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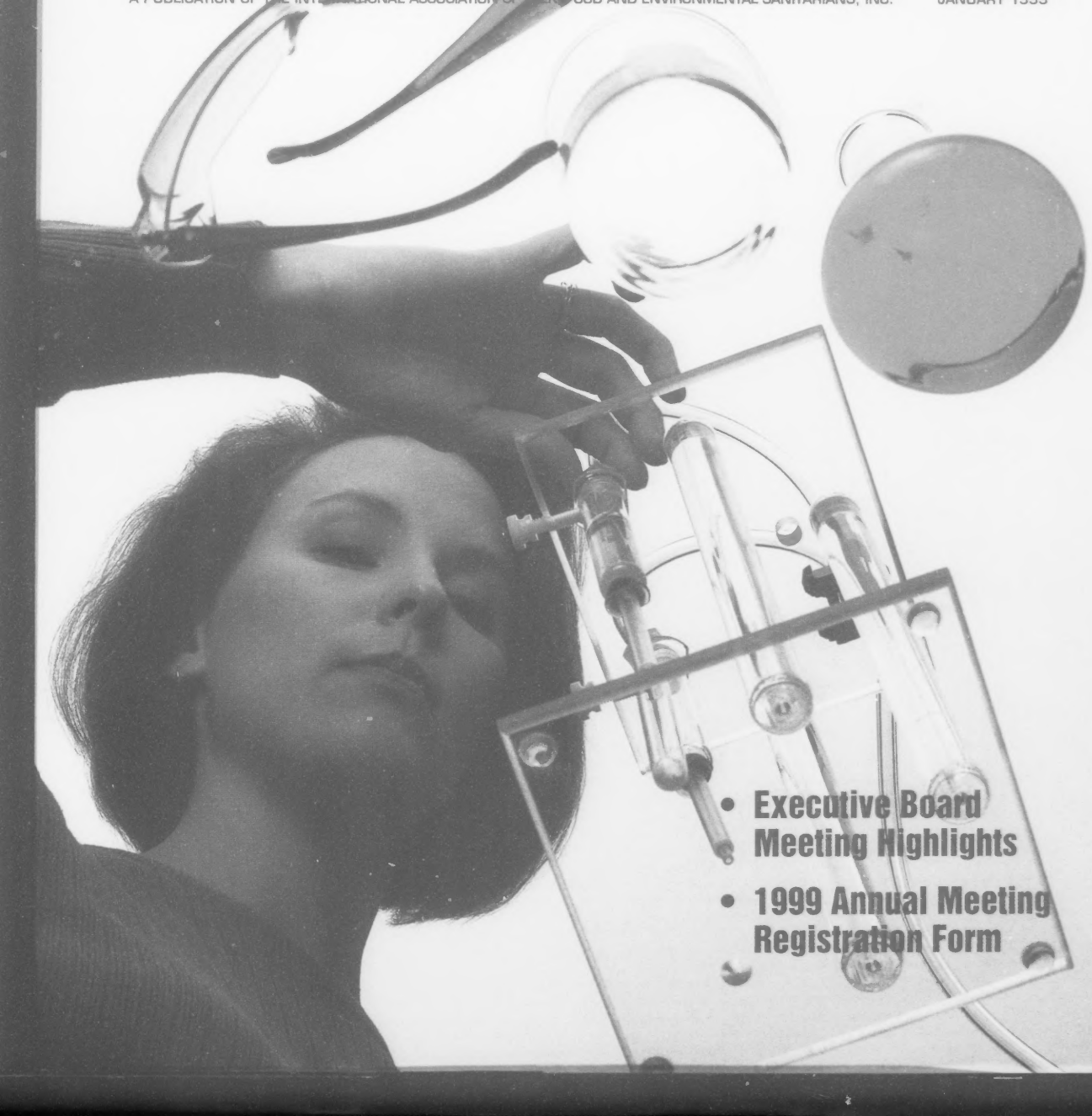
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. JANUARY 1999



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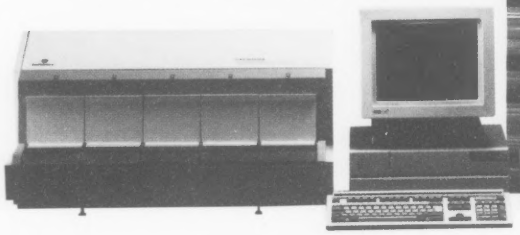

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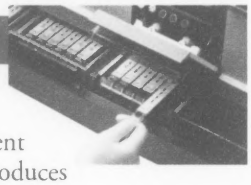

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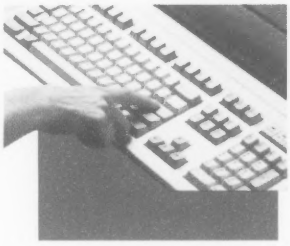

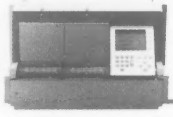

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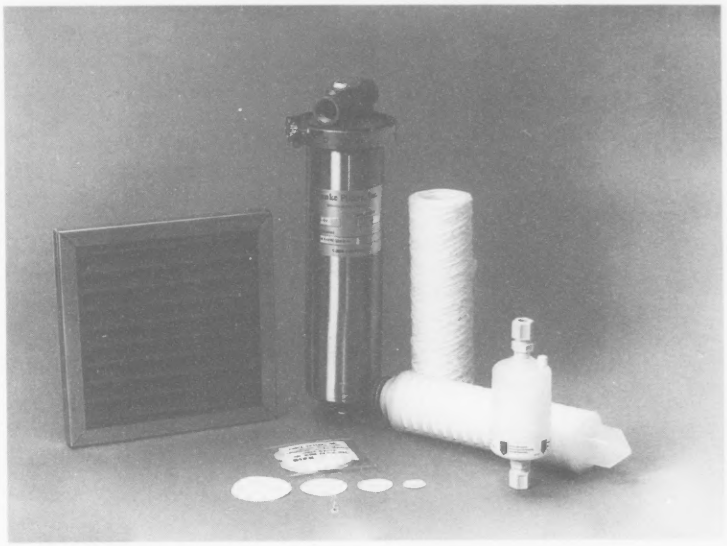

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FROM YOUR PRESIDENT

By ROBERT E. BRACKETT
IAMFES President

"1998 in review"

During our daily hustle and bustle of life, we often lose sight of all the small, incremental changes that are happening around us. It is only when one stops to reflect that one realizes how much has actually happened. As many people do at the beginning of a new year, I often tend to think back on events of the past year as well as plans for the upcoming new year. Whenever I do this, I am always amazed how many changes have occurred and how much progress has been made. Of course, one also realizes the many goals that are left unachieved. Although this is often the case for our personal lives, the same is true for organizations such as IAMFES.

1998 was a great year of accomplishments for IAMFES. Everyone has their own ideas of what constitutes noteworthy milestones or accomplishments. Some are obvious and other less so. In this first President's Column of the new year, I wanted to share my selection of the most noteworthy events and accomplishments of 1998.

- Undoubtedly, the 1998 Annual Meeting was a major accomplishment. Our Nashville Meeting broke all records for attendance, attracted a wide international audience, and allowed attendees to hear some of the best presentations on food protection possible. This past Annual Meeting also attracted many new attendees and Members who have since asked to be involved in our Committees and Professional Development Groups.
- 1998 was the first full year of iMIS. I know that at this point many of you are probably thinking, "Huh, what in the world is iMIS?" For those of you who have no clue what I am talking about, iMIS is the new Membership management computer program. Why do I think that iMIS is such a big deal? Because iMIS is the focal point in IAMFES' goal to provide its Members with better, faster, and more professional service. It does this by consolidating in one place, information that used to be scattered among several different computers, old 3 × 5 cards, paper files, or even memories of staff members. As you can imagine, this situation led to inefficiencies in the IAMFES office. Those of you who are long-time Members may have encountered a scenario like this: You call the IAMFES office to inform them that you haven't received the most recent issue of *Dairy, Food, and Environmental Sanitation* and, as long as you have IAMFES on the telephone, to check the status of the manuscript you previously submitted for publication in *Journal of Food Protection*. Simple request, right? Not before iMIS! In order for your friendly IAMFES staff

member to help you, he or she would have had to check one set of records to see that your Membership was current, another to see when the journals were sent, and perhaps another to obtain your address. Then, an entirely different set of people and another computer system were used for *Journal of Food Protection* submissions. So, it was conceivable that as many as 4 people and 3 computers may have been needed to answer that simple request. In the meantime, you are left to wait, wondering what is going on. With our iMIS system, one person has all the information available in one place. iMIS will also benefit Members by allowing staff to more easily maintain useful statistics on Members as to their interests, geographical location, length of Membership, and similar information. Such information will enable IAMFES to better tailor services to the needs of the Membership.

- Our flagship publication, *Journal of Food Protection*, continued to grow and improve during 1998. We received a record number of high quality manuscripts and published more total pages and larger issues than ever. And, much to the delight of our authors, backlogs of manuscripts and turnaround times were reduced. Our switch to a new printing firm will allow for a more streamlined publication process and allow us to provide Members with additional services, such as access to table of contents and abstracts through the IAMFES Web site that were not previously possible. Finally, the *Journal of Food Protection*'s stature in scientific literature was confirmed by, for the first time ever, being cited in *Index Medicus*.
- One of the most disappointing events of 1998 for the Executive Board and IAMFES staff was losing our Director of Communications, Carol Mouchka. Carol recently decided to accept a position in Minnesota that will offer her new responsibility, challenges, and opportunities for professional growth. Those of you who had the pleasure of working or interacting with Carol know how hard she worked for the Membership and IAMFES. Although we were all disappointed to see Carol leave IAMFES, both the Executive Board and the IAMFES staff wish her the very best in her new position.

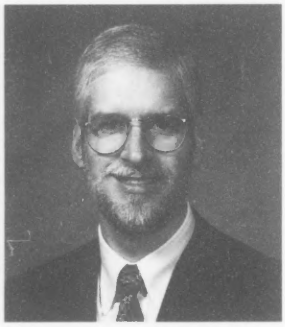
Of course, there were many other significant events that occurred in 1998, but limitations in space prevent me from listing them all. However, the above sampling should give you a feel for the changes going on in IAMFES.

What's in store for 1999 can only be imagined but the future looks bright for the Association. IAMFES will continue the process for changing our name and improving our professional image. We will also work to increase international involvement, seek new affiliates, and improve services for Members. Our past accomplishments were possible only with the active involvement of our Members. The future will require no less.

AND THE MEMBER SURVEY SAYS...

COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
IAMFES Executive Director

"We encourage you to focus on your vision on the future of IAMFES"

"Effective visions prepare for the future, but honor the past." When I read that phrase, written by Tom Peters, I thought of IAMFES; the issues of changing our name and the image transformation for our Association. These issues had been discussed by the Executive Board and many IAMFES Members for a number of years, but were formulated into a plan in April of 1997. During the Board meeting held that April, the Executive Board approved using the slogan "Advancing Food Safety Worldwide" in order to bring an easily recognizable identity to IAMFES. Since that time, we have used the slogan on items related to the IAMFES Annual Meeting and in other places. We hope that you think of IAMFES when you see "Advancing Food Safety Worldwide."

Another historic event took place at that Executive Board meeting. It was approved to begin a process intended to change the name of the Association to the "International Association for Food Protection." This was the beginning of a two-and-a-half year process to prepare for the future. A timeline was developed whereby we would publicize the new name and the voting date of August 3, 1999. We would also actively solicit comments from all IAMFES Members. We received many responses, and they have remained overwhelmingly in support of the new name. The topic was raised at the last two Annual Meetings during the Business Meeting and at Committee, Professional Development Group and other group meetings to ask for Member's comments.

It was felt that by allowing such a long comment period, IAMFES Members will have had many opportunities to hear about the name change prior to voting at the Business Meeting or receiving a ballot in the mail. This plan also was intended to honor the past, by not rushing into a name change without having ample time to discuss the issue.

Recently, we surveyed a representative sample of Membership to determine Members' awareness about the name change. The results will be tabulated and available in time for the February issue of *DFES*. From the surveys, we will assess what type of further communication is necessary to inform IAMFES Members of the vote for changing the Association name.

With an affirmative vote at the 1999 Annual Meeting, ballots will be sent to the entire Membership. More than two-thirds of those voting by ballot, must select yes in order for the name change to become effective. With a positive vote result, steps to implement the name will begin and we anticipate the new name to be in place in January of 2000.

There are so many details to cover when changing a name, you might ask, "why do it?" In order for IAMFES to grow both internationally and domestically, we need to have a name that identifies our Association quickly and easily. It needs to tell what our Members do in a short amount of time. Teamed together with the slogan, "Advancing Food Safety Worldwide," our new name does just that! Members of the

International Association for Food Protection work and dedicate their lives to Advancing Food Safety Worldwide! It all seems to fit together and make sense. It is an effective vision for the future, while honoring the past.

Speaking of the past, more than 32 years have past since the last name change of the Association took place and that was to add "Environmental" to the name. Prior to that, there were 3 name changes that averaged 18 years between each change. We are certainly proud of the past names of the Association and proud of what they stood for. We are proud of many Members that gathered together back in 1911 to form the "International Association of Dairy and Milk Inspectors" and we are proud of all Members who have followed in their footsteps to carry on the work of the Association.

I believe we can all agree that many changes have taken place since formation of the Association in 1911 and Members that preceded us also faced decisions of whether to change the name or not. When faced with the decision, they too had to assess the benefits of making such a change to see if they outweighed remaining status quo. Just think for a moment, what might have happened if someone or some groups of Members were not looking forward to determine a need to change the Association name when it needed to be done. The name may have stayed the International Association of Dairy and Milk Inspectors and the prospective pool of Members would not be adequate to support the type of Association that we have built today.

We encourage you to focus your vision on the future of IAMFES, think about the image and the ability of the Association to present itself to prospective Members involved in food safety. Help us to help you by attracting new Members to the Association. Remember the next new Member to join may be the one who provides assistance or information to solve a problem you have been working on for sometime. They could be the person you hire to work for you, or they may even hire you!

Again, I encourage you to provide your input on the name change issue. Please send comments to me via E-mail at dtharp@iamfes.org or you may want to contact Bob Brackett, IAMFES President at rbracke@cfsqe.griffin.peachnet.edu. We look forward to receiving your thoughts.

Be sure to read your February issue of *DFES* to find out the results of our recent Member survey regarding the proposed name change. We received an excellent response from our Members who have shared their thoughts.

More details to follow...

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An Integrated Approach: The Future of Graduate Food Safety Education

Lee-Ann Jaykus* and Donn R. Ward

SUMMARY

Recent federal food safety initiatives using a farm-to-table approach have been instituted in an effort to improve the safety of the nation's food supply. Because food safety issues are complex and evolving rapidly, experts from academia, industry, and government cite the need for a farm-to-table systems approach, a multidisciplinary perspective, and a larger food safety work force. This paper proposes an integrated approach to graduate food safety education, focusing on multidisciplinary educational and research themes. The educational component encompasses specific courses in the disciplines of Food Science, Agricultural Sciences, Veterinary Medical Sciences, Epidemiology and Public Health, Quantitative Risk Assessment, and Public Policy. For the research component, six specific areas are identified: (1) Pre- and post-harvest food safety, (2) emerging foodborne pathogens, (3) rapid and improved detection methods, (4) epidemiological investigation of foodborne disease, (5) risk assessment and analysis, and (6) consumer education. The integrated graduate education approach will significantly benefit students, but it will also benefit society by serving as a model for the effective training of future food safety professionals.

INTRODUCTION

People, the foods they eat, and foodborne diseases are in the news today as never before. In a classic 1989 article on the emergence of foodborne disease agents, the author identified the following seven basic reasons why pathogens emerge: (1) changes in eating habits, (2) changes in perception and awareness of what constitutes hazards, risks, and hygiene, (3) demographic changes, (4) changes in primary food production, (5) changes in food processing technology, (6) changes in handling and preparation practices, and (7) changes in the behavior of microorganisms *(2)*. Other factors include the rapidly expanding and changing business of buying and selling food commodities. For instance, in the United States alone, the value of food trade rose more than 300% in the past two decades, and up to 75% of all fruits and vegetables are now imported *(3)*. When viewed on an international scale, these dramatic changes in food production, processing, and preparation, along with demographic and lifestyle changes, make control of food safety a global concern. This concern is not likely to change in the near future.

Foodborne disease is a major cause of morbidity and mortality worldwide. In the United States alone, it has been estimated that as many as 6.5 to 33 million cases of foodborne disease occur annually. These illnesses cost up to $9 billion a year in medical expenses and lost productivity, and may result in as many as 9,000 deaths annually *(1)*. In response to the increasing public awareness of food safety, the National Food Safety Initiative was launched in January 1997. Not long afterward (October 1997), a related initiative was introduced to ensure that domestic and imported fruits and vegetables meet the highest health and safety standards. These initiatives seek to improve the safety of the nation's food supply by using a farm-to-table approach, recognizing that food safety is not the responsibility of the federal government alone, but is the shared responsibility of all components of the food system, from primary producers to consumers. With this in mind, it is clear that recent government actions are elements of a larger partnership that includes state and local governments, industry, consumers, primary and secondary (K-12) educational institutions, and academia, working together to ensure the safety of the nation's, and indeed, the world's food supply.

Because food safety issues are complex and evolving rapidly, experts from academia, industry, and government cite the need for a farm-to-table systems approach, a multidisciplinary perspective, and a larger food safety work force *(4)*. Traditionally, food safety education has been provided by land grant universities through its roles of teaching, research, and extension. Now, more than ever, these roles must be confluent as our future food safety professionals will need to be able to understand and perform in all of these capacities at some point in their careers. Currently, although some research functions have evolved from single-discipline projects to multidisciplinary collaborative efforts, the educational function has not, and most academic training in food safety continues to focus on disciplinary specialties. However, a new kind of professional is needed, one with knowledge of the entire food safety continuum and the skills to understand and to address issues wherever they occur along that continuum. But where are these new food safety professionals coming from, and how are we going to train them in a multidisciplinary systems approach so that they can see the so-called "big picture" in the farm-to-table food safety continuum?

MAJOR EDUCATIONAL THEMES

We propose that our future professionals must be broadly trained in all of the sciences associated with food safety. Given the complex and diverse nature of food safety issues, it is imperative that we begin to develop a coordinated and broad-based multi-disciplinary approach to food safety education.

While Food Science faculty can provide some of this academic training, these educators must also rely upon supporting disciplines to train their students. The conventional approach has been to require graduate "minors" in areas such as Microbiology and Toxicology, the idea being that a student with a disciplinary minor will have enough expertise in that discipline to be able to utilize its methods and concepts in their careers. The problem now facing educators is that the disciplines in food safety are so diverse that students under the current educational paradigm cannot possibly see the bigger picture of food safety, nor can the educators in a specific department or college effectively train students in all of the disciplines that are impacting food safety.

So, what are the educational themes that are key to successful food safety training? First and foremost, the future food safety professional must have strong training in Food Science, including an understanding of Food Microbiology, Food Preservation, Food Chemistry, Food Analysis, Processing, Packaging, and Laws and Regulations. From a classic academic disciplinary perspective, these individuals must be grounded in Microbiology and/or Toxicology and must have the methodological background to be able to apply the techniques which are crucial tools in our current and future food safety research, including the techniques of such disciplines as Molecular Biology, Immunology, Epidemiology, and Mathematical Modeling. To see the big picture of food safety, these future professionals must have some familiarity with the Agronomic, Animal, and Veterinary Medical Sciences, as well as Environmental and Public Health Sciences. And because food safety policy and international trade are increasingly important issues, a Public Policy component will be key to the success of these individuals as well. As food safety educational programs grow, future professionals will also need specific training in adult education methods and the means by which to evaluate program efficacy. All of these disciplines must be integrated into coursework that relates specifically to both historical and emerging food safety issues.

Although it would be desirable to incorporate all of these aspects into our food safety graduate education programs, it is unrealistic to expect a single campus, let alone a single department, to be able to take on this monumental task. Only when we begin to plan food safety education and research in a multidisciplinary fashion can these issues be effectively addressed.

MAJOR RESEARCH THEMES

Because training in research methods is such an integral part of graduate education, it is also important to identify the evolving research themes that should be addressed in training future food safety professionals. Again, these themes become multi-disciplinary, requiring input from professionals in a wide array of disciplines. Within the theme of food safety from farm to table, we have identified six major research efforts that provide a focus for student and

faculty collaboration. These include: (1) Pre- and post-harvest food safety, (2) emerging foodborne pathogens, (3) rapid and improved detection methods, (4) epidemiological investigation of foodborne disease (5) risk assessment and analysis, and (6) consumer education.

