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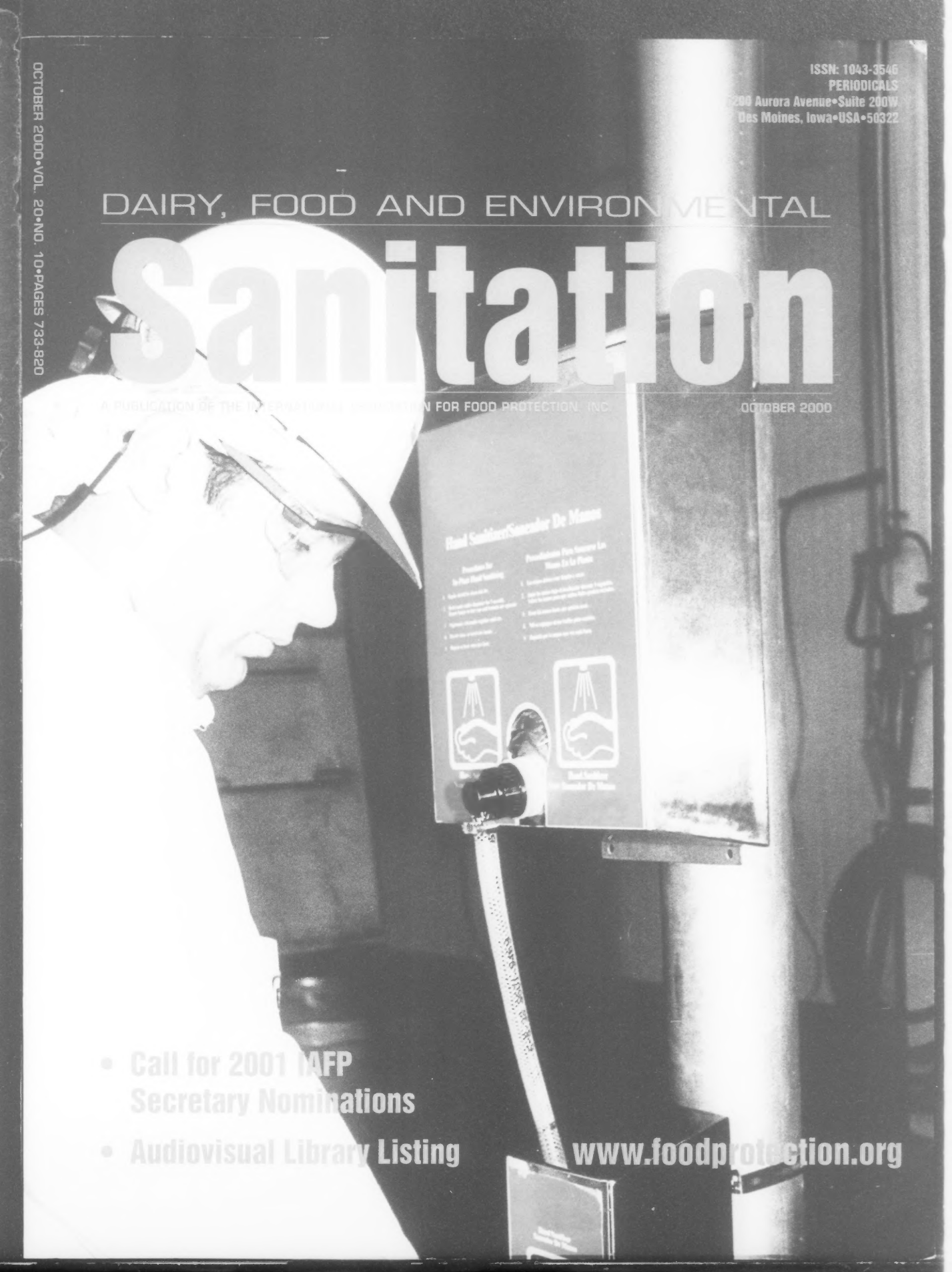
DAIRY, FOOD AND ENVIRONMENTAL

sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION, INC.

OCTOBER 2000



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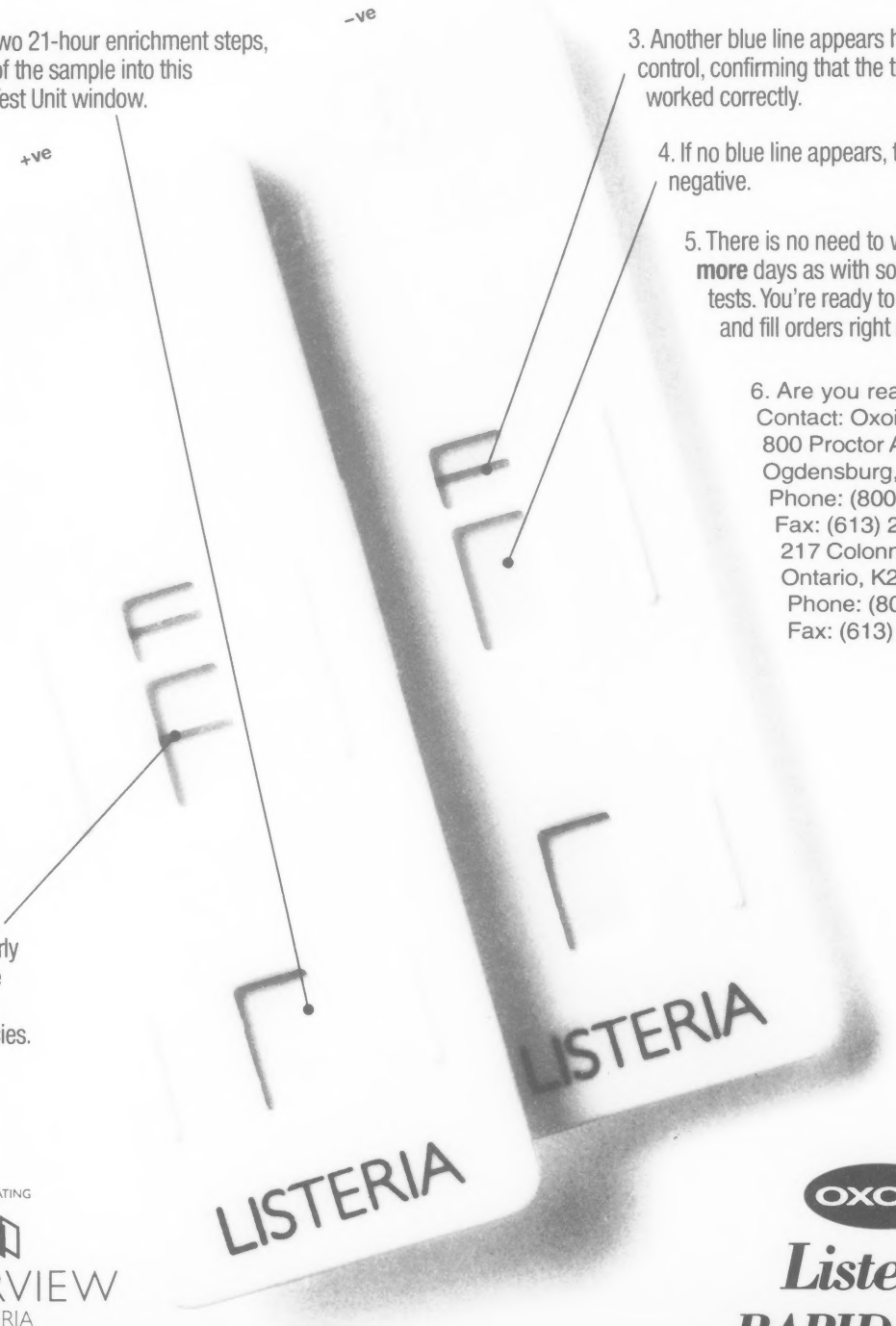

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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

International Association for Food Protection

Articles

Association News

Departments

Editor's Note:

In the September issue of *DFES* on page 681 – Table 1 was printed incorrectly. The corrected table is on page 779 of this issue. We apologize for this error.

Extras

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Food Protection

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1977 Delaval Diary	California Affiliate	Chris Smith
1994 Edition Predictive Microbiology Theory & Application #1	T.A. McMeekin	Wayne Knudson
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Brave Merchandise Gift Box	Georgia Affiliate	Donna Christensen
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Essentials of Food Safety & Sanit. Text	David Z. McSwane	Gun Wirtanen
Fight BAC! Food Safety Curriculum	National Agricultural Library	Tere Ortega
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Ohio River Valley in Vino Veritas	Harry Haverland	Dane Bernard
Ohio State Buckeye Crock with Kitchen Set	Ohio Affiliate	Tom Bennett
Pearl Necklace	Connie & David Tharp	Wilbur Feagan
IAFP Polo Shirt	IAFP	Jack Guzewich
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Procedures to Investigate Foodborne Illness	IAFP	Suzanne Savoie
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Qualicon Glass Mugs 2000 Atlanta	Qualicon	Albert Espinoza
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Registration 2001 IAFP Annual Meeting	IAFP	Dave Henning
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Wine – Ontario Ice Wine	J.M. Scheider, Inc.	Ruth Anne Rose-Morrow
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2001

August 5-8

Hilton Minneapolis
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2002

June 30-July 3

Hyatt Regency
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International Association for Food Protection

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

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My Perspective

By JENNY SCOTT
President

"IAFP's Annual Meeting is second to none"

Now that it's over, I am taking a few moments to reflect on this year's Annual Meeting - and what a meeting it was! We had 1,318 attendees at our meeting in Atlanta, a 16.5% increase over last year. Although the bulk of our attendees (86%) continue to come from the US, 6% came from Canada and 8% came from other countries; we had representatives from 31 countries, including the UK, Finland, China, Korea, South Africa, Mexico, Brazil, and many more! Truly we are an international organization.

Speaking of international, let me digress from this year's Annual Meeting to mention that this November we will host our first workshop outside the US and Canada – on November 12 IAFP will sponsor Produce Safety in Latin America – Experiences, Challenges and Impact on International Trade in Guadalajara, Mexico. This is an area of food safety that has received much attention in the last few years, and because Mexico is a primary exporter of produce to the US, we feel this is an ideal venue for the workshop. The Board is also exploring holding "regional" meetings in international locations to provide opportunities for more of our International Members to participate in Association activities.

This year's Annual Meeting program included 320 scientific presentations, including 21 symposia, 60 oral presentations, and 139 poster presentations, covering cutting-edge research and comprehensive overviews. Topics included *Listeria monocytogenes*, produce safety, food biotechnology, mycotoxins, seafood HACCP strategies, retail foods, risk assessment, issues facing dairy producers and bioterrorism. We kicked off the meeting on August 6 with another first – Dr. Doug Powell of the University of Guelph gave the Ivan Parkin lecture on "Reclaiming Dinner: Enhancing Food Safety and Consumer Confidence" via a video tape which was electronically transmitted after Dr. Powell ran into last minute travel difficulties. This provided a graphic demonstration of what we may be able to do in the future to enhance our program with lectures from world experts who are unable to attend because of scheduling conflicts.

This year we had 88 exhibitors (in 97 booth spaces), whose products and services include sanitation supplies, microbiological testing products, books and magazines, testing and auditing services, educational courses, and much, much more. This is the largest number of exhibitors yet for an IAFP meeting. This is another area in which the Association is growing.

As might be expected, with the growth we are seeing in the Annual Meeting there are also growing pains. Most notably is finding the type of space we need to host a quality meeting. When I first started going to IAFP (then IAMFES) meetings, there were essentially three concurrent sessions: one dairy, one food, and one environmental. There

were few scheduling conflicts, but there were times when none of the sessions was a "gotta-be-there" session. Now, with four or even five concurrent sessions, I find myself wanting to be in several places at once. At the same time, I find the meeting is much more dynamic and I am much more energized and enthusiastic about going each year. I hope you feel the same.

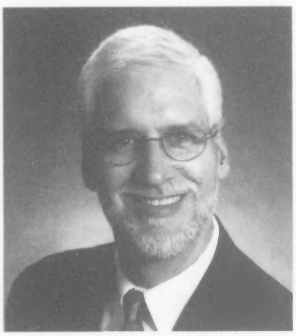
There are many factors to consider when making a decision on where we hold an Annual Meeting. In the past, our meetings have been held in a single facility. We feel this is not only more convenient for attendees, but also more conducive to networking and socializing as well. By holding our meeting in one facility, we are able to negotiate a lower room rate for our attendees. When selecting a meeting site, we consider many factors, including written invitations from Affiliates who are interested in hosting the IAFP Annual Meeting, the desirability of the location in terms of amenities and things to do for families, and whether there is convenient access to the city at reasonable cost. We also try to move the meeting to different parts of the country and to Canada.

But much of this is secondary to the meeting facility itself. Once we determine a city (or cities) to consider, IAFP staff members identify potential properties and visit those under consideration to look at all elements that affect our meeting and attendees. Of primary concern are adequate space for the sessions and posters, location of meeting rooms in relation to each other and in relation to the exhibit hall, and adequate exhibit space. The next concern is the availability of guest rooms and meeting space over the preferred meeting dates. We occupied over 800 rooms at the Atlanta Hilton on our peak nights! And room cost is a factor, sometimes forcing us to move the meeting dates to obtain more reasonable room rates (as we have done for the San Diego meeting in 2002). More and more we are finding that few properties can accommodate the meeting as currently structured. So, for better or worse, the character of the meeting as we know it today will be changing. We are beginning to plan for meetings in which we use more than one facility. Hopefully we can transition into such an arrangement, beginning with hotels adjacent to small convention centers (which was essentially the arrangement in Nashville). The next step might be having to walk a block or two to a convention center for the sessions, and possibly using two nearby hotels. We do not anticipate our meeting growing to a size where we have to use multiple hotels and buses to get between them and the meeting site, at least not in the foreseeable future. But that time may come sooner than we think if interest in our meeting grows even faster than anticipated. I for one will miss the "intimate" nature of the IAFP meeting as we currently know it, but I recognize that if we continue to provide meetings of the caliber of the last few years, then inevitably, "they will come." The Board welcomes your thoughts on our Annual Meeting – things you like, things you don't like, suggestions for improvements. We know we can't satisfy everyone, but we want to do our best to continue to provide you with a food safety conference that is second to none.

Join us next year in Minneapolis, Minnesota for IAFP 2001, the 88th Annual Meeting of the International Association for Food Protection. You won't be disappointed!

COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
Executive Director

"Why become affiliated with IAFP?"

In this month's column, I want to inform you about our Affiliate organizations and how a group may become affiliated with the International Association for Food Protection. But before doing so, I have to make mention of the Annual Meeting recently completed in Atlanta. We are proud to report that we smashed all records with the 87th Annual Meeting by having 1,318 attendees from 31 countries. That number increased over our previous record by 187 – an increase of nearly seventeen percent. Congratulations to everyone who had a part in this success. We will provide a recap of the Atlanta Meeting in our November issue of *DFES*; be sure to watch for it.

Now, back to the topic of Affiliates. We have seen a surge in groups interested in forming Affiliates and in fact have had five new Affiliate organizations chartered in recent years. Beginning in 1997, a Korean Affiliate was formed followed in 1999 by a group from British Columbia, Canada. Then in 2000, we chartered three new Affiliates; one in Mexico; one in Quebec, Canada; and one in the Washington, D.C. area by the name "Capitol Area." This brings our total to 37 Affiliates.

Why the recent interest in forming Affiliate organizations?

We believe there are multiple reasons for seeing this increase. First and foremost is that there is an increased demand for food safety information and an increased desire to network with people having the same interests. Affiliate organizations offer both these attributes by holding meetings where presentation of information takes place and time for establishing new contacts is allowed. We also believe that our Affiliate Council and office staff have actively promoted and communicated with existing Affiliate organizations our desire to expand the network of Affiliates. We are fortunate to have Members working on our behalf who have helped establish Affiliates and who have fostered relationships with our new Affiliates.

Why become affiliated with IAFP?

For a newly established group, the answer is that the Affiliate will provide an opportunity for a localized group of individuals to gather with similar goals of food safety in mind. A driving force in developing an Affiliate is the ability to offer educational opportunities to Members. By Affiliating with IAFP, the organization immediately becomes a recognizable entity and has a direct connection to the International. This lends credibility to the new Affiliate, thereby giving a basis from which to build upon.

What does IAFP offer?

The International supports our Executive Board Member's travel to your Affiliate meeting to present technical information on food safety related issues. We provide the transportation (airfare, etc.) to allow our Board Member to get to your meeting city; you (the Affiliate) provide local expenses such as meals and lodging. It is a wonderful program designed to allow you direct access to our Executive Board for direct information about the International and up-to-date presentations on food

safety. Last year, 21 such presentations took place at Affiliate meetings.

Free copies of *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection* are provided for distribution at your meeting. In addition, we provide other handout information including Audiovisual Library listings, coupons for Membership discounts and IAFP letter openers.

Each quarter during the year, we publish an Affiliate Newsletter and distribute it to Affiliate Board members and Delegates. This is an important form of communication from our office to the Affiliates. Affiliate accomplishments and activities are published giving recognition to deserving Affiliates. By reviewing this Newsletter, Affiliate Officers can keep up-to-date on important deadlines affecting Affiliate organizations.

The Affiliate Awards Program is another benefit offered by the International to Affiliate organizations. By completing an Annual Report and submitting the report to our office, the Affiliate organization will be considered for recognition through the Affiliate Awards program. Affiliate Awards are given at the International's Annual Meeting recognizing the best Annual Meeting, best Educational Conference, best Communication Materials and the overall best Affiliate organization receives the C.B. Shogren Memorial Award.

Each Affiliate designates a Delegate to the Affiliate Council, which meets annually at the IAFP Annual Meeting. The Council provides input to the Executive Board on the direction of the Association and provides an exchange of ideas, activities and information between Affiliates. The Affiliate Council Chairperson serves as a Member of the IAFP Executive Board representing all Affiliate organizations.

What is required of an Affiliate organization?

Affiliate organizations are required to maintain a minimum of five Affiliate members as Members of IAFP. The current President and Delegate must be Members of IAFP and may be included in the five minimum Members. The Affiliate organization must hold an Annual Meeting where they also hold an Annual Business Meeting. An Annual Report must be submitted to the IAFP office by mid-February each year.

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We look forward to working with you to establish an Affiliate organization to serve the needs of food protection members in your area!

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Survey of Grocery Store Seafood Employees

Tori L. Stivers* and Keith W. Gates

SUMMARY

We conducted a survey of grocery store seafood employees to design future training programs. Two hundred seventy-four employees representing 113 southeastern U.S. grocery stores (three companies) completed a questionnaire soliciting information on demographics, previous training, food sanitation and safety knowledge, seafood practices, spoilage and loss, and food safety and loss opinions. Respondents were predominately male, employed on a full-time basis, high school graduates, and between the ages of 18 and 44. On-the-job training was the major seafood training received. Mean percent correct answers were: 55 for food sanitation and safety, 47 for seafood practices, 64 for spoilage and loss, and 44 for food safety and loss opinions. Mean food sanitation and safety scores correlated positively with spoilage and loss scores, while food safety and loss opinion scores correlated positively with mean seafood practices scores. Food sanitation and safety knowledge was associated with hand washing and product temperature control. Seafood knowledge did not consistently translate into appropriate actions such as maintaining shellfish tags and avoiding the commingling of shucked shellfish meats. Seafood sales and percent seafood sales were significantly higher when reduced-quality fresh seafood was repackaged and frozen. Percent seafood sales were significantly lower when reduced-quality seafood was discarded or used for customer samples.

A peer-reviewed article.

INTRODUCTION

Grocery stores have replaced seafood markets as the primary source of fresh seafood for most consumers in the metro-Atlanta area. In U.S. chain stores with a seafood department, seafood averages 1 to 3% of sales *(6)*. An important consumer concern is quality and safety of fresh seafood at the retail level. Employee training plays a crucial role in ensuring safety and quality. However, training employees is difficult because grocery store job turnover rates can exceed 58% for full-time employees in the Southeast, with a median rate of 29.6% *(4)*. The Food and Drug Administration now considers one-quarter of the U.S. population "at risk" for foodborne illness *(5)*. Moreover, many consumers do not practice safe food handling procedures at home *(2)*, making seafood safety paramount at the point of consumer purchase.

Previous retail employee training efforts by The University of Georgia Marine Extension Service had little success because it was difficult financially for store administrators to justify off-site training expenses and because little was known about the type and amount of prior training employees received, or their knowledge of food sanitation, safety, spoilage and loss prevention, as well as about actual seafood practices, employee opinions, and demographics. Recent studies have investigated food sanitation knowledge and supermarket deli worker handling practices *(7, 8)* and Italian food handlers' behavior, atti-

tudes, and knowledge of foodborne diseases *(1)*, but to our knowledge none have focused on seafood handlers. The objective of this study was to collect and evaluate such information and to relay it to grocery store administrators, Marine Extension Service personnel, regulators, and others who design and implement training programs for grocery store seafood handlers.

PROCEDURE

Three multi-store grocery companies were recruited to participate in the survey. A questionnaire used by Thomas et al. *(7, 8)* to survey supermarket deli employees was modified to make it more specific for seafood. A copy of the modified questionnaire was given to seafood administrators of the three participating companies to solicit their input in the questionnaire development process. Only one administrator suggested a change: the addition of one multiple-choice question in the food sanitation and safety section. After this revision, the questionnaire contained 44 multiple choice questions, organized into six sections: background training, food sanitation and safety, seafood practices, spoilage and loss, food safety and loss opinions, and demographics. Three questions had two or more parts and five required employees to circle all appropriate responses. The remaining 36 questions required one response each.

Copies of the questionnaire were distributed in October 1996 via corporate mail to more than 900 seafood department employees of 205 southeastern U.S. grocery stores. Prior to distribution, each questionnaire was randomly assigned a code that would identify the store where the employee worked. Questionnaires were completed anonymously and returned by 274 employees representing 113 stores. Two companies supplied dollar seafood sales and percent seafood sales per store for the fourth quarter of 1996.

Questionnaire responses and financial data were sorted by store, compiled, and given to The University of Georgia Statistical Consulting Center for analysis. For each question, the percentage of employees choosing the correct answer (or choosing individual responses for questions soliciting demographic or training information or for questions that asked employees to circle all appropriate responses) was tabulated both for each company and combined for all three companies. Only combined scores were used in the statistical analyses. Mean scores (percent questions answered correctly) were calculated for the sections on food sanitation and safety, seafood practices, spoilage and loss, and food safety and loss opinions. Data were evaluated for associations between training, knowledge, practices, opinions, and sales. SAS regression analysis was used to determine if there were linear relationships between continuous data (sales, percent sales, mean scores). Analysis of variance (ANOVA) with least square means based on the Tukey-Kramer adjustment was used to detect significant differences between mean scores and number of courses or training hours, number of years of seafood experience, or number of employees choosing versus not choosing an answer for a specific question. The chi-square test was used to check for associations between knowledge and practices. Results were summarized and relayed to company seafood administrators in February 1998.

RESULTS AND DISCUSSION

Demographics

Half of the respondents were male and employed on a full-time basis and 25.5% were female full-time employees (Table 1). Male part-time employees (15.1%) also outnumbered female part-time employees (9.2%). Males constituted 65.3% of the respondents, and 75.7% of respondents were full-time employees. Seventy-seven percent of employees were between 18 and 44 years old, with 28.9% between ages 25 and 34. More than 43% were high school graduates, and about one-third had some college education. Approximately 5% had a bachelor's or more advanced college degree. Twenty percent of employees had 5 to 10 years of seafood experience, but almost one-third had one year or less.

Background training

Eighty-two percent of employees responded that on-the-job training provided the most effective information needed for daily seafood activities; 38.6% reported having 61 or more hours of this training (Table 2). Perhaps on-the-job training was most effective because 47.6% of the employees had never taken any food sanitation, spoilage, inventory control or other related courses. The majority of employees (54.9%) had received seafood training when they first began work, and 26.7% before they began work. Thirty-two percent had received training on a schedule set by their supervisors and 18.7% when they requested it. Only 5.9% had never received training.

