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DAIRY, FOOD AND ENVIRONMENTAL

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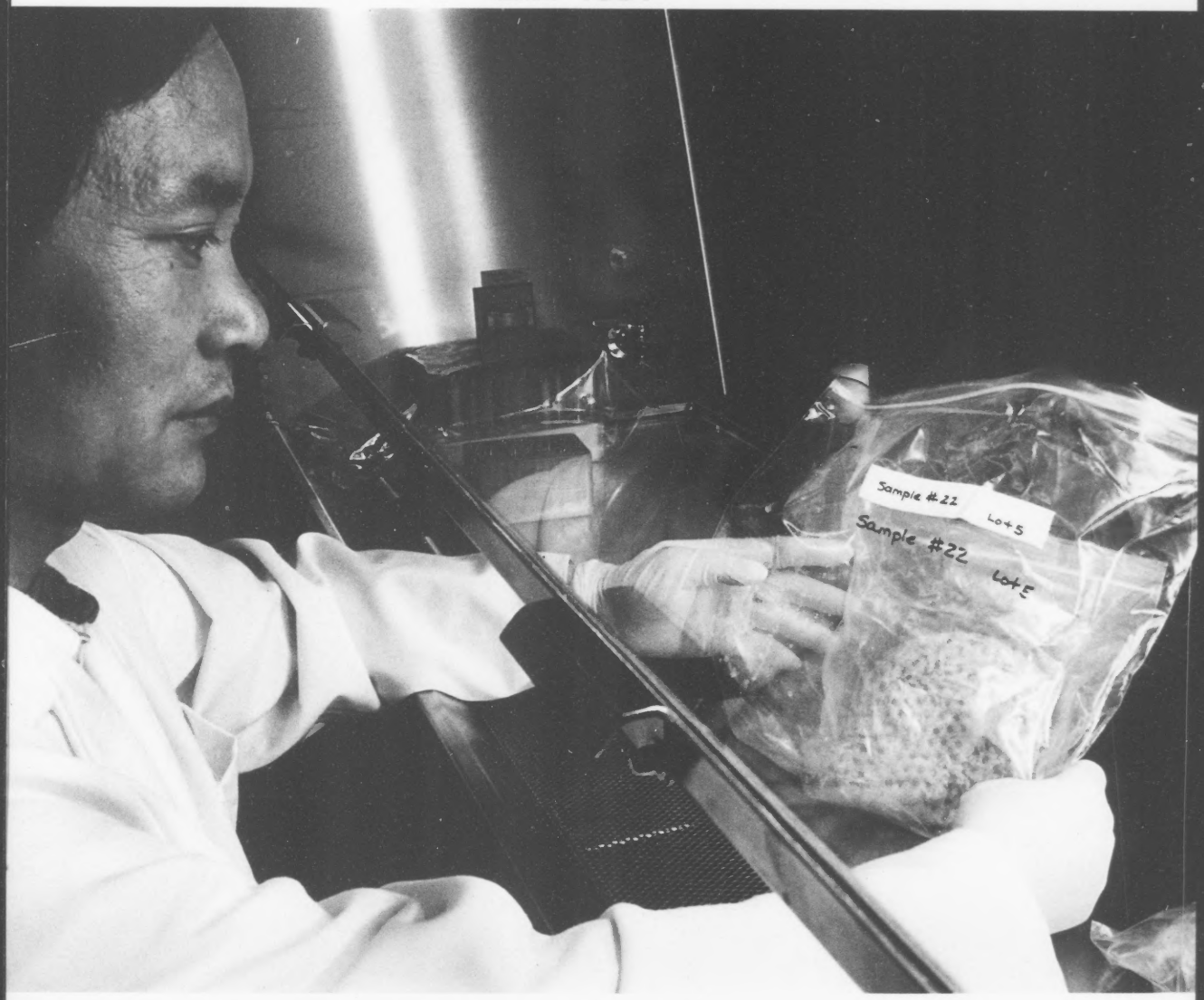
MAY 1994



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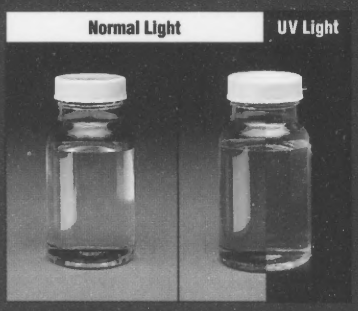

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Association News:

ABOUT THE COVER ... *Dr. Tong Z showing hamburger pattie suspected to contain* Escherichia coli O157:H7. *Photo courtesy of the Center for Food Safety and Quality Enhancement, University of Georgia, Griffin, GA.*

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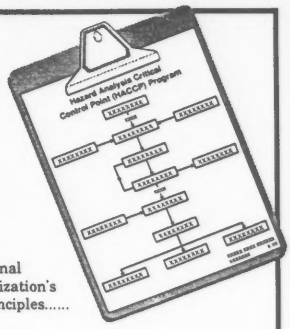

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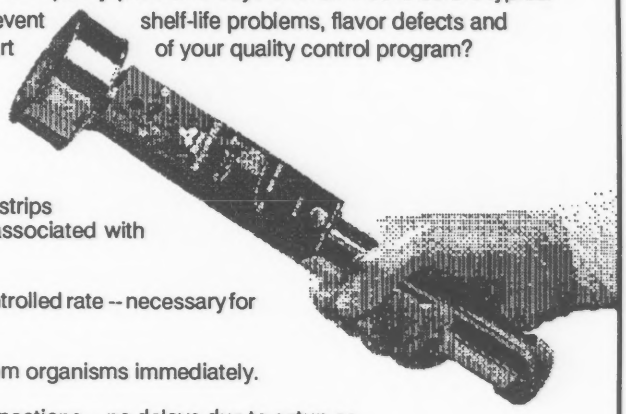

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Thoughts From the President . . .

By
Harold Bengsch
IAMFES President

I well remember one of the first experiments I performed in bacteriology involving oligodynamic action of heavy metals. How I then selected the most resistant organisms and observed a strain of microbes steadily developing increased resistance to ever increasing concentrations of heavy metals.

Today, similar observations are being seen worldwide but not with regard to resistance to heavy metals. Rather, these observations involve sick patients whose bacterial infection is not responding to first-line antibiotic therapy.

The so-called arsenal of miracle drugs (antibiotics) is rapidly growing smaller and smaller. As we entered the decade of the 80s, some writers were speculating that this decade would see the conquering of most infectious diseases. Even as those articles were appearing in the secular press, we were seeing an ever escalating occurrence of microbial drug resistance. Now in the decade of the 90s we are faced with most pathogenic bacteria being resistant to at least one of the 100 plus arsenal of antibiotics.

One might rightfully ask, what has this to do with environmental sanitation? The answer is, everything! An ever increasing population of the so-called super bugs is associated with foods and food production environments.

If we as practitioners of food safety and environmental health simply rely upon the pharmaceutical industry to bail us out with development of the next miracle drug, we may be in for a big surprise. Along with dwindling federal funds for antibiotic research, there has been a companion slow down on the part of big pharmaceutical companies to look for another magic bullet. According to Dr. George Miller at Shering-Plough even attempts to derail this complicated defense mechanism of bacteria, "will not do much more than buy us 5 to 10 years".