Pre-and post-harvest food safety research seeks to combine approaches such as HACCP with established research methods such as epidemiological investigation, in conjunction with emerging disciplines such as quantitative risk assessment, to identify and control biological, chemical, and physical hazards in foods both before and after harvest. This collaborative approach will enable the production, processing, and packaging components of the food safety continuum to safely convert raw foods to value-added products. In the second research effort, the adaptive mechanisms of new or emerging foodborne microbial pathogens must be identified and understood so that scientists can develop improved strategies to prevent and control their persistence in the environment, survival and proliferation in foods, and ability to cause disease. Rapid and improved detection strategies, the third major research thrust, concentrates on mastering immunological and molecular biological techniques along with biosensor technology to enable the detection of minute quantities of microorganisms or toxins under "real-time" and perhaps on-line circumstances. The Centers for Disease Control and Prevention's FoodNet program demonstrates the importance of epidemiological methods in food safety research and data acquisition. Using molecular epidemiological techniques, food safety scientists must be able to distinguish specific strains of foodborne disease agents, identify infection clusters, track foodborne pathogen transmission in space and time, and determine causal associations in foodborne disease outbreaks. Quantitative microbial risk assessment, a developing field that affords a framework for evaluating human health risks associated with microorganisms in foods, provides an opportunity to apply a more scientifically grounded approach to the development of domestic and international food safety policy. Together with risk management and risk communication strategies, this research area will help us to design better HACCP plans, establish food safety equivalence in international trade, and evaluate various risk mitigation strategies. Finally, since the food safety continuum ends with consumers, future food safety professionals will need to provide the end-user with accurate and current information that is key to making informed decisions. This will include development of novel adult education methods and effective assessment methods to assure that educational efforts are working. Although consumer accessibility to computers and the Internet will greatly aid in these efforts, they will not replace more traditional educational forums such as workshops, meetings, and promotional programs.

A MODEL FOR INTEGRATED GRADUATE FOOD SAFETY EDUCATION

Although interdepartmental programs in other broad disciplines have been developed, Food Scientists are less accustomed to collaborative approaches to education. Courses are sometimes team-taught, but designing curricula is more complex and becomes even more complicated as it is increasingly apparent that single campuses may not have all the resources necessary to design and implement an integrated educational program in food safety. However, multiple campuses can begin collaborative ventures that seek to bring the supporting food safety disciplines together into a more cohesive and coherent program.

While the format that integrated food safety education programs may take can be varied, a recent model that we have developed in North Carolina utilizes proximity, complementary programs, and longstanding ties within the University of North Carolina system to cover the spectrum necessary to educate future food safety professionals. The Colleges of Agriculture and Life Sciences, Engineering, and Veterinary Medicine at North Carolina State University (NCSU), in collaboration with the School of Public Health at the University of North Carolina at Chapel Hill (UNC-CH), and the historically black North Carolina A&T University (NC A&T), have begun a collaboration to aid in the establishment of integrated food safety education. While this program is evolving and the exact institutional form has yet to be realized, the North Carolina team has identified some strategies that will be key to the success of this endeavor. First and foremost, there must be a strong commitment on the part of the participating teaching, research, and extension faculty, as well as administrative support, to promote program continuation, enhancement, and funding. Core courses that focus on providing specific food safety background to entering students are key and should be designed and taught by the participating faculty members. An integrative food safety seminar series has been proposed to provide students with an introduction to the many research themes that apply to food safety. Students will be exposed to different areas of food safety research by rotating through different labs before or after selecting a research advisor, and students will gain practical field experience by performing summer internships at federal or state agencies, or alternatively, in the private sector. Incorporation of professional development and research ethics education through seminars, case studies, role-playing, and student-faculty dialogue will help assure the highest quality preparation for professional careers. In all cases, efforts will be made to recruit the most promising students, with attention to ensuring diversity and including under-represented groups.

BENEFITS OF THE INTEGRATED EDUCATION APPROACH

While only a few institutions may have the capability to design and maintain such an integrated program at a single physical location, the aggressive use of distance learning technologies, will allow the opportunity to exist for multiple institutions and states to take advantage of food safety training at all levels. Moreover, the same opportunity will exist for interested personnel in federal and state agencies and in industry, as well as for extension professionals across the country.

From a teaching perspective, integrated food safety education offers an opportunity for a wide array of seemingly unrelated disciplines to come together in a common educational cause. This means that there will be opportunities for creative course design, team teaching, development of critical thinking skills, and the incorporation of professional development and ethics training into the program. Faculty from diverse disciplines will have the opportunity to interact, providing both faculty and students with a broader perspective of the entire food safety continuum. Finally, a consolidated program with centralized recruitment enables specific attention to be paid to diversity issues, further creating a well-represented work force.

The value of integrated approaches to research is well understood. Integrated research provides for the technical expertise required to solve highly complex food safety problems and provides a foundation for increased research support. It also attracts exceptional students to tackle these difficult research issues. Integrated research should provide the technical expertise to facilitate technology transfer to industry, consumers, and other important constituents.

The greatest benefit associated with an integrated approach to graduate food safety education will be from the students graduating from such programs. For those graduates who remain in academia, a food safety doctoral program will address a faculty shortage and extend the integrative model nationally. Graduates who choose to work in government and industry will lead in creating a more broadly trained food safety work force. In all cases, those completing degrees in the integrative model will be better prepared to address the complex food safety issues across the farm-to-table continuum.

Indeed, this is an exciting time for food safety. Food Science departments around the country are in the unique position to offer the strongest and most comprehensive leadership in the development of integrated food safety education programs. With leadership provided by food scientists and cooperation from related disciplines, as well as technological advancements, relevant and timely educational programs in food safety can become a reality. For those of us who are educators, we have a responsibility to mold future food safety professionals so that they can effectively perform their jobs. We challenge all educators to contribute their own personal expertise in helping to make a safer world food supply.

ACKNOWLEDGMENTS

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Consumer Food Safety Awareness and Acceptance of Irradiated Raw Poultry in Three Texas Cities

K. G. Maciorowski, S. C. Ricke,* and S. G. Birkhold

SUMMARY

A 15-question interview survey was administered to determine urban consumers' perceptions concerning raw poultry, food safety concerns, and the likelihood that they would purchase irradiated fresh poultry in Texas. Three hundred consumers were surveyed, 50 in each of two supermarkets in each of three Texas cities. Demographic data was obtained. A majority of respondents from cities with large Caucasian populations, Caucasians in general, and college graduates believe that poultry contains the most harmful bacteria. Hispanic respondents believe that pork contains the most harmful bacteria. A majority of all groups (58 to 92%) believe that poultry is generally safe and that microbiological issues are of primary importance when compared to chemical residues or preservatives. A majority of Houston residents and college graduates have attributed illness to consumed food, whereas a majority of residents of the other two cities and high school graduates have not. Caucasians, males, and college graduates generally would eat irradiated poultry, but Hispanics, minorities, females, and those with a high school diploma or less would not. This information will be helpful in targeting educational programs for urban clientele.

INTRODUCTION

Salmonellosis is a major problem in the United States, costing the US economy approximately 4 billion dollars annually *(20)*. Although much research has been directed toward preventing *Salmonella* spp. from reaching the processing plant *(26)*, *Salmonella* spp. contamination is still a large problem at the point of purchase. Izat et al. *(15)* detected *Salmonella* spp. on 17 to 50% of commercial broiler carcasses purchased at retail. At the processing stage, disinfection options are limited by the consumer's desire for a natural product. Yet the consumer would pay more for meat from which microorganisms have been eliminated *(13)*, and nearly 60 percent of groups attending public policy education forums recommended some sort of industry initiative to protect consumer health *(16)*. Therefore, treatment options that increase safety but without significantly reducing product quality may increase consumers' demand for poultry.

Irradiation may provide a viable treatment option to reduce *Salmonella* in poultry. Approved for controlling bacterial contamination in chicken, turkey and other uncooked

TABLE 1. Survey questions

1. Which type of row meot is more likely to have hormful bocterio?
   o. beef b. paultry c. park d. oll the same
2. Haw mony times a week da yau prepare paultry?
   o. 0 b. 1-2 c. 3-4 d. 5 or more
3. The mast impartant food sofety issue facing paultry consumers is:
   a. chemicol residues b. micrabiologicol/bocterial c. odditives and preservatives
4. In generol, how safe is paultry?
   a. safe b. unsafe
5. Which type af paultry is sofer?
   o. whale, intoct corcosses b. cut-up ports c. ground poultry meot d. oll the some
6. Haw long do yau stare raw paultry in the refrigeratar before use?
   o. never store, always use immediately c. 3-4 days e. freeze immediately,
   b. 1-2 doys d. 5 doys ar longer thow before use
7. Haw da you thow poultry? Circle oll that apply.
   o. in the refrigerotar b. an the caunter c. in o sink of woter d. in the microwave oven
8. Where do you get most af your faad safety infarmatian? Circle all that apply.
   o. television b. newspapers
   c. educotianol system (schaal, cammunity educatian, etc.) d. family and friends
   e. books f. mogozines g. oll of the obove h. never heord of it
9. Hove yau ever attributed illness ta a faad yau consumed?
   o. Yes - Pleose onswer question 10. b. No - Skip to question 11.
10. Which of the following wos the couse?
    a. Allergic Reactian b. Bacteria c. Spoiled Foad d. Other _____
11. *Salmanella* has been identified as an impartant arganism that causes faad poisaning. According ta the USDA, irradiotian of row poultry at opproved levels destroys 99.5 to 99.9% of *Solmonello*. Would you eot irrodioted poultry?
    o. Yes b. No c. Never heord of irrodiotion

In arder ta ensure that this survey reflects an accurate cross-section of the papulation, we wauld appreciate yaur respanses to the following questions:

12. Please circle yaur age graup:
    1-18 19-25 26-35 36-45 46-55 ≥ 56
13. Pleose circle your gender: Mole Femole
14. Whot is your ethnic graup? _____
15. Please circle your educotion level.
    1. fewer than 12 years af schooling 2. high schaal graduate ar GED
    3. ossociotes ar technical degree 4. bochelors degree
    5. masters degree 6. professianal ar Ph.D.

poultry since 1990 *(12, 17)*, food irradiation may extend the shelf life of poultry by as much as one week *(18)*. However, food irradiation as a method may be opposed by a variety of groups, including antinuclear activists, consumer advocates, advocates of natural or organic foods, or radical environmentalists *(17)*. This opposition varies internationally; more than 90% of consumers reacted positively to the idea of irradiation in South Africa *(3)* and more than 90% would purchase irradiated onions in Argentina *(9)*. In the United States, opposition may be decreasing because of increased concerns about food pathogens. In 1990, 71% of those surveyed listed irradiated foods as either a serious or moderate hazard *(19)*. In 1997, however, consumers in an experimental auction were willing to pay 71 cents for the right to exchange a meat sandwich purchased from a fast-food restaurant for a similar but irradiated one *(11)*. Whether this indicates an increased

TABLE 2. Demographic distribution of respondents

Category or Group	City surveyed: Bryan - College Station	El Paso	Houston	n[1]	Chi-square[2]	*P*-value
		n respondents (% respondents from each city in each group)				
Age					73.95	0.001
18 or younger	7 (7.0)	1 (1.0)	6 (6.1)	14		
19 to 25	21 (21.0)	3 (3.1)	6 (6.1)	30		
26 to 35	36 (36.0)	31 (31.6)	22 (22.2)	89		
36 to 45	11 (11.0)	8 (8.2)	31 (31.3)	50		
46 to 55	16 (16.0)	15 (15.3)	21 (21.2)	52		
56 or older	9 (9.0)	40 (40.8)	13 (13.1)	62		
Total in each city	100	98	99			
Educational level (degree attained)					75.47	0.001
None	5 (5.0)	37 (37.3)	8 (8.2)	50		
High school, GED	37 (37.0)	39 (39.4)	25 (25.5)	101		
Associates, technical	15 (15.0)	13 (13.1)	28 (28.6)	56		
Bachelors	25 (25.0)	6 (6.1)	28 (28.6)	59		
Masters	10 (10.0)	2 (2.0)	8 (8.2)	20		
Professional, Ph.D.	8 (8.0)	2 (2.0)	1 (1.0)	11		
Total in each city	100	99	98			
Ethnicity					127.74	0.001
Caucasian	84 (84.0)	22 (23.7)	87 (96.7)	193		
Hispanic	7 (7.0)	63 (67.7)	7 (7.8)	77		
Other[3]	9 (9.0)	8 (8.6)	4 (4.4)	21		
Total in each city[4]	100	93	90			
Gender					0.04	NS[5]
Female	59 (59.0)	58 (58.6)	57 (57.6)	174		
Male	41 (41.0)	41 (41.4)	42 (42.4)	124		
Total in each city	100	99	99			

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Other minorities include African-American, Asian, Middle Eastern and Native Americans.

[4]City totals may vary due to incomplete demographic information filed by some respondents.

[5]NS = Not significant ($P > 0.05$).

TABLE 3. Association between demographic groups across three Texas cities

Category or Group	Age group (% of each line) ≤18	19-25	26-35	36-45	46-55	≥56	n[1]	Chi-square[2]	P-value
Ethnicity								12.00	0.05
Caucasian	5.7	12.4	25.4	20.2	18.1	18.1	193		
Minorities[3]	3.1	6.2	36.1	10.3	17.5	26.8	97		
Gender								12.35	0.05
Female	6.3	9.2	30.5	21.3	13.2	19.5	174		
Male	2.4	11.4	29.3	10.6	23.6	22.8	123		

	Education (degree achieved, % of each line)[4] None	HS, GED	A,T	BS	Graduate degree		n	Chi-square	P-value
Age								35.30	0.005
≤25	27.3	36.4	13.6	20.5	2.3		44		
26 to 35	14.8	37.5	15.9	13.6	18.2		88		
36 to 45	2.0	32.0	24.0	28.0	14.0		50		
46 to 55	17.3	21.2	26.9	28.9	5.8		52		
≥56	22.6	40.3	16.1	14.5	6.5		62		
Ethnicity					MS	P, Ph.D.		60.42	0.001
Caucasian	6.5	31.8	20.3	27.1	8.9	5.7	192		
Minorities	37.8	35.7	16.3	7.1	3.1	0.0	98		
Gender								14.19	0.025
Female	18.5	35.8	22.5	17.3	4.1	1.7	173		
Male	14.5	31.5	13.7	23.4	10.5	6.5	124		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Minorities include African-Americans, Asians, Hispanics, Middle Easterners and Native Americans.

[4]Degree abbreviations: HS, GED: high school or equivalency; A,T: associates or technical degree; BS, bachelors degree; MS, masters degree; P, professional degree.

confidence in irradiation or an increased demand for food safety is not known; 84% of participants in a survey conducted by Hashim et al. *(13)* would prefer that all chicken served in restaurants be irradiated, but 58% would also buy irradiated poultry consistently at retail. Similarly, subjects in an experimental auction conducted by Hayes et al. *(14)* were willing to pay more to eliminate the risk of foodborne disease.

Poultry production and consumption are of primary economic importance in Texas, which produced approximately 5.5% of U.S. broilers in 1997 and is ranked fifth in lbs. of chicken produced *(23)*. As per capita consumption of poultry has steadily increased *(21, 22)*, the demand for pathogen reduction in the poultry industry continues to be a major concern. Before Texan producers commit to the capital costs of irradiation, though, an accurate estimation of the acceptance of irradiation in demographically representative markets must be obtained. The purpose of this study was to determine if consumers in three Texas cit-

TABLE 4. Perception of meat safety by various groups

Category or Ground	Meat with the most harmful bacteria: Beef	Poultry	Pork	All same	n[1]	Chi-square[2]	*P*-value
	—— % respondents in each line ——						
City						30.53	0.001
Bryan-College Station	4.0	43.4	25.3	27.3	99		
El Paso	8.1	21.2	48.5	22.2	99		
Houston	8.2	42.9	16.3	32.7	98		
Education (degree achieved)						34.27	0.005
None	12.2	16.3	46.9	24.5	49		
High school, GED	9.0	32.0	38.0	21.0	100		
Associates, technical	3.6	41.1	28.6	26.8	56		
Bachelors	3.4	45.8	13.6	37.3	59		
Graduate	3.2	51.6	12.9	32.3	31		
Ethnicity						37.45	0.001
Caucasian	4.7	44.5	20.9	29.8	191		
Hispanic	9.1	14.3	51.9	24.7	77		
Other[3]	14.3	33.3	38.1	14.3	21		
Survey language						13.91	0.005
English	7.1	38.7	27.5	26.8	269		
Spanish	3.7	7.4	55.6	33.3	27		

	Safest form of poultry: All same	Cut-up parts	Ground meat	Whole carcasses	n	Chi-square	*P*-value
Age						21.19	0.05
25 or younger	32.6	27.9	14.0	25.6	43		
26 to 35	45.5	13.6	9.1	31.8	88		
36 to 45	51.0	12.2	2.0	34.7	49		
46 to 55	34.0	20.0	4.0	42.0	50		
56 or older	42.6	27.9	1.6	27.9	61		
Survey language (3 cities combined)						10.00	0.025
English	42.5	21.1	6.8	29.7	266		
Spanish	34.6	7.7	0.0	57.7	27		
Survey language, El Paso		Parts or ground				11.96	0.005
English	22.5	29.6		47.9	71		
Spanish	57.7	7.7		34.6	26		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Other minorities include African-American, Asian, Middle Eastern and Native Americans.

TABLE 5. Perception of poultry and processed poultry safety issues by various groups

Category or Group	General consumer perception of poultry: Safe	Unsafe	n[1]	Chi-square[2]	*P*-value
	—— % respondents in each line ——				
City				18.14	0.001
Bryan-College Station	91.9	8.1	99		
El Paso	68.0	32.0	97		
Houston	82.1	17.9	95		
Ethnic group				6.80	0.05
Caucasian	85.7	14.3	189		
Hispanic	72.0	28.0	75		
Other[3]	80.0	20.0	20		
Survey language				9.77	0.005
English	83.0	17.0	265		
Spanish	57.7	42.3	26		

	Most important food safety issue facing poultry consumers: Chemical residues	Microbiological or bacterial	Additives, Preservatives	n	Chi-square	*P*-value
	—— % respondents in each line ——					
Education (degree achieved)					16.99	0.05
None	14.9	57.4	27.7	47		
High school, GED	6.5	62.4	31.2	93		
Associates, technical	11.3	73.6	15.1	53		
Bachelors	13.8	65.5	20.7	58		
Graduate	3.2	90.3	6.5	31		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Other minorities include African-Americans, Asians, Middle Easterners and Native Americans.

ies were willing to buy irradiated poultry at retail supermarkets and whether their willingness could be related to general concerns for food safety.

MATERIALS AND METHODS

Survey procedures

A survey questionnaire (reproduced in Table 1) was developed and circulated at each of two supermarkets in the Bryan/College Station (B-CS) area, at two in both Houston, and at two in El Paso. In the winter of 1993 and spring of 1994, a table was set up at each store, complete with surveys, pencils, souvenir cups and informative pamphlets, and staffed by two or three workers. The surveys were distributed to consumers willing to volunteer responses to the survey questionnaire on Friday afternoons and Saturday mornings in an attempt to survey across a wide variety of demographic groups. In an effort to get a wider range of responses, the workers offered to read the surveys to consumers and, in El Paso, written and oral surveys were offered in Spanish. Approximately fifty surveys (Table 2) were taken at each location. Answers to questions concerning food safety opinions (questions 1, 3, 4, 5, 9 and 10) were then compared across demographic groups, survey language, and city of residence and to the consumers' willingness to eat irradiated poultry (question 11). Questions surveying food preparation habits (questions 2, 6, 7 and 8) were reserved for future publication.

Statistical analysis

Data was sorted by the FREQ procedure of SAS (v.6.11, Cary, NC). Comparisons were made using the Chi-square test for independence.

TABLE 6. Food illness history of various groups

Category or Group	Have attributed illness to food	Have not attributed illness to food	n[1]	Chi-square[2]	*P*-value
	—— % respondents in each line ——				
City				8.62	0.025
Bryan-College Station	43.4	56.6	99		
El Paso	33.3	66.7	99		
Houston	54.1	45.9	98		
Education (degree achieved)				25.04	0.001
None	32.0	68.0	50		
High school, GED	29.0	71.0	100		
Associates, technical	58.9	41.1	56		
Bachelors	56.9	43.1	58		
Masters	50.0	50.0	20		
Professional or Ph.D.	72.7	27.3	11		

	Cause of foodborne illness							
	No illness	Allergic reaction	Bacteria	Spoiled food	Other	n	Chi-square	*P*-value
	——% respondents in each line ——							
City							16.01	0.05
Bryan-College Station	54.0	3.0	20.0	18.0	5.0	100		
El Paso	61.6	9.1	15.2	9.1	5.1	99		
Houston	45.5	2.0	24.2	21.2	7.1	99		
Ethnicity							10.39	0.05
Caucasian	50.8	2.6	20.7	20.2	5.7	193		
Minorities[3]	59.2	8.2	18.4	9.2	5.1	98		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Minorities include African-Americans, Asians, Hispanics, Middle Easterners and Native Americans.

