were associated with at least 25% of all illnesses resulting from consumption of contaminated food and water in the United States in 1938, modern dairy products are currently responsible for considerably less than 1% of the reported foodborne illnesses that are traced back to source each year (25). The reduction in associa-

A peer-reviewed article

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tion of commercial dairy products with foodborne illnesses in the United States since 1938 reflects many comprehensive improvements in milk handling systems, including implementation of on-farm programs to control bovine diseases such as brucellosis, tuberculosis and mastitis; improved farm sanitation practices; temperature control of milk products from the farm to the consumer and the requirement that milk must be kept at 7°C or below within 2 hours of milking (25); and pasteurization of the vast majority of commercial dairy products. The public health objective of milk pasteurization, as defined in the Grade "A" Pasteurized Milk Ordinance (25), is to eliminate all non-sporeforming pathogens commonly associated with milk. Specifically, pasteurization processes are implemented to reduce the potential risk for consumers of illness due to pathogens that may be present in raw milk.

In addition to the overall reduction in the number of illnesses associated with dairy product consumption since 1938, the nature of dairyborne human illnesses has changed as well. In the past 20 years, illnesses from dairy product consumption have been predominantly associated with *Salmonella enterica*, *Listeria monocytogenes*, *Campylobacter jejuni*, and *Escherichia coli* O157:H7 (10), which can be present in milk obtained from healthy animals in an apparently sanitary setting, typically as a consequence of contamination events that occur during or after milking (e.g., milk contamination from contact with fecal material or inadequately cleaned equipment) (2). In recent years, several studies have investigated the presence of pathogenic microorganisms in bulk tank samples collected at the farm (11, 12, 17, 20, 24, 26). For example, Rohrbach et al. (22) reported that bulk tank milk tested positive for pathogens for 17 (25%) of 68 raw milk-consuming dairy producers in East Tennessee and Southwest Virginia. In 2006, illnesses from raw milk consumption made national headlines. *E. coli* O157:H7 was responsible for illness in 4 children from California (7) and 2 children in Washington (8). In 3 additional outbreaks, *Campylobacter jejuni* infections were diagnosed in 2 people in Ohio (9), 5 in Colorado, and > 50 people following consumption of raw milk cheese in Wisconsin (27).

Although consumption of raw milk has been reported as a common practice among dairy farm households in the US (11, 12, 23), it also occurs among non-farm households. For example, residents of urban, suburban and rural areas were reported as raw milk drinkers by both Altekruze et al. (1), who reported raw milk consumption in 1% of 19,356 individuals surveyed in 8 states, and by Shiferaw et al. (23), who reported raw milk consumption in 1.5% of 7,493 individuals surveyed in 5 states. In the United States, regulations associated with sale of raw milk vary from state to state. Raw milk sales are currently allowed in 22 states, with 12 of these states (e.g., CA, ME) allowing sales at retail stores (3, 14). Five additional states allow consumers to purchase or lease one or more cows on a producer's farm as the only legal means of obtaining raw milk within those states (14). Interestingly, although raw fluid milk accounted for a very small fraction (< 1%) of total milk sales in states allowing the sale of raw milk between 1973 and 1992, 40 (87%) of 46 disease outbreaks from raw milk consumption reported nationwide during these years occurred in states in which raw milk sales were legal (5, 16), suggesting a relationship between the availability of raw milk and the incidence of milkborne disease.

Raw milk sales are legal in New York State (NYS). To sell raw milk, a NYS farm must obtain a permit from the NYS Department of Agriculture and Markets and must display a sign stating "NOTICE: Raw milk sold here. Raw milk does not provide the protection of pasteurization" (19). The raw milk must be sold directly to the consumer at the farm where the milk was produced. Milk can be either bottled into single use containers that are mechanically filled and capped, or filled into containers provided by the consumer in the consumer's presence (19).

Milk is New York State's leading agricultural product, accounting for over one-half of the state's total agricultural receipts. NYS milk production in 2005 was 11.7 billion pounds, with a value of \$1.91 billion. NYS is currently third in the nation in milk production (18). As the presence of a vibrant dairy industry in our region presents opportunities for consumption of raw milk, the objective of this study was to determine raw milk

consumption beliefs and practices among New York State dairy producers.

METHODS

A survey was developed to assess current beliefs and practices regarding raw milk consumption among NYS dairy producers. The survey contained 8 questions, several of which had multiple parts. The survey questions were developed to collect information on the demographics of all respondents (e.g., whether they owned or worked on a farm), their household milk consumption practices in the previous year (e.g., whether they drank raw milk, pasteurized milk or both, and the quantity of milk consumed), reasons for consuming or not consuming raw milk, demographics of milk consumers (e.g., number and ages of people, how long they have or have not consumed raw milk), whether or not dairy producers supplied raw milk to others in the community beyond their own household members and the demographics of community raw milk consumers, concerns about raw milk consumption, and calf feeding practices. The specific wording and order of the questions were evaluated by university personnel from multiple disciplines and then tested by a select group of dairy producers to ensure that the language was appropriate for the audience and that all of the desired information would be captured. The project and survey instrument were reviewed by the Cornell University Committee on Human Subjects and determined to be exempt from Federal Regulations for the Protection of Human Subjects (45 CFR 46).

The survey was sent in 2 mailings to Cornell University dairy industry extension services clientele. A requested time frame of 3 weeks was given for return of the survey, and a self-addressed, stamped envelope was provided. Participation in the survey and provision of the respondents' address was voluntary. The mailing lists contained some out-of-state farms, veterinarians, and milk processing plant personnel. Based on information provided by the respondents, the out-of-state farms, veterinarians, and processing plants, as well as respondents who no longer lived or worked on a farm, were removed from the data set. The data from the surveys that were removed had a similar response pattern to the final data set,

TABLE 1. Profile of raw milk consumers

	Ages of raw milk consumers (years)							
	Total	0-5	6-10	11-15	16-20	21-40	41-65	> 65
Raw milk consumers in 66 farm households ¹								
Total number	225	16	19	18	23	70	73	6
% of total	100	7.1	8.4	8.0	10.2	31.1	32.4	2.7
Number of raw milk drinkers per farm household (n = 66)								
Minimum	1							
Maximum	12							
Mean	4							
Non-farm household (community) raw milk consumers served by 39 dairy farms								
Total number	263	9	24	25	33	89	66	17
% of total	100	3.4	9.1	9.5	12.5	33.8	25.1	6.5
Number of community raw milk consumers served by each farm								
Minimum	1							
Maximum	25							
Mean	7							

¹Two survey respondents reporting raw milk consumption did not provide the number and ages of raw milk consumers in the household.

which represented current New York state dairy producers and farm workers.

The survey results for New York state respondents were tabulated in Excel (Microsoft Corp., Seattle, WA) spreadsheets. The data were sorted and percentages and statistical t-tests were calculated within the Excel spreadsheets. Chi-square analyses were conducted with internet software provided by Quantitative Skills (The Netherlands; www.quantitativeskills.com/downloads/). Data from each respondent were included in all analyses except for information related to provision of raw milk by a farm to members of the community, as some farms were represented by more than 1 survey respondent. For analysis of responses to this question, a total of 19 farm replicates were identified and removed to ensure that no farm would be multiply represented as providing raw milk to the community.

RESULTS AND DISCUSSION

Demographics and milk consumption habits of survey respondents

A total of 448 surveys were mailed, and 196 responses (43.8%) were received. The data set was adjusted to include only NYS dairy producers and farm workers,

which represented 336 mailed surveys and 150 responses (44.6%) received. Of the 150 respondents, 135 (90%) owned a dairy farm and 15 (10%) worked on a dairy farm. A total of 97 (64.7%) respondents, including both producers and farm workers, lived on the farm. The farm sizes ranged from 20 to 4,500 cows, with an average size of 682 cows and a median of 400 cows. In general, raw milk consumers were more likely ($P < 0.05$) than pasteurized milk consumers to be associated with smaller farms, as indicated by the average size and median number of cows on the farms, which was 531 and 280 for raw milk consumers, and 806 and 600 for pasteurized milk consumers, respectively.

A total of 68 (45.3%) respondents reported consuming fresh, raw milk from the farm, whereas 82 (54.7%) respondents stated that they had not consumed raw milk in the previous year. Sixty-six of 68 raw milk drinkers reported where they obtained their milk: 33 (50%) obtained milk solely from the farm, whereas 33 (50%) also purchased some commercially processed (e.g., pasteurized) milk from a store. Two respondents who did not consume raw milk reported pasteurizing their own milk on the farm prior to consumption; the remaining 80 pasteurized milk drinkers obtained all of their milk from

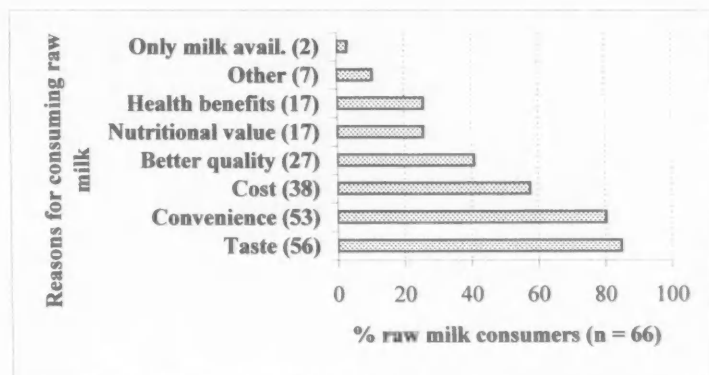
a store. Milk consumption ranged from 0.25 to > 10 gal/wk (0.95 to 37.9 l/wk), with most households consuming between 1 and 4 gal/wk (3.8 and 15.1 l/wk). The average quantity of milk consumed per week did not differ ($P > 0.05$) between the raw and pasteurized milk consuming households; consumption was 4.1 gal/wk (15.5 l/wk) and 3.5 gal/wk (13.3 l/wk), respectively.

Raw milk consumers

The 68 raw milk consumers represented 45.3% of the survey respondents. Dairy producers represented the majority (89.7%) of raw milk drinkers; the remaining 10.3% were farm workers. For all respondents, raw milk was obtained from the producers' bulk tank. Seventy-two percent of raw milk consumers reported living on the farm. In contrast to a previous report by Jayarao et al. (11), who determined that Pennsylvania dairy producers who lived on the farm were 3-fold more likely to consume raw milk compared with producers who lived off the farm, the present study found no significant ($P > 0.05$) relationship between residence on the farm and consumption of raw milk among the respondents.

A total of 225 raw milk drinkers were reported among 66 farm households

FIGURE 1. Reasons reported for consuming raw milk among NYS milk producers (66 respondents). The number of responses in each category is provided in parentheses (217 total responses).



(Table 1); 2 respondents did not provide ages and numbers of household members. Approximately 64% of the raw milk consumers were between 21 and 65 years of age and approximately 16% were under 10 years old. Household sizes ranged from 1 to 12 persons, with an average of 4 persons. Most households had 1 or 2 people who were either between 21 and 40 years old (44 households) or 41 and 65 years old (33 households). Twenty-two households had children under 10 years old. The majority of raw milk consumers indicated that they had been drinking unpasteurized milk for a long time: 76.5% for more than 21 years, 14.7% for 10 to 21 years, 2.9% for 6 to 10 years, and 5.9% for less than 5 years.

Of the 68 raw milk drinkers, 66 reported reasons for consuming raw milk and generally provided more than one reason. The primary reasons given for consuming raw milk were taste (84.8%), convenience (80.3%), and cost (57.6%) (Fig. 1). In a random survey of California residents, Headrick et al. (6) reported that the primary reason for raw milk consumption was "taste". Jayarao et al. (11) reported the primary reasons for raw milk consumption among Pennsylvania dairy producers were "taste" and "convenience." In this survey of NYS dairy producers, almost 40% of respondents said that they perceived their milk to be of better quality than milk purchased at the store. Approximately 26% of the respondents reported consuming raw milk for unspecified health benefits and nutritional

value. Approximately 11% consume raw milk for other reasons, such as "the family likes it better," "freshness," "they ran out of store milk," "they want the higher fat for butter making," or that it "was from grass-fed cows."

Raw milk providers

The 150 surveys from NYS farms represented 131 individual farms (i.e., 19 respondents represented the same farm as another respondent). Of the 131 farms, 39 (29.8%) farms provided raw milk to the community (i.e., to others outside of their immediate family) and 88 (67.2%) did not; 4 respondents did not answer this question. Of the 39 farms, 27 (69.2%) farms supplied raw milk to farm workers, 14 (35.9%) farms supplied raw milk to extended family members, 11 farms (28.2%) supplied milk to neighbors, and 3 farms (7.7%) supplied raw milk to tourists or local consumers with a preference for raw milk. Producers were asked if farm workers considered access to raw milk to be a job benefit. Of the 34 producers that addressed this question, 10 (29.4%) thought that farm workers did consider access to raw milk as a benefit of their employment, 9 (26.5%) did not, and 15 (44.1%) didn't know.

A total of 263 community people were reported to obtain raw milk from 39 farms. Each farm provided raw milk to a range of 1–25 community members, with an average of 7 (Table 1). Non-farm household raw milk drinkers between

21 and 65 years of age comprised the majority (58.9%) of raw milk consumers in the community; 12.5% were less than 10 years old (Table 1). A typical farm that provided raw milk to community members supplied 2 to 4 people that were between 21 and 65 years old, and 1 to 2 children under age 15 years. Producers that supplied milk to more than 10 people in the community provided raw milk to farm workers and extended family.

Interestingly, 10 (25.6%) of the 39 respondents who reported providing raw milk to community members did not consume raw milk in their own households. Of these, 8 (80%) did not consume raw milk because of health concerns, and 13 individual health concerns were reported. Four people preferred to drink skim, 1% or 2% milk and were concerned with the high fat content of raw milk. The following concerns were cited once: "young children in the house," "health risks for guests drinking raw milk," "concern about pathogens," "concern about the possibility of getting a zoonotic disease," "not pasteurized," "possible links between John's and Crohn's disease," "hired workers cut corners and do not keep milk clean," "we want vitamin A and D without taking supplements," and "allergies." Of the 10 pasteurized milk drinkers who provide milk to community members, 4 provided raw milk to farm workers, 4 to extended family members, and 3 to neighbors.

Pasteurized milk consumers

The 82 pasteurized milk consumers represented 54.7% of the survey respondents. Dairy producers comprised the majority (90.2%) of pasteurized milk drinkers; the remaining 9.8% were farm workers. Sixty-nine percent of pasteurized milk consumers reported living on the farm. For the purposes of our survey, those defined as not drinking raw milk were those who had not consumed raw milk during the previous year; however, 68.3% of the pasteurized milk drinkers reported that they used to be raw milk consumers. Of the previous raw milk consumers, 10.7% stopped drinking raw milk in the past 5 years, 44.6% stopped 6 to 10 years ago, 23.2% stopped 11 to 15 years ago, 10.7% 16 and 20 years ago, and 10.8% more than 21 years ago.

Of the 82 pasteurized milk drinkers, 81 reported the reasons they did not consume raw milk and often gave more than one reason. The primary reason for not

TABLE 2. Specific health concerns cited as reasons for not consuming raw milk

Health Concern	% of respondents ¹	Number of responses	Rank
Total responses related to bacteria, illness, risk or pasteurization ²	83.9	47	
Total responses that specified bacterial concerns ²	48.2	27	
High fat content	32.1	18	1
Bulk tank milk is not pasteurized	23.2	13	2
General bacterial/pathogen concerns	21.4	12	3
<i>Salmonella</i>	12.5	7	4
<i>E. coli</i>	8.9	5	5
Bacteria and children's health	7.1	4	6
Bacteria and guests' health	5.4	3	7
Too risky	5.4	3	7
General illness concern	5.4	3	7
Advice from unspecified sources	5.4	3	7
Lack of cleanliness among hired workers	5.4	3	7
Johne's disease	3.6	2	8
Rabies in herd	3.6	2	8
"We know better"	3.6	2	8
Set example for employees	3.6	2	8
Want vitamin A and D fortified milk	3.6	2	8
Liability if others become ill	1.8	1	9
<i>Campylobacter</i>	1.8	1	9
Johne's to Crohn's disease link	1.8	1	9
Pregnant (doctor recommendations)	1.8	1	9
Veterinarian recommendations	1.8	1	9
Allergies	1.8	1	9
Personal choice	1.8	1	9
Bad for you	1.8	1	9

¹Percentage is based on the number of respondents that reported specific reasons for not drinking raw milk (n = 56). The total number of reasons given (n = 92) was larger than the number of respondents because often more than one reason was provided.