Where then does our profession fit into the equation of the drug-fastness phenomena of many species of bacteria? If ever preventive medicine is the order of the day, it finds its calling in the challenge posed by drug-fast microbes. The need has never been greater nor the stakes higher in meeting the challenge for preventing bacteriological infection from occurring in the first place. What is the major and frontline defense for this challenge? Personal hygiene, environmental sanitation, food and water protection, and sanitary waste disposal. If meaningful Health Care Reform is to occur, that reform must contain support for this first line of defense.

Haven't these areas of our profession always been important? Now as never before they have become ALL important. Isn't that what our profession is all about? Until next month.

On My Mind . . .

By
Steven K. Halstead, CAE
IAMFES
Executive Manager

is the IAMFES Mission Statement ...

To the casual observer, the fact that IAMFES has a Mission Statement may not seem like a big deal at all. To your officers and to the IAMFES staff, however, it is a very big deal. Why? Because it tells us who we are and why we exist.

Our Mission Statement was a product of our Strategic Long-Range Planning efforts. When the planning facilitator told me that we would be developing a mission statement, I was somewhat less than enthused because of a previous experience I had with mission statements.

Several years ago, the state-level leaders of my church — and perhaps the original direction had come from the national church — decided that it would be a good thing if each local church had a mission statement.

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

Thus, I found myself on the "mission statement committee" with the charge to "develop a mission statement for us." No more instructions than that. They could have at least said; "In 25 words or less ..."

It was about that time that I discovered that neither I nor anyone else on the committee had any idea what a mission statement was! The clergy wasn't of much help either, so through the magic of a word processor, we banged out a series of one-line statements about our church. The committee then took a word here, another from there, and yet another from over there and somehow put them together into a coherent phrase. Granted it was a feel good phrase with its share of "psycho babble," but it did say a great deal about what we wanted to accomplish. Even more surprising, the congregation bought into it without so much as a changed word!

With that kind of ghost haunting me, I think you can appreciate my trepidation at the idea of developing a mission statement for the association. I was soon to find out that the process is a lot different when you have a facilitator who knows what he/she is doing.

When IAMFES set out to develop its mission statement, we already had our homework done. The Strategic Long-Range Planning Task Force had spent a day determining what we did and did not know about our association. A consulting firm had been hired to do telephone surveys of our members and potential members and to answer as many of the "what we don't know about ourselves" questions as possible. An inch-and-a-half thick report on the survey findings was distributed to the Task Force and hours were spent analyzing the information it contained.

So when the Task Force met to develop the Mission Statement, it was ready for the challenging question, "For what purpose should IAMFES continue to exist?" Our mission statement emerged very quickly with nearly immediate consensus.

That was last August. Since then I have lived with the statement on a daily basis. I look at it at least once a day and use it to keep my focus clear. It now permeates the very thread of the association and is the litmus test that is used with every task we undertake.

Now we are ready to realize our full potential. We have a Mission. And we know what it is.

Dairy, Food and Environmental Sanitation, Vol. 14, No. 5, Pages 256-258 (May 1994)

"FDA's Plans for Food Safety and HACCP — Institutionalizing a Philosophy of Prevention"

Michael R. Taylor, Deputy Commissioner for Policy U.S. Food and Drug Administration, Room 14-95, 5600 Fishers Lane, Rockville, MD 10857

As presented at the IAMFES 80th Annual Meeting, Atlanta, Georgia, August 3, 1993, in the symposium "Microbial Concerns of the International Community Symposium" sponsored by the International Life Sciences Institute

I am grateful for the opportunity to participate in this important symposium on a topic of critical interest to the Food and Drug Administration: foodborne microbial pathogens. This program is itself a sign of the importance food companies and the scientific community attach to this topic, but the issues you are addressing are of great interest and concern to every member of the consuming public, here in the United States and throughout the world.

Other aspects of food safety, like pesticide residues in food, have tended over the years to receive more media and public attention, but safeguarding the food supply against microbiological hazards is and always has been the preeminent food safety challenge. And it is at the top of FDA's food safety agenda.

Indeed, from FDA's perspective, this symposium could not be better timed. We are today in the midst of a major effort to rethink and recast how FDA does its part in assuring the safety of the nation's food supply. And, as I shall explain, the scientific issues you are addressing and the insights you are sharing are at the heart of our effort.

I want to talk with you today about FDA's food safety plans, about how we are working to engage the food industry and the scientific community in a cooperative effort to meet the continuing food safety challenge, and about the need, if we are to do our jobs, for a strong, forward looking scientific research agenda.

Our effort at FDA comes not in response to any food safety crisis — we don't have one. It is rather in fulfillment of our continuing and collective obligation to the American public to assure that the food supply is *and remains* as safe as we are capable of making it.

While our current food safety system has served us well, it is a system under stress. New food processing and packaging technologies, new food distribution and consumption patterns, including much greater emphasis on the retail sale of prepared and ready-to-eat foods, and new strains of microbial pathogens all contribute to today's enormous food safety challenge.

The rising tide of imported foods adds to the stress our food safety system is experiencing. The overall volume of imports is rising; more and more of our imports are processed to some degree; and, in one major area, imports predominate — over half of the seafood Americans consume is imported.

Our food safety system is also under stress from the intangible but very real pressure of public expectations. Consumers expect their food to be safe. They know perfection is not achievable, but they want to know that everything that is feasible to do to produce safe food is being done. And they are ready to hold both the food industry and the government fully accountable when these expectations are not met.

Finally, the food safety system is under stress internally. FDA will never have the resources it would take to physically examine more than a small percentage of imported food shipments or to inspect domestic food establishments more than periodically. State governments, on which we rely heavily for surveillance of the growing retail sector, are also under severe resource constraints, and, while the Federal and State governments work together closely, the Jack-in-the-Box tragedy helped illustrate the gaps that exist in our nation's system of food safety assurance. Roles and responsibilities are not as well defined and as clearly delineated as they should be among all participants in the system: the producers, the processors, the transporters, the retailers and all levels of government.

We must also look critically at FDA's own food inspection system. We operate under a 55-year-old statute and an approach to food inspection that has not kept up with the changes in the food system. We enter facilities periodically; we conduct visual inspections; we sample and analyze in-process and finished product; we conduct some surveillance sampling in the marketplace; and we follow-up aggressively to correct food safety problems after they occur, by removing product from the market and being sure the offending facility is brought into compliance.

But our current system of food inspection is not well designed to *prevent* food safety problems. When we inspect a facility, we can visually determine with reasonable confidence how it is operating during the time we are there, but

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we have little basis for knowing what the conditions were prior to the inspection or for predicting with confidence what the conditions will be in the future.

So, for all these reasons, it is difficult to say we are doing everything that is feasible to do to assure the safety of the food supply.

But, how can we do better?

Fortunately, the answer seems clear. And the answer is one whose core conceptual elements we did not have to invent. I am referring, of course, to HACCP — Hazard Analysis and Critical Control Points — a concept that was invented 30 years ago and is already in use by many food companies.