Scores

The food sanitation and safety section contained general questions about bacteria and hygiene as well as specific questions on pathogens and on illnesses associated with eating seafood. The score (percentage of questions answered correctly) in this section was used as an indicator of employees' knowledge about food sanitation and safety. The scores (percentages of correctly answered questions) in the sections on seafood practices, spoilage and loss, and food safety and loss opinions were used as indicators of employee knowledge in these areas. Spoilage and loss scores were highest, with a mean of 64 (Table 3). Food sanitation and safety scores had the next highest mean score, 55, followed by 47 for the seafood practices section and 44 for the section on food safety and loss opinions. Food sanitation and safety scores (B) were positively correlated with spoilage and loss scores (D). The SAS regression equation describing this relationship was: $B = 33.6 + 0.335\ D$, with $P < 0.0001$, R-square 0.1735 (Fig. 1). Food safety and loss opinions (scores E) were positively correlated with seafood practices (scores C) by the SAS regression equation: $E = 29.8 + 0.3\ C$, with $P < 0.0001$, R-square 0.0686 (Fig. 2).

TABLE 1. Gender, employment status, age, education, and experience level of respondents

Vorioble	*n*	%
Gender & Employment status (271)*		
Mole, full-time	136	50.2
Male, part-time	41	15.1
Femole, full-time	69	25.5
Female, part-time	25	9.2
Age, years (270)*		
< 18	3	1.1
18 - 24	65	24.1
25 - 34	78	28.9
35 - 44	64	23.7
45 - 54	46	17
55 - 64	13	4.8
> 64	1	0.4
Educotion (272)*		
Some high school	19	7
High school groduote	119	43.8
Vocational/tech. school graduate	15	5.5
Some college	85	31.2
Associate's degree	18	6.6
Bachelor's degree	9	3.3
Advanced degree	4	1.5
Other	3	1.1
Seofood experience (271)*		
< 6 months	52	19.2
6 months to 1 year	32	11.8
1-2 yeors	44	16.2
2-5 years	41	15.1
5-10 years	54	20
10-15 yeors	31	11.4
15-20 yeors	8	3
>20 years	9	3.3

*Number of employees responding to question

TABLE 2. Background training

Variable	*n*	%
Most useful training (265)*		
On-the-job	218	82.3
Slides, videos	2	0.7
Pamphlets, manuals	15	5.7
Seafood seminars (sponsored by food trade assoc., regulators, or universities)	15	5.7
Seafood seminars (sponsored by seafood or equipment suppliers)	8	3
Other	7	2.6
Hours of on-the-job training (246)*		
None	9	3.7
≤ 10	43	17.5
11 - 20	34	13.8
21 - 40	52	21.1
41 - 60	13	5.3
≥ 61	95	38.6
Number of food related courses (271)*		
None	129	47.6
One	40	14.8
Two	36	13.3
Three	23	8.5
Four	11	4
≥ Five	32	11.8
Timing of employee seafood training (273)**		
Before beginning work	73	26.7
As a new employee	150	54.9
As determined by supervisor	88	32.2
When required for job promotion	19	7
Upon request	51	18.7
Never had training	16	5.9

* Number of employees responding to question

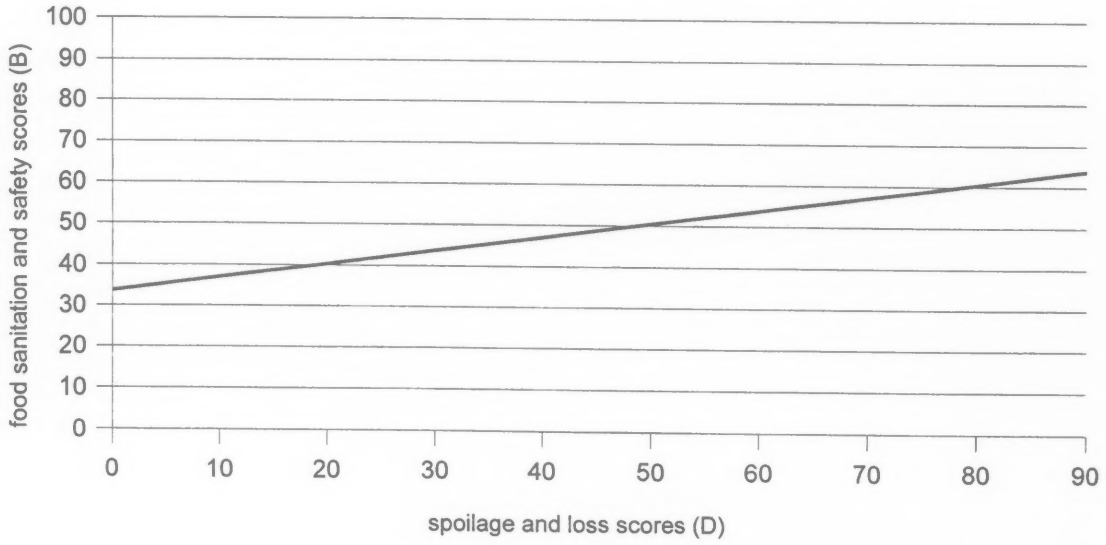
** Number of employees responding to question. (Employees were asked to select all appropriate responses, so total exceeds 100%)

TABLE 3. Mean scores (% questions answered correctly)*

Questionnaire section	Mean score (%)	Minimum - Maximum score (%)
B. Food sanitation & safety	55	7-93
C. Seafood practices	47	0-72
D. Spoilage & loss	64	0-90
E. Food safety & loss opinions	44	0-83

*Based on 274 respondents

Figure 1. Correlation of food sanitation and safety scores, B, with spoilage and loss scores D: B = 33.6 + 0.335 D



Employee knowledge of pathogens or illnesses associated with seafood was low (Table 4). Only 3% of employees knew what kinds of food were associated with Listeriosis and that pregnant women and the elderly are more susceptible to this disease; 12% knew that eating raw oysters and exposing an open wound to seawater was associated with *Vibrio vulnificus* infections. Thirty-five percent knew that temperature abuse of certain fish could result in histamine or scombroid poisoning, and 36% were aware of health conditions that predispose consumers to illness after eating raw oysters. Sixty-nine percent knew that fish parasites (worms) were a natural occurrence and could be transmitted to consumers who eat raw fish. These rates were lower than those found by Angelillo et al., who investigated Italian food handlers' awareness of foodborne pathogens and reported that 86.3% had heard of *Salmonella*; 79.3%, *Staphylococcus aureus*; 56.9%, *Vibrio* species; 52.6% Hepatitis A virus; and 51.6%, *Clostridium botulinum (7)*. However, only 20-50% of Italian food handlers could identify a food vehicle associated with those pathogens.

Influence of training and experience on scores

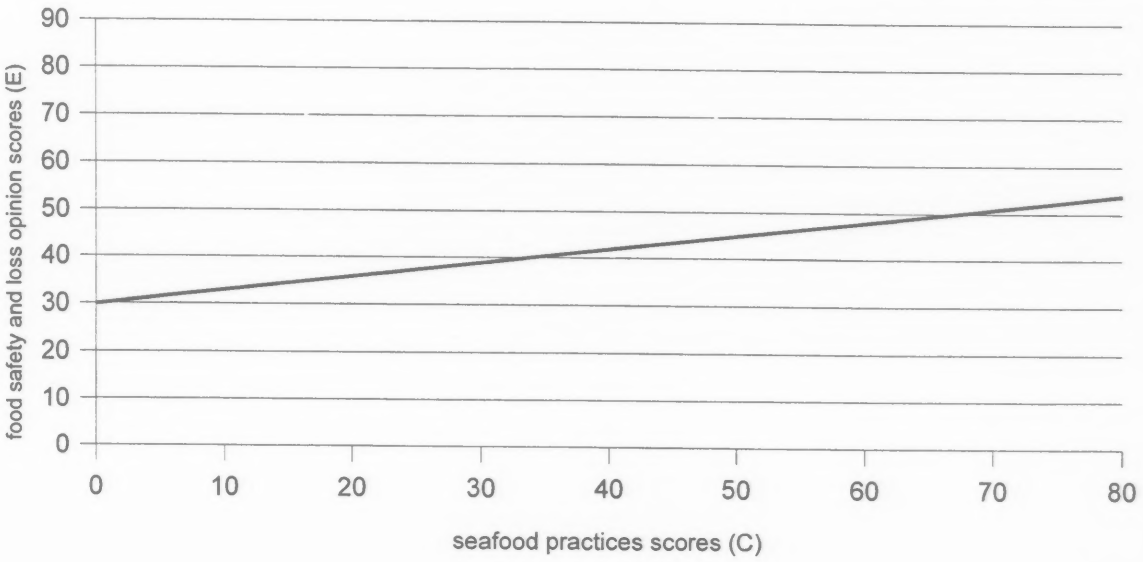
The amount of training and when it was presented to employees influenced scores. Mean food sanitation and safety scores were significantly higher ($P < 0.05$) for employees with 61 or more hours of on-the-job training (58.3) than for employees with 10 hours or less of training (50.5). Mean food sanitation and safety scores were also significantly higher ($P < 0.05$) when employees had two (61.9) or three (61.8) food sanitation, spoilage, inventory control or related courses than with no (52.2) or one course (50.4). Employees who received training when they requested it had significantly higher ($P < 0.05$) mean food sanitation and safety scores (59) than employees who did not (54). Only 18.7% of employees had received training upon request (Table 2).

TABLE 4. Employee knowledge of pathogens and/or illnesses associated with seafood

Illness or pathogen	*n*	%
Listeriosis (274)*	9	3
Vibrio vulnificus (274)*	33	12
Histamine (scombroid) poisoning (274)*	97	35
Parasites (worms) (274)*	188	69
Conditions that predispose consumers to illness from eating raw oysters (274)*	99	36

* Number of employees responding to question

Figure 2. Correlotion of food sofety and loss opinions, scores E, with seofood proctices scores, C: E = 29.8 + 0.3 C



The number of years of seafood experience influenced spoilage and loss scores; mean spoilage and loss scores were significantly higher ($P<0.01$) for employees with five to ten years of seafood experience (70) than for employees with less than six months experience (58).

Influence of food sanitation and safety knowledge on practices

The chi-square test detected several statistically significant knowledge-action associations. Ninety-five percent of employees knew it was important to wash hands after certain activities. Seventy-nine percent knew the importance of hand washing and also used appropriate practices to prevent cross-contamination of unpackaged ready-to-eat foods by raw seafood ($P < 0.001$). Ninety-one percent of employees knew that room temperatures allow bacteria to grow and greatly increase in numbers; however, a lower percentage translated that knowledge into actions that minimized the time seafood spent unrefrigerated during the receiving process (79%) and while the display case was being set up (63%) ($P < 0.05$).

The Food and Drug Administration requires that dealers of shucked (at least one shell removed) or in the shell, fresh or frozen oysters, clams, or mussels, and of whole or roe-on scallops, be certified by their home state. Shellfish tags, which include the dealer's name, address, and certification number, date of harvest, and harvest location, must be attached to all bags of unshucked oysters, clams, mussels, and scallops. The tags must be retained by the

retailer for 90 days after the product is sold *(3)*. In the event illnesses occur from consuming shellfish, the tags provide a means to trace product back to the harvest area so the harvesting waters can be tested, and closed if warranted, to prevent more illnesses. Mixing different containers of either shucked or unshucked shellfish is prohibited because it impedes identification of the harvest area *(3)*.

The majority of employees were aware of risks associated with molluscan shellfish and knew the purpose of shellfish tags, but that knowledge did not consistently translate into appropriate safe practices. Seventy-eight percent of employees knew that raw molluscan shellfish posed the greatest risk of illness for seafood consumers. However, only 40% of those aware of this risk also kept the tags for 90 days ($P < 0.001$). Fifty-eight percent knew the risk of consuming raw molluscan shellfish and avoided commingling different containers of shucked shellfish meats ($P < 0.05$). Eighty-eight percent of employees knew that the purpose of shellfish tags was to trace tainted shellfish back to the growing waters to prevent further illnesses; however, only 43% also kept the tags for 90 days ($P < 0.001$). Sixty-five percent knew the purpose of the tags and also avoided mixing different containers of shucked shellfish meat ($P < 0.05$).

Influence of HACCP awareness and spoilage and loss procedures on sales

Employees who knew the meaning of the acronym "HACCP" worked in seafood departments with significantly higher percent seafood sales (1.61) than employees who did not choose the correct answer (1.45) ($P < 0.05$). While evaluating the influence of spoilage and loss procedures on sales, we discovered several interesting associations. We asked employees what they did with fresh seafood that had declined in quality but was not spoiled. Percent seafood sales were significantly lower ($P < 0.01$) in situations in which employees discarded reduced-quality seafood (1.29) than in those in which they did not choose this answer (1.54). Percent seafood sales were also significantly lower ($P < 0.005$) when employees used reduced-quality seafood for customer samples (1.4) than when they did not use this option (1.6). On the other hand, employees who repackaged and froze reduced-quality fresh seafood worked in departments with significantly higher ($P < 0.001$) fourth quarter sales ($101,863) than sales of departmens that employed those who did not select this answer ($67,378). Repackaging and freezing also produced significantly higher ($P < 0.01$) percent seafood sales (1.9) than when this option was not utilized (1.49).

RECOMMENDATIONS

The majority of employees demonstrated general knowledge of bacteria and hygiene that translated into appropriate actions such as handwashing, keeping seafood at refrigerated temperatures, and preventing cross-contamination of ready-to-eat products. However, awareness of the risk posed by consuming raw molluscan shellfish did not consistently translate into required safe practices. Trainers of seafood employees, store administrators, and regulators must address these lapses if illnesses from eating molluscan shellfish are to be traced, controlled, and/or prevented. Perhaps if employees are educated about illnesses associated with consuming seafood, they may view specific practices as more meaningful. Because HACCP awareness did positively affect percent seafood sales, administrators may want to include it in employee training programs.

Responses to the question of how reduced-quality fresh seafood is handled indicated that seafood sales were affected by employees' actions. Sales were significantly higher when reduced-quality seafood was repackaged and frozen. However, this practice raises concerns of safety and quality. Employees should be made aware that freezing a poor-quality product does not improve it and that the quality of the thawed product will be even worse than before freezing. Because consumers' dissatisfaction with a specific seafood purchase tends to dissuade them from future seafood purchases in general, this practice should be discouraged.

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Pre-harvest Management Practices, Good Manufacturing Practices During Harvest, and Microbiological Quality of Lamb Carcasses

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SUMMARY

One hundred ninety-eight lambs were subjected to differing management strategies to evaluate the influence of these strategies on microbiological contamination of the resulting lamb carcasses. Additionally, during sample collection for this and other studies in six geographically dispersed United States lamb packing plants, areas of opportunity for improvement of good manufacturing practices were documented. Pre-harvest management strategies included: use (or not) of bedding, wet versus dry pens, and wool length (unshorn, shorn ≤ 30 days before harvesting, shorn ≤ 5 days before harvesting). Lambs were separated into 12 treatment groups/pens for 60 days before harvest during the summer season. Sponge samples were collected from external pelt surfaces of hot carcasses, hot carcass surfaces following pelt-removal, and chilled carcass surfaces following 24 h of chilling, and were analyzed for Aerobic Plate Counts (APC), Total Coliform Counts (TCC), *Escherichia coli* Counts (ECC), and the presence of *Salmonella* spp. Additionally, lamb fecal samples were obtained and analyzed for the presence of *Salmonella* spp. None of the fecal samples tested positive for *Salmonella* spp., and only two sponge samples (0.37%) tested positive for *Salmonella* spp. Under conditions of this study, pre-harvest management practices appeared to have no major influence on APC, TCC, and ECC on lamb carcasses.

A peer-reviewed article.

INTRODUCTION

As concerns for the safety of meat products increase, and with the establishment of microbiological testing criteria for *Escherichia coli* and *Salmonella* spp. in meat processing facilities, research efforts aimed at developing more effective means for controlling microbial contamination on carcasses have increased as well. Results of research already completed on in-plant microbial interventions are evident in the industry today. Virtually every plant in the United States uses some type of carcass washing system for removing visible contamination prior to chilling *(20)*. Reduction in mean counts by use of various spray-washing/rinsing treatments is usually in the range of < 1 to 2-3 log CFU/cm^2 *(20)*. Kochevar et al. found that acetic acid and water temperature were the most important factors in reducing Aerobic Plate Counts (APC) and fecal contamination on lamb adipose tissue *(14)*. Hand-held equipment applying steam and vacuum also have become common in United States packing facilities. Kochevar et al. reported that steam-vacuuming reduced mean APC on treated carcass spots by 1.7 – 2.0 log CFU/cm^2 *(13)*.

In-plant microbial interventions are widely accepted as essential tools for producing carcasses with reduced microbial contamination, but the industry also is looking toward the live animal and considering the feasibility of controlling foodborne agents at the farm level. One or more livestock species are reservoirs for several of the most important foodborne disease agents, such as *Salmonella* spp., *Campylobacter* spp., and *Listeria* spp. *(12)*. Research at the farm level also has considered the presentation status of the livestock prior to slaughter and its effect on the contamination of the carcass *(1, 21)*. Biss and Hathaway identified pelt-removal as the most important point for controlling microbiological and visible contamination of ovine carcasses during the dressing procedure *(1)*.

Hadley et al. found that the degree of soiling of the live animal significantly affected the microbial load of the dressed carcass *(11)*. Carcasses derived from sheep with dirtier fleeces carried up to 1,000 times more microorganisms than carcasses derived from sheep with visibly cleaner fleeces. The degree of fecal contamination and other soiling on the fleece can be influenced by many factors, such as the wool length and presence of diarrhea *(8)*. Other factors affecting the condition of the fleece include climatic conditions, transport arrangements, and time spent in holding pens *(15)*. Biss and Hathaway found higher bacterial counts on woolly lambs in comparison to shorn lambs with fleece lengths averaging 1 cm *(1)*. In contrast, Field et al. were unable to demonstrate this increase in microbiological contamination due to longer fleece *(6)*.

In this study, lambs were subjected to specific management strategies in order to evaluate the potential influence on the microbiological contamination of resulting lamb carcasses. In addition, during sample collection for this and other studies in six geographically dispersed lamb packing plants in the United States, various areas of opportunity were documented for improvement of good manufacturing practices (GMPs) associated with overall plant sanitation, handling procedures, sanitation practices, and management of microbiological intervention strategies, in order to assist plants in their efforts to improve GMPs and the microbiological status of their products.

MATERIALS AND METHODS

Study design

One hundred ninety-eight lambs were separated into twelve treatment groups and managed using various strategies. Treatment groups (an average of 16 lambs per group) were as follows: (1) wet/muddy pen, unshorn, bedded on straw/corn shucks; (2) wet/muddy pen, shorn 30 days before harvest, no bedding; (3) wet/muddy pen, shorn 30 days before harvest, bedded on straw/corn shucks; (4) wet/muddy pen, unshorn, no bedding; (5) wet/muddy pen, shorn ≤ 5 days before harvest, bedded on straw/corn shucks: (6) wet/muddy pen, shorn ≤ 5 days before harvest, no bedding; (7) dry pen, shorn ≤ 5 days before harvest, bedded on straw/corn shucks: (8) dry pen, shorn ≤ 5 days before harvest, no bedding; (9) dry pen, unshorn, bedded on straw/corn shucks: (10) dry pen, unshorn, no bedding; (11) dry pen, shorn 30 days before harvest, bedded on straw/corn shucks; (12) dry pen, shorn 30 days before harvest, no bedding. The treatment groups were kept well-fed and managed in separate pens (average size of pens was 4 m × 18 m) at the Colorado State University Sheep Unit (Fort Collins, CO) for sixty days before slaughter during the summer season.

The first six adjacent pens were maintained in a wet/muddy condition using a perforated water hose secured at one end of each pen. The water was sprayed onto each of these pens for 12 hours per day. The remaining adjacent six pens were kept dry. In order to maintain a balanced, complete design of the study, bedded pens, containing a 15 cm base of straw/corn shucks, were alternated with nonbedded pens for both wet and dry pens. Four pens of lambs were shorn 30 days before slaughter and four pens were shorn within 5 days of harvest. The lambs in the remaining four pens were not shorn during the study and exhibited fleeces with a wool length of approximately 7.5 cm. Lambs of each wool length were kept in both bedded and nonbedded pens for both wet and dry pens.

For quick identification of lambs belonging to each pen, the lambs were tagged with a plastic ear tag that was color-coded by treatment group. The intent was to keep a minimum of 16 or a maximum of seventeen lambs in each treatment pen. Two lambs died during the trial, leaving one treatment group with only 14 lambs.

At the end of the trial, four pens (treatment groups) of lambs, including two wet pens and two dry pens, were transported to the packing plant on each of three days. Each treatment group of lambs was kept separate during their transportation (using two trailers equipped with livestock dividers) to the plant in order to prevent cross-contamination between the treatment groups. The transport time was approximately 30 minutes with no stops enroute. In an attempt to avoid in-plant contamination, the lambs in the study were harvested at the beginning of each day, before facilities, equipment and personnel could become contaminated from the handling of other lamb carcasses. The treatment groups remained separate during processing. During the harvesting process, treatment groups that had been kept in a wet, muddy pen were alternated with treatment groups that had been kept in a dry pen.

Harvesting of lambs occurred via use of a New Zealand-style inverted dressing system. With the inverted dressing system, the opening cuts are made in the forequarter region rather than in the hindquarter region. The hindquarter region tends to be an area associated with high contamination. Pelts were pulled from the forequarter down, keeping the contamination around the leg and the anus from being spread across the carcass.

Sample collection

Microbiological analyses performed included Aerobic Plate Counts (APC), Total Coliform Counts (TCC) and *Escherichia coli* Counts (ECC), and presence/absence of *Salmonella* spp. on samples collected from three sampling locations in the slaughtering/dressing/chilling sequence. The samples consisted of: (1) external pelt surfaces of hot carcasses immediately following bleeding but before pelt removal, (2) hot carcass surfaces following pelt removal but before the pre-evisceration wash, and (3) chilled carcass surfaces following 24 h in the cooler but before fabrication or shipment. In addition, fecal samples were obtained from each lamb by collecting the bung during dressing after the pre-evisceration wash cabinet and placing it in a sterile bag (Whirl-Pak®, Nasco, Ft. Atkinson, WI). At the laboratory and on the same day of sample collection, fecal samples were aseptically extracted from each bung sample and analyzed for the presence/absence of *Salmonella* spp.

Before sampling, sterile sponges (in sterile bags) were hydrated with 10 ml of buffered peptone water (BPW; International Bioproducts, Inc., Redmond, WA). Lamb carcasses were sampled using the same procedures that are used for beef and pork carcass sampling and as are described in the new Meat and Poultry Inspection Regulations *(7)*. All samples were collected using aseptic techniques. Only sterile sponges in sterile sample bags (BIOPRO Enviro-sponge Bags, International Bioproducts, Inc., Redmond, WA) were used, and before obtaining each sample, latex gloves and plastic 100 cm^2 templates (BIOPRO, International Bioproducts, Inc., Redmond, WA) used for sampling were pre-sterilized by immersion in 82.2°C water for a minimum of 10 s.

To follow the USDA-approved three-site sampling protocol used for beef and pork, lamb carcasses and pelt surfaces were sponged at the flank, leg and breast. A sterile plastic 100 cm^2 (10 cm × 10 cm) template was first placed directly on the flank area of the carcass and the surface within the template (adipose-muscle tissue surface) was sampled by swabbing with the sponge ten times in a vertical direction and ten times in a horizontal direction according to USDA-recommended procedures *(7)*. The same template was then placed on the breast and the same side of the sponge was used to swab this region (10 vertical and 10 horizontal passes of the sponge). After completing the sponging of the flank and breast, the same template was placed on the leg area and the reverse side of the sponge was used to sponge this region using the same protocol. A total of 300 cm^2 of carcass surface area or external pelt surface area was sampled on each carcass.

Sample preparation, transportation, and analysis

After sample collection, sponges were placed aseptically into sterile sample bags and were hydrated with an additional 15 ml of BPW, bringing the total volume of buffer in the sample bag to 25 ml. Following hydration, the samples were placed in pre-chilled coolers and were transported the same day to the microbiology laboratory (Center for Red Meat Safety, Colorado State University, Fort Collins, CO), where sample analysis began immediately upon sample arrival.