²Calculated from the responses provided.

consuming raw milk was health concerns, which were cited by 63 (77.8%) of the 81 respondents (Fig. 2). The next most important reasons for not consuming raw milk were that it was inconvenient to obtain (27.2%) and that the family preferred commercially pasteurized milk (18.5%). Of the 22 pasteurized milk drinkers who said that raw milk was inconvenient to obtain, only 5 respondents gave this as their sole reason for not consuming raw milk, with 2 residing on the farm and 3 residing off the farm. Seventeen of the pasteurized milk consumers who reported that raw milk was inconvenient to obtain also reported that they avoided raw milk for health reasons or because they preferred commercially pasteurized milk. Of the 63 respondents who did

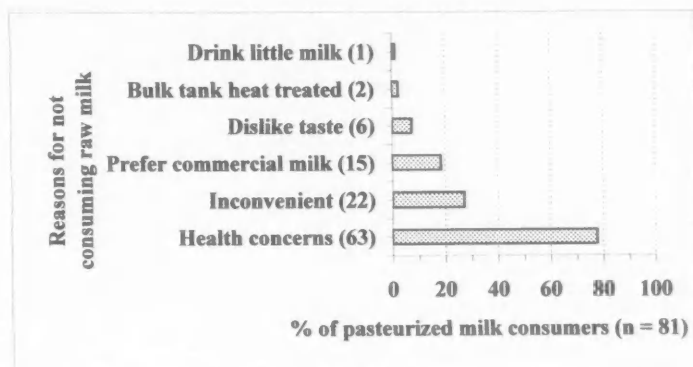
not drink raw milk because of health concerns, 56 provided specific reasons, and often more than one reason (Table 2). Among the 56 respondents, 83.9% gave a combination of concerns regarding avoidance of bacterial illnesses, a desire to drink pasteurized milk, or the perception that drinking raw milk is "risky." Bacterial contamination concerns were cited by 48.2% of the 56 respondents, and specific concerns mentioned were the presence of *E. coli*, *Salmonella* spp., and *Campylobacter*. The next most frequently cited health concern was "the fat content of raw milk," which was cited by 32.1% of the respondents who choose to consume commercially processed skim, 1 or 2% milk. One household stated that they were

following veterinarian's recommendations not to consume raw milk, and another reported following doctor's recommendations during pregnancy. Other responses included: "we know better," "bad for you," and "vitamin fortified milk tastes better than cod liver oil."

Human health concerns related to consumption of raw milk

One survey question was designed to probe whether respondents had concerns about potential health-related problems associated with drinking raw milk from the bulk tank, independently from reasons that might have been given in support of a household's decision not to consume raw milk. Out of 150 respondents, 141

FIGURE 2. Reasons reported for not consuming raw milk among NYS milk producers (81 respondents). The number of responses in each category is provided in parentheses (109 total reasons).



answered this question and, of those respondents, 86 (61.0%) mentioned health concerns associated with raw milk consumption (Table 3). Interestingly, of these 86 responses, 26 (30.2%) were from raw milk consumers, consistent with a report by Jayarao et al. (11), which indicated that many raw milk drinkers in Pennsylvania were aware of the potential for pathogens in raw milk. In the present study, the 26 raw milk-consuming households that expressed health concerns represented 38.2% of the total survey respondents that reported consuming raw milk (68 people), and the 60 pasteurized milk consuming households that expressed health concerns represented 73.2% of the total survey respondents that reported consuming pasteurized milk (82 people). Health-related concerns regarding raw milk consumption, including those related to the fat content of raw milk, were reported significantly ($P < 0.001$) more frequently among households that chose to consume pasteurized milk than among households that chose to consume raw milk.

The most frequently mentioned topic among the 86 respondents that indicated health concerns with raw milk consumption was exposure to bacteria or other pathogens (Table 3). The specific bacterial concerns most frequently cited were related to the potential for *E. coli* and *Salmonella* spp. infections from raw milk consumption and the presence of Johne's disease among the cows in their herds. Concerns regarding exposure to potentially harmful microbes through raw milk consumption are warranted

(21). To illustrate, Kim et al. (15) recently determined that 298 of 316 (94%) bulk tank milk samples collected from across the United States tested PCR-positive for the presence of *Coxiella burnetii*, the organism responsible for Q fever, strongly suggesting a high risk of exposure to this organism from consumption of raw milk. At least 5 outbreaks of illness in the United States were associated with drinking raw milk in 2006; 2 were caused by *E. coli* O157:H7 (7, 8) and 3 by *Campylobacter jejuni* (9, 27). According to the Centers for Disease Control and Prevention, raw milk was specifically implicated in 50 documented outbreaks resulting in 1,440 illnesses from 1990 to 2003 (4).

The ranking of importance of health concerns varied slightly between the pasteurized milk and raw milk drinkers (Table 3). The issue of bacterial concerns linked to guests' health ranked second among raw milk drinkers, but was tied for eighth place among pasteurized milk drinkers. The link between bacterial concerns and children's health was ranked fourth by raw milk drinkers and sixth by pasteurized milk consumers. Many of the concerns given in response to this question were similar to those cited by pasteurized milk drinkers as reasons not to consume raw milk (Table 2).

Calf feeding practices

To determine if farmers were concerned about feeding raw milk to their calves, we developed a question to identify materials fed to calves (i.e., colostrum, waste milk, milk replacer, or other) and

whether or not farm milk fed to calves was heat-treated prior to feeding. Out of 150 survey respondents, 144 (96%) answered this question. Out of these 144 respondents, 137 (95.1%) respondents fed colostrum and 70 (48.6%) fed waste milk. Thirty-four (23.6%) respondents heat-treated the colostrum and/or waste milk prior to feeding calves.

Of the 34 respondents who heat-treated milk for their calves, 9 (26.5%) were raw milk consumers whereas 25 (74.5%) consumed pasteurized milk. The 9 raw milk consumers who heat-treated milk for their calves but drank raw milk in their households reported drinking raw milk for its taste and convenience. Interestingly, however, 5 (55.5%) of these respondents also reported concerns with raw milk consumption and human health issues. Specific concerns given were: "John's," "bacteria causing illness," "sometimes worry about bacteria but our counts are not high," and "when we were using BST and used antibiotics for treatment for illnesses, the milk got to the point it did not taste good; hormones, stressed cows, high somatic cell count made bad milk." Interestingly, one raw milk drinker reported an association between improved calf growth and health from feeding heat-treated milk.

Of the 25 respondents who heat-treated milk for the calves and consumed pasteurized milk, 18 (72%) reported not drinking raw milk because of health concerns. Sixteen of these 18 respondents specified concerns about Johne's disease and contracting bacterial illnesses such as *E. coli* and *Salmonella* spp., and *Campylobacter* infections. Fifteen of the pasteurized milk drinkers provided comments on the relationship between heat-treating the colostrum and/or waste milk and calf health. Eight of the 15 producers who fed heat-treated colostrum and/or waste milk reported improved health and growth of the calves; 2 of these producers also reported reduced calf mortality rates. Four producers reported improved calf health with feeding heat-treated milk as compared with milk replacer; 1 reported no difference as compared with milk replacer; and 2 reported that there was no difference compared with raw milk.

SUMMARY AND CONCLUSIONS

A survey on milk consumption practices of 150 New York state dairy producers showed that 45% had consumed raw

TABLE 3. Cited health concerns related to raw milk consumption

	Total (n = 86 respondents)			Pasteurized milk consumers (n = 60 respondents)			Raw milk consumers (n = 26 respondents)		
	% of respondents ¹	Number of responses		% of respondents ¹	Number of responses		% of respondents ¹	Number of responses	
		Rank	Rank		Rank	Rank			
Total responses related to bacteria, illness, risk or pasteurization ²	82.6	71		80.0	48		88.5	23	
Total responses that specified bacterial concerns ²	69.8	60		68.3	41		73.1	19	
General bacterial/pathogen concerns	33.7	29	1	35.0	21	1	30.8	8	1
No reason given ³	17.4	15	-	20.0	12	-	11.5	3	-
<i>E. coli</i>	15.1	13	2	18.3	11	2	7.7	2	4
<i>Salmonella</i>	14.0	12	3	16.7	10	3	7.7	2	4
Johne's disease	12.8	11	4	11.7	7	4	15.4	4	2
Bacteria and children's health	7.0	6	5	6.7	4	6	7.7	2	4
Bacteria and guests' health	7.0	6	5	3.3	2	8	15.4	4	2
Crohn's disease	7.0	6	5	5.0	3	7	11.5	3	3
Not pasteurized or want pasteurized	5.8	5	6	8.3	5	5	0.0	0	-
Advice from unspecified sources	4.7	4	7	3.3	2	8	7.7	2	4
<i>Listeria</i>	3.5	3	8	3.3	2	8	3.8	1	5
Johne's to Crohn's disease link	3.5	3	8	1.7	1	9	7.7	2	4
High fat content	3.5	3	8	5.0	3	7	0.0	0	-
Cleanliness of hired workers	3.5	3	8	5.0	3	7	0.0	0	-
Tuberculosis	3.5	3	8	5.0	3	7	0.0	0	-
Pregnant (doctor recommendation)	3.5	3	8	3.3	2	8	3.8	1	5
<i>Campylobacter</i>	2.3	2	9	3.3	2	8	0.0	0	-
Liability	2.3	2	9	1.7	1	9	3.8	1	5
Benefits outweigh risks	1.2	1	10	0.0	0	-	3.8	1	5
Veterinarian recommendations	1.2	1	10	1.7	1	9	0.0	0	-
Set example for employees	1.2	1	10	1.7	1	9	0.0	0	-
Penicillin allergy	1.2	1	10	0.0	0	-	3.8	1	5

¹Percentage is based on total number of respondents in each category. The total number of reasons was larger than the number of respondents because more than 1 reason was frequently provided.

²Calculated from the responses provided.

³These respondents reported "concern about health issues and raw milk consumption," but did not provide specific reasons for their response; no rank assigned.

milk in the past year and 55% had not, although the majority of those who currently consume pasteurized milk products had consumed raw milk more than a year ago. The primary reasons for consuming raw milk were taste, convenience and cost. Both raw and pasteurized milk consumers had concerns related to the potential for acquiring bacterial illnesses from raw milk consumption, with concerns about *E. coli* and *Salmonella* spp. infections reported most frequently. For those choosing to consume pasteurized milk, the primary reason for not drinking raw milk was concern regarding the potential for contracting bacterial illnesses. In addition, approximately 32% of the respondents who consume pasteurized milk do not

consume raw milk because of its higher fat content compared to other commercially available milk products. Although 34 respondents reported heating-treating milk that is fed to calves, 9 of these 34 also reported consuming raw milk in their own households.

The results from this survey identified multiple concerns regarding the potential for human illnesses associated with raw milk consumption among NYS milk producers. Some farm families continue to consume raw milk despite health concerns. Scientifically-supported educational materials targeted to dairy producers and other milk consumers that provide factual information on the potential for illness from raw milk con-

sumption, as well as other properties of milk (e.g., composition and nutrition), will allow consumers to make informed decisions regarding consumption of raw milk products. A web site has been developed by our research team to provide such information and can be accessed at www.milkfacts.info.

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Food Safety Training Requirements and Food Handlers' Knowledge and Behaviors

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SUMMARY

Very little research has evaluated how different types of food safety training requirements in foodservice establishments affect food handlers' performance. Foodservice employees ($n = 242$) from randomly selected restaurants from three Midwestern states within a 300-mile radius of the research institution completed a survey to assess their food safety knowledge and important behavioral antecedents (e.g., attitudes, intentions) related to food safety. Employees' compliance with three important food safety behaviors (handwashing, use of thermometers, and proper handling of food and work surfaces) was observed. This study evaluated the effectiveness of two alternative food safety training requirements by comparing knowledge, behavioral antecedents, and behavioral compliance rates between two groups of food handlers: a group from restaurants in which food safety training is mandatory for all food handlers and a group from restaurants in which only shift managers must be knowledgeable about food safety. Mandating training for all food handlers was associated with improved compliance with some food safety behaviors; however, requiring that shift managers be knowledgeable about food safety appears to contribute similarly to employees' knowledge, behavioral antecedents, and compliance with regard to the three important food safety behaviors observed.

INTRODUCTION

Food safety is a vital issue in the United States, given that foodborne illnesses contribute to millions of illnesses and thousands of deaths annually (4, 19). Food safety, specifically in restaurants, is becoming a key public health priority because of the increased number of meals eaten outside the home (20) and the fact that a large proportion (59%) of reported foodborne illness originates in restaurants (5).

Foodservice employees are a crucial link between food and consumers; thus managers must ensure that food handlers are practicing proper food safety techniques. However, research consistently shows that foodservice employees are not performing up to standards (10, 11). In fact, shortcomings related to time/temperature control, improper hygiene, and cross contamination contribute most significantly to foodborne illnesses (8, 10, 11, 21), and these problems are all related to foodservice employees' noncompliance with important food safety guidelines (10, 11).

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Lack of food safety knowledge or training may cause foodservice employees' noncompliance with food safety guidelines. Research suggests that food safety training may increase knowledge (15) and that higher knowledge and more favorable attitudes toward food safety may be associated with better restaurant inspection scores (6). However, increased knowledge does not always translate into improved behaviors (13). Several studies that have attempted to evaluate the effectiveness of food safety training on behavior in foodservice establishments have yielded inconsistent conclusions; many studies find that training is effective (7, 9, 14, 17, 18), while others draw the opposite conclusion (3, 13, 16, 24).

Coterchio, Gunn, Coffill, Tormey, and Barry (9) investigated the effects of foodservice manager training on the restaurant's overall inspection scores. Establishments whose managers were mandated to participate in the training and certification program showed improved inspection scores, as did establishments whose managers voluntarily participated in the program. Establishments in the control group, in which no manager received training, showed no improvements in inspection scores. The authors concluded that training was an effective way of improving compliance with food safety guidelines. It should be noted that the mandated group was required to participate either because of unsatisfactory inspection scores, resulting in suspension of the establishments' food licenses, or because of being linked to cases of foodborne illness. Therefore, these restaurants had substantial room for improvement and had strong incentive to improve inspection scores. While overall inspection scores improved and the number of critical violations decreased, not all problem areas were corrected by the training.

Cohen, Reichel, and Schwartz (7) investigated the effectiveness of an in-house food safety training program for mid-level managers and food handlers in a large catering company. The food safety training was implemented because of reduced microbiological quality of food over a three-month period. The training program was considered a success, because many of the departments exhibited improved microbiological quality of the

food; however, some of the departments did not show improvements.

Kneller and Bierma (14) found that restaurant inspection scores in one county improved after a food safety certified staff member joined the restaurants' personnel. The improvement was beyond what was projected based on inspection trends prior to the certified staff members' employment at the restaurants. Mathias, Sizio, Hazlewood, and Cocksedge (17) investigated the relationship between food safety education and inspection scores and found that restaurants with trained foodservice managers and employees had better inspection scores. Also, McElroy and Cutter (18) evaluated the effectiveness of a state-mandated training program by obtaining self-reports of foodservice employees' behavior change after training. The authors identified the training program as a success because participants reported being more likely to implement food safety practices after training.

On the other hand, Wright and Feun (24) compared restaurants with and without trained and certified managers, both before and after the experimental group received training. No differences in inspection scores were found between the groups at either time. Casey and Cook (3) discovered that inspection scores improved in both experimental (managers were trained and certified) and control groups; however, differences between the improvement scores were not significant. Mathias, Riben, et al. (16) reported no significant relationship between inspection scores in a restaurant and the number of employees who had received food safety training. Also, Howes, McEwan, Griffith, and Harris (13) found that even when foodservice employees have gained the knowledge necessary to perform proper food safety practices through training, the knowledge does not always lead to behavioral change.

Many of these studies investigated the effects of training of the manager on restaurant inspection scores (9, 14, 24). More research is needed to evaluate the effectiveness of training on knowledge and behaviors of foodservice employees who have direct contact with food. Although Cohen, Reichel, and Schwartz (7) investigated the effects of training both food-service managers and employees, they did so within only one establishment. Training managers versus training all

food handlers has important implications for foodservice establishments, because training all food handlers is more costly because of the direct costs (the training itself, compensation of employees' time at training) and the indirect costs (employee turnover). Getting all food handlers to attend food safety training may be difficult, especially if the training is not held at the establishment during normal work hours. Research is needed to investigate the benefits of training all food handlers compared to training only shift managers to be knowledgeable about food safety. The purpose of this study is to address this gap in the literature and investigate the effects of training foodservice employees.