At its heart, HACCP is just the application of good common sense to the production of safe food. Possible avenues of hazard are identified; appropriate preventive controls are designed and installed; the controls are monitored and records are kept to assure that the system is working properly; and, when problems occur, they are identified and promptly corrected.

But, while simple in its basic concepts, HACCP has features that make it a sophisticated and very powerful tool for meeting our food safety responsibility.

It is, first, *science based*. HACCP takes advantage of what we know scientifically to determine which potential avenues of hazard deserve focused attention.

HACCP is *preventive*. It is a systematic approach to preventing food safety problems by anticipating how they are most likely to occur and by installing measures adequate to prevent them from occurring. HACCP is not a zero risk system, but it is a system for preventing problems that *are* preventable.

HACCP *recognizes where the responsibility lies* for producing safe food. Each participant in the food production system that adopts a HACCP plan accepts responsibility for producing safe foods — for having in place a system that is *designed* to produce safe food. Finally, HACCP provides an extraordinary opportunity to link the food industry's system for producing safe food with the government's system of regulatory oversight.

We envision a transformation of Federal food inspection, based on HACCP, in which food inspectors no longer rely solely on visual inspection of facilities, laboratory examination of food, and correction of problems after the fact, but instead focus on verifying that well-designed systems of preventive controls — HACCP plans — are in place and functioning properly.

Such a transformation of food inspection has enormous potential benefits. It will make the food supply safer by preventing problems before they occur. It will enable the government to make more efficient use of its finite inspectional resources. And it will enable government to provide consumers the assurance they seek about the safety of the food supply.

Under a HACCP-based inspection system, government assurances that the food supply is safe will not have to be taken on faith by the consuming public. Our assurances will be based on the existence of *systems* that are *designed* to produce safe food and that the government can verify are working properly.

Beyond these domestic advantages, our movement toward HACCP-based inspection has important implications for international trade in food. The UN's Codex Alimentarius Commission and the European Community (EC) are in the process of adopting HACCP as the international standard for producing safe food. Beginning in 1995, all seafood exported to the EC will have to have been produced under standards certified by the exporting country and accepted by the EC as equivalent to the EC's HACCP standards. And other commodities are expected to follow.

We envision HACCP becoming in future years the central element of the harmonized food regulatory standards on which the international trade in food will depend.

Our vision for the future of HACCP — both domestically and internationally — is broad. But we do not expect to transform the world overnight. Indeed, it is critical that we pursue our vision carefully, gradually and collaboratively, and that we recognize it will take years to fully achieve our goal.

I'd like to take my few remaining minutes to describe how we are approaching the task, including some of the initial steps we plan to take, and then discuss the need for a well-focused research agenda to support the movement to HACCP.

Essential to the success of our HACCP initiative and a central theme of the approach we are taking is *collaboration*, which must occur at many levels.

We are, of course, collaborating with our sister regulatory agencies. The USDA is pursuing its own HACCP initiative for meat and poultry inspection, and I can assure you that the USDA and FDA initiatives will be coordinated and will be substantively consistent. To this end, we have been meeting and working closely with USDA at the technical level as well as at the highest political and policy levels. This collaboration is indicative of the Clinton Administration's approach to addressing important public health issues, and it will assure that HACCP is done right and done government wide.

We also will be collaborating with our state counterparts. We have already met with some state officials to discuss our HACCP plans, and we will soon be issuing an updated and unified version of our model ordinances regarding retail food-handling and sanitation, which will be HACCP-based.

And we will continue to work with our international partners to assure that the worldwide movement toward HACCP achieves both its substantive food safety goals and the goal of internationally harmonized standards for producing safe food.

HACCP is not, however, just a government program. HACCP is what the food industry does to produce safe food and so collaboration with the food industry is essential to the success of our HACCP initiative.

Our first concrete step toward HACCP will be the publication this fall of a proposal to require the adoption of HACCP plans by seafood processors. We have worked closely with the National Fisheries Institute, the principal seafood industry trade association, to develop the technical basis for our proposal, and we are pleased that NFI supports our HACCP initiative.

We also have begun serious discussions with other elements of the food industry on how best to move toward HACCP for commodities beyond seafood. The National Food Processor's Association, which is a long-time supporter of HACCP and has great technical expertise and experience in this area, is taking a leadership role. We intend to work closely with NFPA and take full advantage of the food industry's expertise as we assess how to make HACCP work best as a tool for improving federal oversight of food safety.

We also plan to engage consumer groups, public health organizations, and the scientific community as we consider our move toward HACCP. Before we propose any new rules to extend HACCP beyond seafood, we will publish a Federal Register notice inviting broad public comment on our HACCP goals and how best to achieve them.

We will leave no stone unturned in our effort to gain the widest possible input and collaboration on our HACCP initiative. That is the only way we can be sure we are getting it right.

Let me now close with some thoughts on the need for a HACCP-driven agenda for scientific research. And it really comes back to the philosophy of prevention that permeates HACCP.

Prevention's two key elements are *anticipation* of the problems to be prevented and *design of the right preventive solutions*. Prevention is active, not passive, in its approach. It involves looking for potential problems, rather than waiting for them to occur. In the context of HACCP, it involves designing solutions in advance, rather than patching up problems after they occur. It depends in short, on building and maintaining a knowledge base that stays at least one step ahead of the changes in the food system that can give rise to safety problems.

Thus, the success of HACCP and its philosophy of prevention will depend, in large measure, on the quality of the science supporting them and the ability of the scientific enterprise to anticipate problems and design solutions.

As a non-scientist policymaker, I am not here to prescribe the details of a scientific research agenda to support HACCP. It is for the scientists and those close to the food production process to do that, but the general areas in which our *knowledge curve* must stay ahead of the *problem curve* seem clear.

First there is the basic question of whether we are detecting all the microorganisms present in any particular food matrix. I'm referring to the so-called viable-but-non-culturable phenomenon. This will undoubtedly be a part of ours and others research agenda.

Related to that phenomenon may be the emerging knowledge of biofilms. We now know that bacteria can attach to what we regarded as impregnable surfaces and may be shielded from commonly used sanitizing techniques. This may be of particular importance in the home and retail settings.

Escherichia coli O157 reminded all of us tragically of the dynamism of microbial pathogens. What can we do to anticipate scientifically and thus better prevent the next "emerging" foodborne pathogen? Our research agenda needs to include a thorough study of the ecology of known pathogens and a better understanding of their genetic mechanisms.

If we are going to scientifically identify and prevent foodborne hazards, we also need to know more about the conditions that modulate the virulence of pathogenic microorganisms. We know that stressful conditions, such as extremes of pH or sublethal heat can sometimes render bacteria more virulent. These stress phenomena must be studied in the context of the stresses posed by the food matrix.

For example, *Listeria monocytogenes* is present throughout the environment, but we still don't know all we need to know about its ecology. What are the specific physical, chemical and biological conditions that make it more or less virulent? What precisely are the control measures that can reliably prevent or minimize its presence in food? Do we have the tools we need, as part of a HACCP approach, to detect and monitor the presence of *Listeria* under the various conditions that may be present in a variety of foods?

While many food safety concerns arise from the natural environment, some are created by human intervention, such as new processing, packaging and distribution techniques. HACCP contemplates that a scientific understanding of how such innovations can affect safety be developed in parallel with the new technology itself, so that, when the new technology comes on line, the appropriate preventive controls to assure safety will be in place as well.