Salmonella spp. analysis followed enrichment technique and isolation and identification procedures recommended by USDA-FSIS *(17)*. Total Coliform Counts and ECC were determined using Petrifilm™ *E. coli* Count Plates (3M™ Microbiology Products, St. Paul, MN) after the preparation of appropriate serial dilutions. Following incubation for 48 h at 35°C, both non-*E. coli* and *E. coli* colonies (red and blue colonies associated with a gas bubble) growing on Petrifilm™ *E. coli* Count Plates were counted manually to determine TCC, and *E. coli* colonies (dark blue colonies associated with a gas bubble) also were counted manually to determine ECC. Aerobic Plate Counts were determined on trypticase soy agar (Difco Laboratories, Detroit, MI) using the spiral plating method (Spiral Plater model D, Spiral Biotech, Bethesda, MD). Following incubation for 48 h at 35°C, colonies on spiral plates were counted using a laser colony counter (Model 500A, Spiral Biotech, Inc.) and a CASBA data processor (Model 800, Spiral Biotech, Inc.).

Statistical analysis

Salmonella spp. data are reported as a percentage of samples that tested positive for the pathogen. Bacterial populations (APC, TCC, and ECC) were converted from CFU/ml to $\log_{10}$ CFU/cm^2 of carcass surface area sampled. The minimum detection limit for APC was 0.23 log

TABLE 1. Mean (log CFU/cm²) Aerobic Plate Counts (APC), Total Coliform Counts (TCC), and *E. coli* Counts (ECC) on the external pelt surface stratified by pre-harvest management practice treatment group and the number of samples (n*) for which the counts were below the minimum detection limit of 0.23, -0.08, and -0.08 for APC, TCC, and ECC; respectively log CFU/cm²

Effect	n	n*	APC	n*	TCC	n*	ECC
Wool (*P* of an effect):			$P < 0.12$		$P < 0.02$		$P < 0.11$
30 day (30)	62	0	6.4^{a}	0	2.9^{a}	0	2.8^{a}
≤ 5 day (5)	58	0	6.4^{a}	0	2.7^{b}	0	2.7^{a}
Unshorn (u)	60	0	6.2^{a}	0	2.6^{b}	0	2.5^{b}
Bedding (*P* of an effect):			$P < 0.01$		$P < 0.88$		$P < 0.69$
Bedded (b)	87	0	6.5^{a}	0	2.7^{a}	0	2.6^{a}
Non-Bedded (n)	93	0	6.2^{b}	0	2.8^{a}	0	2.7^{a}
Pen Condition (P) (*P* of an effect):			$P < 0.01$		$P < 0.01$		$P < 0.01$
Wet (w)	90	0	6.4^{a}	0	2.5^{b}	0	2.4^{b}
Dry (d)	90	0	6.2^{b}	0	3.0^{a}	0	2.9^{a}
Three-way interaction (*P* of an effect):			$P < 0.01$		$P < 0.01$		$P < 0.01$
30 × b × w	14	0	6.9^{a}	0	3.2^{ab}	0	2.9^{bcd}
30 × b × d	17	0	6.1^{bc}	0	3.6^{a}	0	3.5^{a}
30 × n × w	17	0	6.8^{a}	0	2.3^{d}	0	2.2^{e}
30 × n × d	14	0	5.8^{de}	0	2.7^{cd}	0	2.5^{de}
5 × b × w	9	0	6.3^{b}	0	2.3^{d}	0	2.3^{e}
5 × b × d	16	0	7.0^{a}	0	3.1^{bc}	0	3.0^{bc}
5 × n × w	17	0	5.9^{cd}	0	2.3^{d}	0	2.3^{e}
5 × n × d	16	0	6.2^{bc}	0	3.0^{bc}	0	3.0^{bc}
u × b × w	17	0	5.6^{e}	0	1.6^{e}	0	1.5^{f}
u × b × d	14	0	6.9^{a}	0	2.7^{cd}	0	2.6^{cde}
u × n × w	16	0	7.0^{a}	0	3.3^{ab}	0	3.2^{b}
u × n × d	13	0	5.5^{e}	0	2.9^{bc}	0	2.8^{bcd}
Root MSE			0.4		0.6		0.6

[a,b,c] In a column and for an effect, means bearing a common superscript letter do not differ ($P > 0.05$).

CFU/cm² based on the maximum sensitivity of the test with no further dilution of the samples. Minimum detection limits for TCC and ECC were both -0.08 log CFU/cm², also based on the maximum sensitivity of the tests with samples further diluted by a factor of 10^{-1}. Values for APC, TCC, and ECC that were below the minimum detection limit were entered into the data set as 0.23, -0.08, and -0.08 log CFU/cm², respectively.

Mean values for APC, TCC, and ECC were then analyzed using analysis of variance procedures of SAS *(18)*. The model included main fixed effects of wool length, use (or not) of bedding, and pen condition (wet or dry), along with the two- and three-way interactions between these main effects. Least squares means for the main effects and three-way interactions were separated using a protected pairwise *t*-test of SAS. All differences were reported at a significance level of $\alpha = 0.05$.

Observations concerning in-plant sanitation and handling practices

During in-plant sample collection in this study and in a previous study involving six geographically dispersed lamb-packing facilities, observations regarding practices and procedures used to slaughter/dress/chill lambs were recorded. These evaluations documented the application of microbiological intervention strategies, sanitation practices, handling procedures, and overall plant sanitation. From these in-plant observations, suggestions for improvement of GMPs were provided to assist plant personnel in their efforts to reduce bacterial contamination and to improve the microbiological quality of lamb carcasses.

TABLE 2. Mean (log CFU/cm²) Aerobic Plate Counts (APC), Total Coliform Counts (TCC), and *E. coli* Counts (ECC) on lamb carcasses at the pre-evisceration sampling location by pre-harvest management subclass, and the number of samples (n*) for which the counts were below the minimum detection limit of 0.23, -0.08, and -0.08 for APC, TCC, and ECC; respectively log CFU/cm²

Effect	n	n*	APC	n*	TCC	n*	ECC
Wool (*P* of an effect):			$P < 0.01$		$P < 0.01$		$P < 0.01$
30 day (30)	46	0	4.7^{b}	0	1.9^{a}	0	1.9^{ab}
≤ 5 day (5)	64	0	4.6^{b}	0	1.6^{b}	0	1.6^{b}
Unshorn (u)	53	0	5.1^{a}	0	2.1^{a}	0	2.0^{a}
Bedding (*P* of an effect):			$P < 0.01$		$P < 0.10$		$P < 0.10$
Bedded (b)	83	0	5.0^{a}	0	1.8^{a}	0	1.8^{a}
Non-Bedded (n)	80	0	4.7^{b}	0	1.9^{a}	0	1.9^{a}
Pen Condition (*P* of an effect):			$P < 0.01$		$P < 0.20$		$P < 0.40$
Wet (w)	89	0	5.1^{a}	0	2.0^{a}	0	1.9^{a}
Dry (d)	74	0	4.5^{b}	0	1.8^{a}	0	1.8^{a}
Three-way interaction (*P* of an effect):			$P < 0.01$		$P < 0.01$		$P < 0.01$
30 × b × w	9	0	5.2^{b}	0	2.5^{ab}	0	2.3^{ab}
30 × b × d	15	0	3.8^{cd}	0	1.0^{c}	0	1.0^{c}
30 × n × w	17	0	6.2^{a}	0	2.1^{ab}	0	2.0^{a}
30 × n × d	5	0	3.7^{d}	0	2.3^{ab}	0	2.2^{ab}
5 × b × w	15	0	5.2^{b}	0	2.6^{a}	0	2.5^{a}
5 × b × d	16	0	5.5^{b}	0	1.9^{b}	0	1.9^{b}
5 × n × w	16	0	4.1^{c}	0	1.1^{c}	0	1.1^{c}
5 × n × d	17	0	3.7^{d}	0	0.9^{c}	0	0.9^{c}
u × b × w	14	0	4.0^{cd}	0	1.0^{c}	0	1.0^{c}
u × b × d	14	0	6.0^{a}	0	2.1^{ab}	0	2.1^{ab}
u × n × w	18	0	6.2^{a}	0	2.5^{a}	0	2.5^{a}
u × n × d	7	0	4.0^{cd}	0	2.6^{a}	0	2.7^{a}
Root MSE			0.6		0.7		0.7

[a-d] In a column and for an effect, means bearing a common superscript letter do not differ ($P > 0.05$).

RESULTS AND DISCUSSION

Microbial contamination

Two samples out of a total of 538 sponge swabs tested positive for *Salmonella* spp. One of these samples was collected from the exterior of a pelt of a lamb that was in the unshorn, non-bedded, wet pen treatment group; the other sample was collected in the cooler from a lamb carcass that was shorn less than 5 days before slaughter, but that was managed in a bedded, wet pen pre-harvest. None of the fecal samples (n = 141; collected from the bungs of each lamb carcass) tested positive for *Salmonella* spp. Not all bungs collected had sufficient feces to test for the presence of *Salmonella* spp. The limited number of positive samples did not allow any conclusions to be drawn relative to pre-harvest management practices of the lambs to reduce incidence of *Salmonella* spp.

The effects of different pre-harvest management strategies on microbial contamination on the external pelt surface are shown in Table 1. Individual treatment effects averaged over each of the other variables differed significantly for all three bacterial counts (APC, TCC, and ECC) only for pen condition. Mean APC of samples collected from the external pelt surface were higher ($P < 0.01$) on lambs that had been managed in pens that were wet, while mean TCC and ECC were higher ($P < 0.01$) on the external pelt surface of lambs that were managed in dry pens pre-harvest (Table 1). Although there are statistical differences between wet and dry pens for APC, TCC, and ECC, these differences are small, and means for the three-way interactions show wet versus dry means to be extremely variable. Differences in microbial populations across wool length and

TABLE 3. Mean (log CFU/cm²) Aerobic Plate Counts (APC), Total Coliform Counts (TCC), and *E. coli* Counts (ECC) on lamb carcasses in the cooler after 24 h of chilling stratified by pre-harvest management treatment subclass and the number of samples (n*) for which the counts were below the minimum detection limit of 0.23, -0.08, and -0.08 for APC, TCC, and ECC; respectively log CFU/cm²

Effect	n	n*	APC	n*	TCC	n*	ECC
Wool (*P* of on effect):			*P* < 0.01		*P* < 0.01		*P* < 0.01
30 day (30)	63	0	3.1^{b}	34	0.2^{b}	43	0.2^{b}
≤ 5 doy (5)	67	0	3.7^{a}	30	0.5^{a}	37	0.4^{a}
Unshorn (u)	65	0	3.6^{a}	40	0.3^{b}	44	0.2^{b}
Bedding (*P* of on effect):			*P* < 0.87		*P* < 0.80		*P* < 0.37
Bedded (b)	96	0	3.5^{a}	51	0.3^{a}	61	0.2^{a}
Non-Bedded (n)	99	0	3.5^{a}	53	0.3^{a}	63	0.3^{a}
Pen Condition (*P* of on effect):			*P* < 0.11		*P* < 0.03		*P* < 0.06
Wet (w)	100	0	3.6^{a}	55	0.4^{a}	61	0.3^{a}
Dry (d)	95	0	3.4^{a}	49	0.3^{b}	63	0.2^{a}
Three-woy interaction (*P* of on effect):			*P* < 0.01		*P* < 0.01		*P* < 0.01
30 × b × w	16	0	3.1^{b}	11	0.1^{c}	12	0.0^{c}
30 × b × d	16	0	5.0^{a}	2	0.7^{b}	5	0.6^{b}
30 × n × w	16	0	1.9^{cd}	12	0.1^{c}	14	0.1^{c}
30 × n × d	15	0	2.4^{c}	9	0.0^{c}	12	0.0^{c}
5 × b × w	17	0	3.0^{b}	1	0.2^{c}	5	0.1^{c}
5 × b × d	16	0	1.7^{d}	11	0.0^{c}	5	0.0^{c}
5 × n × w	17	0	5.3^{a}	5	1.1^{a}	4	0.9^{a}
5 × n × d	17	0	4.9^{a}	13	0.7^{b}	16	0.7^{ab}
u × b × w	17	0	5.1^{a}	13	0.9^{ab}	13	0.7^{ab}
u × b × d	14	0	3.0^{bc}	13	0.0^{c}	14	0.0^{c}
u × n × w	17	0	2.9^{bc}	13	0.0^{c}	13	0.0^{c}
u × n × d	17	0	3.3^{b}	1	0.1^{c}	4	0.0^{c}
Root MSE			0.83		0.48		0.45

^{a,b,c} In o column ond for on effect, means bearing a common superscript letter do no differ (*P* > 0.05)

use (or not) of bedding subclasses were slight and of little practical significance.

Mean (log CFU/cm²) APC, TCC, and ECC of lamb carcass surface samples at the pre-evisceration sampling location, by pre-harvest management subclass, are shown in Table 2. Microbial counts associated with samples obtained from the carcasses of lambs that had been shorn 30 days or less before harvest, including those shorn ≤5 days before harvest, at the pre-evisceration site were lower ($P < 0.05$) than plate counts from lambs that had never been shorn, but differences were small. This was not surprising, because the pre-evisceration sampling location immediately follows pelt removal and, as the pelt is rolled back from the carcass, a longer fleece is more likely to come into contact with the carcass during the removal process. The contact between the fleece and the carcass provides a perfect opportunity for microbial contamination on the external surface of the pelt to be transferred onto the muscle or adipose tissue surface of the carcass beneath the pelt.

The condition of the pen also influenced ($P < 0.01$) APC at the pre-evisceration site (Table 2). Carcasses from lambs that were managed in muddy conditions (wet) had higher ($P < 0.05$) mean APC than carcasses derived from lambs that were managed in dry pen conditions, but differences were small. Carcasses from the lambs maintained in muddy pens (wet) may have had higher microbial loads at the pre-evisceration site due to heavy soiling in the abdominal area of the carcass and due to the presence of dags (mud and/or fecal-coated wool that forms a hanging ball). Some of the dags present on the fleece were large and could

TABLE 4. Mean (log CFU/cm²) Aerobic Plate Counts (APC), Total Coliform Counts (TCC) and *E. coli* Counts (ECC) on lamb carcasses across wool, bedding, and pen condition

Effect	n	APC	TCC	ECC
Sampling location		$P < 0.0001$	$P < 0.0001$	$P < 0.0001$
Pelt-on	180	6.3[a]	2.8[a]	2.7[a]
Pre-evisceration	163	4.8[b]	1.9[b]	1.8[b]
Cooler (after 24 hr of chilling)	195	3.5[c]	0.3[c]	0.3[c]

[a-c] Means in a column that bear a common superscript letter do not differ ($P > 0.05$).

have served as an extension of the fleece, making it easier for microorganisms to be transferred via contact between the fleece and underlying carcass tissue during pelt removal.

Mean (log CFU/cm²) APC, TCC, and ECC on lamb carcasses, in the cooler after 24 h of chilling, by pre-harvest management technique are shown in Table 3. Microbial counts obtained from lamb carcasses in the cooler were important, because these carcasses had been subjected to microbial interventions in the packing plant to remove contamination and were representative of the microbiological quality of the final product at shipment. It was hypothesized that this study would demonstrate that shorn lambs that had been kept in clean, dry conditions would generate lamb carcasses with lower microbial contamination, but results do not support that hypothesis. For example, 8 out of 12 (66.7%) of the pre-harvest management treatment groups had mean ECC values that were not different ($P > 0.05$), ranging from -0.003 log CFU/cm² to 0.07 log CFU/cm². Those treatment groups with the lowest mean ECC included live lambs that had various wool lengths and were subjected to both bedding systems and both pen conditions.

Although the three-way interactions for all three microbiological counts were significant ($P < 0.05$), the main effects have been discussed because of the inability to discern any meaningful interpretations from these interactions. Two-way interactions have not been reported, but their variance has been accounted for in the AOV model. When main effects of pre-harvest management were analyzed individually (Table 3), effects that influenced microbiological plate counts on lamb carcasses in the cooler were wool (APC, TCC, and ECC) and pen condition (TCC only). Type of bedding did not affect ($P \geq 0.1$) mean APC, TCC or ECC, but wool length influenced ($P < 0.01$) all three types of plate counts, and pen condition influenced ($P < 0.01$) TCC on lamb carcasses in the cooler following chilling.

As expected, sampling location had a major effect on microbial plate counts (Table 4), which was why each sampling location was analyzed separately. However, in order to make a comparison between the twelve pre-harvest management treatment groups and the average for each location, mean values were computed for each sampling location across all main effects relative to pre-harvest management (Table 4). Comparisons of mean APC, TCC, and ECC for each treatment group (Tables 1-3) to mean APC, TCC, and ECC across all treatment groups at each sampling location (Table 4) demonstrated that predictions could not be made regarding the level of contamination that would be anticipated to occur on carcasses of lambs subjected to differing pre-harvest management techniques.

Under the conditions of this study, pre-harvest management practices (e.g., wool length, use of bedding, and pen condition before slaughter) appeared to have no major influence on the microbiological quality of lamb carcasses, and the management differences in pre-harvest practices did not provide an effective tool for reliably controlling microbial contamination on subsequent lamb carcasses. In agreement with these results, Van Donkersgoed et al. found that carcasses from beef cattle with dirty hides were of no worse hygienic condition than those from animals with relatively clean hides, and Field et al. could not find a connection between longer fleece length and dirtier lamb carcasses *(21, 6)*. It appeared that, in this study, the greatest control over carcass contamination was exerted within the packing plant through the use of good manufacturing practices and in-plant multiple microbiological interventions. Of course, these pre-harvest management practices can make a positive contribution towards improving the safety of lamb, but cannot be solely relied upon to control contamination (i.e., a critical control point).

Observations concerning in-plant sanitation, and handling practices

Presence of microbiological intervention strategies, sanitation practices, handling procedures, and overall plant sanitation were documented for the lamb-packing facility included in this study and in five additional lamb packing facilities included in previous research. Overall plant sanitation differed considerably among lamb packing facilities. Some plants utilized various decontamination technologies and some were still very primitive regarding the application of microbial intervention systems. From the in-plant observations, several areas of opportunity for improvement became evident. The following discussion includes suggestions for improvement that, if implemented, could lower bacterial contamination on lamb carcasses. With increased focus on food safety by industry, government officials, and consumers, it is important for plants to continually monitor and to improve in-plant manufacturing practices.

Pre-harvest presentation status of lamb

Although the pre-harvest presentation status may not greatly affect the level of contamination on the carcass (as observed in this study), lambs carrying less contamination on their fleece will decrease the level of contamination being brought into the packing facility. Dirty fleeces can carry contamination into the plant and increase the likelihood of microbial hazards occurring on the carcasses. Any efforts that can be made to reduce the possibility of pathogenic bacteria being transferred into the plant and/or onto the carcass should be made. In addition, delivering animals with less fleece contamination can have economic benefits as well. In another study, it was observed that tags on hides of cattle are associated with visible contamination on the carcass, increasing costs of production by decreasing line speeds 10 to 12%. Excessive visible contamination can create a need for additional trimmers, resulting in increased labor costs *(21)*. Fleece contamination can be controlled to some extent by shearing lambs before delivery to the plant. Plants also can improve the pre-slaughter presentation status of their lambs by improving structure and maintaining cleanliness of their holding pens. Some plants use holding pens with raised, slatted floors that enable feces to fall through rather than become embedded in lamb fleeces. This eliminates the need for bedding by keeping the lambs up out of the dirt or mud (especially during the wet season) to prevent the formation of tags/dags.

Pelt removal

Bacteria can easily be transferred from the pelt onto the carcass during skinning operations *(1, 10)*. Plants that are still removing pelts by manual fisting are at a disadvantage with regard to minimizing the microbial loads on their carcasses. The fisting of the carcass is a difficult, labor-intensive process that exists as a key point in the slaughtering/dressing sequence where cross-contamination can occur as employees handle each lamb carcass. Ideally, the installation of an automatic pelt-pulling system in a lamb packing plant would be the preferred method of pelt-removal, but this may not always be economically feasible. Plants at which pelts are removed by manual labor need to take extra care when removing the pelt and pay close attention to worker hygiene, especially between carcasses. Latex gloves should be worn and they need to be sanitized (with 82.2°C water) between carcasses by use of easily accessible hot water sanitizers to reduce the contamination transferred from the wool to the glove and, consequently, to the carcass.

Hot water sanitizers

Most lamb-packing facilities use strategically-placed hot water sanitizers (stainless steel containers, filled with water kept hot via an electric heating element or pipe-fed steam) to quickly decontaminate/thermally sanitize gloves and hand-held equipment during processing. Plant workers and their equipment can easily serve as vehicles for the transmission of microbiological and visible contamination onto the carcass *(3, 19)*. Hot water sanitizers, if used properly, have been shown to be very effective for reducing bacterial contamination on hands and equipment. Water heated to 82.2°C is the common antimicrobial agent, because it rapidly kills bacteria without leaving a residue, which could harm food products *(15)*. In many observed plants, sanitizers had inadequate water levels and were maintained at temperatures below 66°C. In addition, sanitizers in several plants contained high levels of visible contamination. To be effective, the water temperature in the sanitizer needs to be sufficiently high (preferably above 82.2°C). Sanitizers also need to be regularly cleaned, to reduce floating debris from being transferred to the carcass, and to be kept full, to allow for the proper immersion of gloves and equipment.

Steam-vacuuming

Proper use of steam vacuuming is an effective way to reduce visible and microbial contamination on the carcass – particularly when used early on in the harvesting process *(4, 5, 13)*. It was observed that some plant personnel failed to perform steam-vacuuming of every carcass thoroughly and effectively. Steam vacuum use should be concentrated on the carcass areas of highest contamination, such as the breast and leg. Employees that are designated to perform steam-vacuuming need to be properly educated regarding location and duration of proper steam-vacuuming protocol. All carcasses should be steam-vacuumed. Furthermore, for steam-vacuuming to be effective, it needs to occur at the proper point in the slaughter/dressing sequence. Because the pelt-removal process can create extensive contamination (from the pelt rolling back onto the carcass and from the generation of aerosols containing contamination), steam-vacuuming should occur after the pelt is

fully removed from the area to be vacuumed. The breast and leg areas of the carcass generally appeared to be the most highly contaminated regions of the carcass, and careful attention needs to be given to these areas.

Wash cabinets

Many plants use wash cabinets (of different models and styles) in one or two places in the slaughter/dressing sequence to reduce carcass contamination. Some of the cabinets observed had nozzles that were spraying at a very low pressure and some nozzles had become blocked with fat tissue. Kochevar et al. found that the presence of fecal material on lamb adipose tissue decreased with increasing water pressure *(14)*. To effectively remove contaminants such as hair, wool, bone-dust, etc., the nozzles need to be spraying the proper amount of water at an effective pressure. Wash cabinets need to be monitored to ensure that they are functioning properly. Monitoring should include ensuring that nozzles are spraying properly; if nozzles are clogged, an effort must be made to clear them. The water pressure in wash cabinets also needs to be checked. If the nozzles are not spraying water on the carcasses correctly and with enough pressure, they are not being utilized to their full effectiveness.

Rail-outs and carcasses left on line

Carcasses railed out for further trimming during harvesting were often left on the rail-out line for extended periods of time, and sometimes for entire break periods. This procedure subjects carcasses to exposure to higher temperatures (typical on slaughtering/dressing floors) for longer periods of time, thereby increasing microbial growth on carcass surfaces. Clean-up operations (e.g., washing floors with hoses) that often occur during break periods can create aerosols containing bacterial contaminants that are easily transferred to the product *(2)*. Efforts should be made to quickly process carcasses that have been railed out so they can be moved into the cooler expeditiously. In addition, no carcasses should remain on the line while plant employees are going on break, or leaving the line for extended periods of time during normal operations, in order to avoid prolonged exposure to higher temperatures or to aerosols created during clean-up.

Carcass spacing in coolers

In some plants, scientists observed carcasses packed very tightly in the cooler, thus preventing proper airflow to all carcasses. Carcasses that are packed too tightly in coolers fail to chill uniformly, thus allowing increased microbial growth. Areas on carcasses that are in contact during cooling remain wet, preventing complete surface drying *(9)*. Carcasses should be loaded into the cooler using a "first-in, first-out" procedure and spaced properly to allow airflow between carcasses.

CONCLUSIONS

At this time, the best control over the microbiological and visible contamination of lamb carcasses is maintained through good manufacturing practices, many of which were identified in this study, and through in-plant decontamination intervention systems. Improving the pre-slaughter presentation status of lamb may not have a direct effect on the microbiological counts on the final lamb carcass product, but limiting the amount of contamination entering the processing facility can have a positive effect on the final microbiological quality of lamb.