The guidelines suggested by Cochran *(8)* were followed for the combining of demographic groups or survey answers; groups or responses were combined only if a cell from that group or response contained an expected value (E_{ij}) less than 1 or if more than 20% of all E_{ij}s in any Chi-square test were under 5. The responses were considered dependent on demographic group, language, or residence if results indicated statistically significant differences ($P < 0.05$).

RESULTS AND DISCUSSION

Texas is a diverse market, possessing different socioeconomic makeups. The three cities surveyed, B-CS, El Paso and Houston, differed significantly as to age, educational level, and ethnic makeups (Table 2, $P < 0.001$). The majority of B-CS respondents were under 35 years of age were Caucasian, and had either a high school diploma or bachelors' degree. Respondents from Houston were also mostly Caucasian, but were older (the majority of Houston residents surveyed were between the ages of 36 to 45) and had either an associates', technical or bachelors' degree. El Paso shoppers, however, were markedly different from those of B-CS and Houston; the majority were over 56, were Hispanic, and/or possessed at most a high school degree. Approximately 58% of respondents from each city were female, which agrees with the 1990 national census for Texas *(24)*.

TABLE 7. Acceptance of irradiated raw poultry by various groups

Category or Group	% would eat irradiated poultry	% would not eat irradiated poultry	% not familiar with irradiation	n[1]	Chi-square[2]	*P*-value
Age						
18 or younger	7.7	23.1	69.2	13	29.00	0.005
19 to 25	44.8	24.1	31.0	29		
26 to 35	32.1	36.9	31.0	84		
36 to 45	28.0	30.0	42.0	50		
46 to 55	35.3	47.1	17.6	51		
56 or older	40.3	46.8	12.9	62		
City					51.63	0.001
Bryan-College Station	45.9	26.5	27.6	98		
El Paso	21.3	64.9	13.8	94		
Houston	33.7	22.4	43.9	98		
Education (degree achieved)					38.34	0.001
None	14.6	56.3	29.2	48		
High school, GED	21.9	43.8	34.4	96		
Associates, technical	43.6	30.9	25.5	55		
Bachelors	42.4	27.1	30.5	59		
Masters	65.0	20.0	15.0	20		
Professional or Ph.D.	72.7	27.3	0.0	11		
Ethnicity					36.39	0.001
Caucasian	42.4	25.1	32.5	191		
Hispanic	22.2	58.3	19.4	72		
Other[3]	4.8	66.7	28.6	21		
Gender					6.71	0.05
Female	26.9	40.4	32.7	171		
Male	43.7	33.6	22.7	119		
Survey language					22.84	0.001
English	36.4	33.3	30.3	264		
Spanish	7.7	80.8	11.5	26		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Other minorities include African-Americans, Asians, Middle Easterners and Native Americans.

The differences in populations between cities affected the perception regarding the meat containing the most harmful bacteria ($P < 0.001$), along with educational level ($P < 0.005$), ethnicity ($P < 0.001$) and the preferred language of the respondents ($P < 0.005$, Table 4). Respondents from El Paso, those with a high school education, GED or no degree, Hispanics, other minorities, and those surveyed in Spanish all identified pork as the meat containing the most harmful bacteria. These groups are probably not exclusive, as 73% of minority respondents possessed either a high school education, GED or no educational degree (Table 3, $P < 0.001$). In contrast, poultry was identified as the meat containing the most harmful bacteria by a majority of Caucasian respondents, of B-CS or Houston respondents, of respondents with either a technical, associates, or college degree, and of those responding in English. This may indicate that the perception of poultry as dangerous may be greater in English-speaking communities or with higher education. When asked to identify the safest form of poultry, significant differences were noted between age groups and between

TABLE 8. Association between acceptance of irradiated poultry and other food safety concerns

Category or Group	% would eat irradiated poultry	% would not eat irradiated poultry	% not familiar with irradiation	n[1]	Chi-square[2]	P-value
Meat most likely to have harmful bacteria					17.73	0.01
Beef	22.2	44.4	33.3	18		
Poultry	37.1	34.3	28.6	105		
Pork	27.9	53.5	18.6	86		
All same	39.2	24.1	36.7	79		
Most important food safety issue facing poultry consumers					13.91	0.01
Chemical residues	42.3	23.1	34.6	26		
Microbiological, bacterial	38.3	35.1	26.6	188		
Additives, preservatives	15.9	52.4	31.7	63		
Overall safety of poultry					11.40	0.005
Safe	35.5	32.9	31.6	228		
Unsafe	25.0	57.1	17.9	56		
Acquisition of food safety information from family or friends[3]					9.42	0.025
Edu. by family	38.9	44.2	16.8	95		
Not edu. by family, friends	31.1	34.7	34.2	193		
Previous illness attributed to food?					7.57	0.025
Yes	43.0	31.3	25.8	128		
No	26.9	41.9	31.3	160		

[1]Total number of respondents from that line.

[2]Overall chi-square value determined by the Chi-square test for independence following the guidelines of Cochran *(8)*.

[3]Respondents may have received information from multiple sources and thus were allowed to choose multiple answers. "Edu." or "no edu." include all responses which include and exclude the listed source, respectively.

respondents who spoke different languages, though a majority of only those respondents between 46 and 55 years of age ($P < 0.05$) and those responding in English in El Paso ($P < 0.005$) preferred a specific form of poultry, whole carcasses.

A majority of all groups surveyed considered poultry as generally safe (Table 5), although city residence ($P < 0.001$), ethnicity ($P < 0.05$) and survey language ($P < 0.005$) all affected the number of respondents considering poultry as safe.

Respondents from B-CS or Houston, as well as Caucasian and English speaking respondents, all had a high trust in poultry safety, with between 82 and 92% of respondents declaring that poultry was generally safe. This agrees with the finding of Bruhn et al. *(5)*, who found that 84% of respondents (mostly Caucasian) were either very confident or somewhat confident in food safety. Hispanic respondents, El Paso residents, and those responding in Spanish were less confident of poultry products; between 57 and 72 percent classified poultry as generally safe.

When asked to identify the most important food safety issue facing poultry consumers, only education significantly affected the response (Table 5, $P < 0.05$). A majority of all educational levels identified microbiological or bacterial issues as of paramount importance, though a higher percentage (90 percent) of postgraduate degree holders than of any other level considered this of primary importance. This contrasts with the results of Senauer *(19)*, who reported that pesticides and herbicide residues were the most worrisome food safety concern. Perhaps the multistate outbreak of *E. coli* O157:H7 occurring in 1992-1993 *(6)*, along with increased media coverage of other food safety issues such as the potential link between beef and

Creutzfeldt-Jakob disease *(7)*, has shifted consumer opinions.

Respondents were also asked if they had ever attributed an illness to consumed food, regardless of whether medical attention was sought (Table 6). City residence ($P < 0.025$) and educational level ($P < 0.001$) affected the perception of foodborne illness.

Respondents from B-CS or Houston, as well as Caucasian was sought (Table 6). City residence ($P < 0.025$) and educational level ($P < 0.001$) affected the perception of foodborne illness. Most of the residents in B-CS and Houston were split almost equally between attributing illness to food or not, whereas a majority of El Paso residents had not attributed illness to food. When grouped by educational level, a majority of high school or uneducated respondents did not attribute illness to food, whereas a majority of Ph.D. or professional respondents did. This correlation may be due to an awareness of foodborne symptoms. Alterkruse et al. *(1)* reported that a greater percentage of survey respondents with greater than 12 years of education knew the food vehicle for *Salmonella* spp., as compared to respondents with 12 years education or less. Williamson et al. *(25)* cross-tabulated food safety knowledge with education and reported that the highest number of correct responses was attained by respondents seeking advanced degrees. Of those who did perceive illness as foodborne, both city residence and ethnicity affected the perceived cause ($P < 0.05$). A majority of respondents from all three cities and both ethnic groups (Caucasians and minorities) perceived either bacteria or spoiled food as the causative agent of their disease.

The acceptance of irradiated raw poultry was correlated to both demographic group (Table 6) and responses to other questions (Table 7). The acceptance of irradiated raw poultry was affected by age ($P < 0.005$), city residence, educational level, ethnicity, the language of the survey ($P < 0.001$), and gender ($P < 0.05$). A majority (69%) of respondents under age 18, and between 13 and 42% of adult respondents were not familiar with irradiation. The adult respondents who were familiar with irradiation were generally split between acceptance and refusal to eat irradiated poultry, with between 28 and 44% willing to eat irradiated poultry. A majority of respondents with a high school degree or less were unwilling to eat irradiated poultry, but acceptance of irradiated poultry generally increased with educational level. Bruhn and Schutz *(4)* reported that information about irradiation promoted a greater acceptance of irradiated foods; those with a college degree may have a greater exposure to information concerning irradiation. Minorities possessed the highest opposition to irradiation: 58% of Hispanics, 67% of other minorities, and 81% of Spanish-speaking respondents all would refuse to eat irradiated poultry, while a majority of Caucasian respondents (42%) would eat irradiated products. A slight gender difference was noted: A majority of females would refuse to eat irradiated poultry, while a majority of male respondents would accept it. This may be a cause for concern, as adult females are the major purchasers of chicken *(13)* and women do 77% of the cooking *(25)*.

Food safety perceptions were correlated with the acceptance of irradiated poultry, as illustrated in Table 8. Identification of the meat most likely to contain harmful bacteria ($P < 0.01$), the importance of selected food safety issues ($P < 0.01$), the overall perception of poultry safety ($P < 0.005$), acquisition of food safety information from friends ($P < 0.025$), and previous food illness ($P < 0.025$) have all affected the acceptance of irradiated poultry. Generally, respondents who believe that either beef or pork contain the most harmful bacteria are less likely to accept irradiated poultry; this trend may be similar to that seen in Dutch respondents who had difficulty accepting the need for irradiation in "safe" poultry meat *(3)*.

Respondents who either believed that poultry was most likely to contain pathogens or that microbiological issues were most important were generally split evenly between accepting irradiated poultry or not, with between 37 and 38% willing to eat irradiated products. A majority (42%) of respondents stating that the issue of chemical residues was the most important safety concern were willing to eat irradiated poultry. This agrees with a Gallup poll *(10)* which elicited the most positive support for the purchase of irradiated seafood by emphasizing irradiation as using "no chemicals or preservatives." Respondents opposed to additives or preservatives were most opposed to irradiated poultry; Pszcola *(17)* hypothesized that advocates of natural or organic foods may oppose food irradiation. Respondents who claimed to have experienced foodborne disease, however, were more willing to eat irradiated poultry. Whether this is an indication of a desire to avoid further occurrences of foodborne disease or a function of education is not known.

In summary, this survey has identified possible target groups where education may be most effective. Since almost 70% of Texan children under age 18 are unfamiliar with irradiation, it appears that education at the high school level may efficiently increase consumer confidence in irradiation as a disinfection option in Texas. Because Spanish surveys were offered only in El Paso, and because most minors are unfamiliar with irradiation, the groups most opposed to irradiation seem to be adult minorities, particularly Spanish-speaking El Paso residents, Hispanics, and those possessing at most a high school degree. Educational and extension efforts should therefore be increased to reach these target populations. More surveys need to be distributed, however, to determine the most effective methods and sources of food safety education.

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Moderate Heat or Chlorine Destroys *Aeromonas hydrophila* Biofilms on Stainless Steel

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SUMMARY

In previous studies we demonstrated that *Aeromonas hydrophila* was a predominant bacterium on catfish processing equipment and that it readily formed biofilms on stainless steel surfaces. The present study was designed to determine whether moderate heat or chlorine could control *A. hydrophila* biofilms. Results showed that inactivation of older *A. hydrophila* biofilms required more heat than inactivation of younger biofilms. Eight-hour biofilms were inactivated at 50°C within 1 min or by exposure to 25 ppm chlorine for 1 min. Eight-day biofilms were killed to below detection limits at 60°C within 1 min or by exposure to 75 ppm chlorine for 1 min. *Aeromonas hydrophila* was susceptible to sanitation treatments using moderate heat (60°C) or chlorine (50-75 ppm). Such treatments will reduce *A. hydrophila* colonization of stainless steel surfaces, thus reducing potential risks of foodborne disease and food spoilage caused by this organism.

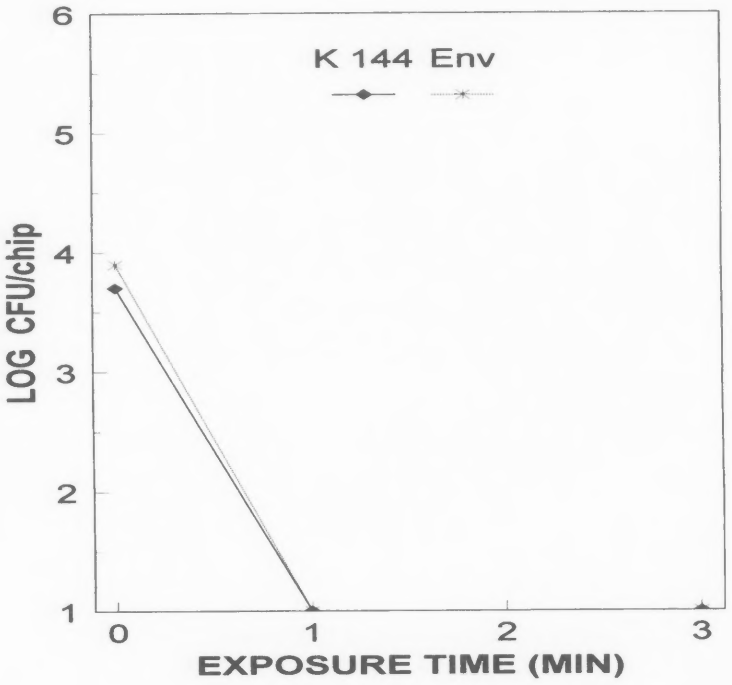
INTRODUCTION

Attachment of microorganisms and subsequent development of biofilms in food processing environments is a potential source of contamination that may lead to food spoilage or transmission of disease-causing agents *(6, 9, 29, 31)*. To reduce or eliminate microorganisms on food contact surfaces, food processors rely on physical and chemical control measures. Physical methods include heat treatment, hand washing, or high pressure sprays, while chemical sanitizing treatments include hypochlorites, iodophors, amphoterics, biguanides, aldehydes, peracetic acid, or quaternary ammonium compounds. Both methods remove and inactivate microorganisms on the surfaces of equipment that may come in contact with raw and processed food *(9, 14, 31)*.

Biofilm formation and destruction with the use of sanitizers or detergents have been studied on several types of materials that include glass, rubber, polypropylene, stainless steel *(12, 13, 19, 27, 30)*, and different plastics *(11)*. Such studies have led to a better understanding of (1) differences between planktonic and sessile bacterial cells *(23)*, (2) sanitizer efficacy against attached bacteria in biofilms *(13, 21, 30)*, (3) factors influencing attachment of bacterial cells to different surfaces *(10, 12, 25)*, (4) differences between organisms *(28)*, and (5) effects of nutrient and environmental conditions on biofilm formation *(16)*.

Many biocidal chemicals are available to inactivate microorganisms; however, no products are available that prevent attachment and primary film formation *(8)*. Even adequate sanitation does not ensure that all bacteria are killed; sanitation

Figure 1. Inactivation of 8-h *A. hydrophila* (strains K144 and Env) biofilms during exposure to 50°C



is not synonymous with sterility *(5)*. To control biofilm accumulation, cleaning with a chlorinated alkaline detergent followed by treatment with a chlorine sanitizer may be used; however, federal regulations limit the use of this type of sanitizer because of potential toxicity and environmental impact *(4)*. In water, molecular chlorine (Cl_2) rapidly hydrolyzes to form hydrochloric acid (HCl) and hypochlorous acid (HOCl). Chlorine present in water as HOCl or OCl^- is defined as "free available chlorine" *(24)*. For fresh hypochlorite solutions, the available chlorine content can be as high as 15% by weight, but during storage (3 or 4 months) solutions can lose as much as 50% of their initial strength *(24)*.

In previous studies we demonstrated that *Aeromonas* spp. predominated in surface biofilms in catfish processing plants *(7)* and that *Aeromonas hydrophila* attached rapidly and irreversibly to stainless steel *(2)*. The goal of the present study was to evaluate the effects of moderate heat or chlorine on the survival of *A. hydrophila* biofilms on stainless steel.

MATERIALS AND METHODS

Stainless steel chips

Stainless steel chips (1 × 1 cm squares) were ultrasonically cleaned in 2% enzymatic detergent solution (Terg-A-Zime, Alconox, Inc., New York, NY) for 15 min. They were dried and sterilized at 121°C for 15 min before use *(2)*.

Culture preparation

Two strains of *A. hydrophila* were used in this study: a clinical strain (K 144) obtained from Dr. Samuel A. Palumbo (Eastern Regional Research Center, U.S. Department of Agriculture, Philadelphia, PA) and a catfish plant environmental strain (Env) isolated by us in a previous study *(8)*. Working cultures were obtained by diluting overnight cultures 1:10,000 in Trypticase Soy Broth (TSB), from which 1 ml was transferred to 9 ml TSB to obtain approximately 10^4 CFU/ml.

Preparation of biofilms

Stainless steel chip, biofilm, and media preparations were as described earlier *(2)*. Different biofilm ages were obtained by incubating stainless steel chips for 8 h, 72 h, and 8 d at 28°C as previously described *(2)*.

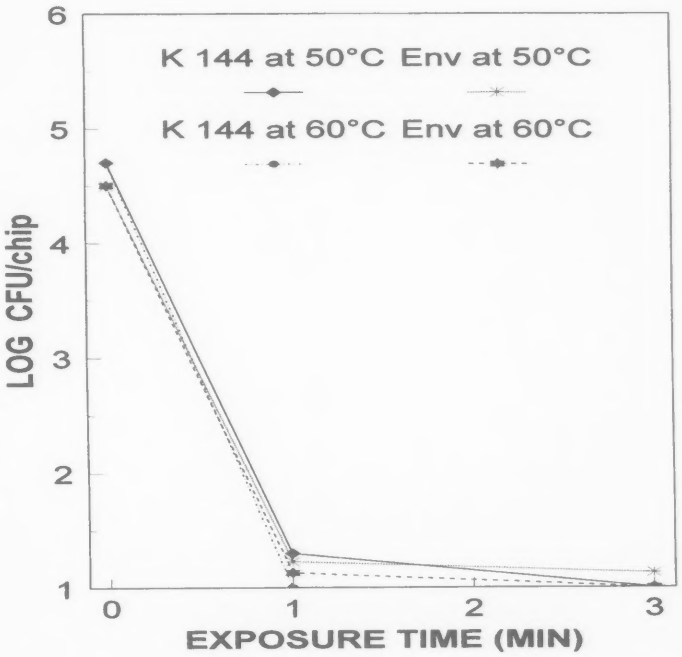
Exposure to heat

Prepared biofilms on chips were submerged in sterile test tubes containing 10 ml 0.1 M phosphate buffered saline (PBS) and 0.5 g microscopic glass beads (0.1 mm; Biospec Products, Inc., Bartlesville, OK) tempered in a water bath set at 50 or 60°C. Following exposure to heat for 1 or 3 min, tubes were immediately placed on ice. Survivors were removed from chips and counted using a method described previously *(2, 23)*. Unheated chips containing biofilms served as controls. The limit of detection with this approach was 10 CFU/chip.

Exposure to sanitizer

Food grade sodium hypochlorite (NaOCl) (Chemland Inc., Turlock, CA) was dissolved in phosphate buffer (pH 7.0) to produce solutions with 0, 25, 50, and 75 ppm free available chlorine. Solutions were prepared fresh before use. Available chlorine was measured using an iodometric method *(3)*. Prepared biofilms were exposed without stirring to 10-ml volumes of sodium hypochlorite solutions containing the study concentration of free chlorine, with one chip per tube. Exposure time was 1 min at 25°C. After exposure, chips were aseptically removed with forceps, dipped in 10 ml 0.1% Tween 80 (Sigma Chemical Co., St. Louis, MO) for 1 min, and then placed individually in 10 ml sterile PBS with 0.5 g microscopic glass beads. These two steps reduced chlorine concentration by diluting the carried-over chlorine solution (9.57 ± 1.56 µl per chip) 1:1,000,000. Accordingly, the highest chlorine concentration tested

Figure 2. Inactivation of 72-h *A. hydrophila* (strains K144 and Env) biofilms during exposure to 50 and 60°C



was reduced from 75 ppm to 0.000075 ppm. Viable cell count was determined by the method described previously *(2, 23)*.

Statistical analysis

Bacterial count reductions, by heat and by chlorine, were determined by use of split plot and complete randomized block designs with factorial arrangement of treatments, respectively. Analysis of variance (ANOVA) was performed on mean $\log_{10}$ CFU/chip microbial population data at a confidence level of $P < 0.05$ using the Statistical Analysis System (SAS Institute, Inc., Cary, NC). Mean values of three replicate experiments, with duplicate samples per analysis time, were separated using the least significant difference procedure.