Previous research has not investigated the effect of mandatory training of shift managers and food production employees on food safety knowledge and behaviors in multiple restaurants. No past research has compared the effects of having shift managers knowledgeable about food safety versus having all food handlers attend mandatory training on food handlers' food safety knowledge and behaviors. Also, previous research has not used the Theory of Planned Behavior (TpB), which focuses on important contributors to behavior, including the behavioral antecedents of attitudes, subjective norms, perceived control, and intentions related to the behavior (1). According to the Theory of Planned Behavior (TpB), the most proximal behavioral antecedent is intention for the behavior, and intentions are predicted from attitudes, subjective norms, and perceived control (1). Attitudes are evaluations of likely outcomes of performing the behavior, subjective norms are perceptions of important others' opinions of performing the behavior, and perceived control includes perceptions of ability to perform the behavior. The current study investigates the effects of food safety training by comparing knowledge, behavioral antecedents, and behaviors of food handlers from restaurants in which only shift managers must be knowledgeable about food safety and food handlers from restaurants in which food safety training is mandatory for all food handlers. The research focuses on three behaviors which contribute most significantly to incidences of foodborne illnesses: handwashing, use of thermometers, and proper handling of food and work surfaces (11).

TABLE 1. Knowledge scores of food service employees in restaurants in which only shift managers must be knowledgeable of food safety (n = 114) and employees in restaurants in which all food handlers must be trained (n = 128)

Behavior	Training Requirements	
	Shift Managers	All Food Handlers
	Means \pm Standard Deviations	
Handwashing	15.48 \pm 1.92	14.72 \pm 2.24*
Using Thermometers	14.27 \pm 2.07	12.82 \pm 2.90***
Properly Handling Food and Work Surfaces	13.80 \pm 1.54	13.57 \pm 2.13
Composite	43.54 \pm 3.94	41.11 \pm 5.92***

Note: Maximum scores possible are 18 for individual behaviors and 54 for composite score.

* $P < .05$; *** $P < .001$.

METHODS

Foodservice employees (n = 242) whose jobs directly involved food preparation tasks served as participants in the study. The study included a random sample of restaurants in Kansas, Iowa, and Missouri and included foodservice establishments with different food safety training requirements based on different city, county, or state regulations. Some establishments were required to have shift managers knowledgeable about food safety (though not necessarily having completed a formal training course or certification), whereas some establishments were required to have all food handlers take a formal food safety training course. Managers of randomly selected restaurants within a 300-mile radius of the university were contacted to request their participation. In Kansas and Iowa, establishments were randomly selected from lists of establishments licensed to serve food, which were provided by the state licensing agencies. In Missouri, establishments were randomly selected from the telephone directory within the designated radius of the research institution. Eligible restaurants included chain and independently-owned operations, as well as both quick- and full-service establishments. In exchange for their employees' participation, managers were offered free food safety training for their food production employees at a later date. Participation prior to the food safety training involved having each food-

service employee complete a food safety knowledge assessment and a questionnaire based on the Theory of Planned Behavior as well as allowing a research assistant to observe the employees' food preparation behaviors in the kitchen during peak business hours.

Pilot tests

The questionnaire was pilot tested to ensure sufficient internal reliability for each of the direct measures included in the Theory of Planned Behavior (i.e., attitudes, subjective norms, perceived control, intentions) for the three behaviors. Internal consistency estimates ranged between .65 and .90. The observation form was also pilot tested with all research assistants involved in the data collection to ensure adequate inter-rater reliability; the average reliability between two assistants observing the same employees at the same time was .71. The questionnaire and observation form are described below.

Questionnaire

Employees indicated their willingness to participate by completing the questionnaire. The cover page of the questionnaire informed the participants that the study was being conducted to better understand foodservice employees' beliefs about food safety and that their responses would be used to improve

compliance with food safety practices in restaurants. The questionnaire contained three sections.

The first section was a knowledge assessment created by the researchers. It assessed knowledge specifically related to the three food safety behaviors of interest: handwashing, use of thermometers, and proper handling of food and work surfaces. The knowledge assessment consisted of nine questions (three for each food safety behavior) with six response options for each question. The instructions directed the participant to circle *all* response options they believed to be correct, stressing that it was acceptable to circle more than one. Each response option was treated as a true/false item, resulting in the equivalent of 54 questions (18 for each behavior). Participants could obtain six points per question if they circled only all of the correct response options.

The second section of the questionnaire assessed the TpB components. This section directly assessed intentions, attitudes, subjective norms, and perceived control for each of the three food safety behaviors. This section was counterbalanced and contained approximately 50 items. The measures of attitude included items such as "For me to use a thermometer to properly check the temperature of food is" (1 = extremely bad, 7 = extremely good). For subjective norms there were questions like "Most of the workers at this restaurant with whom I am acquainted properly wash their hands at work on a regular basis" (1 = definitely false, 7 =

TABLE 2. Behavioral antecedents of food service employees in restaurants in which only shift managers must be knowledgeable of food safety (n = 114) and employees in restaurants in which all food handlers must be trained (n = 128)

Behavioral Antecedents	Training Requirements	
	Shift Managers	All Food Handlers
Handwashing	Means ± Standard Deviations	
Attitudes	6.66 ± 0.54	6.51 ± 0.91
Subjective Norms	6.41 ± 1.00	6.03 ± 1.39
Perceived Control	6.62 ± 0.66	6.50 ± 0.91
Intentions	6.52 ± 0.87	6.35 ± 1.15
Using Thermometers		
Attitudes	6.44 ± 0.71	6.31 ± 0.94
Subjective Norms	5.96 ± 1.21	5.80 ± 1.35
Perceived Control	6.56 ± 0.72	6.40 ± 0.88
Intentions	6.14 ± 1.21	6.11 ± 1.27
Properly Handling Food and Work Surfaces		
Attitudes	6.70 ± 0.54	6.41 ± 0.96*
Subjective Norms	6.46 ± 1.00	5.93 ± 1.46**
Perceived Control	6.54 ± 0.74	6.41 ± 0.94
Intentions	6.71 ± 0.84	6.35 ± 1.43*

Note: Range of scale items is 1 to 7, with higher numbers indicating more positive attitudes and subjective norms or higher perceived control and intention.

* $P < .05$; ** $P < .01$.

definitely true). An example of a perceived control belief was "For me to properly handle food and work surfaces at work is" (1 = extremely difficult, 7 = extremely easy). Intention was measured for each behavior with items such as "I plan to properly wash my hands at work on a regular basis" (1 = strongly disagree, 7 = strongly agree) and "I will make an effort to properly wash my hands at work on a regular basis" (1 = strongly disagree, 7 = strongly agree).

The third section of the questionnaire contained demographic items. It included questions about gender, age, and years of experience working in foodservice.

Behavioral observations

The second aspect of participation involved observation of the foodservice employees by a researcher in the kitchen during food preparation tasks. The observations were conducted in three-

hour sessions during peak service hours. During the course of the observations, six 20-minute sessions were spent watching the employees, with ten-minute breaks between sessions to help avoid observer fatigue. A maximum of four food handlers were observed simultaneously.

Food handlers were observed only for the three behaviors (i.e., handwashing, use of thermometers, and handling food and work surfaces). However, several specific behaviors within each were observed, which included items about using the correct procedures and performing the behaviors at the appropriate times. For example, for handwashing, food handlers were observed for correct procedure (e.g., vigorously scrub hands for at least 20 seconds, clean between fingers) and washing hands at suitable times (e.g., when shift begins, before putting on clean gloves).

Researchers used observation forms to record behaviors. The observation form listed the behaviors being observed, with

a column to denote that the employee performed the behavior when they should have (or that they did it correctly) and a column to record if they did not take action when they should have (or that they did not use correct technique). A separate observation form was used for each 20-minute observation session. These records were combined over the six sessions to calculate compliance rates for each specific behavior and composite compliance rates for the three general food safety behaviors of interest.

RESULTS

Participants

Of the participating sample of foodservice employees, 68.1% were male and 31.9% were female. There were similar numbers of participants from restaurants in which only shift managers must be knowledgeable about food safety (47.1%) and participants from restaurants

TABLE 3. Behavioral compliance scores of foodservice employees in restaurants in which only shift managers must be knowledgeable of food safety (n = 114) and employees in restaurants in which all food handlers must be trained (n = 128)

Behavior	Training Requirements	
	Shift Managers	All Food Handlers
	Mean Compliance Percent ± Standard Deviation	
Handwashing		
Wash hands when starting shift	50.00 ± 51.45	72.73 ± 45.58
Wash hands when returning to the work area (after smoking, eating, chewing gum or tobacco, bussing tables, or using bathroom)	43.76 ± 40.48	52.60 ± 40.20
Wash hands before putting on clean gloves	37.46 ± 33.62	47.33 ± 40.79
Wash hands when food preparation tasks are interrupted or changed	35.59 ± 37.24	39.36 ± 40.72
Wash hands before and after handling raw food	20.41 ± 35.35	10.43 ± 23.85
Wash hands after handling chemicals that could contaminate food	18.27 ± 38.44	19.44 ± 36.34
Wash hands after sneezing, coughing, or using a handkerchief/tissue	12.50 ± 31.08	8.33 ± 20.41
Wash hands after touching anything else that may contaminate hands (unsanitized equipment, work surfaces, cleaning cloths, drinking straw)	11.35 ± 23.68	10.23 ± 21.91
Wash hands after touching body parts	5.74 ± 19.05	2.66 ± 15.65
Wash hands after touching clothing/apron	0.80 ± 4.12	1.37 ± 6.82
Handwashing Procedure		
Dry hands and arms with a single-use paper towel or warm-air hand dryer	97.60 ± 9.87	89.03 ± 27.87**
Rinse hands thoroughly under running water	94.83 ± 21.61	91.27 ± 26.76
Clean between fingers	44.63 ± 42.99	43.52 ± 46.28
Vigorously scrub hands for at least 20 seconds	33.53 ± 40.83	37.72 ± 45.93
Vigorously scrub arms above wrists for at least 20 seconds	26.56 ± 38.41	29.43 ± 42.09
Clean under fingernails	11.92 ± 31.11	32.65 ± 45.75***
Using a Thermometer		
Food stored on the hot line is at least 135°F	100.00 ± 0.00	100.00 ± 0.00
Check internal temperature of food by inserting the thermometer stem or probe into the thickest part of the product	66.67 ± 49.24	58.33 ± 50.00
Food stored on the cold line is 41°F or less	66.67 ± 57.74	--
Wash, rinse, sanitize, and air-dry thermometer before and after use	40.00 ± 51.64	0.00 ± 0.00*
Check temperature of food at the completion of reheating	22.22 ± 44.10	0.00 ± 0.00
Check temperature of food at the completion of cooking	16.61 ± 36.59	8.89 ± 26.63
Properly Handling Food and Work Surfaces		
Leftovers labeled and dated	100.00 ± 0.00	--
Separate raw products from ready-to-eat products	83.33 ± 38.35	83.33 ± 40.82
Food contact surfaces are free of dust, dirt, and food particles	79.60 ± 32.02	78.45 ± 36.97
Food is covered and labeled properly before holding or storing	77.13 ± 38.78	79.96 ± 35.75
Wiping cloths are stored in a sanitizing solution	64.15 ± 46.39	84.21 ± 37.46
Food is covered when transported	59.39 ± 45.97	78.90 ± 36.73*
Separate wiping cloths are used for food and nonfood surfaces	29.63 ± 46.53	100.00 ± 0.00***
Wash, rinse, and sanitize food contact surfaces anytime begin working with another type of food or ingredients	17.77 ± 35.06	31.39 ± 42.76
Wash, rinse, and sanitize food contact surfaces after touching anything that might contaminate the food-contact surfaces	12.59 ± 32.01	18.57 ± 36.55

Note: A "--" indicates the behavior was not observed so a comparison cannot be made between the groups.
* P < .05; ** P < .01; *** P < .001.

in which all food handlers are required to be trained (52.9%). The average age of participants was 28.8 years, although ages ranged from 15 to 79. Participants had an average of 7.5 years of experience working in the food service industry. Of 1,298 restaurants contacted, 31 managers agreed to participate.

Knowledge

A Multivariate Analysis of Variance (MANOVA) was conducted to determine if there were significant differences in food safety knowledge between those food handlers in restaurants in which all food handlers are required to be trained and those in restaurants in which only shift managers must be knowledgeable about food safety. The independent variable was training policy status, with two levels: all food handlers must be trained and only shift managers must be knowledgeable. The dependent variables were knowledge scores related to each of the three food safety behaviors and a composite food safety knowledge score.

The MANOVA indicated a significant difference ($P < .001$). Food handlers in restaurants in which all food handlers were required to be trained had lower composite knowledge scores ($P < .001$), lower handwashing knowledge scores ($P < .05$), and lower thermometer usage knowledge scores ($P < .001$) than the food handlers from restaurants in which only shift managers must be knowledgeable about food safety. The two groups did not differ in their knowledge related to proper handling of food and work surfaces (Table 1).

Behavioral antecedents

A series of three MANOVAs were conducted to investigate the differences between the two groups on the TpB components (i.e., attitudes, subjective norms, perceived control, intention). A MANOVA was conducted for each of the three food safety behaviors (Table 2).

The MANOVAs for the TpB components related to handwashing and for use of thermometers were not significant. However, the MANOVA for the TpB components for proper handling of food and work surfaces was significant ($P < .05$). Food handlers in restaurants in which all food handlers are required to be trained had less favorable attitudes ($P < .05$), less favorable subjective norms ($P < .01$), and lower intentions ($P < .05$)

for proper handling of food and work surfaces than food handlers in restaurants in which only shift managers must be knowledgeable about food safety.

Observed behaviors

Independent samples t-tests were conducted on the 31 specific behaviors observed in the restaurant kitchens and composites of the three behaviors of interest to compare the compliance rates of the two groups. Of the 31 specific behaviors observed, the groups differed in their compliance rates on only five of those behaviors. Among the composite compliance scores, only the composite related to proper handling of food and work surfaces was significant ($P < .01$). The food handlers from restaurants in which all food handlers are required to be trained had better compliance with this behavior in general (Table 3).

Proper handling of food and work surfaces

Two of the nine behaviors related to proper handling of food and work surfaces were observed to have different compliance rates between the two groups. The food handlers in restaurants in which all food handlers are required to be trained were significantly more likely to cover food when transporting it ($P < .05$) and to use separate wiping cloths for food and nonfood surfaces ($P < .001$).

Handwashing

Group differences were found for only two of the 16 observed handwashing behaviors, and both of these related to *how* to perform handwashing properly. Food handlers in restaurants in which all food handlers were required to be trained had higher compliance rates for cleaning underneath their fingernails when washing hands ($P < .001$); however, these food handlers had lower compliance rates for drying hands and arms with a single-use paper towel or warm-air hand dryer after washing hands ($P < .01$).

Use of thermometers

There was one group difference among the six behaviors related to using thermometers. Food handlers in restaurants in which only shift managers must be knowledgeable about food safety were

more likely to wash, rinse, and sanitize the thermometers before and after use ($P < .05$).

CONCLUSIONS AND APPLICATIONS

The results suggest that having shift managers knowledgeable about food safety yields approximately the same results as having all food handlers trained. Having mandatory training for all food handlers is not consistently associated with improved knowledge, behavioral antecedents, or behaviors. However, training all food handlers may provide benefits in some specific areas of food safety.

The group results showed inconsistencies between the three behaviors. For handwashing, food handlers from restaurants in which only shift managers must be knowledgeable about food safety had more knowledge of the proper way to perform the behavior, and these food handlers had higher compliance with drying their hands thoroughly after washing, but they had lower compliance with cleaning underneath their fingernails when washing their hands, compared to the food handlers from restaurants with mandatory training for all food handlers. There were no differences between the two groups for any of the TpB components (i.e., attitudes, subjective norms, perceived control, intention) and most of the specific handwashing behaviors (14 out of the 16 specific behaviors) showed no differences between groups.

For thermometer use, food handlers from restaurants in which only shift managers must be knowledgeable about food safety had higher knowledge scores and higher compliance with washing, rinsing, and sanitizing thermometers before and after use, compared to food handlers from restaurants requiring training for all food handlers. However, the two groups did not differ in terms of the TpB components or compliance with five of the six specific observed behaviors related to using thermometers.

For proper handling of food and work surfaces, food handlers from restaurants in which only shift managers must be knowledgeable about food safety had more positive behavioral antecedents (better attitudes, subjective norms, and intention) for performing the behavior, but they had lower compliance for two

behaviors (covering food when it was being transported and using separate wiping cloths for food and nonfood surfaces). However, the two groups did not differ in their knowledge of the behavior or compliance with seven of the nine observed behaviors.