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3-A Stakeholders Begin Move to Third-Party Accreditation

Partners in the 3-A Sanitary Standards Program are holding discussions regarding the development of a new third-party accreditation (TPA) process for 3-A Symbol authorization.

The 3-A Symbol Administrative Council, the International Association of Food Industry Suppliers (IAFIS), the International Association for Food Protection (IAFP), and the International Dairy Foods Association (IDFA) met three times this summer, and plan to meet again in October 2000, April 2001 and August 2001 to accept input from interested parties. The participating groups are also working in close cooperation with the U.S. Food and Drug Administration and the U.S. Department of Agriculture on developing a TPA plan.

The 55-year-old 3-A Program formulates standards and practices for the sanitary design, fabrication, installation and cleanability of dairy and food equipment or systems used to handle, process and package consumable products where a high degree of sanitation is required. These standards and practices are developed through the cooperative efforts of industry experts. 3-A criteria are universally accepted by equipment manufacturers, fabricators, end users and sanitarians.

Under the current self-certification process, the 3-A Symbol Council accepts applications from equipment manufacturers and fabricators for authorization to display the registered 3-A Symbol on their products conforming to these standards. An ongoing concern for a safe food supply prompted 3-A participants to consider additional ways to ensure that equipment design lends itself to producing a safe product. When in place, the TPA system will provide a higher level of confidence in 3-A equipment across all participating groups.

Five working groups have been created to move the project forward. Four of those groups will develop guidelines regarding auditor qualifications, the auditing process, used/modified equipment issues and an administrative system for handling authorizations. The remaining group will manage ongoing education and communication needs related to the change to a TPA system. During the next year, the working groups will report their progress to partners of the 3-A Sanitary Standards program.

Input on this project from the food industry, including food industry suppliers, food processors and manufacturers and sanitarians is welcome. Comments and questions may be submitted online by visiting the 3-A Web site at www.3-a.org, or may be directed to the following participating groups:

- Dr. Warren S. Clark, Jr.
  3-A Symbol Administrative Council
  312.782.4888
  adpi@flash.net
- Dr. Tom Gilmore
  International Association of Food Industry Suppliers
  703.761.2600
  tgilmore@iafis.org
- David Tharp
  International Association for Food Protection
  515.276.3344
  dtharp@foodprotection.org
- Allen Sayler
  International Dairy Foods Association
  202.737.4332
  asayler@idfa.org

ANNOUNCING...

The **3-A Sanitary Standards Symbol Administrative Council** will hold a meeting to receive additional input on modifying the current "Self-Authorization" system of authorizing use of the 3-A Symbol to a **"Third Party Accreditation"** system. If you are interested in helping to guide this evolutionary process, contact Dr. Warren S. Clark, Jr., Chairperson of the 3-A Symbol Council at 312.782.4888.

Meeting Dates: October 26-27, 2000

Meeting Location: Marriott Wardman Park Hotel
Washington, D.C.

International Association for
Food Protection

Award Nominations

The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. You do not have to be an IAFP Member to nominate a deserving professional. To request nomination criteria, contact:

IAFP
6200 Aurora Ave., Suite 200W
Des Moines, Iowa 50322-2863
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655
Web site: www.foodprotection.org
E-mail: info@foodprotection.org

Nominations deadline is February 19, 2001. You may make multiple nominations. All nominations must be received at the IAFP office by February 19, 2001.

- Persons nominated for individual awards must be current IAFP Members. Black Pearl Award nominees must be a company employing current IAFP Members. NFPA Food Safety Award nominees do not have to be IAFP Members.
- Previous award winners are not eligible for the same award.
- Executive Board Members and Awards Committee Members are not eligible for nomination.
- Presentation of awards will be during the Awards Banquet at the IAFP Annual Meeting in Minneapolis, Minnesota on August 8, 2001.

Nominations will be accepted for the following Awards:

Black Pearl Award – Award Showcasing the Black Pearl

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

Sponsored by Wilbur Feagan and F&H Food Equipment Company.

Honorary Life Membership Award – Plaque and Lifetime Membership in IAFP

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

Harry Haverland Citation Award – Plaque and $1,000 Honorarium

Presented to an individual for years of devotion to the ideals and objectives of IAFP.

Sponsored by DiverseyLever/U.S. Food Group.

Harold Barnum Industry Award – Plaque and $1,000 Honorarium

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

Sponsored by NASCO International, Inc.

Educator Award – Plaque and $1,000 Honorarium

Presented to an individual for outstanding service to the public, IAFP and the arena of education in food safety and food protection.

Sponsored by Nelson-Jameson, Inc.

Sanitarian Award – Plaque and $1,000 Honorarium

Presented to an individual for outstanding service to the public, IAFP and the profession of the Sanitarian.

Sponsored by Ecolab, Inc., Food and Beverage Division.

Maurice Weber Laboratorian Award – Plaque and $1,000 Honorarium

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

Sponsored by Weber Scientific

NFPA Food Safety Award – Plaque and $3,000 Honorarium

Presented to an individual, group, or organization in recognition of a long history of outstanding contribution to food safety research and education.

Sponsored by National Food Processors Association.

International Association for Food Protection

Call for Nominations
2001 Secretary

A representative from education will be elected in the spring of 2001 to serve as IAFP Secretary for the year 2001-2002.

Send letters of nomination along with a biographical sketch to the Nominations Chairperson:

P. C. Vasavada
University of Wisconsin
College of Agriculture
Animal and Food Science Department
410 S. 3rd Street
River Falls, WI 54022-5001
Phone: 715.425.3150
Fax: 715.425.3785
E-mail: purnendu.c.vasavada@uwrf.edu

The Secretary-Elect is determined by a majority of votes cast through a mail vote taken in the spring of 2001. Official Secretary duties begin at the conclusion of the 2001 Annual Meeting. The elected Secretary serves as a Member of the Executive Board for a total of five years succeeding to President, then serving as Past President.

For information regarding requirements of the position, contact David Tharp, Executive Director at 800.369.6337 or 515.276.3344; Fax: 515.276.8655; E-mail: dtharp@foodprotection.org.

Nominations close November 1, 2000.

Call for Abstracts

IAFP
88th Annual Meeting — August 5-8, 2001
Minneapolis, Minnesota

Instructions for Preparing Abstracts

Procedure

- Abstracts should be typed in the space provided or on a separate sheet of paper. Abstracts must be double-spaced using a 12-point font size, and a maximum of 250 words.
- The first letter in each word in the title and proper nouns should be capitalized.
- List the names of authors and institution(s). Capitalize first letters and initials.
- Give the full name, title, mailing address, E-mail address, and the office telephone number of the author who will present the paper.
- Check the box to indicate if the paper is to be presented by a student entered in the Developing Scientist Awards Competition and have the form signed by your major professor or department head. (For more information on the Developing Scientist Awards Competitions, see the following pages.)
- Submit your abstract to the IAFP office. Abstracts must be received no later than January 8, 2001. Return the completed abstract form through one of the following methods:
  1. Mail one printed copy and an electronic version on a 3½ inch disk (saved as a word document) of the abstract to:

     IAFP
     Call for Abstracts
     6200 Aurora Avenue, Suite 200W
     Des Moines, IA 50322-2863
  2. E-mail to abstracts@foodprotection.org
  3. Internet submission will be available in November 2000.

Acknowledgment of receipt of abstract will be sent via mail or E-mail. Authors will be notified of acceptance or rejection by March 1, 2001.

NOTE: Your abstract must be received by the IAFP office no later than January 8, 2001. Photocopies of the abstract form may be used.

Abstract General Information

Content of the Abstract

The abstract should briefly describe the purpose of the research and objectives; methodology; essential results; and conclusions or implications.

Presentation Format

Papers may be presented by oral or poster format at the discretion of the IAFP Program Committee. Oral presentations will be scheduled with a maximum of 15 minutes, including a two to four minute discussion. LCD and 35-mm projectors will be available. Overhead projectors are not to be used. Other equipment may be used at speaker's expense. Prior authorization must be obtained.

Subject Matter for Papers

Papers should report the results of applied research on: food, dairy and environmental sanitation; foodborne pathogens; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives and residues; food and dairy technology; food service and food administration; quality assurance and control; mastitis; environmental health; waste management and water quality. Papers may also report subject matter of an educational and/or nontechnical nature.

Criteria for Acceptance of Abstracts

1. Abstract must accurately and briefly describe:
   (a) the problem studied and objectives
   (b) methodology
   (c) essential results
   (d) conclusions or implications
2. Abstract must report the results of original research pertinent to the subject matter described in "Subject Matter for Papers" section.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting; paper should not appear in print prior to the IAFP Annual Meeting.
5. Results should be summarized. Do not use tables or graphs.

Typical Reasons for Rejection of Abstracts

1. Abstract was not prepared according to "Instructions for Preparing Abstracts." (page 767)
2. Abstract does not contain essential elements described in "Criteria for Acceptance of Abstracts."
3. Abstract reports inappropriate or unacceptable subject matter, is not based on accepted scientific practices, or the quality of the research or scientific approach is inadequate.
4. Work reported appears to be incomplete.
5. The abstract was poorly written or prepared including spelling and grammatical errors.
6. Results have been presented/published previously.
7. The abstract was received after the deadline for submission.
8. Abstract contains information that is in violation of the IAFP Policy on Commercialism.

Additional Abstract Forms

Photocopies of the abstract form may be used.

Membership in IAFP

Membership in IAFP is not a requirement for presenting a paper at the IAFP Annual Meeting.

IAFP Abstract Form

DEADLINE: Must be Received by January 8, 2001

Title of Paper _____

_____

Authors _____

_____

Full Name and Title of Presenter _____

_____

Institution and Address of Presenter _____

_____

Phone Number: _____

Fax Number: _____

E-mail: _____

NOTE: Selected presentations may be recorded (audio or visual). The final decision on presentation format will be made by the Program Committee.

Format preferred: ☐ **Oral** ☐ **Poster** ☐ **No Preference**

Developing Scientist Awards Competitions ☐ **Yes**

Major Professor/Department Head approval (signature and date) _____

TYPE abstract, DOUBLE-SPACED, in the space provided or on a separate sheet of paper using a 12-point font size. No more than 250 words.

Call for Entrants in the Developing Scientist Awards Competitions

Supported by the IAFP Foundation

IAFP is pleased to announce the continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the Developing Scientist Oral Competition or the Developing Scientist Poster Competition.

Purpose:

1. To encourage students and recent graduates to present their original research at the IAFP Annual Meeting.
2. To foster professionalism in students and recent graduates through contact with peers and professional Members of IAFP.
3. To encourage participation by students and recent graduates in IAFP and its Annual Meeting.

DEVELOPING SCIENTIST ORAL AWARDS COMPETITION:

The Developing Scientist Oral Awards Competition is open only to graduate students enrolled in M.S. or Ph.D. programs or recent M.S. or Ph.D. graduates in programs at accredited universities or colleges where research deals with environmental, food or dairy sanitation, protection or safety. Competition entrants cannot have graduated more than one year prior to the deadline for submitting abstracts.

Prior to the Annual Meeting, up to ten finalists will be selected for competition. Awards will be presented at the IAFP Annual Meeting Awards Banquet to the top three presenters (first, second and third places). Presentations are limited to fifteen minutes which includes two to four minutes for discussion.

Awards: First Place, $500 and an engraved plaque; Second Place, $300 and a framed certificate; Third Place, $100 and a framed certificate. Award winners will also receive a complimentary, one-year IAFP membership including both *Dairy, Food and Environmental Sanitation* and *Journal of Food Protection*.

DEVELOPING SCIENTIST POSTER AWARDS COMPETITION:

The Developing Scientist Poster Awards Competition is open to enrolled undergraduate and graduate students or recent graduates from undergraduate or graduate programs at accredited universities or colleges where research deals with environmental, food or dairy sanitation, protection or safety. Competition entrants cannot have graduated more than one year prior to the deadline for submitting abstracts.

Prior to the Annual Meeting, up to ten finalists will be selected for competition and awards will be presented at the IAFP Annual Meeting Awards Banquet to the top three presenters (first, second and third places). Specific requirements for presentations will be provided at a later date. The presenter must be present for the specified time (approximately two hours) during the assigned session.

Awards: First Place, $500 and an engraved plaque; Second Place, $300 and a framed certificate; Third Place, $100 and a framed certificate. Award winners will also receive a complimentary, one-year IAFP membership including both *Dairy, Food and Environmental Sanitation* and *Journal of Food Protection*.

INSTRUCTIONS FOR DEVELOPING SCIENTIST AWARDS ORAL AND POSTER COMPETITION ENTRANTS:

1. Abstracts must be received by the IAFP office no later than January 8, 2001.
2. In addition to adhering to the general procedures for abstract preparation and submission required of all individuals submitting abstracts, competition entrants must submit one copy of their abstract. Competition entrants must also mark the appropriate box on the abstract form to indicate their intention to participate in the Developing Scientist Awards Competition and to designate whether it is "oral" or "poster."
3. Both the competition entrant and his or her presentation must be recommended and approved for the Competition by his or her major professor or department head, who must sign the abstract form.
4. The work must represent original research done by the competition entrant and must be presented by the competition entrant.
5. Competition entrants may enter only one paper in either the Oral or the Poster Competition.

ADDITIONAL INFORMATION:

1. All competition entrants are required to pay the registration fee (i.e., student member rate, Member rate, or nonmember rate) for the IAFP Annual Meeting. Nonmembers may join IAFP and receive the Member rate.
2. Acceptance of papers by IAFP for presentation at the Annual Meeting is independent of acceptance as a Competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the competition chairperson by June 1, 2001.
3. All competition entrants with accepted abstracts will receive a complimentary, one-year IAFP membership which includes their choice of *Dairy, Food and Environmental Sanitation* or *Journal of Food Protection*.
4. All competition finalists will receive a complimentary Awards Banquet ticket and are expected to be present at the banquet where the award winners will be announced and recognized.

JUDGING THE DEVELOPING SCIENTIST AWARDS COMPETITION:

Abstracts and presentations will be evaluated by an independent panel of judges. Selection of up to ten finalists for the Developing Scientist Oral Awards Competition and up to ten finalists for the Developing Scientist Poster Awards Competition will be based on evaluations of the abstracts and the scientific quality of the work (see judging criteria below). All competition entrants will be advised of the judges' decisions by June 1, 2001.

Only competition finalists will be judged at the Annual Meeting and will be eligible for the awards. All other competition entrants with abstracts accepted by the IAFP Program Committee will be expected to present their papers or posters as part of the regular Annual Meeting. The presentations will not be judged and they will not be eligible for the awards.

JUDGING CRITERIA FOR THE DEVELOPING SCIENTIST AWARDS COMPETITION:

ABSTRACT:

Clarity; comprehensiveness; conciseness.

SCIENTIFIC QUALITY:

Adequacy of experimental design; extent to which objectives were met; difficulty and thoroughness of research; validity of conclusions based upon data; technical merit; contribution to science.

PRESENTATION:

Organization (clarity of introduction, objectives, methods, results and conclusions); quality of visuals; quality and poise of presentaation and in answering questions.

NOTE: Your abstract must be received by the IAFP office no later than January 8, 2001. Photocopies of the abstract form may be used.

IAFP Policy on Commercialism

1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or all related type forums and discussions offered under the auspices of the International Association for Food Protection (hereafter referred to as Association forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the expressed permission of the staff or Executive Board. The Association enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for the Association forums.

2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff on the basis of originality before inclusion in the program.

2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the Program Committee chairperson and/or technical reviewers selected by the Program Committee chairperson in order to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this would make the submission or presentation significantly more difficult to understand, the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff will judge whether the use of trade names, etc., is necessary and acceptable.

2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services, however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

2.6 Proprietary Information (See also 2.2.)

Some information about products or services may be proprietary to the author's agency or company, or to the user and may not be publishable. However, their scientific principles and validation of performance parameters must be described. Conclusions and/or comparisons may only be made on the basis of reported data.

2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.

3. GRAPHICS

3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

3.2 Source

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

3.3 Company Identification

Names or logos of agencies or companies supplying the goods or services must not appear on the graphics, except on the first slide of the presentation. Slides showing products may not include predominant nameplates. Graphics with commercial names or logos added as background borders or corners are specifically forbidden.

3.4 Copies

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the Program Committee chairperson, session convenor, and/or staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convenor to verify that all graphics to be shown have been cleared by Program Committee chairperson, session convenor, staff, or other reviewers designated by the Program Committee chairperson.

4. INTERPRETATION AND ENFORCEMENT

4.1 Distribution

This policy will be sent to all authors of submissions and presentations in the Association forums.

4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both staff and technical reviewers selected by the Program Committee Chairperson. All reviewer comments shall be sent to and coordinated by either the Program Committee Chairperson or the designated staff. If any submissions are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

4.3 Author Awareness

In addition to receiving a printed copy of this policy, all authors presenting in a forum will be reminded of this policy by the Program Committee chairperson, their session convenor, or the staff, whichever is appropriate.

4.4 Monitoring

Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convenor that a violation or violations have occurred or are occurring, he or she will publically request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.), and will notify the Program Committee chairperson and staff of the action taken.

4.5 Enforcement

While both technical reviewers, session convenors, and/or staff may check submissions and presentations for commercialism, ultimately it is the responsibility of the Program Committee chairperson to enforce this policy through the session convenors and staff.

4.6 Penalties

If the author of a submission or presentation violates this policy, the Program Committee chairperson will notify the author and the authors' agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, the Association reserves the right to ban the author and the authors' agency or company from making presentations in the Association forums for a period of up to two (2) years following the violation or violations.

NewMembers

CANADA

Steven A. Wright
Hiram Walker & Sons Ltd.
Windsor, Ontario

Yi-Xue Zhau
Umedik Inc., Toronto, Ontario

LEBANON

Michael B. Bayoud
Boecker Public Health, Beirut

PORTUGAL

Manuela Corte-Real
Universidade de Minho, Braga

QATAR

Jasim Al-Jedah
Central Laboratory, Doha

SINGAPORE

Jenny H. Sng
3M Asia Pacific Pl., Singapore

UNITED KINGDOM

James Knowles
University of Southbank, London

Tri I. Wirjantoro
University of Reading, Reading

UNITED STATES

Alabama

Melvin L. Carter
Auburn University, Tuskegee

Shin-Hee Kim
Auburn

Arkansas

Keith Day
Conagra Frozen Foods, Russellville

California

Troy Bonata
Delimex, San Diego

William King
Rhodia Food, Walnut Creek

Doug Willrett
Rhodia Food, Walnut Creek

Connecticut

Cindy Mickune
Umedik, Inc., Bethel

Gordon Tredger
Perkin Elmer, Inc., Norwalk

Delaware

Patrick D. Foley
DuPont Qualicon, Wilmington

District of Columbia

Mary Ellen Butler
Food Chemical News, Washington

Ram Rao
USDA-CSREES, Washington

Laura Sammons
International Dairy Foods Assoc.
Washington

Florida

Stephen Basore
TKM Farms Inc., Belle Glade

Zeb E. Blanton, Jr.
Florida Dept. of Agriculture
& Consumer Services
Altamonte Springs

Doug Campbell
Experior Assessments, Clearwater

Scott F. Harvey
Einsteins Brothers Bagels
Coral Springs

Georgia

David J. Charest
Rhodia, Inc., Snellville

Vincient R. Kramer
Dutch Quality House, Oakwood

Shiao Mei Lee
University of Georgia, Griffin

John Loftis
Harry's Farmers Market, Inc.
Roswell

Ying Mao
University of Georgia, Griffin

Nancy A. Reimer
UGA, Athens

Kidon Sung
University of Georgia, Athens

Illinois

Charles T. Deibel
Deibel Laboratories, Lincolnwood

William E. Gambrel
Dean Foods Co., Harvard

Peter N. Gray
BTI, Chicago

Cassandra Powell
United Airlines, Country Club Hills

Steven A. Sklare
Superior Commercial Services
Skokie

Kansas

Kendra Kerr
Kansas State University
Manhattan

Harshavardhan Thippareddi
Kansas State University, Manhattan

Kentucky

Nathan C. Clayton
John D. Cooley Attorney at Law
Lexington

Joseph O'Leary
University of Kentucky, Lexington

Lynne A. White
University of Kentucky
Lexington

Massachusetts

Jeffrey P. Guilbert
Advanced Instruments, Norwood

Thomas Hankinson
Pure Produce, Worcester

Robert Sanderson
Jonathan Sprouts, Marion

Maryland

Craig Kelly
John Hopkins University Hospital
Laurel

Hanchun Yang
University of Maryland
College Park

Michigan

Kevin Harrah
Livonia

Minnesota

Michael C. Busch
Foss North America, Eden Prairie

Mississippi

Thomas E. Rogers
Orkin, Brandon

Missouri

Paul Chapa
Meat & Poultry, Kansas City

Brittney Wallace
Missouri Dept. of Health
Jefferson City

Nebraska

Willard P. Walrath, Jr.
Kelley Bean Co., Inc., Scottsbluff

New Jersey

Megha Gandhi
Rutgers University
New Brunswick

Robert J. Jankelunas
Nabisco, East Hanover

Michael Kurzawa
Nabisco, East Hanover

Brian K. Mayer
Campbell Soup Co., Camden

Daniel E. Nemeth
Nabisco, Flanders

Ethan B. Solomon
Rutgers University
New Brunswick

James L. Springer
Nabisco Biscuit Co., East Hanover

New York

Richard V. Lee
SUNY at Buffalo, Orchard Park

Ibrahim Naderi
American Express, Jamaica

North Carolina

Randy J. Giwer
Keystone Foods, Reidsville

Scott Jeffrey
Organon Teknika Corp., Durham

J. Royden Saah
NC Dept. of Agriculture
Raleigh

Ohio

Cindy K. Ewing
T. Marzetti, Columbus

Kevin M. Halligan
Toledo Lucas County H.D.
Perrysburg

Bruce Phillips
ChemStation, Dayton

Robert C. Strong
DiverseyLever Consulting
Liberty Township

Puerto Rico

Jose Hoyos
Fuji Food Co., Guaynabo

Rhode Island

Thomas M. Dwyer
International Dioxcide, Inc.
North Kingstown

Tennessee

Philipus Pangloli
University of Tennessee
Knoxville

Texas

Greg A. Gardner
Silliker Laboratories of Texas
Fort Worth

Lee G. Johnson
Texas A&M, College Station

Virginia

Larry E. Glaze
US Public Health Service/FDA
Stafford

Paul R. Nadeau
Corniani Division ACMA USA
Richmond

Edwin Velez Rivera
US Army, Fort Belvoir

Washington

Mary Ferlaga
Washington State Dept. of Health
Kennewick

Cayce Warf
Alcide Corp., Redmond

Wisconsin

Joseph C. Thomas
JWP, Sturtevant

New Sustaining Member

Donna M. Garren
United Fresh Fruit & Vegetable Association
Alexandria, Virginia

UpDates

Silliker Hires Rias as VP of Operations — Europe

Silliker bioMérieux, Inc., has hired Jean Rias as vice president of operations – Europe. The newly created position will be based in Cergy, France and was driven by the food testing and consulting network's rapid expansion in Europe.

Rias has management responsibilities for all of Silliker's European laboratories (currently 10 labs in Belgium, France, Italy, The Netherlands, Spain and the UK) and Silliker's other lines of business; auditing, technical consulting, and training. He will also be responsible for leading the successful integration of new European acquisitions and business activities into the worldwide Silliker network. Rias reports to Russell F. Flowers, Ph.D., Silliker bioMérieux, Inc., President and CEO.

Prior to joining Silliker, Rias served in senior level management positions for many leading European companies, including Giat Industries, Thompson Industries, and Philips in France. Fluent in several languages, Rias has an extensive international background in operations, sales and marketing, strategic planning, and ISO 9000. He is a graduate of the Polytechnique High Engineering School–Paris and ENSTA High Engineering School–Paris.

Copesan Announces New Quality Control Auditor

Copesan is pleased to announce that Tim Chamberlain has been appointed to the position of quality control auditor. In this position, Tim's primary responsibility is completing quality audits related to pest management services provided by Copesan. Tim will also work closely with Copesan's client management team and client personnel as required.