RESULTS AND DISCUSSION

Heat treatment

Exposing 8-h biofilms to 50°C for 1 min reduced counts to below the limit of detection (Fig. 1). Identical results were seen with treatment at 60°C for 1 min (data not shown). For strain K144, 72-h biofilms were eliminated by heating at 50°C for 3 min; however, a mean residual population of approximately 10 CFU/chip of strain Env survived this treatment (Fig. 2). Count reductions to below the limit of detection for 72-h biofilms required exposure at 60°C for 1 and 3 min for strains K144 and Env, respectively (Fig. 2). Heating was significantly ($P < 0.05$) more lethal at 60°C than at 50°C. Exposure time effect (1 and 3 min) did not differ ($P > 0.05$) for 72-h biofilm cells heated either at 50 or 60°C. Likewise, there was no significant difference ($P > 0.05$) between strains in heat sensitivity. Eight-day biofilm counts were reduced by approximately 2 $\log_{10}$ CFU/chip by heating at 50°C for 1 min or by 3 to 4 $\log_{10}$ CFU/chip by heating at 50°C for 3 min (Fig. 3). Eight-day biofilm counts were below the limit of detection when treated at 60°C for 1 min (Fig. 3). Heating eight-day biofilms for 1 and 3 min at 60°C did not affect ($P > 0.05$) count reductions. Strain K 144 8-day biofilm was more resistant ($P < 0.05$) to 50°C than 8-day Env biofilm.

Attempts to recover injured cells by supplementing culture media with 1% sodium pyruvate, 0.1% lactose, and 0.3% yeast extract did not change the numbers of cells surviving a particular heat treatment (results not shown). This finding suggested that heat treatments were lethal to attached *A. hydrophila*. It should be noted that results showed generally increasing heat resistance of *A. hydrophila* as biofilm age increased, which agrees with earlier work involving other bacteria *(18, 23)*. In the present study, the observed increase in resistance with age may be attributed to either an increase in the number of biofilm cells during chip incubation (Fig. 4) or the development of extracellular material in 8-day biofilms (Fig. 5A and 5B). To address these possibilities properly, equal numbers of biofilm cells of different ages would need to be tested with the same treatments. In general, *A. hydrophila* was more susceptible to heat treatment than *Listeria monocytogenes*, which remained viable on stainless steel after treatment at 65°C for 3 min, but was inactivated by being heated at 72°C for 1 min *(18)*.

Chlorine treatment

Exposing *A. hydrophila* 8-h biofilms to 25 ppm free available chlorine for 1 min inactivated adherent cells (Fig. 6). For 72-h biofilms, cell counts were decreased approximately 2 $\log_{10}$ CFU/chip by exposure to 25 ppm chlorine for 1 min. Cell counts for these biofilms were reduced to below detectable limits with exposure to 75 ppm chlorine for 1 min. Eight-day biofilm cell counts were reduced by approximately 2 and 3 $\log_{10}$ CFU/chip by exposure for 1 min to 25 and 50 ppm chlorine, respectively. Cell counts were reduced to below the limit of detection when 8-day biofilm cells were

Figure 3. Inactivation of 8-day *A. hydraphila* (strains K144 and Env) biafilms during exposure to 50 and 60°C

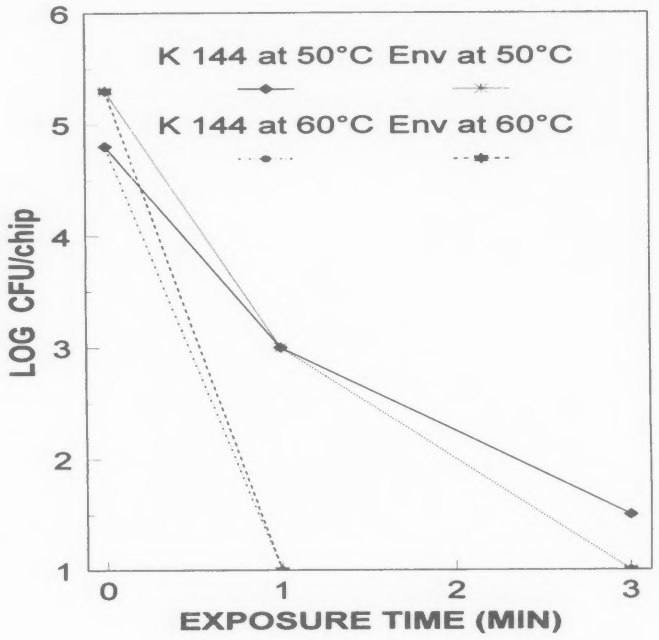
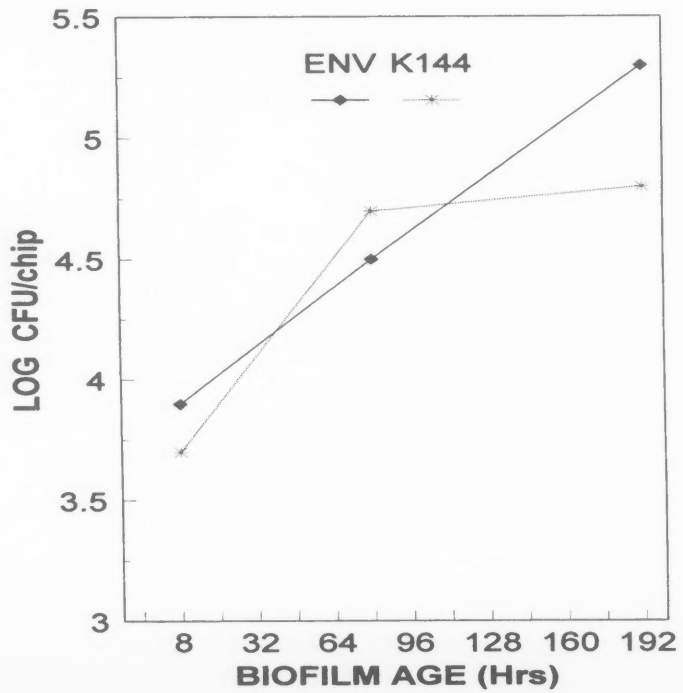


Figure 4. Increase in *A. hydrophila* counts an stainless steel chips during incubation at 28°C in trypticase say broth



exposed to 75 ppm chlorine for 1 min. Increasing chlorine concentration, from 25 to 75 ppm, increased ($P < 0.05$) the number of cells inactivated. There were no observed strain differences ($P > 0.05$) in sensitivity to chlorine. Older *A. hydrophila* (72 h and 8 days) biofilms were more sensitive to chlorine than younger (1-h) *Listeria monocytogenes* biofilms *(17, 26),* which were reduced by only 1 $\log_{10}$ as the result of exposure to 100 ppm chlorine for 1 min *(22).*

CONCLUSION

A. hydrophila biofilms were reduced to below detection limits at 60°C within 1 min or by exposure to 75 ppm chlorine for 1 min. Older *A. hydrophila* biofilms were more resistant than younger biofilms to the control treatments. Wide prevalence of *A. hydrophila* in water and aquaculture products raises concerns as to the possible role of *A. hydrophila* biofilms in food spoilage and human disease transmission *(1, 15).* However, commonly used disinfection procedures (moderate heat and chlorination) *(20)* appear useful in controlling *A. hydrophila* biofilms.

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Figure 5. *A. hydraphila* strain Env attached ta stainless steel chips after (A) 72 h incubatian and (B) 8 days af incubatian in trypticase say brath at 28°C. Nate extracellular material in (B)

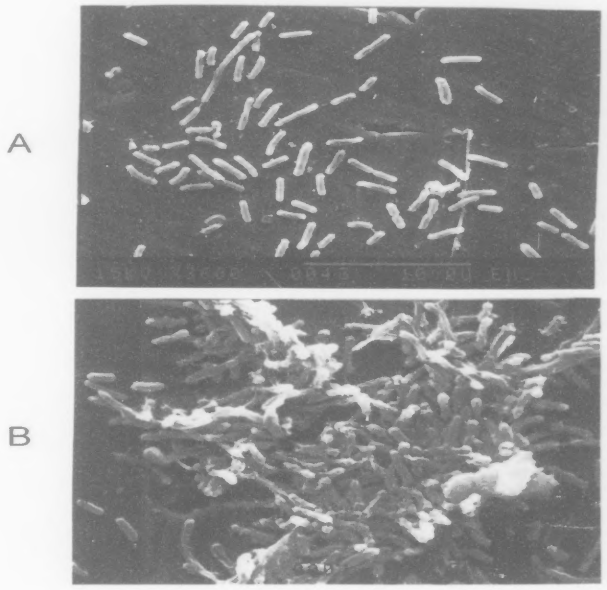
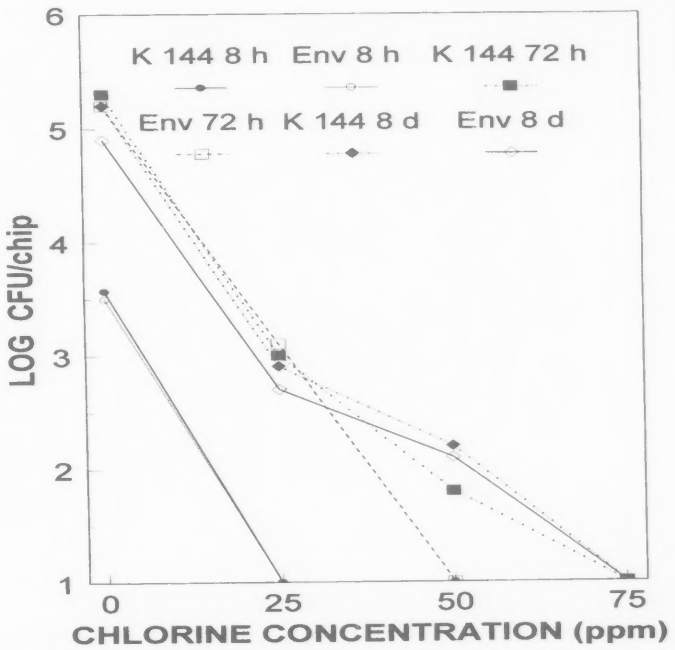


Figure 6. Inactivatian af *A. hydrophila* (strains K144 and Env) 8 h, 72 h, ar 8 day biafilms after chlarine expasure far 1 min



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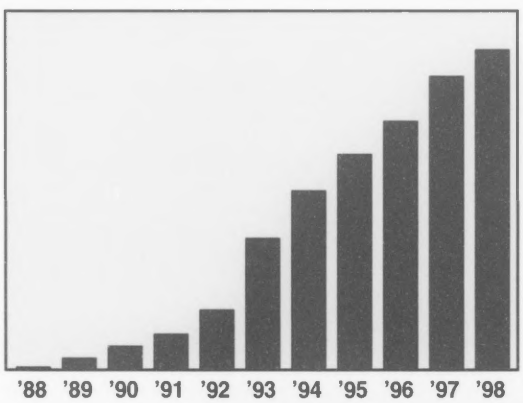

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Northeast Michigan Surveillance Activities for Bovine Tuberculosis in the Livestock and Free-Ranging Deer Populations

Update: September 15, 1998

INTRODUCTION

The eradication of Bovine tuberculosis (TB) in the United States met a significant challenge when, following a hunter-killed deer discovered to have TB in 1994, TB was confirmed in free-ranging (wild) deer in the northeast Lower Peninsula of Michigan in 1995. Following this discovery, the United States Department of Agriculture (USDA) conducted an in-depth risk assessment on the situation which has provided a basis for many of the ciritical steps implemented so far. Since then, numerous actions have been taken to assess the risk, ascertain the extent of the spread of TB, confine the disease to assure no further spread, and develop an eradication strategy. Infected wild deer have been found in five counties (Alpena, Alcona, Montmorency, Oscoda, and Presque Isle). An on-going survey of other wildlife has not found TB in wild elk, badger, red fox, gray fox, opossum, or bobcats thus far. Five coyotes and 2 raccoons have been found infected. Due to the potential for exposure to TB, testing of all cattle and goats over 6 months of age in the five counties was begun. At this time, Bovine TB has been confirmed in 1 beef cow from a herd in Alpena county and the entire herd was depopulated.

Although great progress has been made in the eradication of TB from the United States, the discovery of a wildlife reservoir poses a unique and difficult impediment to this effort. Scientists, biologists, epidemiologists, and veterinarians who have studied this situation have concluded that the most logical theory is that the supplemental feeding of wild deer serves to congregate deer, therefore contributing to the spread of TB. Supplement feeding has been banned and baiting (the practice of hunting deer over feed) has been limited with the intention of reducing the spread of TB between deer and eventually eliminating this disease from the wildlife, therefore completing the eradication. In addition, the deerhunting season has been extended in this area to help decrease the deer population.

BACKGROUND INFORMATION

Tuberculosis is a serious disease caused by several bacteria of the *Mycobacterium (M.)* family that mainly affects the respiratory system. Three main types of TB and their causative agents are: human (*M. tuberculosis*), avian (*M. avium*), and bovine (*M. bovis*). Human TB is the most host specific of the three types, rarely being transmitted to non-human species. Avian TB is typically restricted to birds; however, pigs and a few other animals are susceptible. Bovine TB or cattle TB is the most infectious TB, infecting most warm-blooded animals, including humans. It is this type, Bovine TB, which has infected the deer and other wildlife in the five-county area of the northeastern Lower Peninsula of Michigan.

Although Bovine TB was once relatively common in cattle in the U.S., it has historically been a very rare disease in wild deer. Prior to 1994, only 8 wild white-tailed or mule deer had been reported with Bovine TB in North America. In 1994, a hunter in southwestern Alpena county shot a four-year-old male deer that was infected with Bovine TB. The only other time Bovine TB was found in a wild deer in Michigan was in 1975, in a hunter-killed nine-year-old female deer in Alcona county.

Bovine TB is a disease spread primarily by close contact with infected animals (airborne exposure from coughing and sneezing) and exacerbated by crowding and stress.

Bovine TB is a slow debilitating type of disease that has a long incubation period. Animals that become infected may live and potentially spread the disease for years. While there have been numerous reports of Bovine TB in domestic livestock and captive cervid herds in the U.S., the disease has never before been determined to be self-sustaining in free-ranging wildlife in North America. The best science indicates that the maintenance of Bovine TB in Michigan white-tailed deer is directly related to supplemental feeding and the increased focal densities this practice creates.

Supplemental winter feeding of deer has become common in northern Michigan. Even non-hunters may engage in supplemental feeding for pleasure of wildlife viewing and the psychological satisfaction received from the perception that wildlife have benefited from this practice. Supplemental feeding consists of placing a variety of foodstuffs including carrots, sugar beets, corn, and hay in large piles and allowing wildlife free access to these products during winter (approximately four or five months). This practice brings together a large number of deer for a prolonged period of time, in contrast to the normal grazing practices of deer where they remain spread out over greater distances. Under the unnatural circumstances of supplemental feeding, inhalation of the Bovine TB bacteria or consumption of feed contaminated with Bovine TB bacteria by coughing and exhalation is much more likely to occur than in a free-ranging (wild) cervid (deer or elk) population.

Deer densities in the northeastern Lower Peninsula of Michigan have been maintained above the natural carrying capacity for many years. Focal concentrations of deer at feeding sites can result in even higher densities, resulting in several hundred deer being observed at some feeding sites. While overall densities are moderately high in Michigan, it is the concentration of deer caused by supplemental feeding which is thought to play a major role in the transmission of Bovine TB between animals.

Human health concerns & food safety

Consumers continue to have no reason to worry about the safety of their milk and meat supply. Since 1965, all Grade A milk in Michigan has been required to be pasteurized assuring the safety of Michigan's milk supply. All beef sold for public consumption is required to be inspected as part of USDA's Food Safety Inspection Service's meat inspection program.

Because Bovine TB is generally spread by aerosol transmission, it is highly unlikely that a person would contract the disease from field dressing or eating the meat of an infected animal. There is no specific test that can be easily done to check for Bovine TB in meat. Proper cooking and food safety practices should be followed not only when cooking venison, but when cooking any meat or poultry. Thoroughly cooking venison, as well as any other meat is important to reduce the likelihood of any bacterial disease. All meat, including venison, should be cooked until the meat is no longer pink and the juices run clear. If thoroughly cooked, the likelihood of any disease transmission to individuals consuming this meat is extremely small.

It is important to remember that usually the TB lesions are on the parts of deer that are generally not consumed. These include the inner organs, as opposed to the muscle tissue (meat), making disease transmission to humans from consumption even less likely.

When people field dress deer, it is recommended that it be done in a well-ventilated area, ideally oudoors. Adequate ventilation greatly reduces the possibility of inhaling any bacteria found in lesions inside the deer. If the lungs, ribcage, or internal organs from an animal look abnormal, the meat should not be eaten and the Michigan Department of Natural Resources (MDNR) should be contacted.

People can be skin tested to determine if they are infected with TB. These tests can be done at either the local health department or a private physician's office. A positive skin test, however, does not identify the type or source of the infection. Remember that most people get the infection from other people.

ELIMINATION STRATEGY OF BOVINE TB IN NORTHEASTERN MICHIGAN

The presence of Bovine TB in northeastern Michigan presents a unique and serious problem that poses a risk to humans, domestic livestock, deer, and other wildlife. To address this unique situation, the Michigan Department of Agriculture (MDA), Michigan Department of Natural Resources (MDNR), Michigan Department of Community Health (MDCH), United States Department of Agriculture (USDA), and Michigan State University (MSU) formed a Statewide Bovine TB Committee composed of individuals with diverse expertise and jurisdiction. On this committee were representatives from the agricultural community, hunting groups, wildlife experts, veterinarians, and medical and public health officials. This Committee developed recommendations, to be submitted to the directors of the State agencies, for a management strategy to eliminate the presence of Bovine TB from the infected area of northeastern Michigan. These recommendations were then taken by Dr. R. Ben Peyton, (Department of Fisheries and Wildlife, MSU), to various meetings throughout the state to evaluate public acceptance of the recommendations, then these evaluations were reported to the Directors. The final recommendations include wildlife and livestock management activities, surveillance, public communication efforts and the support and application of scientific research.

On January 29, 1998, Governor John Engler called for a strategy to eradicate Bovine TIB in Michigan wild deer in an Executive Directive to the Directors of MDCH, MDA, and MDNR.

Governor Engler identified actions that must be included in the eradication strategy:

- Development of wild deer herd harvest quotas consistent with the eradication of Bovine TB.

- Development and implementation methods for farmers to eliminate contact between wild deer and livestock.
- Continued comprehensive surveillance of livestock and deer to determine the actual prevalence of the disease and accurately evaluate trends.
- Dissemination of information to hunters, farmers, and the public regarding the need to manage wild deer in the five-county area to eradicate Bovine TB.
- Identification of a Bovine Tuberculosis Eradication Coordinator position within MDCH to work cooperatively with all concerned agencies in overseeing the eradication management strategies.

On February 3, 1998, Governor John Engler appointed Bob Bender, a former State Representative, to this Bovine Tuberculosis Eradication Coordinator position. Mr. Bender has and will continue to work cooperatively with the Departments involved and attend public meetings throughout the state.

SUMMARY OF RESEARCH TO BE CONDUCTED ON *MYCOBACTERIUM BOVIS* INFECTION IN WHITE-TAILED DEER AND RACCOONS AT THE USDA, ARS, NATIONAL ANIMAL DISEASE CENTER

Since 1995, *Mycobacterium bovis* has been isolated from 150 wild white-tailed deer, 5 coyotes, and 2 raccoons originating from a five-county region of northeast Michigan. The presence of *M. bovis* infection in this population of deer is the first wildlife reservoir of TB to be recognized in the United States. Other countries, such as New Zealand and Great Britain, with wildlife reservoirs of TB have not been able to eradicate the disease from domestic livestock. In June 1998, *M. bovis* was isolated from a cow that was from a herd located within the five-county region. Results of DNA fingerprinting indicate that the cow was infected with the same strain of *M. bovis* that is present in the wildlife.

Very little is known about the pathogenesis and transmission of TB in white-tailed deer. In research conducted at NADC, we determined that white-tailed deer can be experimentally infected with *M. bovis* by instillation of the organisms into the crypts of the palatine tonsils. The lesions produced in experimentally infected deer were similar in character and distribution to those observed in naturally infected deer. We also determined that *M. bovis* can be shed in nasal and oral secretions of infected deer, which suggests that these secretions may be involved in the transmission of disease. In addition, we plan to determine the distribution and character of lesions in raccoons experimentally infected with *M. bovis*.

Objectives and approaches:

1. Pathogenesis of *M. bovis* infection in white-tailed deer.

   White-tailed deer will be experimentally challenged by instillation of *M. bovis* into the crypt of the palatine tonsil. Immune responses of the deer will be monitored by skin tests, lymphocyte blastogenesis assay, interferon gamma assay, and an enzyme linked immunosorbent assay. Shedding of *M. bovis* by infected deer will be monitored by bacteriologic culturing of swab samples collected from the tonsilar crypt, nose, and mouth. Deer will be euthanized at various time points up to one year after inoculation. The distribution and characteristics of lesions at each time point will be determined by macroscopic and histopathologic examination.