Food safety training is designed to increase employee knowledge of proper food safety practices, as has been confirmed by previous research (15). Lynch, Elledge, Griffith, and Boatright (15) compared managers' knowledge based on the type of training (from health department, corporate training, no training) they had received. They found that overall knowledge tended to be high (87.2%) regardless of the type of training, and training did increase knowledge levels. However, in the current study, the food handlers from restaurants in which training was mandatory for all food handlers had lower knowledge for the three food safety behaviors, although the difference between the groups did not reach significance for proper handling of food and work surfaces. Further, the overall knowledge of all food handlers combined was moderately high (78.7%), although not as high as Lynch et al. (15) reported. Perhaps this inconsistency was found because Lynch et al. (15) focused on foodservice managers, and the current study investigated foodservice employees. Another possible explanation for the discrepancy is the use of different knowledge assessment measures. Lynch et al. (15) assessed general knowledge of food safety, whereas the assessment used in the current study focused on handwashing, use of thermometers, and proper handling of food and work surfaces. Results of the current study suggest that making food safety training mandatory for all food handlers does not contribute to better knowledge of these three important food safety behaviors. In fact, having a manager knowledgeable about food safety is associated with better knowledge for the food handlers.

Mandatory training for all food handlers also does not improve important behavioral antecedents of food safety. There were no differences between the groups for the behavioral antecedents of two of the three broad food safety behaviors, and the behavioral antecedents for proper handling of food and work surfaces were better for the group from

restaurants in which only shift managers must be knowledgeable about food safety. Therefore, mandatory training for all food handlers was associated with neither improved knowledge nor improvements in behavioral antecedents for important food safety behaviors.

Food safety training is ultimately expected to improve food handlers' compliance with food safety guidelines. Past research suggests that this is an unrealized goal (3, 13, 16, 24). The two employee groups in this study had similar levels of behavioral compliance related to most of the specific behaviors observed, including five of the six thermometer-related behaviors, 14 of the 16 handwashing behaviors, and seven of the nine surfaces behaviors. Even when there were significant differences in the behaviors between the two groups, the direction of the change was not consistent. The current study suggests that instituting mandatory training for all food handlers is not consistently associated with improved employee behavior. However, in some instances it does appear to offer additional benefits compared to requiring only shift managers to be knowledgeable about food safety (e.g., cleaning under fingernails, covering food when it is being transported, using separate wiping cloths for food and nonfood surfaces).

Instituting mandatory food safety training for all food handlers does not appear necessary to ensure food handlers' knowledge, behavioral antecedents, or behaviors related to these three food safety behaviors important to avoidance of foodborne illnesses. Having a knowledgeable shift manager has a generally positive influence on these things. This may be because managers pass on food safety training to their employees, although perhaps not in a formal setting. Although it appears that food handlers' improved compliance with a few specific food safety behaviors may be associated with attending mandatory training classes, the knowledgeable shift manager may be an excellent source for food safety information. One possible explanation for the current results is that food handlers from restaurants in which only shift managers are required to be knowledgeable about food safety issues have better knowledge of food safety because the knowledgeable shift managers feel a greater sense of obligation to instruct food handlers

about food safety. Although the other employee group received a mandatory training class early in their employment in the restaurant, it could be that, because all managers and food handlers in that establishment are trained, no specific manager feels a sense of personal responsibility for monitoring food handlers and instructing them on food safety. However, this is speculative, given that the current study can offer no supporting evidence that the knowledgeable shift managers actually train the untrained food handlers in their establishments.

The discrepancy between the groups in food safety knowledge may be further compounded by the poor quality of food safety training offered by some local health departments. For example, some mandatory classes sponsored by local health departments are only 2 hours long and are used by the jurisdictions as a way to increase revenue. The training obtained in such classes, which is considered sufficient for food handlers to work in restaurants, is much different from the training that would be received in a four or eight-hour ServSafe® course. Although training from local health departments may not be as comprehensive as a ServSafe® course, it may give managers a false sense of security that their food handlers have learned all they need to know about food safety when, in reality, they have not. This study may show equivalent results between the group only mandated to have shift managers knowledgeable about food safety and the group mandated to have all food handlers trained because the quality of the mandatory training provided to the food handlers is so poor that the food handlers learn little from it (and thus, have not really been trained at all). Given the lack of a control group in this study, the accuracy of this statement cannot be determined.

Food handlers showed higher compliance with regard to a few specific behaviors when they had received mandatory training. There may be some aspects of the mandatory training class that food handlers have an easier time internalizing that are lacking in the instruction that may be provided by the knowledgeable shift manager. For example, the ServSafe® training guide suggests including a hands-on GloGerm® exercise in which employees apply to their hands an

invisible powder that glows under black light. After washing, they can see first hand under the black light, the places microorganisms would still exist if hands are not washed effectively (e.g., under fingernails). This type of demonstration may help food handlers internalize the importance of cleaning under fingernails, a behavior that was identified in this study to have a higher compliance rate among the food handlers from restaurants in which food safety training is mandatory for all food handlers. Possibly, the other two behaviors related to proper handling of food and work surfaces have higher compliance because of the specific lessons included in the mandatory training. Shift managers within the establishments that do not have mandatory training for all food handlers should identify areas of formal food safety training that may help them convey important lessons about food safety to their employees (such as cleaning under fingernails, covering food when transporting it, and using separate cloths for food and nonfood surfaces).

It should be noted that compliance with many of the specific food safety behaviors is quite low. Research must identify barriers existing between food handlers and their performance of important food safety behaviors. Past research indicates that food handlers identify barriers such as inadequate resources or supplies, lack of training, lack of reminders, time constraints, and negative consequences of performing the behaviors (2, 12, 22, 23). Food handlers must perceive a reduction in these barriers to comply with food safety guidelines. Training must focus not only on providing knowledge, but also on educating managers and food handlers on how to reduce the barriers they perceive. Removing some barriers, such as providing proper resources and supplies for performing the behaviors (e.g., adequate soap, paper towels, sanitizer) and providing training and reminders about properly performing the behaviors (including when to perform them) is the responsibility of the managers. The managers could also address time constraints and negative consequences. For example, managers should incorporate food safety behaviors into the food handlers' job, stressing that it is a requirement for employment, rather than something that distracts from their performance requirements (i.e., preparing food quickly).

LIMITATIONS

While it is useful to compare the two employee groups and to evaluate the differences in their knowledge, behavioral antecedents, and behaviors, it would be even more useful if there had been a control group (restaurants that do not require anybody to receive training or to be knowledgeable about food safety training). With the results of this study, the effectiveness of two types of food safety training requirements could be compared. However, conclusions about the effects of training in general cannot be made. Future research should determine if either of these types of training requirements is beneficial compared to no training.

The current research spanned three states and includes a more representative sample than many studies that have investigated food safety within one establishment or with restaurants within one county, but the response rate for participation was quite low. Of 1,298 restaurants contacted, only 31 restaurants agreed to participate. The managers who declined participation stated they did not have enough time to participate in a three-year research study. However, because the manager made the decision to participate or decline, the actual food handlers who participated should not be significantly different from those whose managers declined.

This study compared two groups of food handlers based on the type of mandatory training requirements (shift managers versus all food handlers) in the restaurants. It did not investigate further into the type of training the food handlers had received. Food handlers in either group could have received food safety training beyond the requirements of the local regulations. This study also did not make a distinction between different types of classes required when all food handlers are mandated to be trained. Some food handlers could have received a two-hour class and others may have attended a four or eight-hour class. Some food handlers may have received ServSafe® training, and others may have received training sponsored by a local health department. Future research should investigate the effects of different lengths of training and differently sponsored training classes on food handlers' knowledge and behaviors.

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IAFP Timely Topics Symposium on Prepared, But Not Ready-To-Eat Foods — What You Need to Know

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On January 24, 2007, the International Association for Food Protection (IAFP) held a symposium titled "Prepared, But Not Ready-to-Eat Foods – What You Need to Know" in Arlington, Virginia. The symposium was developed in cooperation with the Grocery Manufacturers Association (GMA) and the American Frozen Food Institute (AFFI). It aimed to address food safety issues associated with Prepared, But Not Ready-to-Eat (PNRTE) foods, which is a class of products that comprises a significant portion of the foods consumed in the United States. Many of these products are convenience foods designed for microwave cooking. Recent foodborne illnesses outbreaks and product recalls have focused regulatory, consumer, and industry attention on these products that are partially cooked or contain partially cooked or raw ingredients.

Convened by Stan Bailey (IAFP president-elect) and Vickie Lewandowski (IAFP Vice President), leading experts from government, industry, and academia gave presentations on food safety issues associated with PNRTE foods, as well as efforts and approaches to address those issues. The epidemiology of recent outbreaks, the regulatory position on PNRTE foods and consumer perceptions and expectations were discussed. Additional presentations addressed issues associated with microwave ovens, microwavable foods, validating cooking instructions and appropriate labeling for consumers. The symposium concluded with a roundtable discussion where the speakers, as a panel, further addressed the food safety issues in responses to questions from the audience.

Symposium highlights are below.



Ian Williams, CDC, gave a presentation on the epidemiology of recent foodborne outbreaks associated with PNRTE products. Williams indicated that an estimated 1.4 million *Salmonella* infections occur annually in the US, with approximately 30,000 culture-confirmed cases reported to the Centers for Disease Control and Prevention (CDC). Frozen, microwavable foods are increasingly being recognized as a vehicle for *Salmonella* outbreaks. A number of PNRTE foods have been implicated in *Salmonella* outbreaks, including par-fried stuffed chicken products, chicken nuggets, and chicken strips. Williams reviewed the epidemiology of these outbreaks, as well as the 2007 outbreak that was linked to a single brand of frozen pot pies produced at a single facility. This outbreak involved more than 380 *Salmonella* 14,5:12:- infections in 39 states.

The outbreak strain associated with pot pies was isolated from 11 unopened pot pies (5 from case-patient homes and 6 from stores). The source of the contamination has not been identified. Investigations by CDC and state and local public health officials found that approximately 75% of the patients in this outbreak reported cooking the pies in a microwave. Of case-patients who ate a pot pie cooked in a home microwave, only one-third reported knowing the wattage of their microwave oven. Of the case-patients who ate a pot pie cooked in a microwave outside of the home, approximately 12% reported knowing the wattage. Investigations on these outbreaks have identified consumer confusion over the raw or cooked nature of these products and have revealed issues with inadequate labeling. Williams concluded that these outbreaks highlight the need for frozen PNRTE foods to be thoroughly cooked, such foods should be clearly labeled, and cooking instructions should adequately address how variability in output wattage of microwaves affects cooking times.

Following the presentation, an audience asked how CDC identifies clusters and makes the association of a product with illness. Williams indicated that a cluster is an unusual number of cases that share the same PFGE pattern. The CDC Foodborne Disease Outbreak Response and Surveillance Team (ORST) routinely reviews PFGE

patterns submitted to PulseNet and looks for unusual clusters on which they conduct follow up investigation. Not all clusters turn into outbreaks. Statistical association is not causation, rather, it points out the need for further investigation and help point the investigation in the right direction. Other information, such as isolation of the outbreak strain in implicated product is needed to establish cause. More information on CDC outbreak investigations can be found at <http://www.cdc.gov/foodborneoutbreaks/>.



Daniel Engeljohn, FSIS, gave a presentation on regulatory issues related to PNRTE products. Engeljohn indicated that the USDA Food Safety and Inspection Service (FSIS) has become increasingly concerned about labeling and sanitary conditions associated with the production and marketing of products that are not-ready-to-eat (NRTE). Many of these products also present additional concerns because they may appear to be ready-to-eat (RTE). He noted that labeling and validated cooking concerns raised almost two years ago by FSIS in response to an outbreak associated with one specific NRTE product did not transfer more broadly to other NRTE product that later also were associated with outbreaks.

In two recent outbreaks involving PNRTE products FSIS determined that the establishment could not provide a safe cooking temperature for consumers because the degree of contamination was unknown, emphasizing the need for establishments to collect data on the microbiological profile of these products leaving the plant (i.e., end product testing). In addition, these same establishments did not have necessary information to demonstrate what the consumer is likely to deliver to the product during the safe preparation of the product for consumption.

Engeljohn presented an overview of issues for the food industry to take note of in order to reduce the likelihood of future outbreaks associated with NRTE products. Issues raised included:

- Absence of microbiological thresholds for discerning GMPs in NRTE operations (which can result in variations in microbial loads in NRTE products).
- Controls for NRTE operations focus on preventing growth during production but not preventing contamination or reducing the level.
- Confusion by consumers as to how to distinguish NRTE from RTE products due to similar but subtle differences in labeling features.
- Cooking instructions not validated for pathogens of public health concern.
- Reliance on consumer to adequately handle product, but the instructions are not accurate and the consumers can't follow them.

To address these issues, FSIS will take several steps. One step is to collect relevant data in NRTE operations, e.g., microbiological profiles of the environment and product, validation documentation in support of cooking instructions (both validation studies and evidence that the consumer can and will properly handle the product). FSIS may consider rulemaking to address labeling and GMP issues that cannot be resolved by voluntary efforts. FSIS will also conduct outreach and education to the industry and consumers. FSIS recommends that industry validate cooking instructions, including knowing what pathogens are present at what level, and provide a safety margin in the cooking instructions. For consumers, the Agency recommends always using a thermometer and cooking poultry (intact and non-intact) to at least 165°F and cooking non-intact meat products to at least 160°F for safety.



Sheryl Cates, RTI International, gave a presentation on consumer practices and expectations. She indicated that consumers are increasingly relying on PN RTE foods because these foods are convenient, quick, and easy. However, recent foodborne illness outbreaks suggest that some consumers are not properly preparing these foods to ensure that the product is safe to consume.

Cates presented findings from focus group research on consumers' perceptions of meat and poultry product labeling features and how consumers use these features and other information to determine whether products are not fully cooked and require cooking for safety. The research found that in addition to labeling features such as the phrase "cook thoroughly" and the Safe Handling Instructions label, consumers rely on the appearance of the product and the type of product packaging. Some focus group participants expressed confusion about the inconsistency in product labeling with regard to cooking for safety requirements. They suggested that labeling should be standardized so that consumers do not have to guess whether a product is NRTE or RTE. Terms such as "requires cooking" and "cook thoroughly" were preferred, and a logo was desirable.

With regard to consumers' use and understanding of preparation instructions on meat and poultry products, the research found that few consumers use preparation instructions all of the time; instead, they rely on past experience preparing similar products. An FDA food safety survey on the use of thermometers found that in 1998, 50% of consumers reported that they had a food thermometer, while the number increased to 70% in 2006. Although some companies recommend the use of a food thermometer to check the internal temperature of product, recent survey findings suggest that many consumers do not own a food thermometer and few routinely use a food thermometer. For example, only 13% of consumers indicated that they use a thermometer to check the doneness of hamburgers.

Cates indicated that findings from the research by RTI, in conjunction with other research, can help inform efforts to reduce foodborne illness from the consumption of PN RTE foods. In response to a question on whether any of the focus group studies included teenagers (10–18 years of age), Cates indicated that the focus groups only included adults. Cates also indicated that the studies completed did not look at the use of visual cues to indicate the food had been cooked. She indicated that future research needs would also include identifying appropriate outreach activities for consumers.



Greg Hooper, Campden and Chorleywood Food Research Association, gave a

presentation on factors that affect microwave power and issues with the uniformity of heating in ovens. Hooper indicated that a major factor in the delivery of safe, high quality microwave heated food is ensuring products achieve an adequate time-temperature regime, without causing degradation by overheating. The development of such regimes requires a structured approach and a real understanding of the performance of microwave ovens and the way in which food heats within them. Important factors that can affect microwave performance and the microwave power delivered to foods include microwave power output variance with load size, microwave power output dependency on supply voltage, and microwave power reduction with operating time (magnetron warming). A 20–30% difference in power due to any one of these factors could be observed in studies. Hooper noted that the IEC 60705:1999 method is a standardized method for measuring microwave power output. It is based on the use of 10°C rise in water temperature to calculate power delivered to 1000 g water load in specific container. This method gives the oven ability to heat large loads (1000 g), but not the oven ability to heat small loads (<500 g). The UK uses two rating methods for ovens (1000 g and 350 g), which results in a more accurate determination of oven wattage.