Tim joins Copesan with 30 years of experience in Quality Systems at Kraft-Oscar Mayer. Prior to Copesan, Tim held the position of quality auditor liaison and specifically was the liaison for pest control at the Madison, WI plant for 15 years. Tim's responsibilities at Kraft-Oscar Mayer included, overseeing the pest control program, auditing the HACCP program, and USDA compliance. In addition, Tim created many action plans for pest reduction by using fewer chemicals and using Integrated Pest Management. Tim also worked on an ISO 9000 team to implement documentation for microbiology and pest control reporting.

Lacana Named to IAFIS Board of Directors

Richard (Dick) Lacana was named an at-large member of the International Association of Food Industry Suppliers (IAFIS) Board of Directors. Lacana is vice president/general manager, Global Packaging Machinery Business for International Paper/Evergreen Packaging Equipment in Cedar Rapids, IA. He replaces John Barsanti, who resigned from the Board after taking a position outside the industry.

At International Paper/Evergreen Packaging Equipment, Lacana is responsible for all aspects of packaging machine development, manufacturing, sales and service on a worldwide basis. Before taking over the Global Packaging Machinery Business, he was vice president/general manager of Evergreen Packaging Equipment.

California Milk Advisory Board Names Stan Andre as New CEO

The California Milk Producers Advisory Board (CMAB) has announced that Stan G. Andre, will succeed Adri G. Boudewyn as chief executive officer, effective January 1, 2001. Boudewyn, who is retiring at the end of this year, has been with the CMAB for the past 17 years, the last six as CEO.

"Andre has made tremendous contributions to the CMAB over the years and, as CEO, he has reshaped how we market our milk products," said Jeffery Poston, CMAB board chairman. "He was instrumental in creating the current highly successful 'It's The Cheese' marketing campaign, now in its sixth year. He also led the development of a five-year strategic plan that expanded our marketing outside of California. We looked long and hard to find a replacement who can continue this legacy, and the board feels that Stan Andre has both the experience and the expertise we need."

Andre most recently served as Senior Vice President of Marketing and Sales for Nulaid Foods, Inc., Ripon, California. Prior to that, he served with the CMAB as Director of Manufactured Products from 1986 to 1992. Previously, he held sales management positions with Fillmore Foods, Avoset Food Corporation, and Carnation Company.

Blakely Re-elected to Lead ADPI

Dr. Lee E. Blakely, Land O' Lakes, Inc., St. Paul, MN, was re-elected president of the American Dairy Products Institute (ADPI) during the association's Annual Meeting held recently in Chicago. Blakely, a member of the ADPI Board of Directors since 1989, has served on the Institute's Executive Committee since 1990; he served as ADPI vice-president in 1997 and 1998, and was first elected president of ADPI in 1999.

Re-elected as vice-president was Mark Davis, Davisco International, Inc., Le Sueur, MN. Davis was elected a director of the American Dairy Products Institute in 1992 and has been a member of the ADPI Executive Committee since 1996.

Other officers re-elected to head the association were: secretary, Walt Wosje, Michigan Milk Producers Assn., Novi, MI; and treasurer, Phillip Dale Smith, Leprino Foods, Denver, CO.

Re-elected to serve as members of the Institute's Executive Committee were the above-named officers and directors Donald L. Brick, Swiss Valley Farms Co., Davenport, IA; Bob L. Hall, O-AT-KA Milk Products Cooperative, Inc., Batavia, NY; Harlan H. Mammen, Associated Milk Producers, Inc., New Ulm, MN; William J. Merrick, III, Merrick's, Inc., Reno, NV; Harold A. Schild, Tillamook County Creamery Association, Tillamook, OR; Richard W. Stammer, Agri-Mark, Inc., Lawrence, MA; and John F. Underwood, WestFarm Foods, Seattle, WA.

General Manager, Controller Appointed at Sharpsville Container

A new general manager and a controller have been appointed at Sharpsville Container, Inc., which is one of four operating units of Renaissance Industries, Inc. Sharpsville Container is a well-known manufacturer of stainless steel tanks, closed-loop aseptic systems and containers, and roto molded plastic products for a variety of industrial and logistical uses.

The new general manager at Sharpsville is Angelo A. Giannini, who joins the firm after several years with a variety of companies in the eastern Ohio-western Pennsylvania area including YSD Industries, Midland Steel Products, Medina Blanking, Inc., Wilkof-Morris Steel, Universal-Rundle Corp and G.F. Furniture Systems. Experienced in industrial engineering and plant management, Giannini brings extensive knowledge of high-level quality systems to Sharpsville Container. He recently patented a system for straightening steel rails. Giannini graduated from Youngstown (Ohio) State University with a BA and an MBA.

Appointed as controller at Sharpsville Container is Christopher M. Ghiates, who was manager of finance at Dufer Co. Farrell Corp. in Farrell, PA.

A graduate of Thiel College in Greenville, PA, Ghiates has a degree in accounting and business administration. He worked in public accounting for several years before beginning his career in corporate finance.

In the September issue of *DFES* the manuscript titled "The Effect of Different Thawing Methods on the Growth of Bacteria in Chicken" ran this table on page 681. Under the "Thawing Method" column "In the refrigerator" the number should have been 0.146 and not -0.146. We apologize for this error.

TABLE 1. Change in bacterial population as affected by thawing method
[Log CFU/g (after thawing* -before freezing*]

Thawing Method	APC	Enterobacteriaceae	Pseudomonads
On counter	-0.254	-0.21	-0.403
Flowing, potable water	-0.207	0.003	-0.303
In the refrigerator	0.146	-0.10	0.470

*Average of three samples.

Strikingly Similar Protein May be in Alzheimer's and Mad Cow Disease

A "striking similarity" between proteins involved in the early stages of Alzheimer's disease and mad cow disease was described at the 220th national meeting of the American Chemical Society, the world's largest scientific society. The theory, if verified by other researchers, could help focus efforts to develop preventive drugs, according to the study's lead researcher, Chi Ming Yang, Ph.D., a professor of chemistry at Nankai University in Tianjin, China.

Prion diseases – which include, among others, neurodegenerative diseases such as mad cow disease and its human counterpart, Creutzfeldt-Jakob disease – are caused by a malfunctioning prion protein. In Alzheimer's disease, another neurodegenerative disease, the amyloid precursor protein has been implicated.

Using computer modeling, Yang discovered a similar pattern of amino acids in the prion protein and the amyloid precursor protein: a reductive amino acid followed by three non-reductive amino acids.

"This suggests a common molecular mechanism underlying the initiation stages of sporadic Alzheimer's disease and both sporadic and genetic prion diseases," says Yang. Reductive amino acids are more prone to damage by oxygen-containing free radicals (molecules with a highly reactive unpaired electron) than other amino acids, explained Yang. Normally, the body can clear itself of free radicals. But with age, this system may fail. When enough free radicals accumulate to damage a protein molecule, it can malfunction.

Proteins typically fold into specific three-dimensional structures that determine their functions. A malfunctioning protein may remain partially unfolded, which can place different amino acids in close proximity, Yang explained and in the case of Alzheimer's and prion diseases, the reductive amino acids in close proximity can lead to the formation of protein plaques.

Although Alzheimer's and prion diseases seem to start in similar ways, they progress differently. "This may explain why Alzheimer's disease advances at a much slower pace than Creutzfeldt-Jakob disease," says Yang.

NEWS

Cryptosporidiosis Outbreak Associated with Majorcan Hotel

The Communicable Disease Surveillance Centre (CDSC) in London and the Scottish Centre for Infection and Environmental Health (SCIEH) in Glasgow have received 112 laboratory confirmed cases of cryptosporidiosis in British holiday makers returning from a hotel in the resort Calas de Mallorca on the Spanish island of Majorca. A further 107 suspected cases of cryptosporidiosis in British holiday makers have also been reported to CDSC and SCIEH in 2000. Among the confirmed cases reported to CDSC, two had concurrent infections with *Campylobacter*. The latest date of onset for cases so far reported to CDSC is 15 August, 2000.

The tour operator used by most cases resident in the United Kingdom advised that holiday makers should not use the swimming pool. Ongoing investigation is being carried out.

Scientists Seek Strategies to Safeguard Fresh Sprouts

Fresh sprouts make a crisp, crunchy and healthful addition to sandwiches, salads, soups, omelets and other dishes. Now, studies by Agricultural Research Service scientists may lead to new ways to help protect raw sprouts from attack by *E. coli*, *Salmonella* or other pathogenic microorganisms. These microbes can flourish in the warm, moist indoor environment in which seeds are induced to sprout, according to microbiologist Amy O. Charkowski at Albany, CA Seeds purchased by "sprouters" – the growers who run the indoor operations that yield sprouted seeds – may already be contaminated by microbes harbored in irrigation water, fertilizer, or bird or mouse droppings, according to Charkowski. She is with the Food Safety and Health Unit at the ARS Western Regional Research Center in Albany.

In laboratory studies with radish, alfalfa, broccoli and mung bean sprouts, Charkowski wants to determine what compounds produced naturally by the sprouts such as amino acids – nurture the attacking microbes. She will then determine whether harmless bacteria might be applied to the sprouts to deprive the food-poisoning microbes of the compounds vital to their attack.

In other experiments, Charkowski intends to pinpoint genes that *Salmonella* turns on – or "expresses" – when it colonizes sprouts. Once scientists know which *Salmonella* genes are crucial to successful attacks, the

researchers may be able to develop a strategy to activate and amplify sprouts' natural protective mechanisms. Charkowski anticipates that the genes *Salmonella* activates are likely the same as those it uses when it invades other fresh produce – and perhaps meats and poultry. If that is the case, food safety strategies developed from the sprout research may also help protect these other foods from *Salmonella*. ARS is USDA's chief research agency.

Deadly for Bacteria, Great for Consumers

Electrolyzed water rivals chlorine and heat for killing *E. coli*, *Salmonella* and *Listeria*. Electricity and water can be fatal. But that could be good news for consumers now that researchers have shown the deadly combination also kills bacteria like *E. coli*, *Salmonella* and *Listeria* on foods and food utensils.

"Electrolyzed water" – produced by applying an electrical current to a very dilute saltwater solution kills bacteria on fresh produce more effectively in some cases than heat or water containing chlorine, according to a research report presented at the 220th national meeting of the American Chemical Society, the world's largest scientific society.

"Electrolyzed water could also be used to sanitize cutting boards, eating and drinking utensils, and food-processing equipment," says Yen-Con Hung, Ph.D., the University of Georgia professor who conducted the research. Soaking a cutting board in electrolyzed water for about five minutes at a moderately warm temperature (about 95-105°F) can reduce bacteria up to a million-fold. One advantage of using electrolyzed water to kill bacteria on food surfaces is that it doesn't adversely affect quality as heat can, according to Hung. Trained sensory panelists "found there was no significant effect of the treatment on the quality," he said. They were "unable to find any differences in color, appearance or smell" between produce washed with electrolyzed water and produce washed with tap water.

The electrolytic process produces very acidic water. Hung believes the water's low pH (acidity) and potential for oxidation-reduction contribute to its effectiveness. Essentially, oxidation-reduction involves the exchange of electrons. In the case of bacteria like *E. coli*, *Salmonella* and *Listeria*, this exchange may take away electrons needed by cell membranes for metabolism and survival.

"We think the main indicator of the effectiveness of the solution is the oxidation-reduction potential," says Hung. "When you compare chlorinated water with electrolyzed water, there is a difference in the oxidation-reduction potential, even though they have the same chlorine concentration. The exact role of oxidation-reduction in destroying bacteria is still being investigated."

Chlorine is not physically added to electrolyzed water, but is produced when the electrical current passes through the water and salt mixture. The chlorine that is generated "is definitely one of the major components for killing microorganisms," Hung acknowledges. But, he adds, electrolyzed water has additional active components – oxidants – that his research group is trying to identify. The equipment needed to produce and treat food with electrolyzed water is compact and already produced by several companies in Japan. A typical unit costs between $3,000 and $5,000, says Hung. He believes the food industry will be first to use electrolyzed water and then, as equipment costs come down, consumers will use it at home. A fast-food chain in the United States is testing the technology and several other companies have expressed interest. He did not identify them. A few US water treatment plants already use technology similar to that tested, according to Hung.

Accomplishments of the HACCP-based Inspection Models Project

Preliminary data from FSIS' HACCP-based inspection models project (HIMP) indicate that the new system dramatically improves the safety of poultry products and increases overall consumer protection as well. However, a recent decision handed down by the U.S. Court of Appeals for the District of Columbia reversed a lower court's decision supporting the project, and sent it back for further proceedings. FSIS remains committed to modernizing inspection, and while the Agency explores all options in light of the court's decision, the HIMP project continues. FSIS intends to hold its fifth public meeting on HIMP in September 2000.

In October 1999, FSIS began the project to determine whether new government slaughter inspection procedures, in conjunction with new plant responsibilities, can improve food safety, increase consumer protection, and provide flexibility for FSIS to use its resources more effectively. Under the project, FSIS is establishing performance standards for food safety and non-food safety defects (also known as "other consumer protections" or OCP) found in young chickens, hogs and turkeys. The food safety performance standards for young chickens are set at zero to protect consumers from conditions that may be harmful.

The OCP performance standards are based on baseline data collected in participating plants before the new models were tested and thus represent the system. The new OCP performance standards have been set at the 75th percentile; thus, 25

percent of the plants would have to improve their baseline results in order to meet the more stringent standards. Participating plants must revise their Hazard Analysis and Critical Control Points (HACCP) systems to meet these food safety performance standards and establish process control systems to address the OCP concerns.

FSIS conducts continuous inspection with verification to ensure these standards are met and that products can receive the mark of inspection. Under the new system, FSIS inspectors check for fecal contamination four times more frequently than under the traditional system. Approximately 30 plants that slaughter young chickens, turkeys, and swine have begun participating in the project, although data are available only for young chickens at this time.

Data collection was conducted by Research Triangle Institute, an independent consulting firm. Data collected from 14,000 carcasses before and 14,000 carcasses after the models were implemented were compared in seven young chicken plants to determine whether the new system improves food safety and increases consumer protection. The data are complete for seven poultry plants, while data for nine additional plants will be forthcoming. Data collection is complete for both phases of testing after six weeks of microbiological testing and five weeks of organoleptic testing.

Publication of Comments on the Food Safety White Paper

The European Commission (EU) has published a series of comments from interested parties on the Food Safety White Paper. The White Paper, which was adopted in January this year sets out a major program of legislative form to complete the EU's integrated "farm to table" approach to food safety. It also proposed the establishment of a new European Food Authority. In the spirit of greater transparency at all levels of food safety policy making which is a key element of the new approach, the Commission invited all interested parties to comment on the White Paper. Nearly 110 contributions were received. In so far as their authors have agreed to publication, these comments are now available on the Commission's Europa Web site. The comments include contributions from other EU institutions, EU Member State authorities, third country governments, food and drink industry, agricultural organizations, retailers and distributors of food products, consumer groups and other stakeholders. They represent a wide variety of different, and sometimes contradictory, positions on the White Paper approach. As far as possible, the Commission is taking both general and specific comments into account in its drafting of the concrete proposals.

New Treatment Makes Fruit Juices Safer; New Approach Also Keeps Juice Tasting Fresh

Carbon dioxide, the stuff that makes soft drinks fizzy, can also make fresh fruit juice safer to drink, according to researchers at the University of Florida. The findings were reported at the 220th national meeting of the American Chemical Society, the world's largest scientific society.

Treating juice with carbon dioxide works as well as heat pasteurization to eliminate bacteria without altering the flavor, according to Stephen Hill and Dilek Kincal, graduate students at the university. They conducted their research under the direction of Maurice Marshall, Ph.D., and Murat Balaban, Ph.D., professors at the University of Florida Institute of Food and Agricultural Sciences. "Tasters could not tell the difference between fresh-squeezed orange juice and carbon dioxide-treated juice," Marshall says. An added benefit of the carbon dioxide treatment is that it also improves the appearance of fresh-squeezed orange juice. The process deactivates an enzyme that causes the juice to separate into a transparent, watery layer at the top and a pulpy mass at the bottom. Ninety-eight percent of juices in the United States are heat pasteurized, the same method used to treat milk, according to the U.S. Food and Drug Administration (FDA). Less than two percent of juices do not get pasteurized and can cause food poisoning.

"Right now heat pasteurization is the only game in town to minimize pathogens in juice. The heat required for pasteurization has the effect of making fruit juice taste 'slightly cooked'," according to Marshall. Other alternative methods to pasteurization – UV radiation, high pressure and pulsed electric fields – also raise the temperature of the juice, but for a much shorter period of time.

Using carbon dioxide instead of heat preserves the flavor of the juice while still killing pathogens. Pressurized liquid carbon dioxide is added to the juice at room temperature. After ten minutes, the mixture is depressurized. The carbon dioxide turns into a gas and escapes, leaving behind a pure, non-fizzy juice.

To test the effectiveness of the treatment, the researchers inoculated sterile orange juice and apple cider with *Salmonella*, *E. coli* and

Listeria monocytogenes, another bacteria commonly found in food, and then treated the contaminated juice with the pressurized CO_2. The treatment reduced the bacteria population from more than 100,000 organisms per milliliter to zero. The researchers do not know precisely how the carbon dioxide destroys the microbes but suspect that the reduction of oxygen in the system and high pressure might play a role.

Use of Antimicrobials in Food Animals: New World Health Organization (WHO) Recommendations

WHO has just released global principles aimed at mitigating the risks related to the use of antimicrobials in food animals. Among other uses, antimicrobials kill bacteria in animals used for human food.

Over 70 experts from human and veterinary medicine, national licensing authorities, pharmaceutical companies and international organizations (such as the Food and Agriculture Organization of the United Nations (FAO) and the World Animal Health Organization), met from 5 to 9 June 2000. They discussed six important areas of intervention: antimicrobial registration, distribution/sales, advertising, surveillance, education/training and prudent use.

The new recommendations are designed for use by governments, veterinary and other professional societies, industry and academia. Some of the most important measures included in the new Global principles for the containment of antimicrobial resistance due to antimicrobial use in animals intended for food are:

- obligatory prescriptions for all antimicrobials used for disease control in food animals;
- termination or rapid phasing-out of the use of antimicrobials for growth promotion if they are also used for treatment of humans in the absence of a public health safety evaluation;
- creation of national systems to monitor antimicrobial usage in food animals;
- prelicensing safety evaluation of antimicrobials with consideration of potential resistance to human drugs;
- monitoring of resistance to identify emerging health problems and timely corrective actions to protect human health;
- guidelines for veterinarians to reduce overuse and misuse of antimicrobials in food animals.

Overuse and misuse of antimicrobials in food animals contribute to the emergence of resistant forms of disease-causing bacteria. Such resistant bacteria can be transmitted from food animals to humans, primarily via food. Infections can result that are difficult to cure because the resistant bacteria do not respond to treatment with antimicrobials.

One example is the emergence of antimicrobial-resistant *Salmonella* bacteria in food animals in Europe, Asia and North America which have caused diarrhea, sepsis (blood-poisoning) and death in humans. Another example is enterococci infections which present severe treatment problems, particularly in immunocompromised patients, because these bacteria have become resistant to all available antimicrobials.

WHO had already convened meetings of experts in 1997 and 1998 to identify and assess the risks associated with the use of antimicrobials in food animals. These meetings recognized the existence of the risk for public health and encouraged WHO to develop principles for prudent use of antimicrobials in food animals. This is one part of WHO™ Global Strategy for the Containment of Antimicrobial Resistance.

WHO has just issued a major new report on the use of antimicrobials in treating all types of infectious disease.

California Man Sentenced for Assaulting FSIS Officials

The US Department of Agriculture's Food Safety and Inspection Service (FSIS) announced that a Garden Grove, CA, man was sentenced April 4 in federal court for assaulting and threatening to kill two FSIS compliance officers.

Hanh Van Tran was found guilty of simple assault and of threatening to kill federal officials with a deadly weapon after he used his vehicle to assault the two FSIS compliance officers and threatened to kill them with a gun on July 6, 1999. Tran was sentenced in the US District Court's Central District of California to 12 months and one day in prison.

Upon release from prison, Tran will be on supervised release for three years. During those three years, Tran will be required to participate in a psychological and psychiatric counseling program; will be prohibited from working in any type of operation involving meat products; and must not come within 200 yards of the two FSIS compliance officers.

Prior to the assault and threats made by Tran, he had taken livestock to a custom slaughter facility. Tran's carcasses were detained on June 30, 1999, because they were not labeled with the owner's name, which is

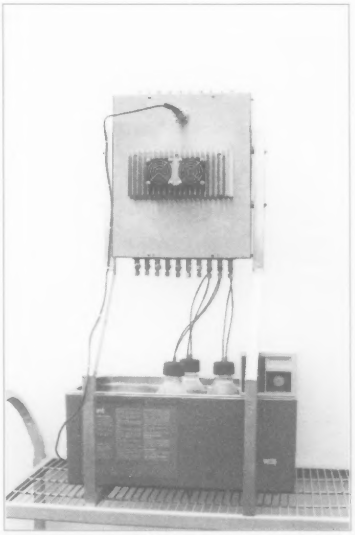
required under FSIS regulations. Custom slaughter facilities slaughter animals for personal consumption, not for sale in commerce.

Ninth Annual Wm. C. Frazier Memorial Lecture Held

Dr. Lester M. Crawford, professor and director of the Center for Food and Nutrition Policy at Georgetown University, Washington, D.C., recently gave the 9th Annual Wm. C. Frazier Memorial Lecture at the University of Wisconsin-Madison. The lecture was given in conjunction with the annual meeting of the Food Research Institute.

Crawford spoke on "Food Safety Objectives: Concentrating on Disease Reduction." In his presentation, Dr. Crawford indicated the "penchant for controversy, polemics, and polarization that have characterized national and international food and nutrition initiatives for at least a hundred years has left a legacy of confusion and mistrust in the public." He continued on to say that "a larger problem than the cacophony of the policymaking process is the hidden agenda" and cited examples of food inspector unions wanting to preserve jobs of members, environmental activists wanting to preserve family farms, advocacy groups opposed to food irradiation, groups spreading invective about food biotechnology, and companies attempting to get drugs approved as food supplements.

Previous Frazier Memorial Lecturers include: Larry Beuchat, Joseph Hotchkiss, Francis Busta, Peter Barton Hutt, Robert Buchanan, Mitchell Cohen, Richard Gilbert, and Douglas Archer.



Columbus Instruments

Condensing Air Drier from Columbus Instruments

In many laboratory applications, evaporation of water from the sample is very undesirable. To restore water content, and at the same time, to be able to keep the flasks open or to draw the gas sample from the head space, a new Condensing Air Drier was developed.

Up to ten flasks can be connected to the overhead heat exchanger containing straight 1/2" stainless pipes embedded in a solid aluminum block. The entire assembly is cooled by a solid state thermoelectric device to the uniform temperature of 1°C. The majority of water in the air is condensed on the tube walls and drips back to the laboratory flasks restoring the original moisture. Flasks can be room temperature or heated. In case the head space gas after leaving the sample bottle has to be perfectly dry, chemical desiccants can be connected in line with the thermoelectric condenser.

Dimensions of the Condensing Air Drier are 18"H × 14"W × 7"D (450mm × 355mm × 170mm), weighing 22 lbs. (10kg), and requires between 50W to 100W of power to operate.

Columbus Instruments, Columbus, OH

Reader Service No. 304

New Accelerometer Offers Versatility and Low Cost from Sensotec, Inc.

Sensotec introduces the New Model SM-5 single-axis, amplified accelerometer. This general purpose, low cost accelerometer is suitable for a wide variety of vibration monitoring applications.

The Model SM-5 performs equally well in both piezoelectric and piezoresistive applications and is available in ±5g range, with sensitivity of 300mV/g. This versatile unit accepts excitation voltages from 9 to 32 VDC, with a 5VDC output, and the useable frequency range is 0-1000 Hz.

The durable ABS plastic housing is screw mounted and highly resistant to the effects of weather. Ten feet of integral Teflon cable completes the package. Operating temperature range is -40 to 120°F, with a temperature effect on zero of only .02%FS/°F.

The innovative design utilizes no damping oil, thus providing faster transient response and minimal phase shift. The SM-5 weighs only 1 oz. and adds minimal mass to the measured object. These units are able to endure high impact levels and overloads.