2. Transmission of *M. bovis* from experimentally infected white-tailed deer to sentinel white-tailed deer.

   White-tailed deer will be divided into two groups. One group will be experimentally challenged with *M. bovis*. Experimentally infected deer will be housed with deer that have not been challenged. Immune responses of experimentally infected deer and sentinel deer will be monitored using various assays. Shedding of *M. bovis* will be monitored by bacteriologic culturing of various swab samples. Sentinel deer that develop immune responses against *M. bovis* will be euthanized and examined for evidence of TB. The distribution and character of lesions will be determined.

3. Transmission of *M. bovis* in naturally infected white-tailed deer.

   We plan to continue our research on transmission of *M. bovis* in naturally infected white-tailed deer when depopulation of the captive white-tailed deer herd in Presque Isle county is resumed. We will collect swab samples from the tonsilar crypts, nose, and mouth of deer that are removed. We will examine lymph nodes of the head and thoracic cavity for evidence of TB. If lesions are present, approximately 20 lymph nodes and other tissue samples will be collected and examined for TB. We also plan to examine the possible transmission of *M. bovis* from does to fawns by collecting samples from the uterus, mammary gland and milk. Fawns that are removed as part of the depopulation will also be examined.

4. Transmission of *M. bovis* from white-tailed deer to cattle.

   We will determine the amount of contact needed between white-tailed deer and cattle in order for *M. bovis* to be transmitted between the two species. One group of cattle will be given feed that contains a known quantity of *M. bovis*. A second group of cattle will be given feed that is shared with a group of experimentally infected white-tailed deer. A third group of cattle will be housed with experimentally infected white-tailed deer and will share feed, water, and bedding. Immune responses of the cattle and deer will be monitored by the assays mentioned in objective 1. Shedding of *M. bovis* from various secretions will also be monitored.

5. *Mycobacterium bovis* infection in raccoons.

   Raccoons will be experimentally challenged with *M. bovis* by mixing a suspension of organisms into food. Three different doses of *M. bovis* will be used to determine the number of organisms needed to infect raccoons by the oral route. At the end of the study period, raccoons will be euthanized and the distribution and character of lesions will be determined.

Contributors to the Bovine TB Report: Dr. Colleen Bruning-Fann (USDA), Dr. Michael Chaddock (MDA), Thomas Cooley (MDNR), Jean Fierke (MDNR), Paul Friedrich (MDNR), Jeanne Lipe (MDA), Dr. Steven Schmitt (MDNR), Dr. Mike Vanderklok (MDA), and Dr. Nathan Zauel (MDA).

Editors of the Bovine Report: Dr. Debbi Donch (MDA), Dr. Nancy Frank (MDA), Geralyn Lasher (MDCH), and Peggy Snyder (MDA).

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- Choosing Appropriate Statistical Distribution
- Simulation Parameters
- Using Risk Assessments
- Interpreting Risk Assessments
- Reporting Results to Risk Managers and the Public

For more information contact:

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Dairy, Food and Environmental Sanitation IAMFES Instructions for Authors

NATURE OF THE MAGAZINE

Dairy, Food and Environmental Sanitation (*DFES*) is a monthly publication of the International Association of Milk, Food and Environmental Sanitarians, Inc. (IAMFES). It is targeted for persons working in industry, regulatory agencies or teaching in milk, food and environmental protection.

The major emphases include:

- practical articles in milk, food and environmental protection;
- new product information;
- news from activities and individuals in the field;
- news of IAMFES affiliate groups and their members;
- 3-A Dairy and Egg Sanitary Standards, amendments and lists of symbol holders;
- excerpts of articles and information from other publications of interest to the readership.

Anyone with questions about the suitability of material for publication should contact the editor.

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All manuscripts including, "Letters to the Editor" should be submitted in triplicate (original and two copies), in flat form (*not folded*), and by First Class mail to Managing Editor, *DFES*, c/o IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863, USA.

When possible, authors are encouraged to submit a fourth copy of their manuscript on computer disk. Manuscripts submitted on disk should be saved as an ASCI file.

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Marth, E. H. 1974. Fermentations. pp. 771-882. *In* B. H. Webb, A. H. Johnson and J. A. Alford. (eds.). Fundamentals of dairy chemistry. 2nd ed. AVI Publishing Co., Westport, CT.

Book by author(s)

Minor, T. E. and E. H. Marth. 1976. Staphylococci and their significance in foods. Elsevier Scientific Publishing Co., Amsterdam.

Book by editor(s)

Vanderzant, C. and D. F. Splittstoesser. (eds.). 1992. Compendium of methods for the microbiological examination of foods. 3rd ed. American Public Health Association, Washington, D.C.

Patent

Hussong, R. V., E. H. Marth and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U.S. Pat. 3,117,870. Jan. 14.

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Anonymous. 1977. Thermally processed low-acid foods in hermetically sealed containers. Code of Federal Regulations No. 21, U.S. Government Printing Office, Washington, D.C.

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To request nomination criteria, contact:

IAMFES
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA

By telephone: 800.369.6337; 515.276.3344;
Fax: 515.276.8655 or E-mail: iamfes@iamfes.org.

Nominations deadline is February 19, 1999. You may make multiple nominations. All nominations must be received at the IAMFES office by February 19, 1999.

* Persons nominated for individual awards must be current IAMFES Members. Black Pearl Award nominees must be a company employing current IAMFES Members. NFPA Food Safety Award nominees do not have to be IAMFES 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 IAMFES Annual Meeting in Dearborn, Michigan on August 4, 1999.

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1990–None Given

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	4th	A. A. Airoldi
	5th	Michelle M. Schaack
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	2nd	Stephen Ingham
	3rd	Douglas Marshall
	4th	B. J. Overdahl
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	2nd	Diane West
	3rd	David Baker
	4th	Karl Eckner
	5th	Hassan Gourama
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	4th	Anna Lambert
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	2nd	Elaine D. Berry
	3rd	J. Eric Line
	4th	Donna Williamson
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	2nd	Janice M. Baker
	3rd	Kyle Sashara
	4th	Lynn McIntyre
	5th	Kwang Yup Kim
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	5th	Tom Yezzi
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	2nd	M. Rocelle S. Clavero
	3rd	Robert Williams
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	2nd	Paris Leggitt
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	2nd	Soraya Rosenfield
	3rd	Jeffrey Semanchek
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	3rd	Amanda E. Whitfield
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Sponsored by The Conference for Food Protection in cooperation with The American Academy of Sanitarians; The Association of Food and Drug Officials; The Foodservice & Packaging Institute, Inc.; The Industry Council on Food Safety; The International Association of Milk, Food and Environmental Sanitarians, Inc.; The National Association of County and City Health Officials; The National Environmental Health Association; NSF International; Public Health Foundation Enterprises, Inc.; and Underwriters Laboratories, Inc.

From 1955 to 1966 two awards were given: the first for general environmental health, the second for food protection. From 1968 to 1973, the award was suspended due to a general lack of innovation in food protection programs during that period.

1955 Cowlitz-Wahkiakum County Department of Public Health, Washington
New York City Department of Public Health, New York City, New York

1956 Tulsa City-County Department of Public Health, Tulsa, Oklahoma
Macon-Bibb-Jones County Department of Public Health, Georgia

1957 San Jose Department of Public Health, San Jose, California
San Diego County Department of Public Health, San Diego, California

1958 Spokane County Department of Public Health, Spokane, Washington
Los Angeles County Department of Public Health, Los Angeles, California
1959 San Diego County Department of Public Health, San Diego, California
Salt Lake City Department of Public Health, Salt Lake City, Utah
1960 Marion County Department of Public Health, Salem, Illinois
San Bernardino County Department of Public Health, San Bernardino, California
1961 Albuquerque Environmental Health Department, Albuquerque, New Mexico
Philadelphia County Department of Public Health, Philadelphia, Pennsylvania
1962 Rocky Mount Department of Public Health, Rocky Mount, North Carolina
Seattle-King County Department of Public Health, Seattle, Washington
1963 Hamilton County Department of Public Health, Cincinnati, Ohio
Lake County County Department of Public Health, Waukegon, Illinois
1964 Orange County Department of Public Health, Santa Ana, California
1965 Spokane County Department of Public Health, Spokane, Washington
Albuquerque Environmental Health Department, Albuquerque, New Mexico
1966 Imperial County Department of Public Health, El Centro, California
Jefferson County Department of Public Health, Birmington, Alabama
1967 Salt Lake City Department of Public Health, Salt Lake City, Utah
1974 Lexington-Fayette County Department of Public Health, Lexington, Kentucky
1975 None Given
1976 Region VI Department of Public Health, Roswell, New Mexico
1977 Los Angeles County Department of Public Health, Los Angeles, California
1978 Arlington County Department of Public Health, Arlington, Virginia
1979 Suffolk County Department of Public Health, Riverhead, Virginia
1980 Allegheny County Department of Public Health, Pittsburgh, Pennsylvania
1981 Nassau County Department of Public Health, Mineola, New York
1982 Winnebago County Department of Public Health, Rockford, Illinois
1983 Pima County Department of Public Health, Tucson, Arizona
1984 Southeastern District Department of Public Health, Idaho
1985 Montgomery County Department of Public Health, Dayton, Ohio
1986 Tri-County Department of Public Health, Colorado
1987 Snohomish Health District, Everett, Washington
1988 San Bernardino County Department of Public Health, San Bernardino, California
1989 Albuquerque Environmental Health Department, Albuquerque, New Mexico
1990 San Joaquin County Environmental Health Division, Stockton, California
1991 Tacoma-Pierce County Health Department, Tacoma, Washington
1992 Boulder County Health Department, Boulder, Colorado
1993 Allegheny County Pennsylvania Health Department, Pittsburgh, Pennsylvania
1994 Du Page County Health Department, Wheaton, Illinois
1995 None given
1996 Snohomish Health District, Everett, Washington
1997 Madison Department of Public Health, Madison, Wisconsin
1998 Clark County Health District, Las Vegas, Nevada

C. B. SHOGREN AWARD

1972-Iowa Affiliate
1973-Kentucky Affiliate
1974-Washington Affiliate
1975-Illinois Affiliate
1976-Wisconsin Affiliate
1977-Minnesota Affiliate
1978-None Given
1979-New York Affiliate
1980-Pennsylvania Affiliate
1981-Missouri Affiliate
1982-South Dakota Affiliate
1983-Washington Affiliate
1984-None Given
1985-Pennsylvania Affiliate
1986-None Given
1987-New York Affiliate
1988-Wisconsin Affiliate
1989-Georgia Affiliate
1990-Texas Affiliate
1991-Georgia Affiliate
1992-Georgia Affiliate
1993-New York Affiliate
1994-Illinois Affiliate
1995-Wisconsin Affiliate
1996-Wisconsin Affiliate
1997-Florida Affiliate
1998-Ontario Affiliate

MEMBERSHIP ACHIEVEMENT AWARD

(Highest Number Increase)

1986-Iowa Affiliate
1987-Florida Affiliate
1988-Florida Affiliate
1989-California Affiliate
1990-California Affiliate
1991-Illinois Affiliate
1992-California Affiliate
Illinois Affiliate
1993-California Affiliate
1994-California Affiliate
1995-Texas Affiliate
1996-California Affiliate
1997-California Affiliate
1998-California Affiliate

Highlights of the Executive Board Meeting October 31 – November 2, 1998 Des Moines, Iowa

The following is an unofficial summary of Executive Board actions from the IAMFES Executive Board Meeting:

Approved the following:

- Minutes of August 14 – 20, 1998 Executive Board Meeting.
- New Investment Policy for monies.
- Dan Erickson's travel to a 3-A meeting – winter 1998-99.
- Retain the Food Sanitation PDG and support establishing a Retail HACCP PDG.
- Formation of a HACCP Task Force.

Discussed the following:

- Audit report for year ending August 31, 1998.
- Publication Update: Journals on schedule. Manuscript copy-editing caught up. *JFP* to begin printing at Allen Press–January 1999. Membership Directory to mail with November *DFES*.
- Membership Update: Gained 170 new Members from Annual Meeting. New recruiting and retention efforts in discussion stage.
- Advertising Update: Sales for year exceeded expense. Working new and established accounts for growth.
- Reorganization of IAMFES Staff duties.
- Severance Package to terminated employee.
- Employee Retirement Contribution.
- IAMFES Planning Document.
- Revision of Board Member position descriptions.
- Committee, Professional Development Group, and Task Force recommendations to the Executive Board.
- Revision of booklet "Procedures to Investigate Foodborne Diseases".
- Distribution of HACCP Manual to interested parties for educational purposes.
- IAMFES responsibilities with the 3-A Sanitary Standards.
- Agreement with IAFIS on 3-A Sanitary Standards.
- Board Member attendance at Affiliate meetings.
- Affiliate Newsletter – fall 1998.
- Interest in formation of new Affiliates.
- Issues relating to changing IAMFES to International Association for Food Protection.
- Constitution and Bylaws relating to name change.
- Reviewed 1998 IAMFES Annual Meeting.
- Discount registration plan for Michigan Affiliate Members to attend the 1999 IAMFES Annual Meeting.
- Planning for 1999, 2000, and 2001 Annual Meetings; future Annual Meeting sites.
- Workshop planned for April in Washington, D.C. on Microbial Risk Assessment.
- Ideas for future workshops.
- Report on ILSI's Microbial Data Collection Conference. IAMFES co-sponsored this conference.
- NSF-Food Safety Conference. IAMFES is a co-sponsor of this conference.
- FSTEA project and IAMFES involvement.
- National Food Safety Alliance.
- *JFP* HACCP article issues.
- NFPA Food Safety Award selection committee.

Next Executive Board meeting: January 24 – 26, 1999, Dearborn, Michigan.

Committee, Professional Development Group, Task Force and Support Group

Recommendations to the Executive Board as Taken from Committee Minutes of Meetings Held in Nashville, Tennessee August 16, 1998

Board Action Taken at the October 31 – November 2, 1998 Executive Board Meeting

STANDING COMMITTEES

Dairy, Food and Environmental Sanitation Management Committee

1. Have Carol Mouchka and Donna Bahun work with Pete Cook, Tom Gilmore, and Christine Bruhn to develop a business plan for *DFES*.
   Board Action: Carol will contact Pete, Tom, and Christine to discuss needs and wants as to a business (publication) plan.
2. Have the IAMFES staff develop a contingency plan for future expansion and growth of *DFES*.
   Board Action: Carol will discuss existing plan with *DFES* Committee Chairperson.
3. Have Carol Mouchka work with the Committee to revise Instructions for Authors to include a Commercialism Policy similar to the one used for the Annual Meeting.
   Board Action: Carol will work with Bill LaGrange and Pete Cook to incorporate a Commercialism Policy into the Instructions for Authors.
4. *DFES* Committee is recommending that reviewers must return their reviews within two months, and authors must return their revisions within three months to have a similar policy like *JFP*.
   Board Action: Accept recommendations to be consistent with *JFP* which is to request that the reviewer return their review within 14 days and the author to submit their revised manuscript within 21 days.
5. The Chairperson, Pete Cook, and Vice Chairperson, Tom Gilmore, meet with the Executive Board to discuss the rotation of Committee Members.
   Board Action: Issue has been addressed and rotation plan is in place.
6. No cover photos of commercial value are to be used.
   Board Action: Recommendation too restrictive. Need to add statement about photo: "Use of this photo does not imply endorsement of any product." Avoid using photos with company names.

Journal of Food Protection Management Committee

1. The Committee recommends that the IAMFES staff, together with *JFP* Scientific Co-editors, and legal counsel, revise the Annual Meeting Policy on Commercialism for adoption as a policy for the *Journal of Food Protection*. Furthermore, it is recommended that the policy, if adopted, be distributed to all members of the editorial board, and included with the Instructions for Authors.
   Board Action: Accept recommendation.
2. The committee recommends that the IAMFES staff investigate cost estimates for an overwrap to include in mailings.
   Board Action: Accept recommendation. Use IAMFES folder, include Membership information and Annual Meeting information.

Past Presidents' Advisory Committee

1. Ribbons at Annual Meeting in 5 year increments after 20 years, i.e., 25, 30, 35, 40, 45, 50 etc.
   Board Action: Accept recommendation.
2. Ribbons designated as "New Member" issued at Annual Meeting.
   Board Action: Already in place.

3. "IAMFES Member" – Ribbons provided for Affiliate Meetings.
   Board Action: Accept recommendation (ribbons provided at the request of the Affiliate). Provide Affiliates an order form for ribbons, journals, and other publications to use at meetings.
4. IAMFES Lapel pins to all IAMFES Members.
   Board Action: Recommendation deferred until name change issue is completed.
5. Establish an "International Lounge" for International Members at Annual Meeting.
   Board Action: Encourage interaction with international attendees at all IAMFES events – separate lounge might limit interaction.
6. Establish a "New Member Reception" for New Members, Past Presidents, Committee/PDG/Task Force Chairs at Annual Meeting.
   Board Action: Establish new Member and International Member orientation session to be held Saturday afternoon (3:00 or 4:00 p.m.).
7. Maintain and strengthen liaisons with other organizations.
   Board Action: Agreed – Will work towards this goal.
8. Proceed with name change, but revise vision statements to reflect scope of association, i.e., recognize dairy industry, environmental sanitarians, food quality as well as food safety, etc.
   Board Action: Agreed – Board asks that PPAC write a proposed vision statement by April 1, for Board consideration.
9. Retain PPAC as advisory to Executive Board on specific issues to be specified by meeting agenda i.e., PPAC meeting should be "agenda driven" not simply scheduled routinely.
   Board Action: Accepted – See #8 above.
10. Mail copy of "summary of board actions" to all Past Presidents.
    Board Action: Accepted – Will begin immediately. (**NOTE:** Board Meeting highlights are printed in *DFES* for Member review.)
11. Eliminate PP Dinner if cost is a consideration, otherwise retain as a "token of recognition."
    Board Action: Board agrees to continue to provide as budget permits; monitor budget with this in mind in the future.

Program Advisory Committee

1. It is recommended that those appointed to the program committee be attending the Annual Meeting, so they can attend the Wednesday meeting and be up to speed for the January meeting.
   Board Action: Agreed – Appointees should be identified by conclusion of January Program Meeting and confirmed at spring Executive Board Meeting (preceding Annual Meeting) to allow appointees to plan appropriately.

SPECIAL COMMITTEES

Committee on Communicable Diseases Affecting Man

1. Minutes not received.

Committee on Sanitary Procedures

1. Accept establishment of E-mail discussion group.
   Board Action: Proceed ASAP. Staff to complete in timely fashion.

Nominating Committee

1. Minutes not received.

PROFESSIONAL DEVELOPMENT GROUPS

Applied Laboratory Methods Professional Development Group

1. No recommendations included in minutes.

Audiovisual Library Professional Development Group

1. Increase Library staff person from 15 to 20 hours a week. The cost of additional time to be born by the IAMFES Board, not the IAMFES Foundation.
   Board Action: The Executive Board and Executive Director will monitor the work load. Additional hours are not necessary at this time.
2. Library users to pay S/H cost of $3.00 per tape for domestic mailing and $6.00 per tape for international mailing. Payment shall be made with each request. Nature of payment shall be determined by staff.
   Board Action: Logistical problems and administrative costs do not warrant this charge. This will be maintained as a free Membership benefit.
3. Audio or visual tapes shall be made of symposia and workshops for sale to IAMFES Members and nonmembers. Net proceeds will be given to Audiovisual Library.
   Board Action: Not cost-effective at this time, but will continue to consider.
4. Staff will develop a plan by next meeting for total Audiovisual Library staff cost to be covered by IAMFES funds, not the IAMFES Foundation funds. Foundations funds can be used for materials, acquisitions, and expanded services.
   Board Action: The Board feels this would have a negative impact on Membership dues and recommends that the Foundation continues to support the Audiovisual Lending Library.

5. Committee to review letter prepared by staff for new (Audiovisual PDG) Member recruitment. Names of potential Committee Members to include, but not limited to *DFES* and *JFP* editors and top 10 (heaviest) users of the Audiovisual Library will be sent letters. Committee Members to supply other suggestions and to do personal recruitment.
   Board Action: IAMFES staff will identify those who use this benefit the most and request them to review tapes.
6. Request ad in journals asking for volunteers for the Committee.
   Board Action: Accepted – Previously ran advertisement soliciting Member involvement with all Committee, PDGs and Task Forces. Board requests that this be repeated.
7. Staff prepare article about committees and need for active Members.
   Board Action: Accepted – Address this through columns and letters (open letter to Membership from Vice President).

Dairy Quality and Safety Professional Development Group

1. No recommendations included in minutes.

Food Safety Network Professional Development Group

1. To improve communication among Members by implementing Listservs for PDGs and IAMFES.
   Board Action: Proceed ASAP. Staff to complete in timely fashion.