A common problem with microwave-heated foods is poor uniformity of heating leading to the formation of hot and cold spots. The uneven heating of microwave foods can be influenced by a number of factors, including non-uniform distribution of dipolar molecules and ionic materials within the food, differences in microwave absorption of frozen/thawed areas, product/component edge heating effects, areas of high and low microwave field strength within the oven cavity and product, and different food component thermal properties. Product

state (ambient, refrigerated, frozen), as well as product composition, affects how foods heat, as does product layout, packaging and location in the oven. Microwave oven performance, in terms of heating uniformity and rate can vary among ovens, even those with the same wattage. Although market constraints can restrict the use of optimum microwavable product designs, appropriate microwave food product and packaging design can help reduce heating uniformity issues. For example, the layout of a three component meal (beef, potato and peas in three layers) affected heating uniformity and heating rate. Placing the potato on top of the beef and peas was found to be a better layout than placing the beef on top of the potato and peas, in that less time was needed to reach target temperature with a narrower range of heating rates and less dehydrated areas, and the product quality was better overall.

Despite the various constraints discussed, Hooper indicated that the development of suitable microwave heating instructions able to give uniformly heated products is possible with the aid of a range of instruction development techniques. The general approach would be to ensure that microwave ovens used for product development are correctly rated; to understand and control the effect of load size, input voltage, and magnetron warming on oven power output; to understand and control the effect of product state and product layout; and, most importantly, to use a disparate range of microwave ovens.

In response to a question on wattage range used for cooking instructions, Hooper indicated that the UK recommended the use of at least two wattage ranges (prefer three). The UK has a dual rating system for microwave wattage (e.g., use 350 g and 1000 g load to determine wattage) and uses a model food rather than water to do the test. It is also generally recommended that products be heated one at a time. Hooper also suggested that rigorous methods be used to test and validate cooking instructions, by using a wide range of ovens, using a number of thermocouples (but be aware that the cold spot could be in between two thermocouples). Hooper indicated that there is a thermal imaging system (cost approximately \$10,000 per unit) available that can map the temperature profile of the product surface.



Michael Davidson, University of Tennessee, gave a presentation on factors that influence

microbial inactivation during microwave cooking. Davidson noted the first microwave was introduced in 1947. He indicated that numerous studies have investigated the inactivation of vegetative microorganisms by microwave heating. The primary factors affecting inactivation of microorganisms by microwaves are the same as for heat, i.e., time and temperature. Additionally, several factors influence penetration of microwaves into foods and consequently the heating rate and heat distribution within a food. These include ionic content, moisture, microwave frequency, product parameters (including mass, density, and geometry), specific heat and equipment.

Davidson noted that the major issue in developing thermal processes for microwave heated foods is non-uniform heating and the variable cold spot of the food. In comparison to conventional heating, microwave heating is highly variable, which may lead to survival of foodborne pathogens in foods even though a measured internal end-point temperature would indicate a process was lethal to a population. While most research indicates that the primary mechanism of inactivation by microwaves is due to heat, at least one study suggested that non-thermal inactivation effects may also occur. However, the majority of research has demonstrated that there is minimal or no non-thermal effect of microwaves on microorganisms. In thermal process development for microwave-heated foods, biological validation is extremely important. As the precise cold spot is unknown and can actually change during heating, test microorganisms must be distributed homogeneously throughout the product before evaluating a process. Davidson showed data from a recent study that culture handling (procedures used to grow the inoculum) has a substantial impact on the inactivation of *E. coli* O157:H7 in peptone water at heating temperatures 58–61°C (more rapid inactivation of cells grown in a chemostat than under static conditions).



Jenny Scott, GMA, gave a presentation on guidelines for validation of consumer cooking instructions for NRTE products. Scott noted that determining the validity of the consumer cooking directions for NRTE foods is an important and effective tool for ensuring the safe consumption of these products by consumers. Unlike RTE products, which are safe to consume in the form purchased

by consumers, NRTE products require cooking by consumers for safety. Several foodborne illness outbreaks due to undercooked raw, breaded poultry products have occurred in the last few years. Concerns over NRTE products intensified during the summer of 2007 when NRTE products such as pot pies and pizzas were implicated in foodborne illness outbreaks. A GMA working group has drafted guidelines for the validation of consumer cooking instructions. The guidelines primarily describe validation through temperature studies, including determination of the number of samples to test, factors affecting the outcome of the test, and the evaluation of test results. Factors related to both the product and the type of cooking device were considered, with a particular emphasis on the validation of microwave cooking instructions, since non-uniform heating of foods in microwave ovens has been implicated as a key factor in undercooking. The guidelines also acknowledge the value of including visual cues with cooking instructions. The guidelines are intended for manufacturers of retail NRTE products to facilitate industry efforts to ensure the adequacy of cooking instructions applied on the label of the products.

Scott noted that the primary focus of the GMA guidance is on product temperature tests. The guidance document discusses the role of a microbiological challenge (inactivation) study as an adjunct to temperature validation study. She also noted that in developing the guidance, initially there was an attempt to generate a "cookie cutter" approach to the number of samples needed to be tested, but eventually, due to the large number of variables involved, the working group decided to recommend that the number of samples tested should be sufficient to provide reasonable assurance that the cooking instructions, if followed, will result in a safe product. The number of samples should be sufficient to capture the variability in product heating and determine which factors are most responsible for this variability. Fewer replicates would be needed for cooking methods (microwave, conventional oven, stove top, etc.) and/or products that provide more uniform heating.

In response to a question on appropriate lethality, Scott noted that a 5-log reduction is recommended in the GMA guidance as a "safe harbor." However, it is possible to build a case for a lower level of log reduction, e.g., for a product using cooked meat components with other ingredients that have low levels of pathogens, by having a robust data set and ongoing verification to indicate that the level continues to be low. There was another question/comment on how many replicates are needed and the need for the guidance to give some recommendation about the number of samples to test. Scott noted that the number of samples will change depending on the products and cooking devices. Although no specific number of samples is recommended in the guidance's main text, several examples will be developed as an Appendix to the guidance and the number of samples will be included for the specific product used as an example for applying the guidance to validate cooking instructions.



Bob Garfield, AFFI, gave a presentation on microwave issues and labeling concerns for the frozen food industry. Garfield noted that microwave ovens have become ubiquitous in home kitchens across the United States, with over 90 percent of homes having at least one unit. In recent years, the convenience of the oven combined with innovative food products and packaging has made microwave cooking a consumer staple. Garfield discussed some of the information that AFFI has learned during the past year about microwave ovens and the preparation of microwavable foods. During the past year AFFI met with the International Microwave Power Institute, the American Home Appliance Manufacturers and major microwave manufacturers to discuss microwave oven technology and cooking trends. Garfield noted that AFFI has completed guidance for consumers titled "Cooking with Microwave Ovens, Nutrition and Food Safety Considerations." The guidelines provide a brief review of microwave cooking and present ways in which consumers can prepare nutritious meals using a microwave oven. Recently, AFFI, in conjunction with its members and other associations such as GMA, has also developed package labeling guidance for microwavable foods. This guidance will help food processors offer clear and comprehensive labeling information for the preparation of PNRTE foods given numerous microwave oven power ratings and options.



At the start of the panel discussion session, **Chris Waldrop, Consumer Federation of America**, gave a brief overview on the food safety issues from the consumer perspective. Waldrop suggested that companies need to use their HACCP plan and process control to get the pathogen loads as low as possible in PNRTE products. He also noted that consumers perceive recalls differently than alerts. He indicated that there is a need for information sharing among all stakeholders and noted that there would be a meeting at the end of February organized by the Partnership for Food Safety Education to develop proper messages to consumers and that the partnership program would welcome input from the audience.

The symposium stimulated many questions from the audience during the roundtable discussion. The following are highlights of some of the questions from the audience and answers and comments from the panel of speakers:

Q: How do we get the word out to consumers that the cooking instructions are there for safety and they need to follow the instructions?

A: One way is using messages such as "cook for safety." There is a need to balance safety and quality. One speaker indicated that complicated cooking instructions, when they are present on the label, are because they are necessary for safety (e.g., that's the only way to safely cook a 0.5 kg product), and there is a need to educate consumers that the instructions are there for a reason. Another useful piece of information is feedback companies get from their consumers through a consumer complaints program. FSIS is interested in such information.

Q: Do you believe a 5-log reduction is needed for safety?

A: The 5-log is a "safe harbor" provided that GMPs are in place. For a product that contains fully cooked meat and poultry components and other ingredients prepared under GMPs, it may be possible to justify a lower level of log reduction. It was indicated that a 5-log reduction is considered adequate for NRTE meat and poultry products, other than those that have a 6.5- or 7-log performance standard.

Q: The FDA Food Code recommends cooking seafood to 145°F. Is the 160°F recommended in the GMA guidance going to result in overcooked seafood such that consumers won't follow the instructions?

A: The GMA guidance does have a table that includes recommended time/temperatures besides 160°F (no hold time required) for cooking a product that does not contain raw poultry. The 145°F for 15 s recommended for fish by the FDA Food Code is included, as are time/temperatures for cooking other products.

Q: Other than finding the cold spot, what is the benefit of doing microbial validation?

A: For some products, e.g., those with dry components or dry spots, where even time and temperatures may not be achieved and adequate lethality is uncertain, microbiological validation would be useful. From a public health perspective, 90% of *Salmonella* infections are not associated with outbreaks, therefore, it is important to investigate further where the problems might be, e.g., microbial profiles in NRTE plants. One approach to minimize the potential for illness is to minimize, to the extent possible, the pathogen loads in NRTE products. Consumer education is also important. FSIS is interested in looking at the microbial profile in NRTE plants. Therefore, it would make sense for industry to look at microbial profiles as well.

Industry can do a better job on validation of cooking instructions. Consumers also play a role by following cooking instructions. It was noted that the food supply is getting more global and more complex. Food safety issues will get more complex rather than simpler.

It was commented that although much of the discussions were on microwave cooking, conventional ovens have a set of issues in validation that are not trivial. There is a lack of quantitative data for pathogens in NRTE products. One audience member made a plea for industry to do more quantitation to generate more data to support adequacy of lethality.

Presentation slides from the symposium are available at <http://www.foodprotection.org/meetingsEducation/TimelyTopicsPresentations.asp>.

Acknowledgements

This paper was prepared based on presentations and discussions at the Symposium. The author wishes to thank Jenny Scott for sharing notes and for reviewing the manuscript.

IAFP Timely Topics Symposium on Prepared, But Not Ready-To-Eat Foods – What You Need to Know

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President's Lifetime Achievement Award

Dr. Samuel A. Palumbo
Naperville, IL



On January 15, 2008, IAFF President Gary Acuff presented Dr. Samuel A. Palumbo with the President's Lifetime Achievement Award. The Award is given at the discretion of the Association President, to recognize an individual who has made a lasting impact on "Advancing Food Safety Worldwide" through a lifetime of professional achievements in food protection. Executive Director David Tharp was among the numerous supporters in attendance at the reception held



at the National Center for Food Safety and Technology in Chicago, which incorporates the FDA Division of Food Packaging and Processing.

Dr. Palumbo earned his BS from Loyola University and his Ph.D. from the University of Illinois, Urbana-Champaign, and retired as Research Professor of Biology at the Department of Biological, Chemical, and Physical Sciences at the Illinois Institute of Technology (IIT). His prominent research focused on the microbiology of food processing operations; growth of foodborne pathogens at low temperatures; interventions to reduce or eliminate pathogens from red meats and meat products; and laboratory and pilot plant detection and enumeration of *Listeria monocytogenes*, *E. coli* O157:H7, *Salmonella*, *Campylobacter jejuni*, and various other pathogens.

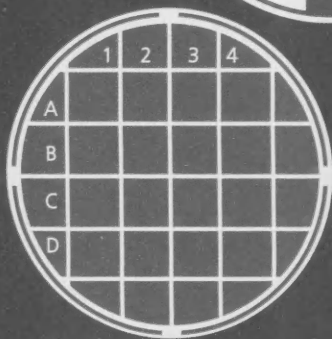
According to Robert Buchanan, Senior Science Advisor of DHHS/FDA/CFSAN, and echoed by numerous colleagues who spent time with him in the Agricultural Research Service of the US Department of Agriculture, Dr. Palumbo's scientific accomplishments and dedicated "contribution in organizing national and international conferences, supporting outreach programs, and his commitment to training the next generation of food microbiologists" rendered him a leader of public service through science.

An IAFF Member since 1991, Dr. Palumbo served on the Nominating Committee (2001–2004) and currently serves on the *JFP* Editorial Board.



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¹ NACMCF Executive Secretariat, "2007 Analytical utility of *Campylobacter* methodologies," U.S. Department of Agriculture, Food Safety and Inspection Service, Washington, D.C. Journal Food Protect. 70:241-250

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Former USDA Expert J. Stan Bailey Joins bioMérieux's Food Industry Management Team

BioMérieux recently announced the appointment of J. Stan Bailey, Ph.D., as director of scientific affairs for the Industrial Diagnostics business group. His new position became effective January 7, 2008.

Prior to joining bioMérieux, Dr. Bailey worked with the United States Department of Agriculture – Agricultural Research Service (USDA-ARS) for 34 years. He was responsible for research directed toward controlling and reducing contamination of poultry meat products by foodborne pathogens such as *Salmonella*, *Campylobacter*, and *Listeria*, and developing methods for recovery of these organisms from foods. Additionally, he has authored or coauthored more than 500 scientific publications in the area of food microbiology, concentrating on controlling *Salmonella* in poultry production and processing, *Salmonella* methodology, *Listeria* methodology, and rapid methods of identification.

"We are excited to bring Dr. Bailey's extensive experience and expertise to our food industry management team. The addition of such a distinguished food microbiologist will strengthen bioMérieux's leadership position in industrial microbiology," said Herb Steward, executive vice president, bioMérieux Inc.

Dr. Bailey is currently the President-Elect of The International Association for Food Protection

and will become the president in 2008. As scientific advisor to the International Life Sciences Institute Food Microbiology Committee, Dr. Bailey has worked closely with the directors of food safety for many of the largest food companies in the United States. Internationally, Dr. Bailey has served as an expert consultant to the Foreign Agriculture Organization of the United Nations.

Dr. Bailey is a Fellow of the American Academy of Microbiology and The International Association for Food Protection. He served as Chair of the Food Microbiology Division of the American Society of Microbiology in 1992 and as Secretary for the AOAC Microbial Methods Committee from 1990–95. He received his B.S. in environmental health sciences, M.S. in food science, and Ph.D. in poultry science from the University of Georgia.

3-A SSI Announces 2008 Officers and New Director

The 3-A Sanitary Standards, Inc. (3-A SSI) Board of Directors recently named Greg Marconnet (Kraft Foods, Inc.) chair and elected other officers for 2008. Dan Meyer (American Dairy Products Institute) was elected vice chair; David Tharp (International Association for Food Protection) was elected treasurer, and Warren S. Clark, Jr. (3-A Symbol Administrative Council, Inc.) was named secretary.

David Jamison, associate deputy administrator, dairy programs, USDA Agricultural Marketing Service was named to the 3-A SSI Board of Directors.

Other members of the 3-A SSI Board of Directors include Lee Blakely (Cheese and Protein International), Lou Beaudette (Admix, Inc.), Paul Gold (Pfizer Global Manufacturing Services), Larry Hanson, (Johnsonville Sausage, LLC), Robert F. Hennes (Chief, FDA/CFSSAN-Milk Safety Branch), Allen Saylor (International Dairy Foods Association), Ronald Schmidt (Food Science & Human Nutrition, University of Florida), Stephen Schlegel (Food Processing Suppliers Association) and F. Tracy Schonrock (3-A Steering Committee).

Tim York Named to UC Davis Center for Produce Safety Board

The Center for Produce Safety at UC Davis has named Tim York, president of Salinas-based Markon Cooperative, as chair of the center's new board of advisors. With 30 industry, academic, and regulatory members named to the advisory board of the Center for Produce Safety, UC Davis is poised to further advance its research and education partnerships on foodborne illnesses such as *E. coli*.

Mr. York brings a strong agricultural and food processing voice to the Center for Produce Safety. "Tim York's leadership on the advisory board will allow UC Davis, other research centers, the produce industry, and regulatory agencies to work together to establish the critical scientific foundation for best practices, that provide a safe food supply for the public," said Devon Zagory, interim executive director of the Center for Produce Safety.

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"The Center for Produce Safety is a critical step forward for the produce industry. The center's mission is to provide ready-to-use, science-based solutions that prevent or minimize produce-safety vulnerabilities. I am pleased to have been asked to serve the industry in this capacity," Mr. York said.

Mr. York formerly served as chair of the National Produce Marketing Association's board of directors and served on the US Department of Agriculture Fruit and Vegetable Industry Advisory Committee.