SENSOTEC, Inc., Columbus, OH

Reader Service No. 305

Breakthrough Kosher Calf Lipase Introduced by Chr. Hansen

Responding to demand for an efficient and cost-effective Kosher Lipase, Chr. Hansen officially announced the launch of their Kosher Calf Lipase, which is immediately available.

Kosher Calf Lipase has been eagerly anticipated by the dairy and food industry. It is standardized to a specific enzyme level designed to produce the desired flavor profile. Kosher Calf Lipase gives the cheese a mild "piccante" flavor and is packaged in one (1) pound packages.

The new Kosher Calf Lipase is certified by the Organized Kashruth Laboratories, the "OK" as Kosher Pareve approved for year-round use.

Chr. Hansen, Inc., Milwaukee, WI

Reader Service No. 306

Pentalift Equipment Corporation Designs Stainless Steel Lift Table for a Major Food Processing Facility

A stainless steel lift table designed to position products in a major food processing facility was developed by Pentalift Equipment Corporation, Buffalo, NY. The lift table is constructed of 100% stainless steel and meets applicable sanitary regulations for food and pharmaceutical production facilities.

According to the company, the lift table was designed for the movement of product from ground level to a mezzanine. Capable of lifting loads to 4,000 lbs. the lift table was built to withstand harsh washdown requirements of food processing operations. Additional sizes and lifting capacities are also available.

Pentalift Equipment Corp., Buffalo, NY

Reader Service No. 307

Burling Instruments Inc. High-Temp Safety Limit Switch/Controller Has an Integral Thermocouple

Eliminating the need for separate components and the associated wiring, the Coupleswitch™ module from Burling Instruments, Inc., combines the functions of an ultra-reliable differential expansion temperature controller/safety limit switch with that of a thermocouple. Functioning equally well as either a temperature controller or a safety limit switch in applications up to 2000°F (1100°C), a Coupleswitch module, with its fully integrated thermocouple assembly, also provides an output through a separate thermocouple terminal strip mounted on the unit housing.

Burling Instruments Inc.

Connections to any external indicator or rewinder can be made either by the user or by Burling.

An indicator package consisting of a 0 - 2000°F (1100°C), 3-1/2-inch panel type meter and up to 30 inches of thermocouple extension wire is available as an option for high temperature applications.

A variety of package designs and configurations are available as standard, including NEMA 1, Single and Dual-Switch NEMA 4, Explosion Proof, Rugged-Designs and Pneumatic.

Burling Instruments Inc., Chatham, NJ

Reader Service No. 308

M² Bio Fluorescence Stereo Microscope for GFP Research from Carl Zeiss, Inc.

Carl Zeiss, Inc. and Kramer Scientific have launched the M² Bio Fluorescence Stereo microscope at the last Society for Neuroscience and Cell Biology meetings. Co-marketed in an exclusive distribution agreement, this new stereo addition to the field of GFP research brings an exciting new dimension into the GFP fluorescence imaging.

The M² Bio uniquely combines stereo macro and compound micro imaging capabilities in a single platform. This system allows user to sort larger populations of a sample in various stereoscopic modes, 10×–105× magnification, or simply pivot the microscope system into position for high-magnification for more detailed observation at 200×-660×. Previously, this task was accomplished by moving a sample to a different microscope. The addition of fixed shutter operated transmitted light offers hands free operation, providing a fully functional system for a broad spectrum of applications.

Early results show great promise for the M² Bio in the field of Developmental and Cell Biology within the *C. elegans*, drosophila and zebra research communities where GFP and its variants have become instrumental in large scale sorting of large populations. There has also been much interest generated in such fields as electrophysiology and invivo microscopy. The ability to combine the ergonomics of stereo observation and high-resolution microscope observation in a single platform will offer enormous improvements in time management in the exploding field of fluorescent proteins, GFP, YFP, BFP and their new counterparts.

Carl Zeiss, Inc., Thornwood, NY

Reader Service No. 309

Celsis Rapid Microbial Testing System Compatible with Barcode Technology

Celsis International plc (Celsis), the microbial risk management group, has announced that its systems used for the rapid detection of microbial

contamination offer barcode information capture. Users can scan the barcode labels found on sample packaging or labels with a simple barcode reading device and the information will automatically appear in the preprogrammed workloads of Celsis proprietary Advance.im software.

Being the only software specifically designed for industrial microbiology end product screening use; Advance.im offers users complete control over testing and results produced from the Celsis Advance™ and Celsis Advance™ coupe luminometers. With the addition of barcode technology, users are now able to streamline the process of entering product sample information into the software, a task that takes time and is highly susceptible to human error. Additionally, Advance.im operates on a Windows® based platform making it simple to operate and compatible with most software and hardware devices available for computing today.

Celsis, Inc., Evanston, IL

Reader Service No. 310

Labconco Presents the Only Rotary Evaporator Made in the USA

Labconco Corporation is pleased to offer the only Rotary Evaporator made in the USA. The Labconco Rotary Evaporator features reliable, straightforward operation with innovative, lab-friendly features.

The controls are on a soft-touch key pad located high on the front for easy accessibility and to prevent risk of splash from solvent spills or the bath. A digital LED display permits monitoring of rotation speed, bath temperature and optional vapor temperature. The sparkless, high torque motor is belt driven and rotates glassware from 0-250 rpm. The lift is controlled manually from the front of the unit by a trigger-action handle.

CEA Instruments, Inc.

The stainless steel bath is insulated by a thermoset polyester housing and a rubber trim ring, preventing risk of burn and serving as a shock absorber for glassware. The water bath temperature ranges from ambient to 100°C and the optional oil bath temperature ranges from ambient to 180°C. A safety limiter turns the bath off automatically if it should run dry. The bath is separate from the drive is it may be repositioned to accomodate different size flasks.

The glassware is positioned up for for easy accessibility. Condenser styles include diagonal, vertical, reflux and Dewar with one liter evaporating and receiving flasks. Two and three liter flasks and coated glassware are also available.

Labconco Corporation, Kansas City, MO

Reader Service No. 311

New Specialized, Stand-Alone Gas Sensors from CEA Instruments, Inc.

The new CEA 420 Series are remote gas monitoring transmitters that use unique, patented sensors which are highly specific, fast responding, poison resistant, and are unaffected by moisture or temperature changes. These stand-alone sensors are available for ammonia, hydrocarbons, freons, ethylene oxide, hydrogen, combustibles, sulfur dioxide, hydrogen sulfide, carbon monoxide, and numerous other gases. Ranges are available to detect these gases in the low ppm, high ppm, or %LEL levels without sensor damage.

The CEA 420 Series are compact, durable, explosion proof, and easy to maintain and operate. These units can be used with most power requirements to produce a continuous 4-20mA signal proportional to the gas concentration. The signal can then be sent to any device capable of interpreting a 4-20mA output. An optional digital display on the CEA 420 Series is also available.

CEA Instruments, Inc., Emerson, NJ

Reader Service No. 312

Kimberly-Clark Offers "Tips" Brochure for Controlling Contamination in Food Processing Plants

Kimberly-Clark's Away From Home Sector has developed a brochure to help quality control, sanitation and purchasing professionals at food processing plants reduce or eliminate opportunities for cross-contamination of hands and surfaces throughout their facilities.

The "10 Tips" brochure offers advice for maintaining a clean, safe and productive work environment—on the plant floor, in maintenance and warehouse areas, and in the washroom. It stresses the importance of proper handwashing techniques for eliminating germs from hands, and offers solutions for keeping germs from spreading from surface to surface.

Kimberly-Clark Corporation, Roswell, GA

Reader Service No. 313

How the Audiovisual Library Serves IAFP Members

Purpose ...

The Audiovisual Library offers International Association for Food Protection Members an educational service through a wide variety of quality training videos dealing with various food safety issues. This benefit allows Members free use of these videos.

How It Works ...

1) Members simply fill out an order form (see page 799) and fax or mail it to the IAFP office. Members may also find a Library listing and an order form online at the IAFP Web site at www.foodprotection.org.
2) Material from the Audiovisual Library is checked out for a maximum of two weeks (three weeks outside of North America) so that all Members can benefit from its use.
3) Requests are limited to five videos at a time.

How to Contribute to the Audiovisual Library ...

1) As the IAFP Membership continues to grow, so does the need for additional committee members and materials for the Library. The Audiovisual Committee meets at the IAFP Annual Meeting to discuss the status of the Audiovisual Library and ways to improve the service. New Members are sought to add fresh insight and ideas.
2) Donations of audiovisual materials are always needed and appreciated. Tapes in foreign languages (including, but not limited to Spanish, French, Chinese [Manderin/Cantonese]), are especially desired for International Members who wish to view tapes in their native language.
3) Members may also make a financial contribution to the Foundation Fund. The Foundation Fund sponsors worthy causes that enrich the Association. Revenue from the Foundation Fund supports the IAFP Audiovisual Library. Call Frank Zuehlke, Senior Accountant, or Lucia Collison, Association Services at 800.369.6337 or 515.276.3344 if you wish to make a donation.

Audiovisual Library

(A Member Benefit of IAFP)

DAIRY

D1170 **3-A Symbol Council**–(8 minute videotape). A video which was developed to make people in the dairy and food industries aware of the 3-A program and its objectives.

D1180 **10 Points to Dairy Quality**–(10 minute videotape). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk-receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance–1992) (Reviewed 1998)

D1010 **The Bulk Milk Hauler: Protocol & Procedures**–(8 minute videotape). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension–1990). (Reviewed 1998)

D1020 **Causes of Milkfat Test Variations & Depressions**–(30 minute–140 slides–tape–script). This set illustrates the many factors involved in causing milkfat test variations or depressions in your herd, including feeding, management, stage of lactation, age of samples, handling of samples, and testing procedures. The script was reviewed by field staff, nutritionists, laboratory personnel and county extension staff. It is directed to farmers, youth and allied industry. (Penn State–1982)

D1030 **Cold Hard Facts**–This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association–1993) (Reviewed 1998)

D1040 **Ether Extraction Method for Determination of Raw Milk**–(26 minute videotape). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA–1988) (Reviewed 1998)

D1050 **The Farm Bulk Milk Hauler**–(30 minute–135 slides–tape–script). This set covers the complete procedure for sampling and collecting milk from farms. Each step is shown as it starts with the hauler entering the farm lane and ends when he leaves the milk house. Emphasis is on universal sampling and automated testing. Funds to develop this set were provided by The Federal Order #36 Milk Market Administrator. (Penn State–1982) (Reviewed 1998)

D1060 **Frozen Dairy Products**–(27 minute videotape). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients; emphasis is on what to look for in a plant inspection. Everything from receiving, through processing and cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA–1987) (Reviewed 1997)

D1070 **The Gerber Butterfat Test**–(7 minute videotape). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA–1990) (Reviewed 1998)

D1080 **High-Temperature, Short-Time Pasteurizer**–(59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.–1986) (Reviewed 1997)

D1090 **Managing Milking Quality**–(33 minute videotape). This training video is designed to help dairy farmers develop a quality management process and is consistent with ISO 9000 certification and HACCP processes. The first step is to evaluate the strengths and weaknesses of a dairy operation. The video will help you find ways to improve the weaknesses that are identified on your farm.

D1100 **Mastitis Prevention and Control**–(2-45 minute videotapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Postmilking Teat Dip Protocols, Milk Quality, Milking Systems. (Nasco–1993)

D1110 **Milk Plant Sanitation: Chemical Solution**-(13 minute videotape). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed... alkaline wash, presence of chlorine and iodophor, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)

D1120 **Milk Processing Plant Inspection Procedures**-(15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre- and post-inspection meeting with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)

D1130 **Pasteurizer - Design and Regulation**-(16 minute videotape). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods-1990) (Reviewed 1998)

D1140 **Pasteurizer - Operation**-(11 minute videotape). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods-1990) (Reviewed 1998)

D1150 **Processing Fluid Milk**-(30 minute-140 slides-script-tape). It was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Reviewed 1998)

ENVIRONMENTAL

E3010 **The ABCs of Clean-A Handwashing & Cleanliness Program for Early Childhood Programs**-For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association-1991)

E3020 **Acceptable Risks?**-(16 minute videotape). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.-1993) (Reviewed 1998)

E3030 **Air Pollution: Indoor**-(26 minute videotape). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and waterproofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Reviewed 1998)

E3040 **Asbestos Awareness**-(20 minute videotape). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.-1988) (Reviewed 1998)

E3055 **Effective Handwashing-Preventing Cross-Contamination in the Food Service Industry**-(3 1/2 minute videotape). It is critical that all food service workers wash their hands often and correctly. This video discusses the double wash method and the single wash method and when to use each method. (Zep Manufacturing Company-1993)

E3060 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)**-(22 minute videotape). Demonstrates the Ceriodaphnia 7-Day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Reviewed 1998)

E3070 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)**-(15 minute videotape). A training tape that teaches environmental professionals about the Fathead Minnow Larval Survival and

Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Reviewed 1998)

E3075 **EPA: This is Super Fund**–(12 minute videotape). Produced by the United States Environmental Protection Agency (EPA) in Washington, D.C., this videotape focuses on reporting and handling hazardous waste sites in our environment. The agency emphasizes community involvement in identifying chemical waste sites and reporting contaminated areas to the authorities. The primary goal of the "Super Fund Site Process" is to protect human health and to prevent and eliminate hazardous chemicals in communities. The film outlines how to identify and report abondoned waste sites and how communities can participate in the process of cleaning up hazardous sites. The program also explains how federal, state and local governments, industry and residents can work together to develop and implement local emergency preparedness/response plans in case chemical waste is discovered in a community.

E3080 **Fit to Drink**–(20 minute videotape). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and floculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.–1987)

E3110 **Garbage: The Movie**–(25 minute videotape). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Reviewed 1998)

E3120 **Global Warming: Hot Times Ahead**–(23 minute videotape). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films–1995)

E3130 **Kentucky Public Swimming Pool & Bathing Facilities**–(38 minute videotape). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987). (Reviewed 1998)

E3135 **Plastics Recycling Today: A Growing Resource**–(11:35 minute videotape). Recycling is a growing segment of our nation's solid waste management program. This video shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc.–1988)

E3140 **Putting Aside Pesticides**–(26 minute videotape). This program probes the long-term effects of pesticides and explores alternative pest-control efforts; biological pesticides, genetically-engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.) (Reviewed 1999)

E3150 **Radon**–(26 minute videotape). This program looks at the possible health implications of radon pollution, methods homeowners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.

E3160 **RCRA–Hazardous Waste**–(19 minute videotape). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)

The New Superfund. What It is & How It Works–A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:

E3170 **Tape 1–Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements**–(62 minute videotape). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process – long-term and permanent cleanup-is illustrated step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.

E3180 **Tape 2–Changes in the Removal Process: Removal and Additional Program Requirements**–(48 minute videotape). The removal process is a short-term action and usually an immediate response to accidents, fires and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

E3190 **Tape 3–Enforcement & Federal Facilities**–(52 minute videotape). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARs) are explained.

E3210 **Tape 4–Emergency Preparedness & Community Right-to-Know**–(48 minute videotape). A major part of SARA is a free-standing act known as Title III: The Emergency Planning and Community Right-to-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency & hazardous chemical inventory and the toxic chemical release inventory.

E3220 **Tape 5–Underground Storage Tank Trust Fund & Response Program**–(21 minute videotape). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking–and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

E3230 **Tape 6–Research & Development/ Closing Remarks**–(33 minute videotape). An important new mandate of the new Superfund is the technical provisions for research and development to create more permanent methods in handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.

E3240 **Sink A Germ**–(10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.–1986). (Reviewed 1998)

E3245 **Wash Your Hands**–(5 minute videotape). Handwashing is the single most important means of preventing the spread of infection. This video presents why handwashing is important and the correct way to wash your hands. (LWB Company–1995)

E3250 **Waste Not: Reducing Hazardous Waste**–(35 minute videotape). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. Waste Not also looks at the obstacles to waste reduc-

tion, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella films)

FOOD

F2260 **100 Degrees of Doom... The Time & Temperature Caper**–(14 minute videotape). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.–1987) (Reviewed 1998)

F2450 **A Guide to Making Safe Smoked Fish**–(21 minute videotape). Smoked fish can be a profitable product for aquaculturalists, but it can be lethal if not done correctly. This video guides you through the steps necessary to make safe smoked fish. It provides directions for brining, smoking, cooling, packaging and labeling, and cold storage to ensure safety. The video features footage of fish smoking being done using both traditional and modern equipment. (University of Wisconsin-Madison–Spring, 1999)

F2005 **A Lot on the Line**–(25 minute videotape). Through a riveting dramatization, "A Lot on the Line" is a powerful training tool for food manufacturing and food service employees. In the video, a food plant supervisor and his pregnant wife are eagerly awaiting the birth of their first child. Across town, a deli manager is taking his wife and young daughter away for a relaxing weekend. Both families, in a devastating twist of fate, will experience the pain, fear, and disruption caused by foodborne illness. This emotionally charged video will enthrall new and old employees alike and strongly reinforce the importance of incorporating GMPs into everyday work routines. Without question, "A Lot on the Line" will become an indispensable part of your company's training efforts. (Silliker Laboratories–2000)

F2440 **Cleaning & Sanitizing in Vegetables Processing Plants: Do It Well, Do It Safely!**–(16 minute videotape) This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for processing plant as it is for washing dishes at home. (University of Wisconsin Extension–1996) (Available in Spanish)

F2010 **Close Encounters of the Bird Kind**–(18 minute videotape). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Reviewed 1998)

F2015 **Controlling *Listeria*: A Team Approach**–(16 minute videotape). In this video, a small food company voluntarily shuts down following the implication of one of its products in devastating outbreak of *Listeria monocytogenes*. This recall dramatization is followed by actual in-plant footage highlighted key practices in controlling *Listeria*. This video provides workers with an overview of the organism, as well as practical steps that can be taken to control its growth in plant environments. Finally, the video leaves plant personnel with a powerful, resounding message: Teamwork and commitment are crucial in the production of safe, quality foods. (Silliker Laboratories–2000)

F2037 **Cooking and Cooling of Meat and Poultry Products**–(2 videotapes – 176 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2036). This is session 3 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon completion of viewing these videotapes, the viewer will be able to (1) recognize inadequate processes associated with the cooking and cooling of meat and poultry at the retail level; (2) Discuss the hazards associated with foods and the cooking and cooling processes with management at the retail level; (3) Determine the adequacy of control methods to prevent microbiological hazards in cooking and cooling at the retail level, and (4) Understand the principle for determining temperature with various temperature measuring devices. (AFDO/USDA–1999)

F2030 **"Egg Games" Foodservice Egg Handling and Safety**–(18 minute videotape). Develop an effective egg handling and safety program that is right for your operation. Ideal for manager training and foodservice educational programs, this video provides step-by-step information in an entertaining, visually-exciting format. (American Egg Board–1999)

F2020 **Egg Handling & Safety**–(11 minute videotape). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board–1997)

F2036 **Emerging Pathogens and Grinding and Cooking Comminuted Beef**–(2 videotapes – 165 minutes.) (See Part 1 Tape F2035 and Part 3 Tape F2037.) This is session 2 of a 3-part Meat and Poultry Teleconference co-sponsored by

AFDO and the USDA Food Safety Inspection Service. These videotapes present an action plan for federal, state, local authorities, industry, and trade associations in a foodborne outbreak. (AFDO/USDA-1998)

F2035 **Fabrication and Curing of Meat and Poultry Products**-(2 videotapes - 145 minutes). (See Part 2 Tape F2036 and Part 3 Tape F2037). This is session 1 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon viewing, the sanitarian will be able to (1) Identify typical equipment used for meat and poultry fabrication at retail and understand their uses; (2) Define specific terms used in fabrication of meat and poultry products in retail establishments, and (3) Identify specific food safety hazards associated with fabrication and their controls. (AFDO/USDA-1997)

F2040 **Food Irradiation**-(30 minute videotape). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, overripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Reviewed 1998)

F2045 **Food Microbiological Control**-(6-videotapes - appoximate time 12 hours). Designed to provide information and demonstrate the application of basic microbiology, the Good Manufacturing Practices (GMPs), retail Food Code, and sanitation practices when conducting food inspections at the processing and retail levels. Viewers will enhance their ability to identify potential food hazards and evaluate the adequacy of proper control methods for these hazards. (FDA-1998)

F2050 **Food Safe-Food Smart-HACCP & Its Application to the Food Industry**-(2-16 minute videotapes). (1)-Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2)-Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Reviewed 1998)

F2060 **Food Safe-Series I**-(4-10 minute videotapes). (1) "Receiving & Storing Food Safely," details for food-service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food-service Facilities and Equipment," outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Food-service Workers," provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Food-service Housekeeping and Pest Control," emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education-1991) (Reviewed 1998)

F2070 **Food Safe-Series II**-(4-10 minute videotapes). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus,* (sauces) (2) *Salmonella,* (eggs) (3) *Campylobacter,* and (4) *Clostridium botulinum.* Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education-1991) (Reviewed 1998)

F2080 **Food Safe-Series III**-(4-10 minute videotapes). More case histories of foodborne disease. This set includes (1) Hepatitis "A", (2) *Staphylococcus aureus* (meats), (3) *Bacillus cereus*, and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education-1991) (Reviewed 1998)

F2133 **Food Safety First**-(50 minute videotape). This food safety training video presents causes of foodborne illness in foodservice and ways to prevent foodborne illness. Individual segments include personal hygiene and handwashing, cleaning and sanitizing, preventing cross contamination and avoiding time and temperature abuse. Foodhandling principles are presented through scenarios in a restaurant kitchen. (Glo-Germ 1998)

F2090 **Food Safety: An Educational Video for Institutional Food-Service Workers**-(10 minute videotape). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (U.S. Department of Health & Human Services-1997)

F2120 **Food Safety: For Goodness Sake, Keep Food Safe**-(15 minute videotape). Teaches foodhandlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food

product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extension-1990) (Reviewed 1998)

F2110 **Food Safety is No Mystery**-(34 minute videotape). This is an excellent training visual for food-service workers. It shows the proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a food-service worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross-contamination, and storage of foods are included. (USDA-1987). Also available in Spanish. -(Reviewed 1998)

F2130 **Food Safety: You Make the Difference**-(28 minute videotape). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: handwashing, preventing cross-contamination, moving foods quickly through the danger zone, and hot/cold holding (Seattle-King County Health Department-1995)

F2135 **Get with a Safe Food Attitude**-(40 minute videotape). Consisting of nine short segments which can be viewed individually or as a group, this video presents safe food handling for moms-to-be. Any illness a pregnant women contracts can affect her unborn child whose immune system is too immature to fight back. The video follows four pregnant women as they learn about food safety and preventing foodborne illness. (US Department of Agriculture-1999)

F2140 **GMP Basics - Employee Hygiene Practices**-(20 minute videotape). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particularly hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories-1997)

F2143 **GMP Basics: Guidelines for Maintenance Personnel**-(21 minute videotape). Developed specifically for maintenance personnel working in a food processing environment, this video depicts a plant-wide training initiative following a product recall announcment. Maintenance personnel will learn how GMPs relate to their daily activities and how important their roles are in the production of safe food products. (Silliker Laboratories-1999)

F2148 **GMP-GSP Employee**-(38 minute videotape). This video was developed to teach food plant employees the importance of "Good Manufacturing Practices" and "Good Sanitation Practices." Law dictates that food must be clean and safe to eat. This video emphasizes the significance of each employee's role in protecting food against contamination. Tips on personal cleanliness and hygiene are also presented. (L.J. Bianco & Associates)

F2150 **GMP: Personal Hygiene & Practices in Food Manufacturing**-(14 minute videotape). This video focuses on the personal hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State-1993)-(Available in Spanish and Vietnamese)

F2147 **GMP Basics: Process Control Practices**-(16 minute videotape). In actual food processing environments, an on-camera host takes employees through a typical food plant as they learn the importance of monitoring and controlling key points in the manufacturing process. Beginning with receiving and storing, through production, and ending with packaging and distribution, control measures are introduced, demonstrated, and reviewed. Employees will see how their everyday activities in the plant have an impact on product safety. (Silliker Laboratories-1999)

F2160 **GMP: Sources & Control of Contamination during Processing**-(20 minute videotape). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross-contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State-1995)

F2165 **HACCP and Its Application to the Food Industry**-(2-17 minute videotapes). Looking to develop a comprehensive food safety and quality control program for your organization? Part one introduces the concept of the HACCP system and the seven principles behind it. Part two takes the viewer through each of the 12 stages in setting up such a system. (Alberta Agriculture-1993) (Reviewed 1999)

F2180 **HACCP: Safe Food Handling Techniques**-(22 minute videotape). The video highlights the primary causes of food poisoning and emphasizes the importance of self-inspection. An explanation of potentially hazardous foods, cross-contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP)

program in a foodservice operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Food-services Association-1990) (Reviewed 1998)

F2170 **The Heart of HACCP**-(22 minute videotape). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work environment. This video emphasizes the principles of primary concern to plant personnel such as critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratories Group-1994)

F2175 **Inspecting For Food Safety-Kentucky's Food Code**-(100 minute videotape). Kentucky's Food Code is patterned after the Federal Food Code. The concepts, definitions, procedures, and regulatory standards included in the code are based on the most current information about how to prevent foodborne diseases. This video is designed to prepare food safety inspectors to effectively use the new food code in the performance of their duties. (Department of Public Health Commonwealth of Kentucky-1997) (Reviewed 1999)

F2190 **Is What You Order What You Get? Seafood Integrity**-(18 minute videotape). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Reviewed 1998)

F2210 **Northern Delight-From Canada to the World**-(13 minute videotape). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Reviewed 1998)

F2240 **On the Front Line**-(18 minute videotape). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association-1993) (Reviewed 1998)

F2250 **On the Line**-(30 minute videotape). This was developed by the Food Processors Institute for training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (Available in Spanish) The Food Processors Institute. 1993. (Reviewed 1998)

F2270 **Pest Control in Seafood Processing Plants**-(26 minute videotape). Videotape which covers procedures to control flies, roaches, mice, rats and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations. (Reviewed 1998)

F2280 **Principles of Warehouse Sanitation**-(33 minute videotape). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking-1993)

F2290 **Product Safety & Shelf Life**-(40 minute videotape). Developed by Borden Inc., this videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problems caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden-1987) - (Reviewed 1997)

F2220 **Proper Handling of Peracidic Acid**-(15 minute videotape). Introduces paracidic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.