Food Sanitation Professional Development Group

1. No recommendations included in minutes.

Fruit and Vegetable Safety and Quality Professional Development Group

1. Accept establishment of E-mail discussion group.
   Board Action: Proceed ASAP. Staff to complete in timely fashion.
2. Look into feasibility of accepting proposal to establish a graduate student competition paper specifically in the applied produce area.
   Board Action: Board will welcome a proposal, including operational details from the Fruit and Vegetable PDG .

Meat and Poultry Safety and Quality Professional Development Group

1. No recommendations included in minutes.

Microbial Risk Assessment Professional Development Group

1. To approve Don Schaffner as Vice Chair and Lee Ann Jaykus as Chair for the group.
   Board Action: Accepted.
2. The group recommends that IAMFES work with Don Schaffner and his committee to produce a workshop on risk assessment in February 1999.
   Board Action: Accepted. This is in process and scheduled for early April in Washington, D.C. area (pending budget approval).

Seafood Safety and Quality Professional Development Group

1. Link the Web site to UC-Davis. Sea Grant content to be IAMFES Web site to Seafood HACCP information to general Membership.
   Board Action: Accept linking UC-Davis Web page. The Board requests additional information on second portion of recommendation.

Viral and Parasitic Foodborne Disease Professional Development Group

1. No recommendations included in minutes.

TASK FORCES

Awards Task Force

1. No recommendations included in minutes.

Constitution and Bylaws Task Force

1. No recommendations included in minutes.

Education Task Force

1. Task Force requests that Web server space be allotted for the "Food Safety Resources for K-12 Educators Database."
   Board Action: Accept recommendation to accommodate when our Web page capabilities will allow.
2. Board consider making the Task Force a committee if IAMFES involvement in review of educational materials is a long-term interest of the Executive Board.
   Board Action: Board will work with the Task Force Chairperson to identify purpose and goals.

SUPPORT GROUPS

Affiliate Council Support Group

1. Continued development of Web site as a way to exchange information among affiliates to include placing [Affiliate] newsletter on Web site, links to affiliate Web sites, and posting meeting schedules and announcements.

Board Action: Accept recommendation – Encourage Affiliates to provide a link to the IAMFES Web site and URL's for their Web sites. Request Affiliate Meeting schedules 3 months in advance of meeting date for posting.

2. Continue supporting Executive Board as speakers for Affiliate Meetings.
   Board Actions: Accept and encourage Affiliates to take advantage of the program that provides Executive Board Members as speakers for Affiliate Meetings.

Foundation Fund Support Group

1. IAMFES should accept the $9,000.00 grant from IAFIS after resolution of some logistic concerns. This will be a one-year trial. The name of the library will be changed to IAMFES-IAFIS Audiovisual Lending Library.
   Board Actions: IAMFES is working with IAFIS to resolve issues involved.
2. The Ivan Parkin Lecture: The Selection Committee will continue their global approach for quality speakers.
   Board Action: Agreed – We will continue to invite high caliber speakers for the Ivan Parkin Lecture.
3. The budget of $17,000.00 be approved. This includes $1,000.00 from the IAMFES restricted fund.
   Board Action: Accepted – (**NOTE**: This is the last year (of three) that $1,000 in additional funds is available from the restricted fund).
4. Maintain the Silent Auction as an exclusive activity of the Foundation Fund. This will not preclude a State Affiliate from having a silent auction at the Annual Meeting. An Affiliate cannot have a concurrent auction.
   Board Action: Agreed that Silent Auction be a Foundation-exclusive event.
5. The Audiovisual Library Committee should work with the IAMFES office in developing a list of sources for audiovisual materials.
   Board Action: Agreed – PDG Members are asked to provide sources to the IAMFES office.
6. Extend the Foundation Fund Group's appreciation and thanks to the IAMFES office staff.
   Board Action: Agreed.

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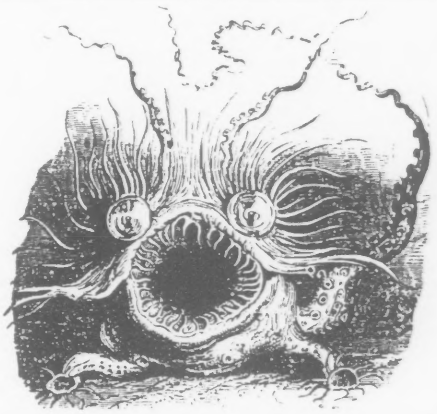

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Universidad Nacional San Luis
San Luis

Mariana Koppman
Dra Mariana Koppmann
Buenos Aires

Hernan Rodriguez Palacios
Instituto Argentino De Gastronomia
Buenos Aires

CANADA

Andre Giguere
Qualtech Equipment
St. Romuald, Quebec

Jin Aye Lim
Tricon Global Restaurants
Markham, Ontario

DENMARK

Lone Gram
Danish Institute for Fisheries
Lyngby

ECUADOR

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Acindec S.A., Quito, Pichincha

IRELAND

Edmond Harty
Dairymaster, Tracee, Co., Kerry

SPAIN

Miquel Angel Urban
S.A. Vichy Catalan
Barcelona

UNITED STATES

ALABAMA

Joel A. Matthews
National Packaging Co., Inc.
Decatur

ARIZONA

Robert L. Gromko
Shamrock Foods Co.
Phoenix

CALIFORNIA

Catherine H. Goldsmith
SIRA Technologies, Pasadena

Richard L. Tate
Dept. of Food & Agriculture
Sacramento

FLORIDA

Michael W. Brennan
Walt Disney World
Orlando

ILLINOIS

Lee Dressel
Illinois Public Health Dept.
Highland

Frank Krupa
Inspection Services, Mt. Prospect

Ben C. Maradkel
Chicago

Janette J. Valignota
Alberto Culver Co.
Melrose Park

IOWA

Christina R. Fontana
Kemin Foods, Des Moines

KANSAS

Dennis D. Foster
N.E.K. Coalition for Environmental Protection, Troy

Joe Kitterman
Riley Co-Manhattan Health Dept.
Manhattan

Ronald H. Tubb
City of Overland Park
Overland Park

LOUISIANA

Melissa J. Lain
Aramark Corp., New Orleans

MAINE

Gary Eaton
Idexx Labs, Westbrook

New IAMFES Sustaining Member

Maria Vallejo
CIAD A.C.
Hermosillo, Sonora, Mexico

MASSACHUSETTS

Kirk W. Martin
Harvard University, Cambridge

MICHIGAN

Leslie D. Bourquin
Michigan State University
East Lansing

MINNESOTA

Neil Kucker
Ecolab Food & Beverage Division
St. Paul

NEW JERSEY

J. David Legan
Nabisco, East Hanover

NEW YORK

Carl Teravainen
O-AT-KA Milk Products Coop Inc.
Batavia

NORTH CAROLINA

Jara Morrison-Rowe
Good Mark Foods, Garner

Arnie I. Sair
North Carolina State University
Raleigh

OREGON

Greig Warner
Multnomah Co. Env. Health
Portland

PENNSYLVANIA

Marvin E. Buck
Microbac Labs, Conneaut Lake

Julie Conaron
National Medical Services
Willow Grove

John B. Wengert
Wengert's Dairy, Lebanon

PUERTO RICO

Wanda L. Rodriguez
Humacao University College
Humacao

TENNESSEE

William C. Morris
University of Tennessee
Knoxville

TEXAS

Karrie Menz
Owens Country Sausage
Richardson

Elsa A. Murano
Texas A & M University
College Station

VIRGINIA

J. Patrick Hadden
Vkrop's Super Markets, Inc.
Richmond

WASHINGTON

Crystal Johnson
Continental Mills, Seattle

WEST VIRGINIA

Charles Wilson
USDA, Kearneysville

WISCONSIN

John J. Adleman, III
Chr. Hansen Inc.
Milwaukee

Frank Chase
Verifine Dairy Products Co.
Sheboygan

Ranee May
University of Wisconsin-River Falls
River Falls

New Members

ARGENTINA

Ana Maria S. DeGuzmion
Universidad Nacional San Luis
San Luis

Mariana Koppman
Dra Mariana Koppmann
Buenos Aires

Hernan Rodriguez Palacios
Instituto Argentino De Gastronomia
Buenos Aires

CANADA

Andre Giguere
Qualtech Equipment
St. Romuald, Quebec

Jin Aye Lim
Tricon Global Restaurants
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National Packaging Co., Inc.
Decatur

ARIZONA

Robert L. Gromko
Shamrock Foods Co.
Phoenix

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Catherine H. Goldsmith
SIRA Technologies, Pasadena

Richard L. Tate
Dept. of Food & Agriculture
Sacramento

FLORIDA

Michael W. Brennan
Walt Disney World
Orlando

ILLINOIS

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Illinois Public Health Dept.
Highland

Frank Krupa
Inspection Services, Mt. Prospect

Ben C. Maradkel
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Melrose Park

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Christina R. Fontana
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N.E.K. Coalition for Environmental Protection, Troy

Joe Kitterman
Riley Co-Manhattan Health Dept.
Manhattan

Ronald H. Tubb
City of Overland Park
Overland Park

LOUISIANA

Melissa J. Lain
Aramark Corp., New Orleans

MAINE

Gary Eaton
Idexx Labs, Westbrook

New IAMFES Sustaining Member

Maria Vallejo
CIAD A.C.
Hermosillo, Sonora, Mexico

MASSACHUSETTS

Kirk W. Martin
Harvard University, Cambridge

MICHIGAN

Leslie D. Bourquin
Michigan State University
East Lansing

MINNESOTA

Neil Kucker
Ecolab Food & Beverage Division
St. Paul

NEW JERSEY

J. David Legan
Nabisco, East Hanover

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Carl Teravainen
O-AT-KA Milk Products Coop Inc.
Batavia

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Good Mark Foods, Garner

Arnie I. Sair
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Raleigh

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Greig Warner
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Portland

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Microbac Labs, Conneaut Lake

Julie Conaron
National Medical Services
Willow Grove

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Wengert's Dairy, Lebanon

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Osmonics Names Three to Develop New Opportunities

Osmonics has announced three additions to the company's executive management team.

Wil Pergande, Rick Lesan, and A. P. Roy Choudhury have been promoted to Vice President Special Projects.

Pergande is also General Manager at Osmonics' Rockland, Massachusetts, location, where he is responsible for marketing pure steam generation equipment to pharmaceutical customers, and reverse osmosis (RO) systems for seawater applications. He came to Osmonics in 1995, after more than 30 years in the water treatment industry. He earned his bachelor's degree in mechanical engineering from Marquette University.

Lesan was previously Assistant to the President for Technical Development, coordinating research and development efforts among all Osmonics locations. He began his career with Osmonics in 1994, bringing more than 25 years of experience in membrane technology for reverse osmosis and ultrafiltration (UF). He received his bachelor's degree in chemical engineering from the University of California, Berkeley.

Roy Choudhury, formerly Assistant to Vice President International, joined Osmonics in 1995. For the past 25 years, Roy Choudhury has specialized in coordinating large-scale purification projects for international customers. He earned undergraduate degrees from Ohio State and Purdue, as well as a Ph.D. in chemical engineering from Northwestern University and an MBA from Claremont Graduate School.

SRC Vision Announces Appointment of Senior Staff Scientist

SRC VISION, Inc., has appointed Dr. Hooshmand Kalayea as its new Senior Staff Scientist.

Kalayea has over fifteen years of experience as a Research Engineer at E. I. DuPont in Wilmington, DE. He specialized in development and implementation of specific purpose image pattern recognition systems. Prior to DuPont, he was a Research Scientist at ORS Automation, Inc., in Princeton, NJ.

Fisher to Lead New Dorner Division

The appointment of Michael C. Fisher as President of its newly-formed Systems Division has been announced by Dorner Mfg. Corp., Hartland, WI.

In his new capacity, Fisher will head sales, marketing, engineering and operations for the new division which was formed to respond to the specialized needs of customers seeking integrated material handling, parts transfer systems involving dispensing, labeling, sortation identification and related operations.

Since 1995, Fisher has served as Dorner Manufacturing's Vice President of Manufacturing. During that time, he was responsible for initiating a number of major programs that resulted in improved asset management, ISO 9001 quality program, and support of rapid growth. Before joining Dorner, he served as General Manager of the U.S. Division for Sky Climber, Inc., Stone Mountain, GA.

Scientists Comment on Proposed EPA Plant Pesticide Rule

What are the possible consequences of the U.S. Environmental Protection Agency (EPA) proposed plant pesticide rule? The Council for Agricultural Science and Technology (CAST), an international consortium of 36 scientific and professional societies, released an issue paper *The Proposed EPA Plant Pesticide Rule* in which a CAST panel of five members of the National Academy of Sciences discusses this proposal. In 1996 and 1997, two reports were published in which eleven professional scientific societies and an advisory panel of the Biotechnology Industry Organization discussed the issues relative to the EPA proposal. The CAST panel formed in 1998 was charged with examining the scientific merit of the differing viewpoints based solely on scientific principles.

Under statutes developed for chemicals applied externally to plants, the EPA proposes to regulate genetically engineered plants containing genes for pest resistance that have been introduced by techniques of recombinant deoxyribonucleic acid (rDNA). Plants with such genes would be designated pesticides.

The CAST panel members, as well as other scientists, say designation of plants as pesticides is indefensible on scientific grounds for the following reasons: (1) pest resistant plants produced by genetic engineering may be indistinguishable from plants bred for pest resistance by conventional methods. These latter plants are exempt from the EPA proposed guidelines even though the end results of recombinant DNA strategies are the same as conventional breeding; (2) scientific panels have stated that genetically modified crops should be judged on their safety, allergenicity, toxicity, and other properties, and not the means by which the trait has been introduced. Thus, the properties of the modified plant, in terms of risk, are important, not the technique used to modify the plant; (3) numerous mechanisms, which confer resistance to pests, exist in plants. It is scientifically illogical to combine these various mechanisms in plants into one category and state that they must be regulated if they result from recombinant DNA technology; and (4) no evidence exists that the plant's level of resistance to pests creates hazards in the environment.

If the EPA rules go into effect, the CAST panel foresees the likelihood of serious economic consequences in the food industry. Labeling plants as pesticides would underline public confidence in the safety of the food supply. If plants are safe for human consumption, there is no reason to label them as pesticidal. Adoption of the proposed EPA regulations would discourage development of pest resistant minor crops or crops resistant to minor pests, which would delay the time until chemical pesticide use can be decreased. Enforcing the EPA regulations would increase the regulatory burden on all companies as well as on the EPA. Small companies, who are the ones most likely to develop pest resistance in those minor crop plants, could be forced out of business or find it necessary to change their business plans by the increased paperwork and scientific data gathering.

FPI Announces 1999 Crumbine Award Criteria

The Foodservice & Packaging Institute, Inc. (FPI) announced the availability of the criteria for the *1999 Samuel J. Crumbine Award for Excellence in Food Protection at the Local Level.*

The Crumbine Award annually recognizes excellence in food protection services at public health agencies in the US and Canada. The winner of the award is selected by an independent panel of food protection practitioners composed of representatives from leading public health and environmental health associations, a past Crumbine Award winner, a consumer advocate, and a food industry representative. The jury makes its award selection each spring in a judging process administered by FPI.

Entries for the Crumbine Award competition are limited to US and Canadian local government public health agencies (county, district, city, town, or township) that provide food protection services to their communities under authority of a statute or ordinance. Past winners may apply five years after receiving the award.

Named for one of America's most renowned health officers and health educators, Samuel J. Crumbine, M.D. (1863-1943), the Award has elevated the importance of food protection programs within local public health agencies and has inspired excellence in the planning and delivery of those services. The Crumbine Award was first offered in 1955 and has been presented almost every year since then.

The 1998 Award was presented to the Clark County Health District

at the National Environmental Health Association (NEHA) Annual Education Conference in Las Vegas, NV. Staff from the winning agency were also honored at the 85th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians (IAMFES). Another award presentation occurred during the annual meeting of the National Association of County & City Health Officials (NACCHO).

Questions about the Clark County Health District's award-winning program should be directed to Mary Hahn at 702.383.1251. For information about the Crumbine Award, a copy of the criteria, and a sample of past winning entries, please contact Lynn Rosseth, FPI's Market Development Manager at 703.527.7505.

Food Processors and Manufacturers See Room for Improvement in Plant Productivity

According to a recent survey of food processors and manufacturers, only twenty-one percent of respondents are "very satisfied" with their plant employees' productivity. In fact, an equal percentage are either "very" or "somewhat" dissatisfied with their plant employees' productivity. These are just some of the findings from Maker Food Group's *Survey on Employee Productivity Among Food Processors and Manufacturers*. Other survey findings include: Nearly half (47%) of participating food processors and manufacturers believe monetary incentives would improve employee productivity, although forty-two percent indicate that their company does not offer any incentives to plant employees for productivity improvements. Although a clear majority (84%) of survey respondents say their company offers training to improve plant employees' productivity, only 26% of participants cite training programs as the most effective method of improving productivity and efficiency within the plant. Of the eighty-four percent of participating food processors and manufacturers who say they offer training to plant employees to improve productivity, quality assurance (74%), safety (74%), and operating techniques (68%) are cited most often as the types of training companies offer. Of the fifty-eight percent of participating food processors and manufacturers who say their company does provide incentives to improve employee productivity, the incentives they offer include goal-sharing plans, gift certificates for extra efforts, informal lunches, monetary benefits, year end bonuses, spot awards, outings, and parties.

FDA Funds Cooperative Agreements on Food Safety

In fiscal year (FY) 1998, FDA funded seven (7) cooperative agreements under the President's Food Safety Initiative. These projects may be funded for up to two or three years depending on progress and the availability of funds. In the April 16, 1998, *Federal Register,* FDA announced the availability of these research funds to study the microbiological hazards associated with the food animal production environment which includes animal feeds.

A listing of the funded agreements follows: On-farm risk factors for zoonotic enteropathogens associated with cattle feed and water, Dale Hancock, Washington State University, Pullman, WA; Waterbome dissemination of *Escherichia coli* O157:H7; Charles Kaspar, University of Wisconsin, Madison, WI; STEC, *Salmonella* virulence and antibiotic resistance in cattle and feed, David Acheson, New England Medical Center, Boston, MA; Factors affecting numbers of acid-resistant *Escherichia coli* in cattle, James Russell, USDA-ARS, Ithaca, NY; Survey of antimicrobial resistant *Enterococci* in animals, Marcus Zervos, William Beaumont Hospital, Royal Oak, MI; Control of EHEC in cattle by probiotic bacteria, Michael Doyle, University of Georgia, Athens, GA; and Evaluation and use of BAM/FDA and rapid methods for on-farm survey, Ann Draughton, University of Tennessee, Knoxville, TN.

Additional information about these agreements is available from Dr. David B. Batson, Center for Veterinary Medicine (HFV-502), Food and Drug Administration, 8401 Muirkirk Rd., Laurel, MD 20708; Phone: 301.827.8021.

Grocers Have Responsibility

Mike Wright, Chairman of the Board of the Food Marketing Institute (FMI) and Chairman, President and CEO of SUPERVALU Inc., one of the largest grocery wholesalers in the U.S., recently told a marketing conference that the millions of cases of foodborne illnesses reported each year mean supermarkets now face an even greater responsibility in educating their customers how to safely store, serve and prepare food.

"The circumstances that exist now make it essential for every single member of our industry – retailers, restauranteurs, wholesalers, processors and growers – to make food safety the highest possible priority," Wright said.

"A single lapse can result in a life-threatening disease."

FSIS and FDA Promote HACCP Awareness with State Partnerships

As part of its farm-to-table food safety strategy, USDA's Food Safety and Inspection Service has linked with the Department of Health and Human Services Food and Drug Administration to establish partnerships with 11

states. These state partnerships will enhance food animal producers' knowledge concerning the Hazard Analysis and Critical Control Points (HACCP) systems implementation and its possible impact on the production sector.

Funding is being provided for activities in the states that will improve food safety, animal health, and quality assurance by promoting the voluntary adoption of HACCP-compatible practices from farm to slaughter plant. Through the establishment of partnership groups, small producers will gain a greater awareness of food safety and good production practices. Consumers will ultimately benefit because, as packers implement HACCP systems, more suppliers of live animals will be available who follow practices that reduce the risk of chemical, physical, and microbial hazards.

Awards were made by FSIS and FDA to: Colorado, Louisiana, Michigan, Nebraska, New York, Ohio, Oregon, South Dakota, Texas, Vermont, and Wisconsin.

Hawaii Voters Approve Irradiation Facility

Grocery Manufacturers of America President and CEO C. Manly Molpus congratulated the Friends of Agriculture-Hawaii who were successful on Election Day – by a 473-vote margin with over 51,000 votes cast – in defeating a ballot initiative that would have prevented the construction of a food irradiation facility.