At the Center for Produce Safety's first advisory board meeting, Mr. Zagory and Mr. York worked with board members to establish priorities for the center, such as developing university and produce-industry partnerships, assimilating research data on produce safety, and establishing an ongoing research program.

The Center for Produce Safety (www.cps.ucdavis.edu <<http://www.cps.ucdavis.edu/>>) works closely with the Western Institute for Food Safety and Security (www.wifss.ucdavis.edu), also based at UC Davis, to address numerous food safety issues, including foodborne illnesses. The center was established in 2007, and will appoint its permanent executive director in February 2008.

Michelman Strengthens Leadership Team with Hiring of New CFO

Michelman has strengthened its executive leadership team, hiring Mr. Alan Blake as the company's new CFO and vice president, finance. Mr. Blake will assume responsibility for all aspects of the finance and IT departments.

In his new role, Mr. Blake will lead the retooling of the company's IT infrastructure and financial systems to support and improve efficiencies in Michelman's growing global operations.

According to Mr. Steve Shifman, president and CEO at Michelman, "Alan has extensive experience planning and implementing highly effective and aggressive growth plans for a variety of private and publicly held companies. His experience and knowledge lends itself perfectly to streamlining our global communications, and establishing financial efficiencies between our sales, support and manufacturing facilities around the world. As a larger percentage of our increasing revenue shifts outside North America, it is critical our communications and financial structure keeps pace and continues to allow us to grow, without compromising the world-class products, service and support our customers have come to expect."

A Miami University (Oxford, OH) alum, Mr. Blake was most recently executive vice president and CFO for Rogers Ltd., Inc., with responsibility for all financial, IT and loss-prevention issues. He also held positions with Arthur Anderson and Totes, Inc.

Lynn Dyer Named Vice President at FPI

The Foodservice Packaging Institute (FPI) announced the appointment of Lynn M. Dyer as vice president of the association.

Ms. Dyer joined the Institute in 1998 after working as a consultant for Eamonn Bates Europe Public

Affairs in Brussels, Belgium, where she helped manage the European Food Service & Packaging Association.

A 1994 graduate of the University of Richmond with a BA in international studies, Ms. Dyer most recently served as director of marketing at the Institute, producing the organization's annual "State of the Industry" report, and directing a variety of the Institute's market research initiatives.

In addition, Ms. Dyer has been responsible for organizing the Institute's spring and fall meetings, managing the association's linen and lace, egg packaging and food packaging tray divisions, and serves as administrator of the annual Samuel J. Crumbine Award for Excellence in Food Protection, a nationally recognized program honoring the country's outstanding local government food protection program.

FKI Logistex Canada Appoints Michael Bell Customer Service and Support Manager

FKI Logistex announces the appointment of Michael Bell to the position of manager, customer service and support, FKI Logistex Canada. Mr. Bell leads the recently expanded FKI Logistex regional service organization in Canada, which provides enhanced support to customers in the warehouse and distribution, manufacturing, airport, post and parcel markets.

Mr. Bell has 10 years of experience with FKI Logistex, beginning as a site technician at an automated storage and retrieval (AS/RS) distribution plant in

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Glasgow, Scotland. Soon after his promotion to site supervisor, he was transferred to North America as a Toronto-based service coordinator, serving customers in Canada and the United States.

3-A SSI Names New Certified Conformance Evaluator

Mr. Paul (Lynn) Sturgill recently completed the requirements for accreditation by 3-A Sanitary Standards, Inc. as a certified conformance evaluator (CCE). Based in Arvada, Colorado, Lynn is the principal of Sturgill Welding & Code Consulting. He provides engineering consulting in the areas of welding, corrosion, materials selection, code compliance, specification review, and code-compliant welding documentation.

The CCE designation is required for those wishing to conduct Third Party Verification (TPV) inspections of dairy equipment covered by 3-A Sanitary Standards. The TPV was implemented by 3-A SSI in 2003 as a requirement for equipment manufacturers or used equipment resellers to obtain or renew authorization to use the 3-A Symbol. The authorized use of the 3-A Symbol on such equipment shows conformance to 3-A Sanitary Standards for sanitary equipment design, fabrication and construction materials.

A total of 22 professionals hold the CCE credential. To qualify

for the credential, a candidate must meet specific education and professional experience requirements and pass a written examination to demonstrate the ability to review and evaluate complex processes, knowledge of the types of equipment and processes to which 3-A Sanitary Standards are applied, and the ability to interpret engineering drawings pertaining to manufacturing equipment and instrumentation for the food processing industries.

Complete details on 3-A SSI inspection program requirements and a current roster of the CCEs are available at the 3-A SSI web site at www.3-a.org, see The 3-A Symbol and Third Party Verification, Certified Conformance Evaluators.

Bonnie Fernandez Named to Lead Produce Safety Center at UC Davis

Wheat industry executive Bonnie Fernandez has been selected as the new executive director of the Center for Produce Safety at the University of California, Davis.

Ms. Fernandez, who currently serves as the executive director of the California Wheat Commission, assumed the new position on March 1.

"Bonnie Fernandez brings to this position a wealth of knowledge and practical experience in California agriculture," said Neal Van Alfen, dean of UC Davis' College

of Agricultural and Environmental Sciences. "She will help establish the critical partnerships that are necessary to provide a safe food supply, from the farm to the consumer's table."

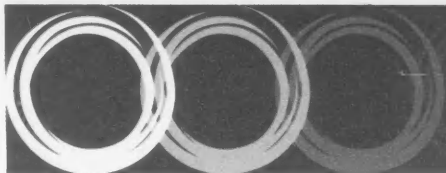
Tim York, chair of the center's board of advisers and president of the Salinas-based Markon Cooperative said, "We look forward to the leadership Bonnie will provide for the Center for Produce Safety as we move forward to develop workable, science-based solutions that will safeguard the food supply and strengthen California's produce industry."

Ms. Fernandez has served with the California Wheat Commission since 1984, including 15 years as the commission's executive director. She holds a master's degree in business administration from California State University, Sacramento, and a bachelor's degree in agricultural business management from California Polytechnic State University, San Luis Obispo.

She has served on various US Dept. of Agriculture advisory committees, is currently a member of the Agri-Business President's Council and chair of the US Wheat Associates Food Aid Working Group. She was the first chair of US Wheat Associates Phytosanitary Committee.

The Center for Produce Safety, established in April 2007, is intended to be a clearinghouse for research related to produce safety. Plant scientist Devon Zagory has served as its interim director since October.

www.foodprotection.org



Ireland: Fifty-Four Percent Increase in Food Safety Enforcement Orders in 2007

The Food Safety Authority of Ireland (FSAI) has stated that there were a total of 57 Enforcement Orders served for breaches in food safety legislation in 2007 compared with 37 in 2006 – up 54%. This is the highest number of Enforcement Orders served in the past three years. The FSAI warned food business operators to put in place and adhere to robust food safety measures and to make this the key business priority for 2008.

Between January 1 and December 31, 2007, enforcement officers served 37 Closure Orders, 5 Improvement Orders and 15 Prohibition Orders on food businesses throughout the country. This compares with 27 Closure Orders, 7 Improvement Orders and 3 Prohibition Orders issued in 2006. The FSAI is urging all food business operators to prioritize their food safety and hygiene practices in 2008 and to ensure that all staff involved in food production or preparation are adequately trained and/or supervised in food hygiene practices. Commenting on the annual figures, Dr. John O'Brien, chief executive, FSAI stated that the FSAI and its official agencies will continue to implement a rigorous inspection policy throughout 2008 to ensure full compliance with food safety legislation is achieved industry wide.

"The 2007 figures represent a 54% increase on the 2006 figures which is disappointing. Consumers have a right to expect the highest standards in food safety when they

are purchasing food. Food businesses must comply with not only their legal obligations but their business obligations to supply safe food to their customers. Those food businesses who continue to flout the law and fail or refuse to implement the food safety prerequisites will face the consequences. Consumer protection is the driving force of our organization and the food inspectorate. Enforcement officers only resort to using their legal powers to close a premises when standards have fallen so low that consumer health has been put at risk. They will continue to apply the full rigors of the law until all food businesses understand their legal responsibility to implement a food safety management system and produce food that is safe to consume," Dr. O'Brien said.

"The number of Enforcement Orders issued in 2007 is the highest since 2004 and reverses the downward trend in enforcements apparent over the last number of years. Consumers have to be confident that the food they are eating is safe. Food business operators should take full advantage of the information and support made available by the FSAI and the enforcement officers to ensure a suitable food safety management plan is developed and put in place in line with legal requirements," Dr. O'Brien concluded.

The details of the businesses served with these Orders are published on the FSAI Web site at www.fsai.ie. Closure and Improvement Orders will remain listed on the Web site for a period of three months from the date of when a premises is adjudged to have corrected its food safety issue, with Prohibition Orders being listed for a period of one month.

3-A SSI Announces New Volunteer Service Awards

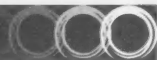
3-A Sanitary Standards, Inc. (3-A SSI) recently announced a new Volunteer Service Awards program to recognize the extraordinary dedication and commitment of individuals who contribute to the development of voluntary standards and the mission of 3-A SSI. The three new annual awards constitute a highly visible and significant form of recognition for the outstanding service of individuals to the advancement of 3-A SSI.

The new 3-A SSI awards include the following:

The **Leadership Service Award** is presented to an individual or group who demonstrates a record of significant contribution to 3-A SSI voluntary standards development and who has demonstrated outstanding service in enabling 3-A SSI to attain its objectives. Accomplishments may include leading a major new activity, reducing the cycle time of development, revitalizing a 'dormant' activity or other outstanding service.

The **3-A SSI Advancement Award** honors outstanding accomplishments performed by any individual or group on behalf of 3-A SSI, such as advancing the use or industry recognition of 3-A Sanitary Standards or 3-A Accepted Practices.

The **Next Generation Award** honors an individual who has been engaged in 3-A SSI standards development activities for less than five years and has demonstrated leadership, dedication and significant contributions to the development of 3-A Sanitary Standards or 3-A Accepted Practices.



According to 3-A SSI Executive Director Tim Rugh, "3-A SSI relies on a network of engaged and committed volunteers to forge consensus on the voluntary standards and practices and we should all recognize the immense contribution they make to this organization and to the goal of advancing public health."

More details on the new program and a Nomination Form are available on the 3-A SSI Web site at www.3-a.org under News & Events. The deadline for 2008 nominations is April 4, 2008. Awards will be presented at the 3-A SSI Annual Meeting on May 21, 2008 in Milwaukee, WI.

US-FDA Issues Documents on the Safety of Food from Animal Clones

After years of detailed study and analysis, the Food and Drug Administration has concluded that meat and milk from clones of cattle, swine, and goats, and the offspring of clones from any species traditionally consumed as food, are as safe to eat as food from conventionally bred animals. There was insufficient information for the agency to reach a conclusion on the safety of food from clones of other animal species, such as sheep.

FDA has issued three documents on animal cloning outlining the agency's regulatory approach — a risk assessment; a risk management plan; and guidance for industry.

The documents were originally released in draft form in December 2006. Since that time, the risk assessment has been updated to include new scientific information. That new information reinforces the food safety conclusions of the drafts.

In 2001, US producers agreed to refrain from introducing meat or milk from clones or their progeny into the food supply until FDA could further evaluate the issue. The US Dept. of Agriculture will convene

stakeholders to discuss efforts to provide a smooth and orderly market transition, as industry determines next steps with respect to the existing voluntary moratorium.

The agency is not requiring labeling or any other additional measures for food from cattle, swine, and goat clones, or their offspring because food derived from these sources is no different from food derived from conventionally bred animals. Should a producer express a desire for voluntary labeling (e.g., "this product is clone-free"), it will be considered on a case-by-case basis to ensure compliance with statutory requirements that labeling be truthful and not misleading.

Because clones would be used for breeding, they would not be expected to enter the food supply in any significant number. Instead, their sexually reproduced offspring would be used for producing meat and milk for the marketplace. At this time, the agency continues to recommend that food from clones of species other than cattle, swine and goat (e.g., sheep) not be introduced into the food supply.

An animal clone is a genetic copy of a donor animal, similar to an identical twin, but born at a different time. Cloning is not the same as genetic engineering, which involves altering, adding or deleting DNA; cloning does not change the gene sequence. Due to their cost and rarity, clones are intended to be used as elite breeding animals to introduce desirable traits into herds more rapidly than would be possible using conventional breeding.

The risk assessment finds that meat and milk from clones of cattle, swine, and goats, and food from the sexually reproduced offspring of clones, are as safe to eat as food from conventionally bred animals. The science-based conclusions agree with those of the National Acad-

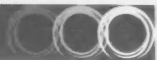
emy of Sciences, released in a 2002 report. The assessment was peer-reviewed by a group of independent scientific experts in cloning and animal health. They found the methods FDA used to evaluate the data were adequate and agreed with the conclusions set out in the document.

The risk assessment presents an overview of assisted reproductive technologies widely used in animal agriculture, the extensive scientific information available on the health of animal clones and their sexually reproduced offspring, and an assessment of whether food from clones or their sexually reproduced offspring could pose food consumption risks different from the risks posed by food from conventionally bred animals. These conclusions were first presented in draft documents over a year ago. Since then, the agency has updated the risk assessment with data that became available, as well as taking into account comments from the public comment period.

"After reviewing additional data and the public comments in the intervening year since the release of our draft documents on cloning, we conclude that meat and milk from cattle, swine, and goat clones are as safe as food we eat every day," said Stephen F. Sundlof, D.V.M., Ph.D., director of FDA's Center for Food Safety and Applied Nutrition. "Our additional review strengthens our conclusions on food safety."

The risk management plan outlines measures that FDA has taken to address the risks that cloning poses to animals involved in the cloning process. These risks all have been observed in other assisted reproductive technologies currently used in common agricultural practices in the United States.

FDA is currently working with scientific and professional societies with expertise in animal health and reproduction to develop standards



of care for animals involved in the cloning process. Although the agency is not charged with addressing ethical issues related to animal cloning for agricultural purposes, FDA plans to continue to provide scientific expertise to interested parties working on these issues.

The guidance for industry addresses the use of food and feed products derived from clones and their offspring. It is directed at clone producers, livestock breeders, and farmers and ranchers purchasing clones, and provides the agency's current thinking on use of clones and their offspring in human food or animal feed.

In the guidance, FDA does not recommend any special measures relating to the use of products from cattle, swine, or goat clones as human food or animal feed. Because insufficient information was available on clones from other species, e.g., sheep clones, to make a decision on the food consumption risks, the guidance recommends that food products from clones of other species continue to be excluded from the human food supply. The guidance states that food products from the offspring of clones from any species traditionally consumed for food are suitable to enter the food and feed supply.

For more information, visit <http://www.fda.gov/cvm/cloning.htm>.

AMI Foundation and NMA Host Well-Attended Briefing Aimed at Confronting Challenge of *E. coli* O157:H7

The American Meat Institute Foundation (AMIF) and the National Meat Association hosted a briefing in Washington, D.C., to confront the challenge *E. coli* O157:H7 poses to the beef industry.

Nearly 150 industry members, academics and government officials shared information about *E. coli* O157:H7's incidence in beef and in other foods and the pathogen's impact on public health. Experts also detailed recommended best practices for *E. coli* control during slaughter and processing, as well as lotting, sampling and testing best practices that can help track and retrieve product when necessary.

AMI President and CEO J. Patrick Boyle opened the briefing by detailing the progress that the industry has made over the last two decades in enhancing beef safety, but acknowledged that trends in 2007 gave the beef industry pause. A slight up-tick in *E. coli* O157 incidence in ground beef represented a departure from the sustained declines that have been observed since 2000.

"We all share a common goal: to produce the safest beef possible," Mr. Boyle said. He noted that given the industry's food safety track record, "Much is expected of industry, and rightfully so. We are eager to meet those expectations."

USDA Under Secretary for Food Safety Richard Raymond, M.D., said USDA is redoubling efforts to ensure meat safety through actions including enhanced sampling programs and a new more sensitive test method to detect *E. coli* O157:H7. Despite many questions surrounding the cause of the uptick in *E. coli* O157, Mr. Raymond said "I don't believe the industry got complacent."

He detailed the agency's use of "Public Health Alerts" to convey information when insufficient details are known to recommend recalling a specific product. While he acknowledged that these alerts have been controversial, he indicated that the industry can expect them to be used periodically going forward.

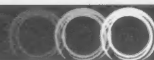
Mr. Raymond detailed USDA's agenda to turn the trend, he also offered reassurance: "It's not a disaster. People should not be afraid to eat ground beef."