These are questions and needs that can be met by focused, forward looking scientific research. They are questions and needs that *must* be met if the full benefits of HACCP's preventive philosophy are to be realized.

I know that when I say this to an audience of concerned scientists, I am preaching to the choir. But my message is intended for a broader audience. It includes those who must commit the funds to support this research, as well as the general public.

The lesson of every food safety event we have experienced in this country, whether it involves pesticides, environmental contaminants or microbial pathogens, is that an ounce of prevention *really is* worth a pound of cure. It is worth it because it can prevent harm to those whose health is directly affected, and it is worth it because it reduces the economic burden on those whose product lines are jeopardized and who bear the costs of compensating for and correcting food safety problems.

And the ounce of prevention HACCP provides is worth it also because it responds to the basic demand consumers make that we do everything that is feasible to do to assure the safety of food.

We now know that that means prevention. It means the application of our best science to preventing food safety problems. And, in coming years, it will mean the adoption of HACCP as the best means we have available to produce safe food.

Thank you for the opportunity to be here today.

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The Microbiology Division's Perspective on *Listeria monocytogenes*, *Escherichia coli* O157:H7 and *Campylobacter jejuni/coli*

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As presented at the IAMFES 80th Annual Meeting, Atlanta, Georgia, August 3, 1993, in the symposium "Foodborne Microbial Pathogens" sponsored by the International Life Sciences Institute

The Microbiology Division, Food Safety and Inspection Service (FSIS), has the responsibility for designing, directing, interpreting and reporting microbiological testing programs conducted by FSIS. Our scientists are also responsible for evaluating or developing suitable laboratory reference or screening methods which will enable us to carry out our regulatory mission of detecting microorganisms in U.S. meat and poultry products. Presented here is an overview of our monitoring and surveillance programs for three foodborne pathogens: *Listeria monocytogenes*, *Escherichia coli* O157:H7 and *Campylobacter jejuni/coli*.

Listeria monocytogenes

Dr. Mitchell Cohen of the Centers for Disease Control and Prevention (CDC) recently reported that the number of human cases of *L. monocytogenes* in the United States has fallen from 2,000 cases in 1986 to 1,000 cases in 1991, a reduction of 50% (*4*). Among cited contributory factors to this decline was monitoring and surveillance programs carried out by U.S. Regulatory Agencies.

This is not the first time that U. S. Department oof Aggriculture's (USDA's) monitoring and surveillance programs for either *Salmonella* spp. or *L. monocytogenes* in cooked, ready-to-eat meat and poultry products has been praised by the CDC. We do believe that our programs have contributed to public health through the recall of monitored products and to increased awareness of the dangers of this pathogen. We also believe that the reduction in cases in large part belongs to the increased, effective control programs that the industry has put forth to control the bacterium in the processing plant environment.

The reduction in numbers of cases can also be attributed to the well-informed American consumers and medical communities. Through various sources of consumer education programs, consumers are more aware of the risks taken by children, pregnant females, the immunocompromised, and the elderly in cooking high-risk foods and in improper food-handling.

Before the Microbiology Division could initiate monitoring and surveillance programs for *L. monocytogenes*, an acceptable method needed to be developed. Our search for a method to detect this organism began in 1981 following a Canadian outbreak associated with the consumption of coleslaw prepared from cabbage fertilized with manure from infected sheep. However, it was not until 1986 that our Microbiology Division Laboratory in Beltsville, MD developed a method suitable for our use in meat and poultry products. This method has been shared internationally with researchers and has proven its value in the recovery of the organism from meat and poultry products. This method is outlined in our Laboratory Communication No. 57.

Using this method, McClain and Lee recovered *L. monocytogenes* from 20/41 (40%) of ground beef samples and 12 of 23 (52%) of pork sausage (*7*). These results led to the hypothesis that there may be widespread contamination in raw and ready-to-eat meat products under our jurisdiction. We, therefore, developed a monitoring program for *L. monocytogenes* similar to our already established and successful *Salmonella* monitoring program. The FSIS published a notice in the Federal Register on March 11, 1987 outlining this monitoring program for ready-to-eat, cooked meat and poultry products. This program was initiated despite the fact that there were as yet no known cases of human listeriosis caused by the consumption of ready-to-eat meat and poultry products (*12*). Because listerial multiplication at refrigerator temperatures during extended storage of products could constitute an increased risk to consumers and because the infectious dose for pregnant women and the immunocompromised were unknown, the USDA, CDC and the FDA agreed on a zero tolerance for these products.

On April 14, 1989, FSIS received conclusive evidence from the CDC linking a cooked turkey frankfurter to a case of human listeriosis. In view of this new evidence, FSIS revised its policy and published requirements on its revised *Listeria* monitoring program (*13*). This program remains in place today.

In this current program, monitoring samples of cooked, ready-to-eat meat and poultry products are collected and examined for the presence of *L. monocytogenes*. A 25 g portion of the collected and submitted sample is analyzed.

If any sample contains *L. monocytogenes* the entire lot manufactured on that day or shift is considered adulterated. Generally, manufacturers voluntarily hold product from which monitoring samples have been collected until test results are known. However, if products are not held and reach the marketplace, FSIS has the authority to issue a public recall.

The FSIS processing operations staff and in-plant inspectors then initiate a hold and test program until the manufacturer proves that production of *Listeria*-free product is resumed. Potentially contaminated products produced at the same facility ("non-like products") are also collected and analyzed for *L. monocytogenes*. The manufacturer must review their operations and take appropriate in-plant action to prevent production of contaminated product. If the product is not available in retail size packages, a slice is collected aseptically from a large product (such as cooked beef roast) for sampling purposes, and recall action will not be taken until subsequent lots (verification samples or intact noncompromised product) also prove positive for *L. monocytogenes*. This rules out the possibility of contamination occurring during the sampling process.

In addition to our monitoring programs, FSIS also conducts product surveys designed to collect information on the occurrence of *L. monocytogenes* in both raw and ready-to-eat meat and poultry products. *Listeria monocytogenes* is one of the pathogens included in our new raw meats surveys, The Nationwide Baseline Data Collection Programs. These programs began in 1992, with our steer/heifer program and will be expanded to include other animal species.

Escherichia coli O157:H7

In January and February of this year, the United States witnessed the largest foodborne outbreak of *E. coli* O157:H7 this country has ever had. Frozen hamburger patties produced in November of 1992 were cooked at a fast food restaurant to temperatures below the minimum internal temperatures (155°F) recommended by the Washington State Department of Public Health. In the final analysis, there probably will be four associated deaths and more than 500 laboratory-confirmed primary and secondary infections that occurred in four states – Washington, Idaho, California, and Nevada. Unfortunately, young children were most susceptible to this outbreak strain and several people spread the infection by person-to-person contact. Children also are more likely to suffer from Hemolytic Uremic Syndrome, which is the primary cause of childhood fatalities with this infection.

Escherichia coli O157:H7 was first recognized as a human pathogen in 1982 when CDC was notified of an outbreak in Oregon and Michigan of bloody diarrhea. In that event, 47 people developed the classic symptoms of severe abdominal cramps and bloody diarrhea. Of those 47 people, 33 were hospitalized and *E. coli* O157:H7 was isolated from the stools of those patients.