"Congratulations to the food and agriculture industry in Hawaii and other supporters of irradiation who fought hard to ensure consumers heard the facts about irradiation," said Molpus. "What this vote signifies is that a fear campaign based on misleading information and scare tactics doesn't resonate with a majority of voters. This victory is a great win not only for the agriculture community and the economy in Hawaii, but also for the future of one of the most effective food safety techniques available."

Site selection for the new facility is expected to begin this month and the facility should be completed and operating in one year. The County of Hawaii has already approved a $2 million appropriation to develop markets for the treated fruit, currently quarantined from the Mainland without post-harvest treatment for fruit flies.

During the last weekend of the campaign, both local newspapers gave their support to building the food irradiation facility.

Irradiated fruits and vegetables as well as meats and poultry may be available for consumers to purchase in local grocery stores in the near future. A recent poll by GMA showed 80% of consumers would be likely to purchase an irradiated food product for themselves or their children if it was labeled, "irradiated to kill harmful bacteria."

Salmonella Oranienburg Outbreak In Ontario Linked to Cantaloupes

Twenty-two cases of *Salmonella* Oranienburg with onset of illness between 12 May and 30 June 1998 were reported to the Ontario Ministry of Health as part of the routine surveillance of enteric pathogens. This is in contrast to 14 and 10 cases reported in Ontario for all of 1997 and 1996, respectively.

A case series and case-control study revealed that 85% (17/20) had eaten cantaloupe during the 3 days prior to their illness. One case could not remember if cantaloupe was consumed during the time period in question.

One of the cases was 7 months of age, and the only raw foods eaten were cantaloupe and banana. None of the cases had any cantaloupe available for microbiologic testing. The cases had purchased the cantaloupe at a number of retail outlets between 18 May and 28 June 1998.

A matched case-control study found that the only food item significantly associated with illness was consumption of cantaloupe during a 3-day period

Laboratory investigations on the isolates from the 20 cases by phage typing and pulsed-field gel electrophoresis (PFGE) revealed that 19 were indistinguishable. The remaining isolate had a different phage pattern and showed a different PFGE pattern, which was classified as possibly related.

Cantaloupes were imported into Ontario from numerous sources including the United States, Mexico, and Central America. An attempted traceback of cantaloupes supplied to the retail outlets identified by the cases could not identify a common supplier.

This is the first time in Ontario that cantaloupe consumption has been associated with *Salmonella oranienburg*.

Reprinted from: Canada Communicable Disease Report, Volume 24-22, Health Canada, Laboratory Centre for Disease Control, November 15, 1998.

FightBAC Comes to Canada

A coalition of Canada's food industries, consumer and health groups, and government launched the Canadian version of the FightBAC food safety consumer education campaign in late November.

A 1998 study by the Canadian Food Inspection Agency found that consumers are often unaware or misinformed about all they can do

to protect themselves from harmful foodborne bacteria.

The initial goal of the campaign is to convey to consumers, four key principles of food safety:

Clean: Wash hands and surfaces often; Separate: Don't cross-contaminate; Cook: Cook to proper temperatures; and Chill: Refrigerate promptly.

Foundation and Joseph E. Seagram & Sons Inc., Award Scholarships

The Foundation's scholarship program is the largest of its kind in the industry. In 1999, the Foundation will award more than $600,000 in scholarships and other financial aid to students and educators at every level of professional development from high school and college through continuing education programs. Starting in 2000, the Foundation will award $1 million annually.

The Educational Foundation and Joseph E. Seagram & Sons, Inc., have awarded 59 scholarships to students for the fall 1998 Professional Management Development (ProMgmt™) program. Of the 127 applications received, close to half of the applicants were awarded scholarships. The scholarships further the Foundation's effort to advance education in the restaurant and hospitality industry.

Foundation awards include: undergraduate and ProStart/ ProMgmt. scholarships; fellowship and work study grants; and industry assistance grants. These financial gifts are made possible through the generosity of dozens of corporations and hundreds of individuals who believe in the necessity and value of lifelong learning.

IFT Announces New Scholarship for Undergraduate Students

The Institute of Food Technologists (IFT) announces the establishment of a $50,000 endowed scholarship, which will annually benefit an outstanding junior or senior undergraduate student majoring in food science at a college or university with an IFT-approved curriculum. The scholarship, named in honor of the late Arthur T. Schramm, will be awarded in June 1999 for the first time in the amount of $2,250.

The scholarship was established by Mr. Schramm's wife, Alice T. Schramm, now deceased, and will be executed by their daughter, Barbara Brandel. It was designed to encourage outstanding students to apply their scientific training to the improvement of food. During the latter half of his career, Mr. Schramm applied his academic background in chemistry to food flavoring research, primarily at Food Materials Corporation (later bought by Bush Boake Allen).

The application deadline for the scholarship is Feb. 1, 1999. Application forms are available from IFT or food science department heads at colleges or universities with IFT-approved curricula. For a list of these colleges or universities, go to IFT's Web site at 208.195.221.88/awa/PB98-99.

For more information, interested students may contact Patti Pagliuco at IFT at 312.782.8424 ext. 144 or via E-mail at <pgpagliuco@ift.org>.

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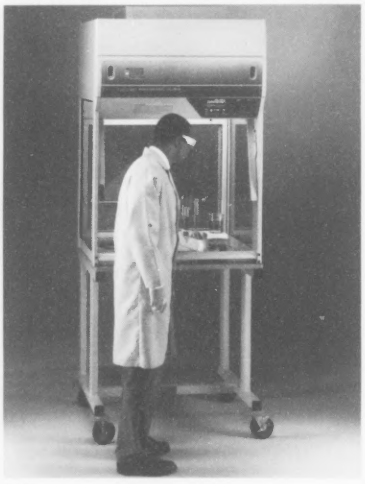

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Labconco Corporation offers the New Paramount™ 360 Filtered Enclosure to remove small quantities of gaseous contaminants such as fumes from organic solvents, acids, formaldehyde, and ammonia. The 360 Model includes all the features and benefits of the Paramount Filtered Enclosure, as well as a clear baffle and back wall which allow instructors to observe students and allow viewing example experiments in progress. The tempered safety glass baffle pivots down for easy cleaning

As an internal blower pulls air into the enclosure, contaminants released within tie enclosure are diluted by the air, drawn through the rear baffle, and adsorbed onto, or treated by, two internal carbon-based filters. A front air foil directs airflow into the enclosure to minimize turbulence and maximize fume containment. Since the Paramount Filtered Enclosure requires no ducting, it is moveable, conserves energy, and has lower installation costs than traditional fume hoods.

The Paramount Filtered Enclosure incorporates color coded Filter Cells engineered to the National Institute for Occupational Safety and Health (NIOSH) guidelines for respirators.

Labconco Corporation, Kansas City, MO

Reader Service No. 226

Metromax Q™ Addresses Sanitation Issues for Storage in the Foodservice Industry

In response to the growing need for clean and safe food storage and preparation areas, InterMetro Industries Corporation offers the quick-to-clean, easily reconfigured MetroMax Q storage system. A key benefit of MetroMax Q is the ability to remove the polymer mats and place them in a standard size dish rack for a quick and thorough cleaning. Solid mat overlays are also available to contain spills.

MetroMax Q's innovative design allows shelves to be positioned and adjusted quickly and easily in minutes. Whenever needs change, MetroMax Q can be changed immediately, without tools. Patented shelf corners allow shelves to be adjusted at 1 inch increments without affecting shelves above or below.

The MetroMax Q Storage system also features an open architecture frame that can accommodate space saving accessories. Ledges, drop-in baskets, dividers, solid mats, dunnage storage and security cages are just some of the many accessories available for the line. Constructed of epoxy coated steel and advanced polymer materials, MetroMax Q is NSF listed and comes with a 15 year warranty against rust on posts and frames and a lifebme guarantee against rust on the mats. In addition, MetroMax Q can be made completely mobile with the addition of an assortment of smooth rolling casters.

InterMetro Industries Corporation, Wilkes-Barre, PA

Reader Service No. 227

New Chemical Method Improves Cooling Tower Thermal Capability

A novel method for increasing the thermal capability of cooling towers has been discovered. With the use of newly developed formulations, tower efficiency increases of 5-12% have been measured in cooling-limited towers over three years. *New Chemical Method Discovered for Improving Cooling Tower Thermal Capability* discusses the new technology and the results of several evaluations at a commercial utility plant and two industrial facilities. The technical paper concludes that this new technology (POWERBOOST® cooling water treatment) provides a non-capital alternative to improving

The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.

tower efficiency. In addition, a significant, measurable economic benefit can be realized depending on the facility and the process involved. Based on generated data, it is feasible that power generating facilities can save millions of dollars per year with low level doses. Chemical and petrochemical plants have seen an average increase in production of 1% when using this technology.

Ashland Chemical Co., Boonton, NJ

Reader Service No. 228

Sigma's REDTaq™ DNA Polymerase Enables Researchers to See the Difference at Work

Sigma has introduced a new Taq DNA polymerase, REDTaq™, that delivers the same reliable performance as Sigma's standard Taq. It's also easier to see and thus more convenient to use.

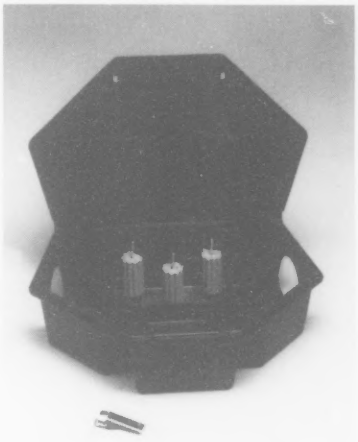
The addition of REDTaq to a tube produces a thin red layer that is visible at the bottom. REDTaq's color eliminates the uncertainty that can occur with interruptions in pipetting REDTaq makes it easy to confirm proper mixing of samples: When the red color is uniform a solution is thoroughly mixed.

REDTaq requires no loading buffers since the post-PCR samples are dense enough to be loaded directly onto an agarose gel. The red dye works as a tracking dye, migrating just faster than bromphenol blue.

Because REDTaq is formulated at one unit per microliter, it's easier to pipette accurately. A uniform amount of enzyme added ensures consistency in the amount of end product.

Sigma, St. Louis, MO

Reader Service No. 229



Bell Labaratories, Inc.

Protecta LP Equipped with New Vertical Bait Securing Rods

Bell Laboratories now equips its tamper-resistant Protecta LP Bait Station with three vertical bait securing rods that hold Bell's 20-gram and 1-oz. extruded Blox securely in the bait station, even if it is moved.

Bell's Final, Contrac, Ditrac and Detex Blox easily slip onto the 3-inch metal rods, reducing the service time for technicians. Once the lid on the Protecta LP is closed, the vertical rods are locked in place.

As an added plus, the rods hold the bait upright, reducing the chance of the Blox melting off the rods in excessively hot weather or baiting conditions.

Bell's bait securing rods, add extra protection in sensitive areas by preventing rodents from translocating bait to their nests and by keeping people and wildlife from shaking the bait out of the bait station.

Bait securing rods also extend the life of the Blox by elevating it above the floor of the bait station, away from any moisture buildup. Slugs and chewing insects, such as grasshoppers and. roaches, are also less likely to attack an elevated, secured bait.

Bell Laboratories, Inc., Madison, WI

Reader Service No. 230

Ecolab Recognizes the Worker as a Critical Control Point

As much as 30 percent of all foodborne contamination is a direct result of insufficient personal hygiene. That means hand and boot washing are key components of a plant's effective food safety program. Ecolab's new EcoCare™ personnel hygiene program helps plants reduce the risk of contaminating the foods and beverages they process.

EcoCare includes a complete line of hand cleaners and sanitizers, doorway sanitizing systems, and state-of-the-art touchless dispensers combined with valuable worker training. Ecolab's doorway system should be installed in doorways leading into the production plant floor to provide an automatic sanitizing spray or sanitizing foam blanket for worker's boots and shoes and the wheels of plant equipment. Touchless handcleaning and hand sanitizing dispensers ensure that workers use the correct amount of soap and sanitizer and eliminate conventional dispensers' potential for spreading germs. The systems feature color-coded bilingual labels with easy-to-understand icons.

Many production floor employees are unaware of the invisible nature of deadly microorganisms. They may not be sure whether they have scrubbed long enough to kill all the bacteria on their hands or understand the importance of eliminating contaminants from their boots and plant equipment wheels.

To help workers know how well they're cleaning their hands, the EcoCare hands-on training materials include a specially formulated lotion that is applied

to a worker's hands before washing. When the worker's hands are examined under an ultraviolet light after washing, missed areas will glow. The lotion, EcoCare 700, gives a graphic illustration of how microbial bacteria can get capped under fingernails, cuticles and in wrinkles on the skin when hands are not properly washed.

The EcoCare program has five levels of soaps and sanitizers that are gentle to the skin and meet USDA criteria. Unique packaging ensures that the soaps, sanitizers and lotions remain contaminant-free.

Ecolab Inc., St. Paul, MN

Reader Service No. 231

Check Thermometer Accuracy with New Calibration Blocks at Critical Temperatures!

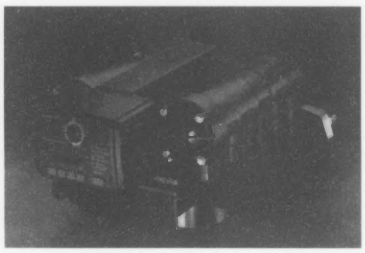
Thanks to new patented Temperature Calibration Blocks, food quality and safety professionals can easily ensure thermometer accuracies at important temperature points rather than the typical 310°F (0.0°C) ice point. This eliminates the skill and time needed to prepare "ice slurry cups" for thermometer calibration checks, and also gives lab traceability.

A Calibration Block is available for each of these important temperatures: 160.0°F, cooking temperature for thermal sterilization, killing pathogenic bacteria; 140.0°F the lowest temperature for hot-serving pans/ buffets since bacterial growth increases markedly below this level; and 40.0°F, the highest temperature allowed for refrigerated food to maintain reduced bacterial growth.

The patented Calibration Blocks are held at their stated level ±0.5°F, with a stability of ±0.3°F, traceable to NIST. By returning the block to the manufacturer annually, the NIST certification can be maintained as "current." The block is designed for widely used ~1/8" diameter probe tips up to 0.15" diameter. The tips should be inserted approximately four inches into the block cavity to avoid emergent stem error. Any such error is easily seen by increasing immersion depth until no further change is seen. A wrench is supplied to grip and turn most bimetal thermometer heads while their adjustment nuts are held locked into the cavity cover-plate allowing rapid adjustment calibration.

All QA Products, Inc., Gainesville, FL

Reader Service No. 232



Osmonics

New 2-Inch Magnum Control Valve Simplifies Installation and Service

The new Autotrol® Magnum Cv™ PLUS control valve from Osmonics features 2-inch inlet and outlet connections which simplify installation and use with high volume water softeners and filters.

The Magnum CV PLUS offers valve connections which extend from the back of the valve. In addition to saving space and providing a clean appearance, the rear ports allow the installer to hang the connecting pipes from the wall instead of the ceiling, simplifying installation and maintenance. The 2-inch inlet and outlet port is a standard size for most connections and has become a requirement for plumbing codes in many states.

Osmonics, Minnetonka, MN

Reader Service No. 233

Air Filtration System Offers Users Clean, Dry Compressed Air

The Model 180 Extractor/Dryer® Filtration System from La-Man® removes tiny particles of dirt, dust, oil, rust, and moisture from compressed air lines simply, economically and without an additional power supply. It is ideal for the larger demands of applications such as sandblasting and paper mill operations.

The Model 180 features a two-stage filtration system. In the first stage, a coalescing effect occurs as compressed air passes through a cartridge mesh filter that captures larger contaminants and causes moisture to form larger droplets. The air then enters the extraction chamber where particles collect and moisture condenses on the honeycomb. This particle-laden water flows along the bottom and out the drain. In the second stage, air passes through a wire supported fiber filter cartridge where any remaining moisture and contaminants are dried and filtered. The result is clean and dry exhaust air that won't disrupt air equipment operation.

Airflow capacity for the Model 180 is 500 SCFM with a maximum pressure of 150 PSIG. Dew points range from 10° to 35°F at atmosphere. The 180 comes standard with a 5-micron rating, with lower micron ratings available.

Additional features of the Mode180 include 2" NPT side ports and a weep drain. Other options include a float drain, an electronic drain and a differential pressure gauge.

La-Man Corporation, Port Orange, FL

Reader Service No. 234

BusinessExchange

Services/Products

COMPLETE LABORATORY SERVICES

Ingman Labs, Inc.
2945 - 34th Avenue South
Minneapolis, MN 55405
612-724-0121

Reader Service No. 153

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Reader Service No. 215

Employment Opportunities

Sales and Technical Marketing

Molecular Diagnostics and Microbiology

Our client is a highly entrepreneurial subsidiary of a Fortune 100 Corporation. Based upon enthusiastic acceptance by industry leaders, the Company is aggressively expanding its genetics-based microbial detection and analysis business. Multiple openings exist for both Sales Representatives and Technical Account Managers. The Company develops and manufactures proprietary, fully automated, leading edge systems that are changing the way food and pharmaceutical companies monitor and control product quality.

Technical Account Managers: Incumbents will have broad responsibilities related to technical marketing and support of the Company's genetics-based microbial detection systems. Working as part of sales-marketing team, Technical Account Managers will utilize industry knowledge (food or pharmaceuticals) and technical expertise to support the selling effort and educate prospects regarding the application and benefits of the Company's products. Incumbents will assume primary responsibility for system installation, user training and support/expansion of product applications throughout the customers' operations. Technical Account Managers will effectively utilize and coordinate Company resources to achieve these objectives.

Requirements: MS or Ph.D. in Microbiology, Molecular Biology or a closely related field. Minimum of 5 years relevant experience in the food or pharmaceutical industry. Intimate knowledge of quality issues, challenges and methods in the target market(s). Must have demonstrated effectiveness as both a team member and leader. Excellent communication & presentation skills and general business perspective are required. Enthusiasm and a strong desire to work with new technology are essential.

Sales Representatives: Incumbents, working as part of a sales-marketing team, will be responsible for "missionary selling" to target accounts where you will introduce new concepts/processes for quality control and microbial detection made possible by our client's products. Sales Representatives will develop and implement strategies to effectively sell instruments and consumables systems at the executive, dept head and laboratory manager levels.

Requirements: BS required, strong preference for the life sciences. Minimum of 2 years relevant experience selling to food, pharmaceutical or hospital customers. Candidates must be team oriented, comfortable with leading edge technology and effective dealing at all levels (executive to laboratory technician). Consultative selling experience, knowledge of microbiological testing methods/products and QC/QA are highly desirable. Excellent communication & presentation skills are required.

For immediate consideration, submit CVs or resumes to:
Korban Associates
312 W. State Street
Kennett Square, PA 19348
FAX: 610-444-8612
Email: HYPERLINK mail to:korbanro@korban.com

All inquiries are confidential. EOE.

IAMFES ANNUAL MEETING

86th Dearborn • Michigan

EVENT INFORMATION

EVENING EVENTS

Cheese and Wine Reception
Sunday, August 1, 1999, *(8:00 p.m. – 10:00 p.m.)*

An IAMFES tradition continues for attendees and guests. The reception begins immediately following the Ivan Parkin Lecture on Sunday evening in the exhibit hall.

Exhibit Hall Reception
Monday, August 2, 1999, *(5:00 p.m. – 6:30 p.m.)*

Relax with colleagues and friends in the exhibit hall at the end of the day. Exhibitors showcase the latest developments in the industry at an informal reception.

Historical Adventures
Monday, August 2, 1999, *(6:00 p.m. – 9:30 p.m.)*

Ride a carriage back into history at the Greenfield Village living museum. Discover what inspired inventors Henry Ford, Thomas Edison and Orville and Wilbur Wright. Gather around the antique carousel. Enjoy dinner and spend the evening with friends.

An Evening in Wine Country
Tuesday, August 3, 1999, *(5:30 p.m. – 10:30 p.m.)*

A quiet country evening begins in surroundings reminiscent of an "Old World" wine cellar at Pelee Island Winery, located near Kingsville, Ontario. Then tempt your taste buds in the tropical gardens of Colasanti while exotic birds call to you from the wild.

(When traveling to Canada, proof of citizenship such as voter's registration, passport, or birth certificate is required.)

Take Me Out to the Ballgame
Tuesday, August 3, 1999, *(6:00 p.m. – 10:30 p.m.)*

Cheer yourself silly as the Detroit Tigers take on the Chicago White Sox in one of the oldest baseball stadiums in the U.S. When the game is over, you can claim be one of the last fans to visit the original Tiger Stadium before it closes. Tickets and round trip bus transportation included.

IAMFES Awards Banquet
Wednesday, August 4, 1999, *(6:00 p.m. – 10:00 p.m.)*

A special occasion to formally recognize the accomplishments of deserving food safety professionals. An elegant reception and dinner are followed by the awards ceremony. Business attire requested.