Centers for Disease Control Chief of the Enteric Diseases Epidemiology Branch Patricia Griffin, M.D., offered a detailed examination of the epidemiology surrounding human cases of *E. coli* O157, as well as consumer food safety behavior. While she did not have foodborne illness trend data for 2007, she said she was not expecting major changes and predicted that the trends would be "close to the status quo."

A panel of industry experts representing a cross-section of industry segments detailed industry best practices that have been successfully implemented to reduce *E. coli* O157 in beef products. The best practices have been developed through a collaborative effort with the Beef Industry Food Safety Council and are updated periodically.

Guy Lonergan, Ph.D., gave an extensive review of pre-harvest research to reduce colonization and prevalence of *E. coli* O157 in beef cattle. While Dr. Lonergan highlighted very promising pre-harvest technologies, representatives of USDA and FDA gave an overview of the approval and licensing procedures for drugs and vaccines that are a major hurdle in rapid implementation of pre-harvest technologies.

National Cattlemen's Beef Association Vice President of Issues Management Rick McCarty presented data showing an increase in consumer concern about beef safety in the autumn of 2007 following intense beef safety and recall-related media coverage, but showed data collected in January 2008 indicated that confidence returned as intense coverage eased.



Mr. McCarty also said NCBA data indicate that despite federal and industry recommendations that consumers use instant-read thermometers to validate cooking temperatures, only 17 percent do so. He also said that the majority of consumers rely strongly on visual cues to determine doneness, despite the fact that these visual cues are not accurate indicators of doneness.

Fighting Foodborne Illness

The bacterium *Escherichia coli* O157:H7 is notorious for causing foodborne illness. When it infects people, one would like to know as soon as possible which of two possible Shiga toxins the infectious microorganism is producing, as one is much more dangerous than the other. A set of newly identified glycoconjugates may lead to a practical, inexpensive diagnostic for these toxins, which are named for the Japanese researcher who discovered the bacterial cause of dysentery.

Epidemiological studies have shown that if *E. coli* O157:H7 introduces Shiga toxin 2 (Stx_2) into a person's gastrointestinal tract, that person has a significant risk of developing hemolytic uremic syndrome—a cause of brain damage, renal failure, and death. Stx_1 is only weakly associated with the syndrome, so patients with Stx_2 need to be monitored and treated more vigilantly than those with Stx_1 .

Stx_1 and Stx_2 can be distinguished with monoclonal antibodies, but antibodies are expensive and require cold storage, which is not always feasible in developing countries, where most *E. coli* O157:H7 infections occur. Now, Alison A. Weiss, Suri S. Iyer, and coworkers at the University of Cincinnati

have identified two glycoconjugates that can differentiate between the two Shiga toxins at potentially less expense and without any need for reagent refrigeration (Angew. Chem. Int. Ed., DOI: 10.1002/anie.200703680).

Each glycoconjugate consists of a carbohydrate recognition element that binds selectively to Stx_1 or Stx_2 , a flexible spacer, and a biotin group. Streptavidin binding to the biotin group can be used to immobilize the glycoconjugate on a solid surface or bead for biosensor use. In the study, the glycoconjugates captured Stx_1 or Stx_2 in a highly selective manner from human stool samples.

Weiss, Iyer, and coworkers now hope to study the factors that govern the glycoconjugates' selectivity. They also aim to develop a simple assay kit for Stx_1 and Stx_2 . Such a kit "would prove extremely useful in outbreak situations, because it would enable doctors to tell which patients can go home and which need to be admitted" to a medical facility for further treatment, Iyer says. The glycoconjugate strategy might also be applicable to other toxins and pathogens, he notes. "For example, glycoconjugates might be tailored synthetically to capture specific variants of influenza virus, including the highly pathogenic avian flu," he says.

Although more study is needed to characterize the fundamental basis for the interactions, the approach "could potentially be developed into a rapid and accurate point-of-care diagnostic tool that would help physicians decide whether they need to worry about hemolytic uremic syndrome or not," comments physical organic chemist Eric J. Toone of Duke University.

Federal Oversight of Food Safety: FDA's Food Protection Plan

The Food and Drug Administration (FDA) is responsible for ensuring the safety of roughly 80 percent of the US food supply, including \$417 billion worth of domestic food and \$49 billion in imported food annually. The recent outbreaks of *E. coli* in spinach, *Salmonella* in peanut butter, and contamination in pet food highlight the risks posed by the accidental contamination of FDA-regulated food products. Changing demographics and consumption patterns underscore the urgency for effective food safety oversight. In response to these challenges, in November 2007, FDA and others released plans that discuss the oversight of food safety. FDA's Food Protection Plan sets a framework for food safety oversight. In addition, FDA's Science Board released FDA Science and Mission at Risk, which concluded that FDA does not have the capacity to ensure the safety of the nation's food supply. This testimony focuses on (1) federal oversight of food safety as a high-risk area that needs a government-wide reexamination, (2) FDA's opportunities to better leverage its resources, (3) FDA's Food Protection Plan, and (4) tools that can help agencies to address management challenges. To address these issues, GAO interviewed FDA officials; evaluated the Food Protection Plan using a GAO guide for assessing agencies' performance plans; and reviewed pertinent statutes and reports. GAO also analyzed data on FDA inspections and resources.

FDA is one of 15 agencies that collectively administer at least 30 laws related to food safety. This fragmentation is the key reason GAO added the federal oversight of food safety to its High-Risk



Series in January 2007 and called for a government-wide reexamination of the food safety system. We have reported on problems with this system, including inconsistent oversight, ineffective coordination, and inefficient use of resources. FDA has opportunities to better leverage its resources. Efficient use of resources is particularly important at FDA because we found that its food safety workload has increased in the past decade, while its food safety staff and funding have not kept pace. GAO has recommended that FDA establish equivalence agreements with other countries to shift some oversight responsibility to foreign governments, explore the potential for certifying third party inspections, and consider accrediting private laboratories to inspect seafood, among other actions. We also reported that FDA and the US Dept. of Agriculture (USDA) conduct similar inspections at 1,451 facilities that produce foods regulated by both agencies. To reduce overlaps,

we recommended that, if cost-effective, FDA enter into an agreement to commission USDA inspectors at such facilities. FDA incorporated some of these recommendations in its Food Protection Plan. FDA's Food Protection Plan also proposes some positive first steps intended to enhance its oversight of food safety. Specifically, FDA requests authority to order food safety recalls and issue additional preventive controls for high-risk foods, both of which GAO has previously recommended. However, more specific information about its strategies and the resources FDA needs to implement the plan would facilitate congressional oversight. FDA officials acknowledge that implementing the Food Protection Plan will require additional resources. Without a clear description of resources and strategies, it will be difficult for Congress to assess the likelihood of the plan's success in achieving its intended results. The Science Board cites numerous management challenges

that have contributed to FDA's inability to fulfill its mission, including a lack of a coherent structure and vision, insufficient capacity in risk assessment, and inadequate human capital recruitment and retention. In light of these challenges, GAO has identified through other work some tools that can help agencies improve their performance over time. For example, a Chief Operating Officer/Chief Management Officer can help an agency address longstanding management problems that are undermining its ability to accomplish its mission and achieve results. In addition, a well-designed commission can produce specific practical recommendations that Congress can enact. Critical success factors that can help ensure a commission's success include a statutory basis with adequate authority, a clear purpose and timeframe, leadership support, an open process, a balanced membership, accountability, and resources.

In Memory

William L. Arledge

We extend our deepest sympathy to the family of William Arledge who recently passed away. IAFP will always have sincere gratitude for his contribution to the Association and the profession. Mr. Arledge has been a member of IAFP since 1957 and was President of the Association in 1981.

INDUSTRY PRODUCTS



Torrey Pines Scientific, Inc.

Heating and Chilling Laboratory Equipment from Torrey Pines Scientific, Inc.

Torrey Pines Scientific, Inc. has announced its new line of analog hot plates, stirrers and stirring hot plates. These units feature large 12" (30.48 cm) square heater tops in a choice of ceramic or milled-flat cast aluminum. The temperature range is to 450°C with stirring of aqueous solutions up to 10 liters from 100 to 1500 rpm.

The units can support more than 50 pounds (22.6 kg) on the plate surface, and they are designed to keep spills out of the chassis. All controls are mounted well in front of the heater surface to protect the user against accidental burns.

The units are available in 100VAC/50Hz, 115VAC/60Hz, 220VAC/60Hz and 230VAC/50Hz, are fused for safety and are UL, CSA and CE rated.

Torrey Pines Scientific, Inc.

866.573.9104

San Marcos, CA

www.torreypinesscientific.com

QMI® Aseptic Sampling Method Approved for Use by Milk Haulers and Dairy Plants

Recent publication of FDA memo RIMS-a-46 Actions of the 2007 National Conference on Interstate Milk Shippers, authorizes use of the QMI® aseptic sampling system for sampling milk tanker trucks.

Bob Gilchrist, fluid milk marketing and transportation manager of Agri-Mark said, "We have found the QMI aseptic sampling method to be a safe, convenient, accurate and economical method of sampling milk tanker trucks. The QMI system is exactly what this industry needs to sample without having to open the top hatch of the milk tanker."

The QMI method of sampling from the side or rear of a locked compartment on a milk tanker truck has several advantages. First, the QMI method allows for a more accurate and representative sample. The sample is also collected aseptically, meaning it reduces the chance of contamination of the milk by bacterial, chemical or environmental contaminants. Second, it helps with receiving bay efficiency by allowing samples to be taken before trucks enter the receiving bay. This benefit is a particular advantage to milk processors facing a continual issue of congestion and delay in milk unloading. Third, this method helps the industry comply with the Bioterrorism Preparedness and Response Act by controlling access to the milk load. Finally, it improves sampling safety by allowing samples to be taken from the ground, meaning drivers and milk plant employees are

no longer required to make the dangerous climb to the top of the milk tanker truck to collect samples.

Darrell Bigalke, president of QMI, stated, "This application of the QMI aseptic sampling method provides a significant benefit to the dairy industry. For the first time dairy processors and milk haulers will be able to collect clean, representative samples of their milk load, and do it efficiently and safely."

An FDA guided study was conducted, comparing the QMI method of sampling to the currently approved method of dip sampling. The FDA found that the data collected by the two methods were not statistically different and determined that the QMI aseptic sampling method is an equivalent and reasonable alternative to dip sampling. This is good news for the dairy industry.

Quality Management, Inc.

651.501.2337

Oakdale, MN

www.qmisystems.com

New AccuFill™ Quad-Batching System from Gainco Provides High-Speed Operation, Superior Accuracy, and Labor Savings for Red Meat Processors

The new AccuFill™ Quad-Batching System for red meat from Gainco, Inc. provides the most efficient, high-speed way to collect and group red meat items such as loose meats, finger meat and variety meats for downstream bagging procedures. The system combines superior weighing accuracy with

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efficiency improvements, resulting in significant labor savings and a more streamlined process.

Suitable for processing whole muscle meats as well as further processed products, Gainco's AccuFill™ Quad-Batching System collects, weighs, batches and can count four separate streams of incoming product. The finished batches are then indexed and moved to a downstream bagging operation for final handling.

The design of Gainco's AccuFill™ Quad-Batching System offers many benefits to food processors. Logistics and process efficiencies are improved, while labor savings of three-to-four full-time employees per work shift are attainable. The labor savings alone enables the system to deliver an ROI of less than 12 months.

An important feature of the Quad-Batching System is Gainco's own Infiniti™ Plus programmable controller, providing protection against washdown water and condensation thanks to a highly durable polymeric housing that protects the weighing apparatus equally well in cold work environments or during hot washdowns and high-pressure washing. Likewise, the housing is impervious to the harsh chemicals typically used in washdown procedures in meat, poultry and seafood processing environments. The unit is NTEP-certified, and third-party tests show that the controller's performance meets the stringent IP69K washdown standard.

Further enhancing the effectiveness of washdown activities is the "sanitary" open-frame construction of the AccuFill™ Quad-Batching sys-

tem. In washdown mode, all weight hopper buffers are opened and the conveyor is run, facilitating a time- and cost-efficient cleaning cycle, thereby dramatically simplifying sanitation procedures. The open-frame design also simplifies access to the equipment for performing maintenance procedures.

Gainco's Dataman® Data Collection System, available for use with AccuFill™ Quad-Batching 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 is provided to plant managers and corporate executives via a network interface. The raw data can then be moved to popular databases such as Oracle, SQL Server and DB2.

Gainco, Inc.
800.467.2828
Gainesville, GA
www.gainco.com

BAX® System Real-Time PCR Assay for *S. aureus* Certified by AOAC-RI

A BAX® system assay from DuPont Qualicon that uses real-time PCR to detect *Staphylococcus aureus* (*S. aureus*) has been certified as Performance TestedSM Method No. I20701 by the AOAC Research Institute in Gaithersburg, MD.

The AOAC Research Institute is a non-profit international, scientific organization that provides an independent third-party review of

test kit performance claims. Food processors who require an AOAC-approved testing method can now use the BAX® system assay for quick and reliable detection of *S. aureus*, a foodborne species that has been implicated in human illness. As validated on powdered infant formula, the assay's sensitivity can detect one viable cell in a gram of product. For quality testing in ground beef and soy protein isolates, threshold values can also be determined by modifying the sample preparation protocol. Results are comparable to traditional culture methods but available next-day, with less than 90 minutes processing time.

"Because even small amounts of toxin from *S. aureus* can cause food poisoning, processors count on the BAX® system for accurate, reliable detection," said Kevin Huttman, president of DuPont Qualicon. "This approval from AOAC adds value to the BAX® system line of certified products, all designed to help food companies protect their products and their brands."

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

DuPont Qualicon
302.695.5300
Wilmington, DE
www.dupontqualicon.com

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Biolog Initiates Launch of Its Revolutionary GEN III Microbial Identification System

Bilog, Inc. began the launch of its 3rd generation microbial ID system with the first public presentation detailing how the system works.

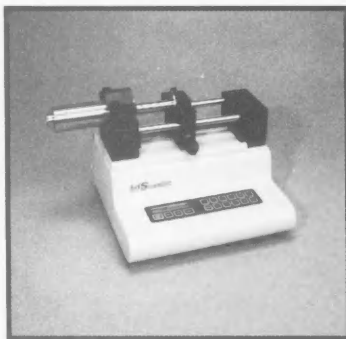
The new GEN III System is built around a single test panel that can be used to identify more than 1,000 species of gram-negative and gram-positive bacteria. Set-up consists of a simple one-minute protocol and no Gram-stain, pre-tests or follow-on tests are required. Previous Biolog ID systems identified 800 species and used two panels, one for gram-negative bacteria and a different panel for gram positive bacteria. Bacterial ID systems from other companies utilize 2 or more panels and identify only about 300 species. The GEN III system is revolutionary in its speed and simplicity of testing as well as in its broad and comprehensive species coverage.

The 96-well GEN III Micro-Plate™ panel incorporates 71 carbon source and 23 chemical sensitivity assays in a pre-coated dry chemistry format. With these 94 tests, the system analyzes a bacterial cell's properties including its ability to metabolize all major classes of biochemicals and its sensitivity to chemicals that may inhibit growth. The colorimetric pattern or "fingerprint" generated by the bacterium is automatically interpreted against GEN III's extensive species library.

Biolog's customers work in diverse disciplines of microbiology. The new system is fully compatible with previous Biolog systems, allowing the customer base to quickly and easily upgrade. Using GEN III

in conjunction with Biolog's other microbial identification databases, over 2,200 species of bacteria, yeast and filamentous fungi can be identified quickly and easily.

Biolog, Inc.
800.284.4949
Hayward, CA
www.biolog.com



KD Scientific

KD Scientific High Pressure Syringe Pump for Pumping into Reaction Vessels

KD Scientific has introduced the new Model KDS 410, a high pressure syringe pump capable of pushing 2, 4, 6, or 10 syringes simultaneously into reaction vessels.

The new high pressure pump works with syringes from 10 µl up to 140 ml to provide accurate flow delivery from 1 nl/min to 145.5 ml/min.

The KDS 410, with its powerful 230 pounds of linear force, is ideal for delivery of flow to chemical reactors or for viscous fluids being fed into aerosol nozzles. The pump can be triggered remotely by a foot pedal or a switch.

The KDS 410 can also interface to a computer through the RS 232 interface.

Other applications for the KDS 410 are in pharmaceutical, chemical, petrochemical, biotechnology, semiconductor, plastics, industrial, government, scientific research and development markets.