F2230 **Purely Coincidental**-(20 minute videotape). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats Company-1993.) (Reviewed 1998)

F2310 **Safe Food: You Can Make a Difference**-(25 minute videotape). A training video for food-service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning and sanitizing,

and handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional foodhandlers. (Tacoma-Pierce County Health Department-1990). (Reviewed 1998)

F2320 **Safe Handwashing**-(15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology and Management-1991) (Reviewed 1998)

F2325 **Safe Practices for Sausage Production**-(3 hour videotape). This videotape is based on a series of educational broadcasts on meat and poultry inspections at retail food establishments produced by the Association of Food and Drug Officicals (AFDO) and USDA's Food Safety and Inspection Service (FSIS), along with FDA's Center for Food Safety and Applied Nutrition. The purpose of the broadcast was to provide training to state, local, and tribal sanitarians on processes and procedures that are being utilized by retail stores and restaurants, especially those that were usually seen in USDA-inspected facilities. The program will cover the main production steps of sausage products, such as the processes of grinding, stuffing, and smoking, and typical equipment used will be depicted. Characteristics of different types of sausage (fresh, cooked and smoked, and dry/semi-dry) will be explained. Pathogens of concern and outbreaks associated with sausage will be discussed. The written manual for the program is available at www.fsis.usda.gov/ofo/hrds/STATE/RETAIL/manual.htm. (1999)

F2460 **Safer Processing of Sprouts**-(1 hour and 22 minute videotape). Sprouts are enjoyed by many consumers for their taste and nutritional value. However, recent outbreaks of illnesses associated with sprouts have demonstrated a potentially serious human health risk posed by this food. FDA and other public health officials are working with industry to identify and implement production practices that will assure that seed and sprouted seed are produced under safe conditions. This training video covers safe processing practices of sprouts including growing, harvesting, milling, transportation, storage, seed treatment, cleaning and sanitizing, sampling and microbiological testing. (CA Dept. of Health Services, Food and Drug Branch; U.S. Food and Drug Adminstration, and the Centers for Disease Control and Prevention - 2000)

F2330 **Sanitation for Seafood Processing Personnel**-(20 minute videotape). A training video suited for professional foodhandlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional foodhandler is introduced to a variety of sanitation topics including: (1) foodhandlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross-contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Reviewed 1998)

F2340 **Sanitizing for Safety**-(17 minute videotape). Provides an introduction to basic food safety for professional foodhandlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox-1990) (Reviewed 1998)

F2350 **SERVSAFE® Serving Safe Food**-(4-20 minute videotapes). This video series illustrates and reinforces important food safety practices in an informative and entertaining manner. The material is presented in an easy to understand format, making it simpler for employees to learn and remember this essential information. Each video includes a leader's guide that provides all the information managers need to direct a productive training session. (Educational Foundation of the National Restaurant Association-1993) (Reviewed 1998)

F2360 **SERVSAFE® Serving Safe Food Second Edition**-(6-10 minute videotapes). The program still covers all the major areas of food safety training, but there is an added emphasis on training employees to follow HACCP procedures. The second edition program includes an Employee Guide, Leader's Guide and six instructional videos. (Educational Foundation of the National Restaurant Association-1993)

F2430 **Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant**-(20 minute videotape) A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laboratories Group-1996)

F2370 **Supermarket Sanitation Program-"Cleaning & Sanitizing"**-(13 minute videotape). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees. (1989) (Reviewed 1998)

F2380 **Supermarket Sanitation Program–"Food Safety"**–(11 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees. (1989) (Reviewed 1998)

F2390 **Take Aim at Sanitation**–(8 minute videotape). This video features tips on food safety and proper disposal of single service items. Also presented is an emphasis on food contact surfaces as well as the manufacture, storage and proper handling of these items. (Foodservice and Packaging Institute, Inc.–1995). (Available in Spanish)

F2410 **Wide World of Food-Service Brushes**–(18 minute videotape). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989) (Reviewed 1998)

F2420 **Your Health in Our Hands–Our Health in Yours**–(8 minute videotape). For professional foodhandlers, the tape covers the do's and don'ts of foodhandling as they relate to personal hygiene, temperature control, safe storage and proper sanitation. (Jupiter Video Production–1993). (Reviewed 1998)

OTHER

M4010 **Diet, Nutrition & Cancer**–(20 minute videotape). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.

M4020 **Eating Defensively: Food Safety Advice for Persons with Aids**–(15 minute videotape). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC–1989)

M4030 **Ice: The Forgotten Food**–(14 minute videotape). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.); it documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association–1993)

M4040 **Legal Aspects of the Tampering Case**–(25 minute videotape). This was presented by Mr. James T. O'Reilly, University of Cincinnati School of Law at the fall 1986 Central States Association of Food and Drug Officials Conference. He emphasizes three factors from his police and legal experience–know your case, nail your case on the perpetrator, and spread the word. He outlines specifics under each factor. This should be of the greatest interest to regulatory sanitarians, in federal, state and local agencies. (1987)

M4050 **Personal Hygiene & Sanitation for Food Processing Employees**–(15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State–1993)

M4060 **Psychiatric Aspects of Product Tampering**–(25 minute videotape). This was presented by Emanuel Tanay, M.D. from Detroit, at the fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead to up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper proof containers are not the ultimate answer. (1987)

M4070 **Tampering: The Issue Examined**–(37 minute videotape). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro–1987)

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- ❒ E3060 EPA - Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)
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- ❒ E3080 Fit to Drink
- ❒ E3110 Garbage: The Movie
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- ❒ E3150 Radon
- ❒ E3160 RCRA - Hazardous Waste
- ❒ E3170 The New Superfund: What It is & How It Works-(1) Changes in the Remedial Process: Clean-up Standards & State Involvement Requirements
- ❒ E3180 The New Superfund: What It is & How It Works-(2) Changes in the Removal Process: Removal & Additional Program Requirements
- ❒ E3190 The New Superfund: What It is & How It Works - (3) Enforcement and Federal Facilities
- ❒ E3210 The New Superfund: What It is & How It Works - (4) Emergency Preparedness & Community Right-to-Know
- ❒ E3220 The New Superfund: What It is & How It Works - (5) Underground Storage Tank Trust Fund & Response Program
- ❒ E3230 The New Superfund: What It is & How It Works - (6) Research & Development/Closing Remarks
- ❒ E3240 Sink a Germ
- ❒ E3245 Wash Your Hands
- ❒ E3250 Waste Not: Reducing Hazardous Waste

FOOD

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- ❒ F2090 Food Safety: An Educational Video for Institutional Food-Service Workers
- ❒ F2120 Food Safety: For Goodness Sake, Keep Food Safe
- ❒ F2110 Food Safety is No Mystery
- ❒ F2130 Food Safety: You Make the Difference
- ❒ F2135 Get with a Safe Food Attitude
- ❒ F2140 GMP Basics: Employee Hygiene Practices
- ❒ F2143 GMP Basics: Guidelines for Maintenance Personnel
- ❒ F2148 GMP - GSP Employee
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- ❒ F2250 On the Line
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- ❒ F2290 Product Safety & Shelf Life
- ❒ F2220 Proper Handling of Peracidic Acid
- ❒ F2230 Purely Coincidental - English
- ❒ F2310 Safe Food: You Can Make a Difference
- ❒ F2320 Safe Handwashing
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- ❒ M4050 Personal Hygiene & Sanitation for Food Processing Employees
- ❒ M4060 Psychiatric Aspects of Product Tampering
- ❒ M4070 Tampering: The Issue Examined

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3-A® Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products Equipment, Number 74-01

Formulated by

International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
United States Public Health Service (USPHS)
The European Hygienic Equipment Design Group (EHEDG)
The Dairy Industry Committee (DIC)

It is the purpose of the IAFIS, IAFP, USPHS, EHEDG, and DIC in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Sensors and Sensor Fittings and Connections heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, EHEDG, and DIC at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products, and other perishable foods or comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

A1 These standards cover the sanitary aspects of sensors and sensor fittings and connections for equipment which contains or processes milk and milk products and on lines which convey milk and milk products.

A2 In order to conform with these 3-A Sanitary Standards, sensors and sensor fittings and connections shall comply with the following design, material, and fabrication criteria.[1]

B DEFINITIONS

B1 *Product:* Shall mean milk, milk products, and culture media.

B2 *Solutions:* Shall mean those homogeneous mixtures of chemical solute(s) and solvent used for flushing, cleaning, rinsing, and sanitizing.

B3 Surfaces

B3.1 *Product Contact Surfaces:* Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, diffuse, or be drawn into the product.

B3.2 *Nonproduct Contact Surfaces:* Shall mean all other exposed surfaces.

B4 *Sensor Fittings and Connections (hereinafter referred to as "fittings"):* Shall mean fittings and/or connections for instruments or their sensing elements that will be installed in product equipment and in sanitary pipelines, for the measurement of temperature, pressure, liquid level, pH, oxidation-reduction potential (ORP), viscosity, conductivity, or composition.

B5 *Permanently Installed Fittings:* Shall mean fittings that are permanently installed in the equipment or system by welding or a method provided for in the applicable 3-A Sanitary Standards or 3-A Accepted Practices.

[1]Use current revisions or editions of all referenced documents cited herein.

B6 Sensors

B6.1 *pH Sensor:* Shall mean a device which is sensitive to hydrogen ion activity requiring a hydrogen ion-sensitive electrode and a reference electrode providing electrolytic contact with the product or solution.

B6.2 *Oxidation-Reduction Potential (ORP) Electrode:* Shall mean a noble metal electrode sensitive to electrochemical potential of the product or solution and a reference electrode providing electrolytic contact with the product or solution.

B6.3 *Conductivity Sensor:* Shall mean a device sensitive to resistance changes in the product or solution as a function of ionic concentration.

B6.4 *Pressure Sensor:* Shall mean a device sensitive to changes in force per unit area as exerted by the product or solution.

B6.5 *Temperature Sensor:* Shall mean a device sensitive to the degree of hotness or coldness of a product or solution.

B6.6 *Viscosity Sensor:* Shall mean a device sensitive to the flow resistance of product or solution.

B6.7 *Liquid Level Sensor:* Shall mean a device capable of measuring liquid product or solution height either directly or indirectly, or as a function of pressure (see B6.4).

B6.7.1 *Ultrasonic Level Sensor:* Shall mean a device capable of measuring liquid product or solution height using high frequency sound energy.

B6.8 *Composition Sensor:* Shall mean a device capable of measuring the chemical constituents of the product or solution.

B7 *Noble Metal(s):* Shall mean metals, such as gold, silver, platinum, and iridium which have a relatively positive electrode potential, and which do not enter readily into chemical combination with nonmetals. These materials have a high resistance to corrosive attack by acids and corrosive agents and resist atmospheric oxidation.

B8 *Bond:* Shall mean the adhesive and/or cohesive forces holding two materials together, excluding press or shrink fits.

B9 Cleaning

B9.1 *Mechanical Cleaning or Mechanically Cleaned:* Shall mean soil removal by impingement, circulation, or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means in equipment specifically designed for this purpose.

B9.2 *Manual Cleaning:* Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses and tank(s) which may be fitted with recirculating pumps, and with all cleaning aids manipulated by hand.

B10 *Sanitizing or Sanitization:* Shall mean a process applied to a cleaned surface which is capable of reducing the numbers of the most resistant human pathogens by at least 5 logarithmic reductions (99.999%) by applying accumulated hot water or steam or by applying an EPA-registered sanitizer according to label directions. Sanitizing may be effected by mechanical or manual methods.

B11 *Sterilization:* Shall mean a process effected by heat, chemicals, or other mechanical means that destroys all vegetative bacteria and inactivates relevant bacterial spores.

B12 *Simple Hand Tools:* Shall mean implements normally used by operating and cleaning personnel such as a screwdriver, wrench, or hammer.

B13 *Readily or Easily Removable:* Shall mean quickly separated from the equipment with the use of simple hand tools.

B14 *Nontoxic Materials:* Shall mean those substances which under the conditions of their use are in compliance with applicable requirements of the Food, Drug, and Cosmetic Act of 1938, as amended.

B15 *Corrosion Resistant:* Shall mean the surface maintains its original surface characteristics for its predicted service period when exposed to the conditions encountered in the environment of intended use including expected contact with product and cleaning,

sanitizing, or sterilization compounds or solutions.

C MATERIALS

C1 Metals

C1.1 Product contact surfaces shall be of stainless steel of the AISI 300 Series[2] or ACI types[3] (See Appendix, Section F,) or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

C1.2 Noble metals or their oxides may be used for pH or ORP electrodes and parts having the same functional purposes and shall be nontoxic.

C2 Nonmetals

C2.1 Glass may be used in pH or ORP electrodes and, when used, shall be heat and chemical resistant. (See Section E2.)

C2.1.1 Fluids internal to the pH and ORP measuring and reference electrodes shall be nontoxic.

C2.2 Where materials having certain inherent functional purposes are required for specific applications, such as ion-permeable materials on pH electrodes or reference junctions in pH or ORP sensors, or as level sensors, ceramic materials may be used. Ceramic materials shall be inert, nontoxic, insoluble, and resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization. The ceramic materials shall be nonpermeable to microorganisms and shall have an average pore size less than 0.20µm.

C2.3 Rubber and rubber-like materials may be used for sensor insulators, sensor holders, gaskets, diaphragms, bonded coatings and coverings, and parts having the same functional purposes.

C2.3.1 Rubber and rubber-like materials, when used for the above specified application(s), shall conform with the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C2.4 Plastic materials may be used for sensors, sensor insulators, sensor holders, gaskets, diaphragms, bonded coatings and coverings, and parts having the same functional purposes.

C2.4.1 Plastic materials, when used, for the above specified application(s) shall conform with the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

C2.5 Ion-permeable plastic materials may also be used on pH electrodes or reference junctions in pH or ORP sensors.

C2.5.1 Plastic materials, when used for the above specified applications, shall meet all requirements of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces in Dairy Equipment, Number 20-, except for Section H2 (weight gain). The plastic materials shall be nonpermeable to microorganisms and shall have an average pore size of less than 0.20 µm.

C2.6 Rubber and rubber-like materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization.

C2.6.1 The final bond and residual adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.[4]

C2.7 Materials used for transmitting pressure in diaphragm-type devices shall be nontoxic.

[2]The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, November 1990, Table 2-1, pp. 17-20. Available from the American Iron and Steel Society 186 Thorn Hill Road, Warrendale, PA 15086 (724) 776-1535.

[3]Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.

[4]Adhesives shall comply with 21 CFR 175 – Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (202) 512-1800.

C3 In a processing system to be sterilized by heat and operated at a temperature of 250°F (121°C) or higher, all materials having product contact surface(s) used in the construction of instrument fittings and connections shall be such that they can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250°F (121°C) and (2) operated at the temperature required for processing.

C4.1 All nonproduct contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All nonproduct contact surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product contact and nonproduct contact surfaces shall not be painted.

D FABRICATION

D1 Surface Texture

D1.1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds, and crevices in the final fabricated form. (See Appendix, Section G.)

D2 Permanent Joints

D2.1 All permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds, and crevices when in the final fabricated form. (See Appendix, Section G.)

D2.1.1 In such cases where welding or the use of adhesives for joining plastic insulation materials to probe conductors or other metallic components is impractical, press-fitting may be employed. The final juncture shall be continuous, without crevices, and shall not allow liquid penetration under the conditions encountered in the environment of intended use, and in cleaning and bactericidal treatment or sterilization. (See Appendix, Section J.)

D3 Bonded Materials

D3.1 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment or sterilization, the rubber, rubber-like, or plastic material does not separate from the base material to which it is bonded.

D4 Cleaning and Inspectibility

D4.1 Fittings that are to be mechanically cleaned shall be designed so that the product contact surfaces of the sensing device can be mechanically cleaned and all nonremoved appurtenances thereto can be mechanically cleaned and are accessible for inspection.

D4.2 Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an installed position or when removed. Demountable parts shall be readily removable.

D5 Gaskets

D5.1 Gaskets having a product contact surface shall be removable or bonded.

D5.2 Grooves in gaskets shall be no deeper than their width.

D5.3 Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 in. (6.35 mm) in depth or be less than 1/4 in. (6.35 mm) wide, except those for standard O-rings smaller than 1/4 in. (6.35 mm) and those provided for in Section D9.

D5.4 Gaskets and seals shall be exposed to cleaning solutions during mechanical cleaning.

D6 Radii

D6.1 All internal angles of less than 135° on product contact surfaces shall have radii of not less than 1/4 in. (6.35 mm) except that:

D6.1.1 Smaller radii may be used when they are required for essential functional reasons, such as those in sensing devices for high pressure gauges, viscosity sensors, ultrasonic level sensing devices, and conductivity sensors. In no case shall such radii be less than 1/32 in. (0.794 mm) except that:

D6.1.1.1 The radius at the juncture of flat sealing surfaces and at the junctures of press-fits is zero by nature of the design and definition of this type of fabrication.

D6.1.2 The grooves in gaskets or gasket retaining grooves shall be not less than 1/16 in. (1.59 mm), except those for standard 1/4 in. (6.35 mm) and smaller O-rings, and those provided for in Section D9.

D6.1.3 The radii in grooves for standard 1/4 in. (6.35 mm) O-rings shall not be less than 3/32 in. (2.0 mm) and for standard 1/8 in. (3.18 mm) O-rings shall be not less than 1/32 in (0.794 mm).

D6.1.4 The minimum radii for fillets of welds in product contact surfaces shall be not less than 1/4 in. (6.35 mm) except that the minimum radii for such welds may be 1/8 in. (3.18 mm) when the thickness of one or both parts joined is less than 3/16 in. (4.76 mm).

D7 Threads

D7.1 There shall be no threads on product contact surfaces.

D8 Draining

D8.1 All product contact surfaces shall be self-draining when properly installed, except for normal clingage.

D9 Fittings and Connections

D9.1 All sanitary fittings and connections shall conform with the 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-.

D10 Heat Sterilization Systems

D10.1 Sensor fittings, connections, and gaskets, if used, in a processing system to be sterilized by heat and operated at a temperature of 250°F (121°C) or higher shall comply with the following additional criteria:

D10.1.1 The construction shall be such that all product contact surfaces can be (1) sterilized by saturated steam or water under pressure (at least 15.3 psig or 106 kPa) at a temperature of at least 250°F (121°C) and (2) operated at the temperature required for processing.

D10.1.2 Devices that have a product contact surface(s) to be used in such a processing system, not designed so that the system is automatically shut down if the product pressure in the system becomes less than that of the atmosphere and cannot be restarted until the system is re-sterilized, shall have a steam or other sterilizing medium chamber surrounding the joint at the product contact surface between the fitting and the device. The sensor fitting shall be constructed so that the steam chamber or other sterilizing medium chamber may be exposed for inspection.

D10.1.3 The connection(s) on steam or other sterilizing medium chambers for the steam or other sterilizing medium lines shall be such that the lines can be securely fastened to the connections. The lines shall be connected in a manner that they may be disconnected to allow the sterilizing medium chamber to be inspected and cleaned if necessary.

D11 Drawing

D11.1 Sensors, sensor fittings, and connections drawings are found in Appendix, Section J of these standards. Dimensions and the contour of these components shown on the drawings are for reference only and changes may be added if they do not affect cleanability. Sensors, sensor fittings, and connections not illustrated in these drawings shall be considered as being included in these standards provided they conform to the provisions herein and have no special requirements for fabrication and installation.

D12 Nonproduct Contact Surfaces

D12.1 Nonproduct contact surfaces shall be relatively free of pockets and crevices, and shall be readily cleanable. Nonproduct contact surfaces that are prone to corrosion, such as aluminum connector heads, shall be coated to resist attack by normally encountered cleaning and sanitizing solutions. Those surfaces to be coated shall be effectively prepared for coating. (See Appendix, Section I.)

D12.2 All interconnecting capillary tubes or electrical cables shall be corrosion resistant, smooth, and cleanable. If armored, the armor shall be of spiral stainless steel or plastic coated. There shall be no exposed woven armor.

D12.3 Nonproduct contact surfaces shall have provision to drain leakage of product. If the nonproduct contact surface is insulated, the leakage shall drain beyond the insulation.

E SPECIAL CONSIDERATIONS

The criteria for fittings and connections having special requirements for fabrication or installation will be found in the following sub-sections:

E1 Sensor spuds for tanks shall comply with the following drawings: 3-A 74-00-13, 3-A 74-00-14, and 3-A 74-00-15. (See Appendix, Section L.)

E1.1 Shall be welded flush to the inside of the tank (vessel).

E1.2 Shall be installed so that the leakage detection port, if provided, is at the lowest point.

E1.3 When the sensor capsule is in its installed position in the sensor spud, the O-ring or gasket and diaphragm shall form a crevice-free joint and shall be self-draining.

E2 When glass is used as a product contact surface in pH or ORP electrodes, the glass should be installed in such a manner as to protect it from breakage or be provided with a cleanable sanitary protective shield or device.

APPENDIX

The Appendix of 3-A Sanitary Standards is not normative but is intended to provide guidance on material selection, fabrication criteria, cleaning procedures, and may include drawings or other pertinent information.

F STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 Series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. The chemical compositions of these cast grades are covered by ASTM specifications[5] A351/A351M, A743/A743M and A744/A744M.

G PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Section D1 herein. A maximum R_a of 32 µin. (0.80 µm), when measured according to the recommendations in American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)[6] B46.1 - *Surface Texture*, is considered to be equivalent to a No. 4 finish.

H OPERATING RANGE

Sensors should be labeled in visible locations with information about the conditions of use regarding maximum or minimum allowable temperature and/or pressure conditions.

I NONPRODUCT CONTACT SURFACES

The following design criteria are recommended for nonproduct contact surfaces:

1. Exposed threads should be minimized.
2. No exposed continuous piano-type hinges should be used on the equipment or control cabinets.
3. Electrical and utility connections should be as remote as practical from the product areas or connections.
4. Riveted appendages should not be used.
5. Name plates should be effectively sealed to the equipment. If name plates are used, welding is preferred.
6. Caulking should be avoided.
7. Socket head cap screws should not be used.