Interviews with these victims revealed that all had eaten hamburger from a fast food chain outlet. The meat was most likely contaminated before being made into hamburger patties and the organism apparently survived the cooking process.

Since survival of cooking processes seemed to be emerging as an important element in foodborne illness caused by *E. coli* O157:H7, USDA collaborated with an independent laboratory to generate data on the ability of cooking times and cooking temperatures to kill *E. coli* O157:H7 in ground beef (*5*). The heat lethality of this organism is similar to that of *Salmonella*. It exhibits a relatively low resistance to heat and should be killed by proper cooking.

The Microbiology Division also began several surveillance and monitoring programs in raw beef and poultry products to elucidate the prevalence of *E. coli* O157:H7 in these products. In a raw beef surveillance program conducted between January 1987 and March 1990, only 2 (0.1%) out of 1,647 beef brisket and ground beef samples collected were positive for *E. coli* O157:H7. One positive sample was found in ground beef and one in beef brisket (unpublished data).

Since calves are more likely to harbor this organism than other bovines, we conducted a surveillance program to detect *E. coli* O157:H7 in bob veal kidneys. This survey took place between May 1988 and January 1989. Five samples (0.4%) out of 1,408 samples collected were positive for *E. coli* O157:H7 (unpublished data). Following these results, we extended this program and examined the prevalence rate of *E. coli* O157:H7 in fancy veal kidneys. Between January 1989 and March 1992, only three samples (0.1%) out of 5,542 samples collected were positive for *E. coli* O157:H7 (unpublished data).

Between January 1989 and March 1992, we analyzed 6,133 samples of broiler backs and necks for O157:H7. No positive samples were detected (unpublished data). Therefore, the Microbiology Division has continually analyzed raw product for *E. coli* O157:H7 through various sampling programs since 1987.

We continue to monitor for *E. coli* O157:H7 in the Nationwide Microbiological Data Collection Programs. All previous raw meat surveillance studies were discontinued in March 1992 because of the low number of positive results found and the fact that we were designing the Nationwide Beef Microbiological Data Collection Programs.

Since 1990, the Microbiology Division has published five scientific papers on *E. coli* O157:H7 (*5,8,9,10,11*). Procedures used in the official FSIS method for the isolation and identification of *E. coli* O157:H7 are detailed in Revision 3 of Laboratory Communication No. 38 (FSIS, Beltsville, MD; also published by Okrend et al.) (*8,9*).

Campylobacter jejuni/coli[1]

Campylobacter spp. were associated with human enteric foodborne illness in the 1970s. This group of bacteria has long been associated with warm-blooded animals, but went unrecognized due to the lack of adequate detection methods. The CDC has conducted epidemiological studies which indicate that *C. jejuni* causes acute diarrheal illness in humans and that isolations from such cases exceed those of *Salmonella* spp. and *Shigella* spp. combined (*2,3*). These observations make *Campylobacter* a group of bacteria of concern, particularly in view of their prevalence in uncooked meat and poultry. (NOTE: *Campylobacter* spp. shall refer to *C. jejuni/coli* in the remainder of this document.)

Campylobacter is present in the environment of and in warm-blooded animals throughout most, if not all, parts of the world. It has been reported in humans, food, animals, free-living birds, flies, pets and other reservoirs (*8*). Its incidence is generally higher in poultry, perhaps because of the higher body temperature of birds and the preference of *Campylobacter* for increased temperatures for optimum growth (*6*). It may be transmitted to people by contaminated water, raw milk and marginal sanitary practices in food preparation.

In addition to its pervasiveness, some work has been done that allows regulatory and public health officials to make some preliminary judgements on the relationship of the organism and food safety. *Campylobacter* is similar to *Salmonella* in that its primary environment is the enteric tract of warm-blooded animals and its primary reservoir is living, domesticated, warm-blooded animals. *Campylobacter* spp. are easily destroyed by heat and there has been no indication to date that drying increases heat resistance as it does with some *Salmonella* spp. *Campylobacter* spp. are also very susceptible to chlorine solutions commonly used in food processing plants.

In contrast to *Salmonella* spp., *Campylobacter* spp. do not grow or compete well with other bacteria at common food abuse temperatures. They require a high temperature to grow, but survive without growth at refrigeration temperatures. In general, when bacteria such as *Salmonella* spp. are given the opportunity to grow as they are in recontaminated foods abused at room temperatures, both the attack rate and the severity of illness increase. It appears that the level of *Campylobacter* in contaminated foods is governed only by the extent of initial contamination and that temperature abuse is not much of a contributing factor. Heat resistance of this organism is also relatively low.

The current position of FSIS in regard to the presence of *Campylobacter* spp. in food is essentially the same as that for *Salmonella* spp. In raw meat and poultry, *Campylobacter* is considered an unavoidable though undesired contaminant. In fully cooked, ready-to-eat foods, the presence of *Campylobacter* spp. would indicate inadequate heat processing, recontamination or both; and the food would be subject to regulatory action. The FSIS for a number of years has carried out a strong consumer education program to recommend proper cooking methods and sanitation methods in the kitchen to assure the safe preparation of meat and poultry. This consumer education program is closely associated with land grant colleges throughout the nation and also newspaper and magazine food editors. In general, the FSIS position is similar to that of most other countries throughout the world.

For cooked products, existing cooking and post-processing sanitation procedures appear adequate for *Campylobacter* spp. control.

Control in processing plants currently remains a matter of reduction, not elimination. The use of chlorine, organic acid sprays, hot water rinses and good general sanitation are the current weapons in the control arsenal. Irradiation is an effective control and has been recently approved for poultry. Although irradiation of poultry is deemed safe and efficacious by the FDA, there remains a public acceptance barrier and only time will tell if the public will judge freedom of *Campylobacter*, *Salmonella*, *Listeria* and other non-sporeforming bacteria as a sufficient benefit above perceived irradiation problems.