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

KD Scientific
508.429.6809
Holliston, MA
www.kdscientific.com

Nilfisk CFM 118 Industrial Vacuum

Each year, too many food manufacturers purchase ineffective, poor quality shop-style vacuums, commonly sold in retail stores. Even when used for ordinary housekeeping functions, these vacuums, while low in cost, quickly find their way onto the trash heap due to motor burn-ups and inefficient operation. The Nilfisk CFM 118 industrial vacuum, which specifically addresses the maintenance issues of food plants, combines powerful suction and outstanding filtration in a portable design that is built to last; actually saving manufacturers money in the long run.

The smallest vacuum in the CFM line, the 118 is compact and easy-to-use. It's built for maximum suction power, with a large main filter that prevents premature clogging, and a special external filter shaker that enables users to shake the main filter free of dust without opening the vacuum. When equipped with an optional HEPA filter, this unit retains 99.995% of all collected ultra-fine particles, down to and including 0.18 microns. Other features include a by-pass motor and

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easy-to-remove wheeled collection container.

In addition, the Nilfisk CFM 118 can be equipped with a variety of accessories and filters that are ideal for use in food manufacturing plants, such as those for overhead and high-temperature cleaning, and special applications that require anti-static hose/accessories or NOMEX filters.

Nilfisk-Advance America, Inc.

610.647.6420

Malvern, PA

www.pa.nilfisk-advance.com

Efficient New Homogenizer Design from APV Invensys

The new APV 110T Homogenizer combines good looks with innovative technology, delivering powerful performance and making life easier for service and maintenance crews and operators alike. The result is the APV 110T Homogenizer in a radically new design and with a number of defining, best-in-class features.

The APV 110T Homogenizer for dairy, food, cosmetic, chemical, pharma, and bio-tech applications is available in two versions – a Rannie series with three-piece valve housing and a Gaulin series with mono-block valve housing. Both series offer capacities ranging from 660 gph to a huge 5544 gph.

The new modular design makes the APV 110T suitable for a wide range of applications and valve types. Homogenizing valves can easily be changed to accommodate different products and/or capacities on the same homogenizer.

The operating panel is located in one corner providing a clear view of and access to all external gauges and controls from a single point of



APV Invensys

operation. The Liquid End, the major source of noise, is located farther away from the operator, thus providing a significant noise reduction. The Power End, which is concealed under stainless steel panels, has also been redesigned to enable higher performance and provide direct service access.

The side panels are locked by quarter turn key-locks for safety reasons, and can be easily lifted off the bottom hinges to reduce service area. Once the side panels have been removed, the top can be lifted off without the use of any tools. At slightly less than 5 feet tall, the height of the homogenizer facilitates removal of the top.

The front right of the operator panel is a double-sized, 5 microns oil filter that increases the intervals between oil changes. An easily accessible external APV heat exchanger reduces water consumption and facilitates service and maintenance. This design also saves valuable repair time by ensuring the separation of oil and water in the event of a failure. The electrical control box behind the panel below the controls also enables servicing from the outside.

The Power End features a balanced, low-speed crankshaft for reduced noise. The crankshaft is also

available in a special, heat-treated alloy delivering increased power, either to increase capacity or to maintain capacity at a lower speed in order to reduce noise and wear.

The internal gear unit, which eliminates the need for a second cooling system, is located as close as possible to the drive in order to deliver maximum power and increase service life. A special spring also enables self-adjusting belt tightening, thus eliminating the need for belt maintenance and typically increasing belt life to 25,000 hours of operation.

The Liquid End ensures backward compatibility with existing spares, and features interchangeable XFD, SEO and LW valve types and sizes in order to facilitate spare parts stocking at customer premises. The APV Micro-Gap homogenizing valve ensures maximum homogenizing efficiency and control, and all materials and packings conform to high hygiene standards, making the APV 110T Homogenizer suitable for a wide range of demanding applications.

An enhanced, concrete sub-frame contributes significantly to noise reduction, dampens vibrations, and optimizes stability. Additional noise insulation options include an insulating cabinet for the power end and a liquid end extension in the form of an add-on kit.

The all-round enhancements featured in the new APV 110T Homogenizer add up to a significant gain in performance and service life of the various components, as well as cutting maintenance time by facilitating removal of covers and providing direct and easy access to components.

APV Invensys

920.648.8311

Lake Mills, WI

www.apv.com

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PROPOSED SYMPOSIA TOPICS AND ROUNDTABLES

SYMPOSIA:

- 2008 Foodborne Disease Outbreak Update:
Salmonella in Processed Foods
- Bacterial Physiology—A Forgotten Theme That
is Critical for the Food Microbiologist
- Back to the Future: How Clinical Microbiology
Findings Today Predict the Food Microbiology
Headaches for Tomorrow
- Coming Out of the *Campylobacter* Closet:
International Strategies for Reducing Human
Campylobacteriosis
- Food Safety and Regulatory Issues Associated
with Non-Thermal Processing of Foods and
Beverages from Fish to Table
- CSI Beverage Plant: Case Studies in Yeast
and Mold Spoilage
- Harmonization of Irrigation Water Practices
Best Practices in Global Food Export and Import
- Sampling and Sample Prep: Unglamorous but Very
Necessary
- Globalization of Acceptance Criteria for Micro-
biological Methods: Separating the Science
from the Politics
- Dairy Pasteurization in Today's Risk-Based Food
Safety Environment – International Perspectives
on the Use of Risk Assessment Tools
- Food Safety Issues in Food Transportation –
Keeping It Cold and Keeping It Clean
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Eating Seafood—Is It Worth the Risk?

The Sequel to the Mystery Outbreak—What to Do
When It Happens to You

Subject to change



IAFP 2008 NETWORKING OPPORTUNITIES

IAFP FUNCTIONS

WELCOME RECEPTION

Saturday, August 2 • 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, August 2 • 3:00 p.m. – 4:30 p.m.

Sunday, August 3 • 7:00 a.m. – 5:00 p.m.

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

STUDENT LUNCHEON

Sunday, August 3 • 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, August 3 • 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, August 3 • 6:00 p.m. – 7:00 p.m.

Join us to kick off IAFP 2008 at the Opening Session. Listen to the prestigious Ivan Parkin Lecture delivered by Dr. Russell S. Flowers.

CHEESE AND WINE RECEPTION

Sunday, August 3 • 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, August 3 through Wednesday, July 6

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

COMMITTEE AND PDG CHAIRPERSON

BREAKFAST (By invitation)

Monday, August 4 • 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, August 4 • 12:00 p.m. – 1:00 p.m.

Sponsored by JohnsonDiversey

Tuesday, August 5 • 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, August 4 • 5:00 p.m. – 6:00 p.m.

Sponsored by DuPont Qualicon

Tuesday, August 5 • 5:00 p.m. – 6:00 p.m.

Sponsored in part by The Kroger Co., Q Laboratories, Inc., Quality Assurance Magazine, and Springer

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)

Monday, August 4 • 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.

BUSINESS MEETING

Tuesday, August 5 • 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, August 6 • 4:00 p.m. – 4:45 p.m.

The John H. Silliker Lecture will be delivered by Dr. Michael Doyle.

AWARDS RECEPTION AND BANQUET

Wednesday, August 6 • 6:00 p.m. – 9:30 p.m.

Bring IAFP 2008 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Dr. Gary R. Acuff to Incoming President, Dr. J. Stan Bailey.



IAFP 2008 GENERAL INFORMATION

REGISTRATION INCLUDES

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

PRESENTATION HOURS

Sunday, August 3

Opening Session 6:00 p.m. – 7:00 p.m.

Monday, August 4

Symposia & Technical Sessions 8:30 a.m. – 5:00 p.m.

Tuesday, August 5

Symposia & Technical Sessions 8:30 a.m. – 5:00 p.m.

Wednesday, August 6

Symposia & Technical Sessions 8:30 a.m. – 3:30 p.m.
Closing Session 4:00 p.m. – 5:00 p.m.

EXHIBIT HOURS

Sunday, August 3	7:00 p.m. – 9:00 p.m.
Monday, August 4	10:00 a.m. – 6:00 p.m.
Tuesday, August 5	10:00 a.m. – 6:00 p.m.

GOLF TOURNAMENT

Saturday, August 2

Golf Tournament at Golf Club of Dublin 6:30 a.m. – 12:30 p.m.

HOTEL INFORMATION

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

The IAFP Annual Meeting Sessions, Exhibits and Events will take place or depart from the Hyatt Regency Columbus. Official hotels for IAFP 2008 are as follows:

Hyatt Regency Columbus	\$129 per night
Crowne Plaza	\$129 per night
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CANCELLATION POLICY

Registration fees, less a \$50 administration fee and any applicable bank charges, will be refunded for written cancellations received by July 18, 2008. No refunds will be made after July 18, 2008; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 11, 2008.

Event and tour tickets purchased are nonrefundable.



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 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 JULY 1, 2008 TO AVOID LATE REGISTRATION FEES

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 Student Luncheon - Sunday, 8/3 _____

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- **2, Information Systems & Logistics Distribution (IS/LD)**, Westin Mission Hills Resort and Spa, Rancho Mirage, CA. For more information, call 202.639.5900 or go to www.gmabrands.com.
- **2-4, Missouri Milk, Food and Environmental Health Association Annual Educational Conference**, Stoney Creek Inn, Columbia, MO. For more information, contact Gala Miller at 573.659.0706; E-mail: galaj@socket.net.
- **8-9, ISO 22000 Food Safety Essentials**, Calgary, Ontario, Canada. For more information, contact QMI at 800.463.6727 or go to www.training@qmi.com.
- **9, Metropolitan Association for Food Protection Spring Seminar**, Rutgers University, Cook College Campus Center, New Brunswick, NJ. For more information, contact Carol Schwar at 908.475.7960 E-mail: cschwar@co.warren.nj.us.
- **9, SfAM 2008 Spring Meeting - Broadening Microbiology Horizons**, Aston University, Birmingham, UK. For more information, call 44.0.1234.328330 or go to www.sfam.org.uk.
- **10, Indiana Environmental Health Association Spring Educational Conference**, Emergency Services Education Center, Wayne Township, Indianapolis, IN. For more information, contact Kelli Whiting at 317.221.2256; E-mail: kwhiting@hhcorp.org.
- **11-16, The Conference for Food Protection Biennial Meeting**, The Omni San Antonio Hotel at the Colonnade, San Antonio, TX. For more information, contact Jeff Lineberry at executivedirector@foodprotect.org.
- **17, Ontario Food Protection Association Spring Technical Session, Mississauga Convention Centre**, Mississauga, Ontario, Canada. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.
- **17-18, Principles of HACCP Training**, Sheraton Gateway Suites, Rosemont, IL. For more information, contact ASI at 800.477.0778 or go to www.asifood.com.
- **21-24, Better Process Control Schools**, Pennsylvania State University, The Nittany Lion Inn, State College, PA. For more information, contact Melissa Maurer at 814.863.2956; E-mail: melissa@psu.edu.
- **27-29, ADPI/ABI Annual Conference**, Marriott Hotel, Chicago, IL. For more information, call 630.530.8700 or go to www.adpi.org.
- **28-30, Management Skills for Emerging Leaders in Environmental Health and Safety**, Boston, MA. For more information, contact Harvard School of Public Health at 617.384.8692 or go to www.hsph.harvard.edu/ccpe.
- **13-15, Florida Association for Food Protection Annual Education Conference**, St. Petersburg Hilton-Bayfront, St. Petersburg, FL. For more information, contact Zeb Blanton at 407.618.4893 or go to www.fafp.net.
- **14-15, Pennsylvania Association of Milk, Food and Environmental Sanitarians Annual Meeting**, Nittany Lion Inn, Penn State University, State College, PA. For more information, contact Gene Frey at 717.397.0719; E-mail: erfrey@landolakes.com.
- **18-20, 2008 APHL Annual Meeting**, St. Louis, MO. For more information, call APHL at 240.485.2745 or go to www.aphl.org.
- **19-22, 3-A SSI 2008 Annual Meeting**, Four Points Sheraton, Milwaukee Airport, Milwaukee, WI. For more information, call 703.790.0295 or go to www.3-a.org.
- **21-24, Campylobacter Isolation and Identification from Foods Workshop**, Dept. of Poultry Science, Auburn University, Auburn, AL. For more information, call Omar Oyarzabal at 334.844.2608; E-mail: oyarzoa@auburn.edu.
- **26-28, IAFP Latin America Symposium on Food Safety**, Campinas, São Paulo, Brazil. For more information, go to our Web site at www.foodprotection.org.
- **31, 15th Annual Food Allergy Conference - Food Allergies: Living and Learning**, Marriott Westchester Hotel, Tarrytown, NY. For more information, call 800.929.4040 or go to www.foodallergy.org.

MAY

- **2, Carolinas Association for Food Protection Spring Meeting**, Madren Conference Center, Clemson University, Clemson, SC. For more information, contact Steve Tracey at 704.633.8250; E-mail: smtracey@foodlion.com.
- **4-7, The FMI Show Plus MARKETECHNICS®**, Mandalay Bay Convention Center, Las Vegas, NV. For more information, call FMI at 202.452.8444 or go to www.fmi.org.
- **6-9, Better Process Control Schools**, Ramada Inn Geneva Lakefront, Geneva, NY. For more information, contact Nancy Long at 315.787.2288; E-mail: NPLI@cornell.edu.
- **8, Metropolitan Association for Food Protection Spring Seminar**, Rutgers University, Cook College Campus Center, New Brunswick, NJ. For more information, contact Carol Schwar at 908.475.7960; E-mail: cschwar@co.warren.nj.us.
- **10, 15th Annual Food Allergy Conference - Food Allergies: Living and Learning**, Embassy Suites Hotel, Rosemont, IL. For more information, call 800.929.4040 or go to www.foodallergy.org.

IAFP UPCOMING MEETINGS

AUGUST 3-6, 2008
Columbus, Ohio

JULY 12-15, 2009
Grapevine, Texas

AUGUST 1-4, 2010
Anaheim, California

COMING EVENTS

JUNE

- **1-5, American Society for Microbiology 108th General Meeting**, Boston Convention and Exposition Center, Boston, MA. For more information, call 202.737.3600 or go to www.asm.org.
- **7-11, AFDO Annual Educational Conference**, Crowne Plaza Anaheim Resort Hotel, Garden Grove, CA. For more information, call 717.757.2888; E-mail: afdo@afdo.org.
- **9-11, 2008 Midwest Section of AOAC International Annual Meeting and Exposition**, Bozeman Best Western – GranTree Inn, Bozeman, MT. For more information, contact Heidi Hickes at 406.994.3383 or go to www.midwestaoac.org/2008meeting.html.
- **10, Ontario Food Protection Association Professional Development Day and Golf Tournament**, Springfield Golf Course, Guelph, On-

tario, Canada. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.

- **10-11, Principles of Inspecting and Auditing Food Plants**, Chicago, IL. For more information, contact AIB at 785.537.4750 or go to www.aibonline.org.
- **13-20, Twenty-Eighth International Workshop/Symposium—Rapid Methods and Automation in Microbiology**, Kansas State University, Manhattan, KS. For more information, contact Dr. Daniel Y.C. Fung at 785.532.1208; E-mail: dfung@ksu.edu.
- **18-20, 9th Joint CSL/JIFSAN Symposium**, York, UK. For more information, contact Helen Crevald at csl-jifsan@csl.gov.uk or go to www.csl.gov.uk.
- **24-26, New Zealand for Food Protection Listeria Workshop in Association with New Zealand Institute of Food Science and**

Technology (NZIFST) Annual Meeting, Rotorua, New Zealand. For more information, contact Lynn McIntyre at 64.3.351.0015; E-mail: lynn.mcintyre@esr.cr.nz.

JULY

- **2-4, Missouri Milk, Food and Environmental Health Association**, Stoney Creek Inn, Columbia, MO. For more information, contact gala Miller at 573.659.0706; E-mail: galaj@socket.net.
- **20-3, Canadian Institute of Public Health Inspectors Conference**, St. John's, New Foundland. For more information, go to www.ciphi.nl.ca.

AUGUST

- **3-6, IAFP Annual Meeting, Hyatt Regency Columbus**, Columbus, OH. For more information, go to www.foodprotection.org.



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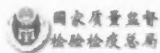
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- F2506 Worker Health and Hygiene: Your Job Depends on It!
- F2600 Food Industry Security Awareness: The First Line of Defense

OTHER

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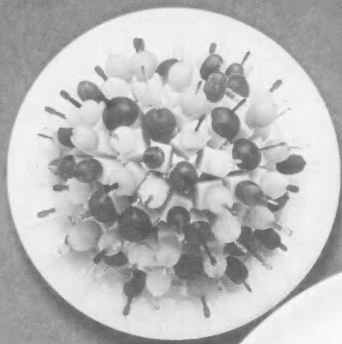
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