J PRESS-FITS

Press-fits may be used to produce crevice-free permanent joints in metal-to-plastic product contact surfaces when welding or bonding is not practical. Press-fits may only be used to assemble parts having circular cross sections, free of shoulders or relieved areas.

The design of press-fits depends on a variety of factors. The outside diameter of the part being inserted is greater than the inside diameter of the hole and the parts are forced together by applying pressure. The pressure required is dependent primarily upon the diameter of the parts, the amount of interference, the

[5]Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9500.

[6]Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017-2392 (212) 705-7722.

distance the inner member is forced in, and the characteristics of the plastic material.

Materials and assembly procedures should be used which will assure that a crevice-free joint is produced.

K ENGINEERING DESIGN AND TECHNICAL CONSTRUCTION FILE

The following is an example of an engineering design and technical construction file (EDTCF) to be maintained by the fabricator as evidence of complying with 3-A Sanitary Standards or 3-A Accepted Practices. (The file may contain more or less information as applicable to the equipment or system.)

K1 Purpose

K1.1 To establish and document the material, fabrication, and installation (where appropriate) requirements for the engineering design and technical construction files for all products, assemblies, and sub-assemblies supplied by the manufacturer thereof to be in compliance with the sanitary criteria found in 3-A Sanitary Standards or 3-A Accepted Practices. It is recommended that the engineering and construction file or files be submitted with applications for 3-A Symbol use authorization.

K2 Scope

K2.1 This EDTCF applies to equipment specified by:

K2.1.1 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products Equipment, Number 74-.

K2.1.2 List all other applicable 3-A Sanitary Standards and 3-A Accepted Practices.

K3 Responsibilities

K3.1 This EDTCF is maintained by: The Engineering Manager (or other company official) {name and title of responsible official} is responsible for maintaining, publishing, and distributing this EDTCF.

K3.2 Implementation: All divisions, specifically development engineering, standards engineering, sales engineering, and product departments are responsible for implementing this EDTCF.

K4 Applicability

K4.1 The 3-A Sanitary Standards and 3-A Accepted Practices are voluntarily applied as suitable sanitary criteria for dairy and food processing equipment. 3-A Sanitary Standards are referenced in the Grade A Pasteurized Milk Ordinance: "Equipment manufactured in conformity with 3-A Sanitary Standards complies with the sanitary design and construction standards of this Ordinance."

K5 References

K5.1 List any additional regulations that apply to the equipment or system covered by this EDTCF.

K5.2 Date of conformity or 3-A Symbol Authorization and certificate number, if authorized.

K6 Design and Technical Construction File

K6.1 The Engineering Design and Technical Construction File may consist of the following:

a. an overall drawing of the subject equipment;
b. full detailed drawings, accompanied by any calculations, notes, test results, etc. required to check the conformity of the equipment with the 3-A Standards or 3-A Practices;
c. a list of: (1) the essential requirements of the standards or practices; (2) other technical specifications, which were used when the equipment was designed;
d. a description of methods adopted;
e. if essential, any technical report or certificate obtained from a competent testing body or laboratory;
f. any technical report giving the results of tests carried out internally by Engineering or others;
g. documentation and test reports on any research or tests on components, assemblies and/or the complete product to determine and demonstrate that by its design and construction the product is capable of being installed, put into service, and operated in a sanitary manner (optional);
h. a determination of the foreseeable lifetime of the product (optional);
i. a copy of the instructions for the product (Instruction Manuals/Instruction Books);
j. for serial manufacturing, the internal measures that will be implemented to insure that the equipment will continue to be manufactured in conformity with the provisions of the 3-A Sanitary Standards or 3-A Accepted Practices;
k. engineering reports;
l. laboratory reports;
m. bills of material;
n. wiring diagrams, if applicable;

o. sales order engineering files;
p. hazard evaluation committee reports, if executed;
q. change records;
r. customer specifications;
s. any notified body technical reports and certification tests;
t. copy of the 3-A Symbol authorization, if applicable.

K6.2 The file does not have to include detailed plans or any other specific information regarding the sub-assemblies, tooling, or fixtures used for the manufacture of the product unless a knowledge of them is essential for verification of conformity with the basic sanitary requirements found in 3-A documents.

K6.3 The documentation referred to in K6.1 above need not permanently exist in a material manner in the EDTCF, but it must be possible to assemble them and make them available within a period of time commensurate with its importance (one week is considered reasonable time). As a minimum, each product EDTCF must physically contain an index of the applicable document of K6.1 above.

K6.4 The EDTCF may be in hard copy or software form.

K7 Confidentiality

K7.1 The EDTCF is the property of the manufacturer and is shown at their discretion, except that all or part of this file will be available to the 3-A Symbol Council or a regulatory agency for cause and upon request.

K8 File Location

K8.1 The EDTCF shall be maintained at {location}.

K9 File Retention

K9.1 The EDTCF (including all documentation referred to in K6.1) shall be retained and kept available for 12 years following the date of placing the product in use or from the last unit produced in the case of series manufacture.

L DIAGRAMS

These diagrams are intended to demonstrate general principles only, and are not intended to limit individual ingenuity. The design used should conform with the sanitary requirements set forth in these 3-A Sanitary Standards. The following examples are included in this Appendix:

Note: The drawings have not changed and are not included in this publication, but are included in the reprints.

These 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Products Equipment are effective August 11, 2000.

ComingEvents

OCTOBER

·**24-25, Michigan Environmental Health Association's Annual Food Protection Conference,** Amway Grand Hotel, Grand Rapids, MI. For further information, contact Diane Forys at 810.987.5306.

·**25, Metropolitan Association of Dairy, Food and Environmental Specialists (MADFES) Fall Meeting,** Victorian Manor, Edison, NJ. For additional information, contact Carol Schwar at 903.689.6693.

· **25-27, Florida Association for Food Protection.** Florida FFA Leadership Training Center, Haines City, FL. For additional information, contact Frank Yiannas at 407.828.5848.

·**30-1, The International Association of Food Industry Suppliers (IAFIS) Milk Safety Seminar,** US Trade Center, Mexico City, Mexico. The three-day course will feature sessions on subjects such as HACCP, the US and Mexican regulatory environment, good manufacturing practices, the 3-A Standards program, and much more. For additional information, contact Andrew Drennan at 703.761.2600 or adrennan@iafis.org.

·**31, North Dakota Environmental Health Association Annual Conference,** Grand Fork Holiday Inn, Grand Forks, ND. For further information, contact Debra Larson at 701.328.1292.

NOVEMBER

·**1-2, The International Association of Food Industry Suppliers (IAFIS) Stainless Steel Workshops,** Four Points Sheraton Milwaukee Airport, Milwaukee, WI. IAFIS and the Nickel Development Institute will present a workshop on The Selection & Fabrication of Stainless Steels for Sanitary Service. For additional information, contact Dorothy Brady at 703.761.2600 or fax: 703.761.4334.

·**2, Ontario Food Protection Association Annual Meeting,** Delta Meadowvale Hotel, Mississauga, Ontario, Canada. For additional information, contact Glenna Haller at 519.823.8015.

·**6-7, HACCP I: Documentating Your HACCP Prerequisite Program,** Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, contact Marlene Inglis, Guelph Food Technology Centre, 88 McGilvray St., Guelph, Ontario N1G 2W1 Canada; phone: 519.821.1246; fax: 519.836.1281; E-mail: gftc@uoguelph.ca.

·**8-10, The Dairy Practices Council® Annual Conference,** Pittsburgh-Greentree Holiday Inn, Pittsburgh, PA. For additional information, contact The Dairy Practices Council®, 51 E. Front St., Suite 2, Keyport, NJ 07735; phone/fax: 732.203.1947; E-mail: dairypc@dairypc.org.

·**8-10, International Life Sciences Institute (ILSI) Europe 2nd International Symposium on Food Packaging—Ensuring the Safety and Quality of Foods,** Vienna, Austria. For more information, contact ILSI Europe, Avenue E. Mounier, 83-Box 6-B, 1200 Brussels, Belgium, or phone: 32.2.771.00.14; fax: 32.2.762.00.44; E-mail: Packaging.Sympo@ilsieurope.be.

·**8-10, Servsafe® for the Retail and Food Service Sector,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.836.1246; fax: 519.821.1281; E-mail: gftc@uoguelph.ca.

·**8-11, NFPA 93rd Annual Convention,** Sheraton Chicago Hotel & Towers, Chicago, IL. For further information, contact Mary Olsen, Director, Meetings and Conventions at 202.639.5968; or fax: 202.639.5932.

·**12, IAFP Workshop, Produce Safety in Latin America, Experiences, Challenges and Impact on International Trade** Guadalajara Mission Carlton Hotel, Guadalajara, Mexico. See page 775 of this issue for additional information or contact the Association office at 800.369.6337; 515.276.3344.

·**12-16, American Public Health Association's 128th Annual Meeting,** Boston, MA. For more information, phone: 202.777.2470; fax: 202.777.2531; E-mail: ashell.alston@apha.org.

·**13-16, Pacific Congress on Milk Quality and Mastitis Control,** Nagano, Japan. Co-sponsored by IAFP. For additional information, contact Secretariat for PC2000, Philpot and Associates International, P.O. Box 120, Homer, LA 71040; phone: 318.927.2388; fax: 318.927.3133; E-mail: philpot@homerla. com.

·**15-17, IFT's International Food Safety and Quality Conference and Expo,** Orange County Convention Center, Orlando, FL. For additional information, call 312.782.8424.

·**16-17, Alabama Association for Food Protection Annual Meeting.** For additional information, contact Patricia Lindsey at 256.734.0243.

·**21-23, Second National On-Farm Food Safety and Quality Assurance Conference,** Novotel Launceston, Tasmania. For more information, contact Tasmanian Qual-

ity Assured Inc., P.O. Box 193, Launceston 7250, Tasmania; phone: 03.6331.6377; fax: 03.6331.4344; E-mail: tqainc@microtech.com.au.

·**30, HACCP: An Executive Summary,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.821.1246; fax: 519.836.1281; E-mail: gftc@uoguelph.ca.

DECEMBER

·**4-5, Food Safety Objectives: Public Health, HACCP and Science Conference,** Georgetown University, Washington, D.C. For further information, contact Phillipa Orme, FSO 2000 Conference Secretariat, 12 Church St., West Hanney, Wantage, Oxon OX12 OLN, UK; Phone 44.01235.868811. Fax: 44.01235.868811; E-mail: p.orme@dial.pipex.com.

·**4-6, InterBev 2000,** Morial Convention Center, New Orleans, LA. For more information call Joe Nemchek at 203.840.5949.

·**4-6, Thermal Process Development Workshop**, Monarch Hotel, Dublin, CA. Presented by National Food Processors Association. Participants will generate heat penetration data in the pilot plant of NFPA's research laboratory. For more information, call Customer Service at 202.639.5954.

·**13-14, HACCP IV: Train the Trainer,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.821.1246; fax: 519.836.1281; E-mail: gftc@uoguelph.ca.

JANUARY

·**20-21, New HACCP Workshop for International Poultry Processors,** Atlanta, GA. Sponsored by The US Poultry and Egg Association. Leading the workshop will be Dr. S. F. Sarge Bilgili and Dr. Donald E. Conner. For more information, contact US Poultry & Egg Association, 1530 Cooledge Road, Tucker, GA 30084-7303; phone: 770.493.9401; fax: 770.493.9257; E-mail: training@poultryegg.org.

FEBRUARY

·**20-22, Kentucky Association of Dairy, Food and Environmental Specialists,** Executive West, Louisville, KY. For additional information, contact Tim Wright at 606.873.4541.

·**21-22, California Association of Dairy and Milk Sanitarians Annual Meeting,** Ontario, CA. For further information, contact John Bruhn at 530.752.2192.

camp in Minnesota (1995), a trailer park in Washington, Illinois (1997), Alpine, Wyoming (1998), Albany, New York (1999), and Walkerton, Ontario (2000).

In addition to these major outbreaks, in which large numbers of people became ill at the same time, there is a low-level, endemic incidence of waterborne microbial disease associated with inadequately treated domestic water supplies. It is estimated that there are on the order of 900,000 cases of illness and 900 deaths each year in the United States from microbial pathogens in water supplies.

One fundamental problem with current regulatory approaches for addressing water supply-associated waterborne diseases is that the coliform standard that is used for evaluating the "sanitary quality" of treated water does not reliably assess the presence of cyst-forming protozoa or enteroviruses.

Standard Methods for the Examination of Water and Wastewater, 20th ed. (1998) states, "Tests for the detection and enumeration of indicator organisms rather than of pathogens is used. The coliform group of bacteria...is the principal indicator of suitability of a water for domestic, industrial, or other uses... ."

In Drinking Water Quality, 2nd ed., Vol.1– Recommendations from the World Health Organization, (1993) it is recommended that *E. coli* be the indicator of choice when resources for microbiological examination are limited. Because enteroviruses and the resting stages of *Cryptosporidium*, *Giardia*, amoebae, and other parasites are known to be more resistant to disinfection than *E. coli*, the absence of the latter will not necessarily indicate freedom from the former.

Canadian drinking water guidelines have been developed for a variety of microbiological, chemical, physical, and radiological parameters. These guidelines, which apply to drinking water from all private and municipal water sources, are set out in a publication entitled "Guidelines for Canadian Drinking Water Quality." Because provision of drinking water is a provincial responsibility, the guidelines are not applied federally except in those areas that fall under federal jurisdiction. However, virtually all provincial and territorial governments have established their own measures of water quality based on the Guidelines. The maximum allowable concentration (MAC) for coliforms in a single test is <10/ 100 ml; however, the MAC will also be exceeded if coliforms are detected in more than 20% of samples from a single distribution system or if *E. coli* is detected at any level.

Under the Total Coliform Collection Rule (TCR), in the United States, all public water systems are required to routinely monitor their tap water for total coliforms. The presence of total coliforms in drinking water indicates that the system is either fecally contaminated or vulnerable to fecal contamination. TCR also requires a periodic sanitary survey to evaluate and document the capabilities of the water system's sources, treatment, storage, distribution network, operation and maintenance, and overall management to ensure safe drinking water.

The Surface Water Treatment Rule (SWTR) in the United States covers all water systems that use surface water or groundwater under the direct influence of surface water. SWTR is an Environmental Protection Agency regulation intended to protect against exposure to *Giardia intestinalis*, viruses, and *Legionella*, as well as many other pathogens. This rule requires that all such systems reduce the level of *Giardia* by 99.9% (three log reduction) and viruses by 99.99% (four log reduction). All surface water systems must disinfect their water. Most water systems also must filter their water unless they meet EPA-specified filter avoidance criteria that define high-quality source water. Specifically, the current SWTR requires

(a) a 0.2 mg/l disinfectant residual entering the distribution system;

(b) maintenance of a detectable disinfectant residual in all parts of the distribution system;

(c) a combined filter effluent performance standard for turbidity (i.e., for rapid granular filters, 0.5 nephelometric turbidity unit [NTU] maximum for 95% of measurements [taken every 4 hours] during a month); and no single NTU reading >5.0; and

(d) watershed protection, redundant disinfection capability, and other requirements for unfiltered systems.

The SWTR is presently under review.

There is obviously a need to redefine our concept of "potability." We must significantly improve our ability to determine the adequacy of municipal water treatment to prevent microbial pathogens from causing epidemic as well as endemic waterborne and foodborne illness.

REFERENCE

1. Lee, G. F., and Anne Jones-Lee, G. Fred Lee & Associates. 1993. Public Health Significance of Waterborne Pathogens Domestic Water Supplies and Reclaimed Water. Landfills and Water Quality Management, El Macero, California.

CareerServicesSection

McCormick & Company, Inc., a worldwide leader in the spice and flavoring markets, has an opening for a Manager Food Safety/Microbiology at its Technical Innovation Center located in Hunt Valley, Maryland, a suburb of Baltimore. McCormick has been recognized as a "100 Best Company To Work For in America," and offers competitive salary, benefits, Company-funded pension, and profit sharing.

Candidate will provide leadership to McCormick's Food Safety program. Working closely with Corporate QA, responsibilities will include managing proactive research, investigating, and reporting on food safety issues to appropriate Company, customer and governmental officials. In addition, coordinating the testing, refining, developing and implementing microbiological methods, as well as management of departmental staff and projects will be necessary.

Skills and experience which qualified candidates will possess include:

1) Master's Degree or Ph.D. (Ph.D. preferred) in Microbiology or related science and 10-year's experience.
2) Food safety expertise with a strong practical microbiological knowledge.
3) Significant experience in microbiological methodology and interpretation.
4) Demonstrated ability to establish health risk (Quantified Risk Assessment).
5) Ability to apply good business judgment toward rendering direction and understanding in management product safety decision making.
6) Front line/production QC experience required.
7) Ability to manage and coach staff and provide directional leadership to corporate scientific professionals.
8) Experience testing, refining, developing and implementing microbiological methods.
9) Assessment of potential risk of emerging pathogens.
10) HACCP
11) Laboratory Integrity w/experience in a food processing lab is essential.
12) QA, operations experience and/or lab management background are a plus.
13) Strong presentation skills, written and verbal communication and teamwork skills are required.

Interested candidates should fax their resume and salary history to McCormick & Company, Inc.; Attention: Microbiologist Search at 410-771-7649 or mail to: McCormick & Company, Inc., 204 Wight Ave., Hunt Valley, Maryland 21031.

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Research Notes

* Asterisk indicates author for correspondence.

ADVERTISING INDEX

Actions From the 3-A Sanitary Standards Committees Annual Meeting

The 3-A Sanitary Standards Committees met May 7-12 in Milwaukee, Wisconsin, to review tentative 3-A Standards and one tentative Practice. The following summarizes the actions recommended by the 3-A Committees. These tentative documents were approved and will be effective November 12, 2000, except where noted.

1. 3-A Sanitary Standards for Filters Using Single Service Filter Media, *Number 10-04.*
2. 3-A Sanitary Standards for Equipment for Packaging Viscous Products, *Number 23-03.*
3. 3-A Sanitary Standards for Air Eliminators, *Number 29-02.*
4. 3-A Sanitary Standards for Scraped Surface Heat Exchangers, *Number 31-03.*
5. 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections Used on Milk and Milk Product Equipment, *Number 74-01.* (Effective date is August 11, 2000.)

For additional information on the 3-A Sanitary Standards Program, visit www.3-a.org, or call IAFIS at 703.761.2600.

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a. Total Number of Copies *(Net press run)*	3,588	3,850
b. Paid and/or Requested Circulation (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. *(Include advertiser's proof and exchange copies)*	2,696	2,703
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f. Total Free Distribution *(Sum of 15d. and 15e.)*	319	453
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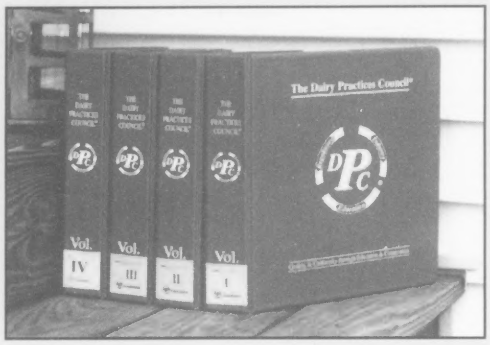

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THOUGHTS on Today's Food Safety...

Water Quality and Its Impact on Food Safety

Michael H. Brodsky
Brodsky Consulting
Thornhill, Ontario, Canada

Although waterborne diseases are typically considered to be problems of underdeveloped countries with inadequate sanitary practices, there is increasing recognition that industrialized, developed countries also have significant public health problems caused by use of untreated, partially treated, or inadequately treated domestic water supplies. The incidence of major outbreaks of the classical waterborne bacterial diseases, such as typhoid fever and cholera, has become very low in developed countries since the initiation of chlorination of domestic water supplies. However, outbreaks of waterborne diseases still occur.

People can become infected by waterborne microbial pathogens if they:

- consume water (either directly or indirectly through its use in food preparation or processing) from untreated, inadequately treated, or conventionally treated domestic water supplies that contain human pathogens.
- consume inadequately cooked shellfish or fish from areas where the waters or sediment contain human pathogens.
- consume food crops grown on land irrigated with contaminated domestic wastewater, or augmented with treatment plant sludge or inadequately composted animal manure.

Pathogenic agents of concern in water include many of the same organisms of concern in food safety:

- bacteria – *Salmonella*, *Shigella*, *Escherichia coli* (*E. coli*), *Vibrio*, *Klebsiella*, *Campylobacter*, *Legionella*, *Pseudomonas*
- viruses – include enteroviruses (poliovirus, echovirus, coxsackievirus), Hepatitis A, rotavirus
- protozoa – *Entamoeba*, *Giardia*, *Cryptosporidium*, *Cyclospora*

These organisms/agents are found in fecal material of infected/carrier individuals. Some are also present in the fecal material of healthy, asymptomatic individuals, and/or in fecal material of other animals. Some of these organisms also occur naturally in the environment.

The number of organisms required to cause disease in an individual depends on a variety of factors, including the nature of the organism, its virulence characteristics, and the susceptibility of the individual.

It has been known for more than 50 years that the conventional disinfection of domestic water supplies (accomplished by addition of chlorine to achieve a chlorine concentration of 1 mg/l of water) is highly effective against most Gram negative intestinal bacteria. It has also been long recognized, however, that that level of chlorination for the conventional contact time is not adequate to control many enteroviruses and is significantly deficient in controlling cyst- and oocyst-forming pathogenic protozoa that are ubiquitous in domestic raw water supplies. The practice of flocculation and filtration as part of municipal water treatment of surface waters significantly reduces the numbers of cyst- and oocyst-forming protozoa and enteroviruses and minimizes the frequency of major outbreaks of waterborne disease caused by those organisms in drinking water subjected to those processes. However, failures in the performance of those systems, and inadequate treatment provided for other supplies, continue to allow significant outbreaks of waterborne disease. Furthermore, flocculation and filtration do not "kill" or inactivate these agents, but rather remove them from the water to the sludge.

The presence of enteric pathogens in domestic water supplies represents a potentially significant threat of foodborne diseases where water treatment is inadequate. Major outbreaks of disease associated with inadequate treatment of domestic water supplies continue to occur periodically in developed countries. In the past few years, *Cryptosporidia* and *Giardia* have caused major outbreaks of disease in every province in Canada and in many states in the United States. The number of reported outbreaks is grossly underestimated since Cryptosporidiosis and Giardiasis are not universally reportable. *Cyclospora* outbreaks associated with fresh fruit and produce have occurred in both Canada and the United States. Recently, waterborne outbreaks caused by *Escherichia coli* O157:H7 have caused death and significant morbidity in Cabool, Missouri (1989), Grampian, Scotland (1991), a summer

Continued on page 810

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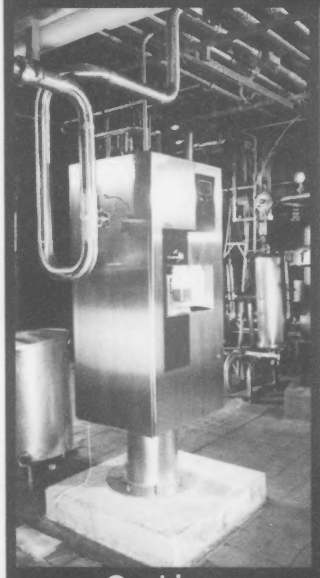

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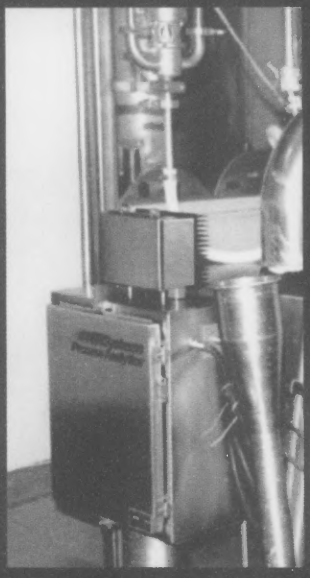

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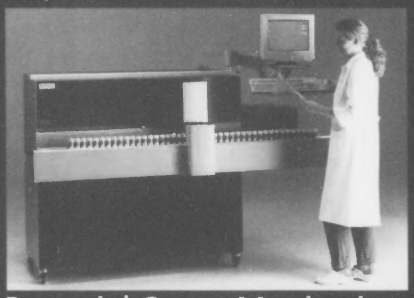

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