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REFERENCES

1. Bean, N. H., P. M. Griffin, J. S. Goulding and C. B. Ivey. 1990. Foodborne disease outbreaks, 5-year summary, 1983-1987. J. Food Prot. 53:711-728.
2. Blaser, M. J. 1980. *Campylobacter fetus* subspecies *jejuni*: The need for surveillance. J. Infect. Dis. 141:670.
3. Blaser, M. J. and L. B. Reller. 1981. *Campylobacter enteritis*. New Eng. J. Med. 305:444.
4. Cohen, M. 1993. ABC Research Corporation Workshop: Hazard Analysis Critical Control Point Program for Ground Beef. Gainesville, FL.
5. Line, J. E., A. R. Fain, Jr., A. B. Moran, L. M. Martin, R. V. Lechowich, J. M. Carosella and W. L. Brown. 1991. Lethality of heat to *Escherichia coli* O157:H7: D-value and Z-value determinations in ground beef. J. Food Prot. 54:762-766.
6. Luechtefeld, N. W. and W. L. L. Wang. 1981. *Campylobacter fetus* subsp. *jejuni* in a turkey processing plant. J. Clin. Microbiol. 13:266-268.
7. McClain, D. and W. H. Lee. 1988. Development of USDA-FSIS method for isolation of *Listeria monocytogenes* from raw meat and poultry. J. Assoc. Off. Anal. Chem. 7:660-664.
8. Okrend, A. J. G., B. E. Rose and B. Bennett. 1990. A research note: A screening method for the isolation of *Escherichia coli* O157:H7 from ground beef. J. Food Prot. 53:249-252.
9. Okrend, A. J. G., B. E. Rose, B. and R. Matner. 1990. An improved screening method for the detection and isolation of *Escherichia coli* O157:H7 from meat, incorporating the 3M Petrifilm™ Test Kit - HEC- for hemorrhagic *Escherichia coli* O157:H7. J. Food Prot. 53:936-940.
10. Okrend, A. J. G., B. E. Rose and C. P. Lattuada. 1990. A research note: Use of 5-bromo-4-chloro-3-indoxyl-ß-D-glucuronide in MacConkey sorbitol agar to aid in the isolation of *Escherichia coli* O157:H7 from ground beef. J. Food Prot. 53:941-943.
11. Okrend, A. and B. E. Rose. 1991. Laboratory Communication No. 38. USDA, FSIS, Microbiology Division.
12. USDA, FSIS. 1987. Testing for *Listeria monocytogenes*. Fed. Reg. 52:7464.
13. USDA, FSIS. 1989. Revised policy for controlling *Listeria monocytogenes*. Fed. Reg. 54:22345-22346.

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[1]*Materials for this section were taken from an FSIS Speech, "Importance of Campylobacter to the Food Industry" by M. Norcross, R. Johnston and J. Brown.*

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Concerns Regarding the Occurrence of *Listeria monocytogenes*, *Campylobacter jejuni*, and *Escherichia coli* O157:H7 in Foods Regulated by the U.S. Food and Drug Administration

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INTRODUCTION

Food safety has come to the attention of the food industry, the American public and the entire world during the past decade. This is perhaps due to the large size of human outbreaks of gastroenteritis occurring, the seriousness of the illnesses that result from the consumption of foods containing various species of microbes, and/or the overall awareness of the public to microbial food safety due to the publicity generated by the news media responses to foodborne outbreaks. Public awareness of foodborne microbial illness is further fostered by the reality of foodborne illness increasing in the United States as well as in other industrialized nations. The past decade has also revealed the ability of a number of microbes to: either be foodborne, a fact previously unknown; develop the ability to reproduce in foods previously unable to support their growth; or, evolve to fill ecological niches previously unavailable to them. *Listeria monocytogenes* is an example of a microbe that was not known to be foodborne until the 1980's (*39*), although the ability of the microbe to cause listeriosis in humans has been known since 1929, the major means of transmission had been thought to be through contact with infected animals (*28*). Two outbreaks of botulism occurred in the past decade due to foods previously considered to be antimicrobial (*52,53*). The first outbreak, traced to the germination of *Clostridium botulinum* endospores into vegetative cells and the subsequent production of botulism toxin, occurred in 1983 and was demonstrated to be due to sauteed onions kept warm on the side of a cooking grill in a restaurant (*36*). The sticking of the onions on the grill apparently provided an anaerobic environment in which the microbe germinated and produced botulism toxin. The second occurred in late 1985 and was traced to the production of botulism toxin in an opened, unrefrigerated, bottle of chopped garlic in soybean oil (*56*). Subsequent to these outbreaks, Food and Drug Administration (FDA) has required the acidification of products packed in oil to a pH $\leq$4.6 or some other form of microbial inhibitor, and be labeled to require refrigeration after opening. Examples of microbes possibly mutating to fill an ecological niche include *Salmonella enteritidis* in grade A whole chicken eggs (*55*), and the emergence of *Escherichia coli* O157:H7 as a human pathogen (*47*).

The past decade witnessed both the largest (*48*) and the deadliest (*15*) foodborne outbreaks ever reported in the United States, both occurring in 1985. The largest foodborne outbreak resulted in over 16,284 confirmed cases of salmonellosis due to the consumption of milk contaminated with *Salmonella typhimurium* (*48*). Salmonellosis is increasing in the United States (*16,55*) as well as in other industrialized countries, such as the United Kingdom (*63*), and a variety of bacterial agents are either being discovered as new causes of gastroenteritis, or it is being determined that illnesses originally believed to be spread by either animal-to-man or man-to-man are spread via ingestion of contaminated foods. The deadliest foodborne outbreak ever to occur in the United States also occurred in 1985 and was due to the presence of *L. monocytogenes* in a Mexican-style soft cheese. This outbreak will be discussed later in this paper. Three microbes that are relatively newcomers to the list of foodborne agents of gastroenteritis are the subject of this paper: *Listeria monocytogenes*, *Campylobacter jejuni* and *E. coli* O157:H7.

Listeria monocytogenes

The incidence of listeriosis appears to be increasing worldwide, the majority of cases occurring among individuals with some form of underlying condition that suppresses the immune system (*24*). However, healthy individuals have

acquired listeriosis from the ingestion of contaminated foods as demonstrated in major foodborne outbreaks and in sporadic cases (*24*). Predisposing conditions associated with foodborne listeriosis cases include neoplastic disease, pregnancy, immunosuppression due to drugs or disease, alcoholism, diabetes mellitus, cardiovascular and renal collagen disease, hemodialysis failure and extremes in age (*24*). Mortality rates worldwide range from 13 to 43%, with the highest mortality being among neonates with listeriosis (36%) (*24*). The source and route of infection in most cases of listeriosis remain unknown, although the demonstration of food as the vector in a large number of recent outbreaks suggests that food is a major source of listeriosis (*24*). Incidence rates in the United States appear to be decreasing as revealed by an as yet incomplete analysis of data submitted to the Centers for Disease Control and Prevention (CDC) (*18*).

Listeria monocytogenes has been isolated from a variety of environmental sources, including soil, vegetation and the intestinal tract of animals, including mammals, birds, fish, crustaceans and insects (*42*). The finding of the microorganism in products that come into contact with the soil is, therefore, not surprising, nor is its finding in seafood, which may become contaminated following evisceration or after contact with or exposure to birds or contaminated water (*22*).

Vegetables have been culture-confirmed to be responsible for an outbreak of listeriosis in Nova Scotia in 1983 due to the fertilization of cabbage fields with sheep manure obtained from animals with circling disease (the Veterinarian term used to describe listeriosis in sheep) (*49*). Epidemiological studies implicated celery, tomatoes, or lettuce in a small outbreak of listeriosis in 1986 (*31*), and vegetables were suggested as a vehicle for listeriosis as early as 1967 (*12*). A number of surveys have been conducted, implicating a wide variety of vegetables that contain *L. monocytogenes* on a sporadic basis (*24*), with two crops grown in the soil, potatoes and radishes, being more consistently positive than other vegetables (*30*). Only one vegetable, carrots, have consistently been demonstrated to be negative for the presence of this microbe (*7*) and as little as 1% carrot juice added to bacteriological culture broth inhibits the reproduction of *L. monocytogenes* (*7*). The factor(s) in carrot juice responsible for this activity have not been isolated, yet they appear to be heat labile in that cooked carrots lose their inhibitory effect (*7*). Numbers of *L. monocytogenes* found on fresh vegetables are generally less than 200 CFU/gm, but can reproduce to higher numbers on some intact vegetables upon storage at refrigeration temperature (*24*).