TOURS

Great Lakes and "Motor City" Culture
Sunday, August 1, 1999, *(9:30 a.m. – 3:00 p.m.)*

Belle Isle, a 1000 acre island park, beckons you to visit the Dossin Great Lakes Museum and other cultural attractions. Tour the Coast Guard Station on the Detroit River. Then it's smooth sailing to lunch on the waterfront at Sinbad's restaurant. Start your engines at the interactive "Motor City Exhibition" in the Detroit Historical Museum. Race to explore your favorite destinations including the Detroit Institute of Art, the Museum of African American History and the Detroit Science Center.

At Home with the Auto Barons
Monday, August 2, 1999, *(9:30 a.m. – 3:30 p.m.)*

Just for a day, imagine you are a guest in Fair Lane, the 15th and final home of Henry Ford. Stroll through the same 56 rooms, 15 baths and 8 fireplaces as some of the world's most influential people.

Don't forget your invitation for lunch at the Eleanor and Edsel Ford Estate, located on the shores of Lake St. Claire. Architect Albert Kahn created a sense of the English countryside in the home at Grosse Point. Inside, original masterpieces line the walls. Your tour includes the home, the scenic gardens, the pool-house, the garage with Mrs. Ford's custom-built 1952 Lincoln Town Car, and the children's playhouse.

All Things Canadian
Tuesday, August 3, 1999, *(9:30 a.m. – 3:30 p.m.)*

Watch as world famous Canadian Club Whiskey is produced at the Hiram Walker & Sons distillery. Then stroll through the classical Jackson Park gardens featuring over 12,000 rose bushes in bloom. Soak up the local flavor during lunch at a restaurant in downtown Windsor, Canada. Step inside the log cabin used as terminal of the Underground Railway built by fugitive slave John Freeman Walls.

(When traveling to Canada, proof of citizenship such as voter's registration, passport, or birth certificate is required.)

GOLF TOURNAMENT

FORE! Best-Ball Golf Tournament
Sunday, August 1, 1999, *(6:00 a.m. – 2:00 p.m.)*

A swinging good time at the newest golf course in the area — the Inkster Golf Course. You don't even need to know how to play to win a prize. Golf, transportation, breakfast, lunch and prizes all included in your registration fee.

GENERAL INFORMATION

IAMFES 86th ANNUAL MEETING
AUGUST 1-4, 1999
DEARBORN, MICHIGAN

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

■ Meeting Information

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

Registration includes:

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

■ Registration Information

Please mail the registration form with payment today. Registrations post-marked after July 1, 1999 must pay the late registration fee. Checks should be made payable to: IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2863, USA. For faster service, use your credit card and call 800.369.6337, or fax the completed registration form with credit card information to 515.276.8655.

■ Refund/Cancellation Policy

Registration fees, minus a $50 processing charge and any applicable bank charges, will be refunded for written cancellations received by July 15, 1999. **No refunds will be made after July 15;** however, the registration may be transferred to a colleague with written notification. Refunds will be processed after August 6, 1999.

■ Hotel Information

For reservations, contact the hotel directly and identify yourself as an IAMFES Annual Meeting attendee to receive a special rate of $102 per night, single or double. Make your reservations as soon as possible, this special rate is available only until July 2, 1999.

Hyatt Regency Dearborn
Fairlane Town Center
Dearborn, Michigan 48126
Phone: 313.593.1234; Fax: 313.593.3366

■ EVENTS

(See the preceeding page for detailed descriptions)

■ Evening Events

Sunday, August 1, 1999
Cheese and Wine Reception *(8:00 p.m. – 10:00 p.m.)*

Monday, August 2, 1999
Exhibit Hall Reception *(5:00 p.m. – 6:30 p.m.)*
Historical Adventures *(6:00 p.m. – 9:30 p.m.)*

Tuesday, August 3, 1999
An Evening in Wine Country *(5:30 p.m. – 10:30 p.m.)*
Take Me Out to the Ballgame *(6:00 p.m. – 10:30 p.m.)*

Wednesday, August 4, 1999
IAMFES Awards Banquet *(6:00 p.m. – 10:00 p.m.)*

■ Tours

Sunday, August 1, 1999
Great Lakes and "Motor City" Culture
(9:30 a.m. – 3:00 p.m.) (Lunch included)

Monday, August 2, 1999
At Home with the Auto Barons
(9:30 a.m. – 3:30 p.m.) (Lunch included)

Tuesday, August 3, 1999
All Things Canadian
(9:30 a.m. – 3:30 p.m.) (Lunch included)

■ Golf Tournament

Sunday, August 1, 1999
FORE! Best-Ball Golf Tournament *(6:00 a.m. – 2:00 p.m.)*

MEMBERSHIP RATES

	UNITED STATES	CANADA/ MEXICO	INTERNATIONAL
Membership with *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation* (Student Membership)*	**$140.00** ($70.00)	**165.00** ($95.00)	**$210.00** ($140.00)
Membership with *Dairy, Food and Environmental Sanitation* (Student Membership)*	**$85.00** ($42.50)	**$95.00** ($52.50)	**$110.00** ($67.50)
(Student Membership* with *Journal of Food Protection*)	($42.50)	($57.50)	($87.50)

**Full-time student verification required*

All prices include Shipping & Handling

Prices effective through August 31, 1999

FOR OFFICE USE
First initial Last name
Registration # DFES

REGISTRATION FORM

IAMFES 86th Annual Meeting August 1-4, 1999 Dearborn, Michigan

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

Title Employer

Mailing Address (Please specify: ❒ Home ❒ Work)

City State/Province Country Postal/Zip Code

Telephone Fax E-mail

IAMFES Member since: 19____

Regarding the *Americans with Disabilities Act*, please indicate special requirements you may have. _____

REGISTER BY JULY 1, 1999 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES:	MEMBERS	NONMEMBERS	AMOUNT
Registration (Awards Banquet included)	$ 245 ($295 late)	$365 ($415 late)	
IAMFES Student Member*	$ 40 ($ 50 late)	Not Available	
Retired IAMFES Member*	$ 40 ($ 50 late)	Not Available	
One Day Registration: ❒ Mon. ❒ Tues. ❒ Wed.	$ 125 ($150 late)	$180 ($205 late)	
Spouse/Companion (Name): _____	$ 35 ($ 35 late)	$ 35 ($ 35 late)	
Children 15 & Over (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	
Children 14 & Under (Names): _____	FREE	FREE	

*Awards Banquet not included

EVENTS:		# OF TICKETS	
FORE! Best-Ball Golf Tournament (Sunday, 8/1)	$ 80 ($ 95 late)		
Historical Adventures (Monday, 8/2)	$ 39 ($ 44 late)		
Children 14 and under	$ 29 ($ 34 late)		
An Evening in Wine Country (Tuesday, 8/3)	$ 49 ($ 54 late)		
Take Me Out to the Ballgame (Tuesday, 8/3)	$ 22 ($ 27 late)		
IAMFES Awards Banquet (Wednesday, 8/4)	$ 40 ($ 45 late)		

TOURS:			
Great Lakes and "Motor City" Culture (Sunday, 8/1)	$ 45 ($ 51 late)		
At Home with the Auto Barons (Monday, 8/2)	$ 42 ($ 47 late)		
All Things Canadian (Tuesday, 8/3)	$ 43 ($ 48 late)		

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

TOTAL AMOUNT ENCLOSED _____

(CHECK PAYABLE TO IAMFES — US FUNDS ON US BANK)

International Association of Milk, Food and Environmental Sanitarians
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA
Phone: 800.369.6337; 515.276.3344
Fax: 515.276.8655; E-mail: iamfes@iamfes.org

Credit Card Payments:

❒ VISA ❒ MasterCard ❒

Card # | | | | | | | | | | | | | | | | |

Exp. Date _____

Name on Card _____

Signature _____

EXHIBITORS DO NOT USE THIS FORM

ComingEvents

FEBRUARY

·**3-4, 1999 Food Sanitation Workshop,** Doubletree Hotel, Modesto, CA. This two-day workshop is designed for all levels of personnel in the food industry directly or indirectly involved with sanitation. A supplier exhibit is included on the first day. Contact Dr. Linda Harris, Department of Food Science & Technology, University of California, Davis, CA 95616; 916.754.9485; E-mail: ljharris@ucdavis.edu.

·**5, Train the Trainer — Techniques for Educating Adults in Sanitation**, Doubletree Hotel, Modesto, CA (limited enrollment). This half-day workshop will cover the basics of adult education theory and will provide participants with the tools to deliver effective training sessions. Focus will be on sanitation training. Contact Dr. Linda Harris, Department of Food Science & Technology, University of California, Davis, CA 95616; 530.754.9485; E-mail: ljharris@ucdavis.edu.

·**6-8, United 99, United Fresh Fruit & Vegetable Association 95th Convention & Exposition,** San Diego Convention Center, San Diego, CA. For more information, call 703.836.3410; Fax: 703.836.7745.

·**14-17, National Mastitis Council 38th Annual Meeting,** Arlington, VA. For additional information, contact National Mastitis Council, 2820 Walton Commons West, Suite 131, Madison, WI 53718-6797; Phone: 608.224.0622; Fax: 608.224.0644.

·**16, Georgia Assn. of Food & Environmental Sanitarians Meeting.** For additional information, contact Judy Harrison at 706.542.3773; Fax: 706.542.1979; E-mail: judyh@arches.uga.edu.

·**16-18, Kentucky Assn. of Dairy, Food & Environmental Specialists Affiliate Meeting,** for additional information, contact James Wesley at Lake Cumberland District Health Dept., P.O. Box 800, Somerset, KY 42502.

·**23-26, Better Process Control School,** University of California, Davis. Aimed toward high-acid food cannery employees, retort operators, seam closure operator, and food processing industry, this course examines microbiology of canning, still retorts, aseptic processing and packaging systems. For registration call 800.752.0881, Dept. 2406 or 530.757.8777. For program information, contact Diane Barrett at 530.752.4800; E-mail: dmbarrett@ucdavis.edu.

·**24-25, California Association of Dairy and Milk Sanitarians Affiliate Annual Meeting,** Sacramento, CA. For additional information, contact John Bruhn at 530.752.2191.

·**25, Ontario Food Protection Association Spring Technical Meeting**. For further information, contact Bill Boylan at 905.403.5055.

MARCH

·**10, Dairy HACCP Workshop,** Madison, WI. This one-day workshop will cover design and implementation of HACCP plans in dairy plants. For additional information, contact the Program Coordinators or Dept. of Food Science, University of Wisconsin-Madison, Madison, WI 53706-1565; Phone: 608.262.3046; Fax: 608.262.6872.

·**10-12, Michigan Environmental Health Association 54th Annual Educational Conference**. For further information, contact Chuck Lichon at 517.832.6656.

·**10-12, Practical HACCP for Food Processors,** Sponsored by Silliker Laboratories Group, Inc. Waterfront Hilton, Huntington Beach, CA. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800.829.7879; 708.957.7878; Fax: 708.957.8405.

·**16-17, Basic Food Microbiology Seminar,** Holiday Inn, Portland Airport, Portland, OR. This course will introduce the participant to the fundamental characteristics of microorganisms and relate the application of microbiology to foods, food safety, and sanitation. For additional information, contact Jack Brook, Mt. Hood Community College, 26000 SE Stark St., Gresham, OR 97030; Phone: 503.491.7473; Fax: 503.491.7389; E-mail: brookj@mhcc.cc.or.us.

·**22-24, Principles of Quality Assurance Seminar,** Manhattan, KS. This seminar provides basic instruction and examples for developing a quality assurance program. For more information or to enroll, contact AIB, 1213 Bakers Way, P.O. Box 3999, Manhattan, KS 66505-3999; Phone: 785.537.4750; Fax: 785.537.1493; Web site: aibonline.org.

·**22-26, Laboratory Methods in Food Microbiology,** held at Silliker Laboratories' Corporate Research Center, Teaching Laboratory, South Holland, IL. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800.829.7879; 708.957.7878; Fax: 708.957.8405.

·**29-1 April, IAFIS Annual Conference,** Westin Rio Mar Beach Resort and Country Club, Rio Grande, Puerto Rico. The Conference Committee has formulated a program that will incorporate the traditional Conference networking, Association business, and well-known speaker presentations with an in-depth look at the current business practices of member companies, and how they can be improved. For additional information, contact IAFIS, 1451 Dolley Madison Blvd., McLean, VA 22101-3850; 703.761.2600; Fax: 703.761.4334.

APRIL

·**7-8, Introduction to Microbiological Criteria and Sampling Plans,** Omni Netherland Plaza, Cincinnati, OH. Sponsored by Silliker Laboratories Group, Inc. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800.829.7879; 708.957.7878; Fax: 708.957.8405.

·**7-9, Missouri Milk, Food and Environmental Health Association Annual Educational Conference,** Ramada Inn, Columbia, MO. For further information, contact Steve St. Clair, Phone: 573.221.1166 or 1167; Fax: 273.221.1214.

·**8-12, Canadian Institute of Public Health Inspectors Educational Conference**, Vancouver, B.C. For additional information, contact Richard Taki, Promotions Chair at 604.736.2866; Fax: 604.736.8651; E-mail: bcciphi@cnx.net.

·**8-10, Introduction to Statistical Methods for Sensory Evaluation of Foods,** University of California-Davis, Davis, CA. This course introduces statistical analysis to the beginning sensory scientist as well as being an excellent update on applying statistical procedures for the experienced professional. For additional information, contact Michael O'Mahoney at 530.752.6389; E-mail: maomhony@ucdavis.edu.

·**12-13, An Insider's Look at Microbial Risk Assessment Workshop,** DoubleTree Hotel, National Airport, Arlington, VA. This workshop will compare and contrast two risk assessments conducted to address the risk of *Salmonella* Enteritidis in shell eggs to illustrate how different data and assumptions can impact the resulting risk estimates. For further information, contact IAMFES at 515.276.3344; Fax: 515. 276.8655; E-mail: iamfes@ iamfes.org.

·**12-14, Sensory Evaluation: Overview and Update,** University of California-Davis, Davis, CA. Designed for both the beginner and experienced professional, this course will give an overview on why tests can be set up in some ways and not in others, enabling the professional to modify and custom-design techniques specific to the product being tested. For additional information, contact Michael O'Mahony at 530.752.6389; E-mail: maomhony@ucdavis.edu.

·**13-14, Microbiological Concerns in Food Plant Sanitation & Hygiene,** San Antonio, TX. Sponsored by Silliker Laboratories Group, Inc. For additional information, contact Silliker Laboratories, Education Services Dept., 900 Maple Road, Homewood, IL 60430; Phone: 800. 829.7879; 708.957.7878; Fax: 708. 957.8405.

·**19, International Dairy Federation Symposium,** Convention Centre, Ottawa, Canada. The symposium will deal with the subject of Laboratory Accreditation and Proficiency Testing. For additional information contact, International Dairy Federation, Secretariat, 41 Sqaure Vergote, B-1030 Bruxelles, Belgium or Fax: 32 2 733 04 13; E-mail: Info@fil-idf.org; Web site: www.fil-idf.org.

MAY

·**3-5, First NSF International Conference on Indoor Air Health: Impacts, Issues and Solutions,** Marriott Tech Center in Denver, CO. This new conference explores the contrasting and complementary viewpoints of medical, scientific, academic, laboratory, regulatory and industry forces focused on critical indoor air health issues. For additional information, contact Wendy Raeder by Phone: 734.769.8010 ext. 205; Fax: 734.769.0109; E-mail: raeder@nsf.org.

·**6-12, 15th International Trade Fair for Packaing Machinery, Packaging and Confectionery Machinery,** in Düsseldorf, Germany. For further information, contact Dusseldorf Trade Shows, Inc., 150 N. Michigan Ave., Suite 2920, Chicago, IL 60601 or Phone: 312.781.5180; Fax: 312.781.5188; Web Site: www.dtsusa.com/dts/.

·**12-14, Food Irradiation 99 Conference—The Solution to the Food Safety Crisis,** Sheraton National Hotel, Arlington, VA. This international conference will present an examination of the business and technical outlook for food irradiation as a solution to the growing global problem of food safety. For further information, contact Deborah Crommett, Conference Coordinator, Intertech Conferences, 411 US Route One, Portland, ME 04105 or Phone: 207.781. 9800; Fax: 207.781.2150; E-mail: info@intertechusa.com or www.intertechusa.com.

·**18-19, Aseptic Processing and Packaging Introductory Workshop,** University of California-Davis, Davis, CA. This course focuses on the engineering, microbiological and chemical principles related to aseptic processing. Hands-on laboratories allow participants to learn methods of aseptic product quality evaluation, packaging and equipment particulars. For further information, contact Diane Barrett at 530.752. 4800; E-mail: dmbarrett@ucdavis.edu.

·**20, Advanced Aseptic Processing and Packaging,** University of California-Davis, Davis, CA. As a continuation of the 2-day introductory workshop, this course will focus on heat penetration and distribution, process deviation and recommendations, and a computerized program for calculating thermal processes is demonstrated. For further information, contact Diane Barrett at 530.752. 4800; E-mail: dmbarrett@ucdavis.edu.

·**24-26, 3rd International Symposium on Recombined Milk and Milk Products,** Penang, Malaysia. The symposium will seek to discuss and review issues facing the milk recombination industry, the need for the industry to keep pace with the challenges of the future, and product development opportunities presented by the introduction of new technologies and emerging markets. For further information, contact Alison Johnson, The Secretariat, 3rd International Symposium on Recombined Milk and Milk Products, Private Bag 16, Werribee, Victoria Australia, 3030 or Phone: 61 3 9742 0117; Fax: 61 3 9742 0201; E-mail: alison.johnson@foodscience.afisc.csiro.au.

ADVERTISING INDEX

CONGRATULATIONS

In November of 1998, IAMFES participated in the NSF International Conference on Food Safety in Albuquerque, New Mexico. While exhibiting, we offered a one-year Membership with IAMFES. We are pleased to announce the following winners of the drawing:

Kirk W. Martin, Harvard University
Cambridge, MA

Melissa J. Lain, Aramark
New Orleans, LA

IAMFES hopes these new Members find their Membership rewarding.

We would like to take this opportunity to thank all attendees who stopped by our booth while at the NSF Conference.

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103	118	133	148	164	178	193	208	223	238	253	268	283	298	313	328	343
104	119	134	149	165	179	194	209	224	239	254	269	284	299	314	329	344
105	120	135	150	166	180	195	210	225	240	255	270	285	300	315	330	345
106	121	136	151	167	181	196	211	226	241	256	271	286	301	316	331	346
107	122	137	152	168	182	197	212	227	242	257	272	287	302	317	332	347
108	123	138	153	169	183	198	213	228	243	258	273	288	303	318	333	348
109	124	139	154	170	184	199	214	229	244	259	274	289	304	319	334	349
110	125	140	155	171	185	200	215	230	245	260	275	290	305	320	335	350
111	126	141	156	172	186	201	216	231	246	261	276	291	306	321	336	
112	127	142	157	172	187	202	217	232	247	262	277	292	307	322	337	
113	128	143	158	173	188	203	218	233	248	263	278	293	308	323	338	
114	129	144	160	174	189	204	219	234	249	264	279	294	309	324	339	

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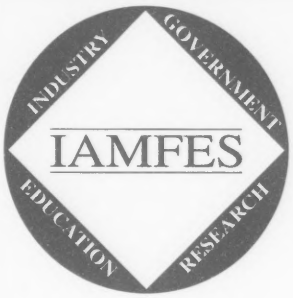

Invite A Colleague to Join

The International Association of Milk, Food and Environmental Sanitarians, founded in 1911, is a non-profit educational association of food safety professionals with a mission *"to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."*

❋ *Who Should Join?*

The Association is comprised of a diverse membership of 2,900 people from 50 nations. IAMFES Members belong to all facets of the food protection arena including: Industry, Government and Academia.

❋ *Why Should They Become an IAMFES Member?*

Dairy, Food and Environmental Sanitation — A reviewed monthly publication that provides practical and applied research articles and association news, updates, and other related information for food safety professionals. All IAMFES Members receive this publication as part of their Membership.

Journal of Food Protection — An international, refereed scientific journal of research and review papers on topics in food science and food aspects of animal and plant sciences. This journal is available to all individuals who request it with their Membership.

The IAMFES Lending Library — Provides quality training videos dealing with various food safety issues. IAMFES Members are allowed free use of these videos.

The IAMFES Annual Meeting — Is a unique educational event; three days of technical sessions, symposia and exhibits provide attendees with over 250 presentations on current topics in food protection. IAMFES Members receive a substantially reduced registration fee.

❋ *Help Others Find Out About IAMFES...*

To learn more about IAMFES and the **many** other benefits and opportunities available to a Member, visit our Web site: www.iamfes.org or please call 515.276.3344 or 800.369.6337; Fax: 515.276.8655; E-mail: iamfes@iamfes.org. We will be happy to send new Member information if you provide us the necessary mailing information.

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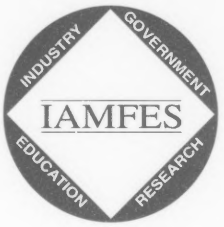

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