A number of listeriosis outbreaks and sporadic cases have been attributed to the consumption of dairy products contaminated with *L. monocytogenes*, including raw milk, cheeses and ice cream/fresh cream (*24*). As has already been mentioned (*15*), the United States experienced the deadliest foodborne outbreak ever reported in 1985 (*15*). This was due to the consumption of contaminated Mexican-style cheese made from pasteurized milk recontaminated with *L. monocytogenes* present in unpasteurized milk added to improve the flavor of the final product (*15*). The organism was also isolated from the plant environment (*24*). This outbreak involved 142 cases, 93 of them were perinatal and 49 were adults; mortality was 48 individuals (34% mortality rate), comprised of 30 fetuses and newborn infants and 28 adults (*24*). Another listeriosis outbreak due to a contaminated soft cheese has been identified subsequent to the United States outbreak. This outbreak occurred in the canton de Vaud in Switzerland during the period 1983 to 1987 (*8*). A total of 122 listeriosis cases were discovered with 32 deaths recorded (26% mortality rate). Recall of the implicated cheese resulted in an immediate decrease in the number of listeriosis cases occurring in the region (*8*).

There have been limited studies regarding the occurrence of *L. monocytogenes* in seafood products, a summary of which is provided in (*22*). A limited number of studies have demonstrated that this microbe may reproduce in sterilized and reinoculated shrimp, crabmeat, lobster tail, surimi and white fish stored at 7°C (*33*); and, in nonsterile fish products such as cooked shrimp, cooked lobster and cold smoked fish (*21, 24, 33*,). Seafood has only been epidemiologically-linked as a vector for outbreaks of listeriosis, although two cases of sporadic listeriosis have been traced to the consumption of seafood (fish and smoked cod roe) (*24*). Cooked and picked crustaceans as well as cold-smoked fish are the commodities most frequently found by FDA to contain this microbe for the past several years.

The policy of the FDA remains what has been commonly referred to as the "zero tolerance" policy, which is very conservative. No *L. monocytogenes* organisms are permitted in a food which was not intended for further heat treatment. The policy served to spur several United States industries to spend millions of dollars to modernize their operations and institute procedures to ensure that their finished products (ready-to-eat foods) were free of *Listeria monocytogenes*. This policy, in concert with the policy of USDA, has apparently assisted in the decrease of sporadic listeriosis in the United States. The number of listeriosis cases has dropped from 2,000 in 1986 to about 900-1,000 in 1991 and 1992 (*18*). Health education efforts in the United States also have contributed to this decrease in cases.

With more sophisticated science and greater knowledge about the *Listeria* microbe, several realizations became apparent. First, there are only a few cases of listeriosis per year in a population that exceeds 250 million, and the majority of these cases involve individuals who are immunocompromised, due to disease, medical treatment or pregnancy. Second, the organism is widespread, perhaps ubiquitous in certain raw foods. Third, most sporadic cases of listeriosis are epidemiologically linked to a few foods, notably soft cheeses, undercooked chicken and poorly reheated hot dogs. Fourth, some ready-to-eat foods (green salads, cold-smoked salmon) are made without a listericidal processing step, yet apparently were not sources of infection in a case control study performed by CDC. Due to these facts, the FDA "zero tolerance" policy is being vigorously challenged. Some foreign governments envision our policy as being a trade barrier put into place to keep their perfectly safe products out of the American marketplace. Some eminent scientists say that individuals are ingesting low numbers of *L. monocytogenes* every day, with no apparent harm being observed. Some industry groups claim that FDA is putting companies out of business by requiring unreach-

able goals in terms of requiring listeria-free ready-to-eat food products.

The FDA is in the middle of this controversy and has reexamined the available information and is now considering possible changes to the current policy. These changes would include: stratification of products by known, established risk; maintenance of a strict standard for those products which have received a listericidal process or which would support the reproduction of the microbe to higher numbers; and, the allowance for low numbers of *L. monocytogenes* in foods demonstrated to be listericidal, but in which the microbe is found in low numbers due to the unavoidable presence of the microbe in the raw food. Any change in the FDA future policy regarding *L. monocytogenes* will not result in the compromise of our high standards of public health protection.

Campylobacter jejuni

Campylobacter jejuni is now considered the most frequent cause of bacterial diarrhea in the United States (*23*). In prospective studies in which both *Salmonella* and *Campylobacter* were both cultured for, *Campylobacter* cultures outnumbered *Salmonella* isolates 10 to 1 in college students, and 2 to 1 in patients in a multicenter study (*60*). The infectious dose for *C. jejuni* has been estimated at less than 200 organisms (*23*), possibly accounting for its occurrence as the leading cause of bacterial gastroenteritis in the United States.

The ecology of the *Campylobacter*s centers mainly on animal reservoirs, where they reside as commensals (*10, 26*). Animal reservoirs include poultry, cattle, swine and sheep, contamination of the muscle thought to occur during the slaughtering process (*10*). In addition to food production animals, domestic dogs and cats have also been demonstrated to harbor *C. jejuni* in their intestinal tracts (*10, 26*), as have wild birds and mammals (*46*). Young animals, puppies and kittens, appear to have a higher percentage of intestinal carriage than do adult animals (*9, 13, 50, 51, 58*), with adult animals tending to have an increased isolation rate if housed in a kennel type of situation (*13, 25*). Laboratory animals (the majority of which were asymptomatic) have been demonstrated to also harbor *C. jejuni/coli* in their intestinal tracts (*61*).

The vectors of most common source outbreaks of Campylobacteriosis involve the ingestion of contaminated water or milk, although epidemiological studies implicate poultry as the vehicle of infection in the majority of cases (*3*). Milk is by far the food commodity regulated by FDA responsible for the majority of Campylobacteriosis cases in the United States (*10,19*). *Campylobacter jejuni* and *C. coli* are both extremely sensitive to heat, pasteurization of milk readily destroying the organisms in raw milk (*46*). The classic type of milkborne Campylobacteriosis outbreak observed in the U.S. involves the visiting of a rural dairy farm by school children on an outing from an urban setting. Typically, the farmer offers the children a taste of raw milk at the completion of the tour, the result being the development of Campylobacteriosis upon returning home (*46*). An interesting recontamination of properly pasteurized milk has been described in the United Kingdom where milk is delivered to homes in glass bottles (*32,54*). Jackdaws and Magpies have been observed pecking at the tops of milk bottles, recontaminating the milk in this manner. Up to 60% of Campylobacteriosis cases in the United Kingdom that occurred during the months of May and June in 1990 and 1991 have been attributed to this form of milk recontamination (*46*).

Other foods regulated by FDA demonstrated to serve as vectors for the dissemination of *C. jejuni* include mushrooms (*29*), raw or poorly cooked fish (*27*), and shellfish (mussels and oysters) (*2,11*). Due to the ubiquitous nature of this microbe in the feces of mammals and birds, it is possible that any food subjected to untreated animal waste may potentially be contaminated with this microbe.

The finding of this microbe in any cooked ready-to-eat product regulated by FDA is considered to be violative of the Food, Drug and Cosmetic Act, and thus subject to regulatory action. *Campylobacter* species are not especially hardy in the environment or on foods, and are especially susceptible to heating. Thus, the finding of this microbe on fruits and vegetables appears to be of a transient nature, and, as of the moment, appears to be insignificant. Prevention of Campylobacteriosis relies upon the avoidance of cross contamination in food-handling, maintenance of good kitchen hygiene, adequate cooking of meat and poultry, and the avoidance of certain foods known to be vectors of *C. jejuni/coli* such as raw milk, raw finfish and shellfish, and undercooked meat.

Escherichia coli O157:H7

Escherichia coli O157:H7 has been well documented as the cause of hemorrhagic colitis, which is characterized by the presence of large amounts of overt blood in the stools of individuals with the illness. This organism has recently been in the news due to a large outbreak that occurred in the Pacific Northwest. This outbreak was related to the consumption of undercooked hamburgers from a fast food chain, involved at least 400 individuals, 100 hospitalizations, and the death of at least one child (*19*). This is a relatively newly emerging human pathogen, in that it was not until 1982 that epidemiologists were able to firmly identify this microbe with hemorrhagic colitis, following two food-associated outbreaks (*47*). The first of these outbreaks involved 26 cases in the state of Oregon, the second, 21 cases in the state of Michigan (*47*). In the latter outbreak, *E. coli* O157:H7 was cultured from the same lot of hamburger that was used in the Michigan restaurants during the outbreak (*62*).

It is difficult to determine the true incidence of *E. coli* O157:H7 infections in the United States as it is not a reportable disease in many of the states (as of October, 1992, only 11 states required the reporting of the isolation of *E. coli* O157:H7 to CDC and only four states requiring the reporting of Hemolytic Uremic Syndrome (HUS) to this agency (35). Washington state was the first state to require the reporting of cases, the first year of surveillance revealing an annual incidence of 2.1 cases per 100,000 population (*44*). Cases of hemorrhagic colitis were reported in individuals ranging in age from 11 months to 78 years of age. The highest incidence rate was reported in children <5 years of

age (6.1 cases per 100,000 population) (*44*). Another study conducted in Washington, this one a retrospective study conducted in King County, WA, revealed an annual incidence of 0.69 cases per 100,000 children aged less than 15-years-old in 1971-1975 and 1.74 cases per 100,000 in 1981-1986 (*59*). A study conducted in Michigan revealed an annual incidence of HUS of 0.5 case per 100,000 population of children less than 18 years of age in 1979 (*37*). This increased to 2.0 cases of HUS per 100,000 in 1988, the increase in HUS being due to an increase in the incidence of *E. coli* O157:H7 gastroenteritis in the state (*37*).

Dairy cattle have been identified as a reservoir for *E. coli* O157:H7 as have beef cattle, the organism being isolated from the feces of healthy as well as sick animals (*17,38,41*). In addition, this microbe has been reported to colonize the ceca of chickens (*4*), and the isolation of the microbe from retail samples of pork, chicken and lamb suggests that these animals may also harbor the organism in their intestinal tracts (*1*). Thus, the contamination of any food product with the feces of these animals has the potential to be a vector for the dissemination of this microbe to the human population.

An unusual outbreak of hemorrhagic colitis occurred in Massachusetts in 1991. This outbreak originally involved four children admitted to a Boston children's hospital, three of whom were cultured and tested positive for *E. coli* O157:H7 (*6*). Epidemiological investigations eventually identified 23 individuals with *E. coli* O157:H7 infections with an onset time between October 23 and November 24, 1991 (*6*). The vector for the transmission of the infective agent was epidemiologically determined to be apple cider; culturing of 10 half-gallons of cider from the implicated cider mill failed to demonstrate the presence of the microbe (*6*). Inoculation studies performed, however, demonstrated that the microbe disappeared in the cider after storage at room temperature for 8 days, but survived for 20 days if the cider were refrigerated (*6*). Addition of 0.1% sodium benzoate reduced the survival period at refrigerator temperature to 7 days (*6*). The unusual aspect of the above-mentioned apple cider outbreak concerns the pH of the product itself, which ranged in values between 3.6 to 4.0, a pH range generally accepted as being rapidly bacteriocidal. This was not the only outbreak of gastroenteritis attributed to this type of product. An outbreak of HUS occurred in Canada in 1980 was also linked to the consumption of fresh-pressed apple juice (*57*). Symptoms experienced by the infected individuals suggest the causative agent was *E. coli* O157:H7, although the microbe was not identified from infected individuals stools (*57*). An outbreak of gastroenteritis due to *S. typhimurium* in apple cider also occurred in New Jersey in 1974 (*14*). This latter case, as well as the 1991 apple cider case, were both demonstrated to be due to the use of apples that had fallen onto the ground and subsequently utilized for the making of the ciders (*6,57*). Speculation is that the apples became contaminated with animal feces containing the pathogens, were not adequately cleaned prior to squeezing, and the ciders were not stored for a sufficient period of time to allow the pH to eliminate viable pathogenic microbes contained in them (*6,57*). These outbreaks suggest that the effectiveness of utilizing pH as a microbial inhibitor/bactericidal agent may have to be reexamined by FDA due to the possibility of pathogenic microbes adapting to survive in low acid environments for periods of time longer than previously experienced.

The contamination of the exterior of apples with feces of animals, presumably feces containing *E. coli* O157:H7, suggests that any food product that comes in contact with animal feces may be a vector for causing outbreaks of hemorrhagic colitis. Ground grown vegetables fall into this category, although no outbreaks have been demonstrated to be caused by vegetables, to date (*45*). It has been demonstrated that salad vegetables (shredded lettuce and sliced cucumber) will allow the survivability of this microbe on these products until the products demonstrated deterioration at refrigerator temperatures (*1*). Reproduction of the microbe will even occur at temperatures >12°C and above, with no observable deterioration of the food products (*1*). Carrots, however, were demonstrated to produce some substance(s) inhibitory to *E. coli* O157:H7, similar to that reported for *L. monocytogenes* (*1,7*). It is entirely possible that seafood may be contaminated with this microbe if exposed to animal or human fecal material either in their growing areas or during processing. To date, no sporadic outbreaks of HUS have been associated with the consumption of either cooked or raw seafood.

The transmission of this microbe in daycare settings (*5*) and the relatively low numbers found in hamburger of the same lots involved in the recent Northwestern HUS outbreak (*39*) suggest the ingestion of relatively small amounts of this microbe are sufficient to cause human illness. Prevention of hemorrhagic colitis is thus dependent upon good personal hygiene, education, avoidance of cross-contamination in kitchens, and good slaughter house practices. Much concerning the ecology of this microbe on the farm is not yet known and studies need to be conducted to determine how this microbe infects animals so that appropriate steps may be taken to prevent its colonization of farm animals. The finding of this microbe in any ready-to-eat product is considered by FDA to be a violation of the Food, Drug and Cosmetic Act.

DISCUSSION

The three microbial pathogens discussed in this paper, *L. monocytogenes*, *C. jejuni*, and *E. coli* O157:H7, have a number of factors in common. All appear to have small infectious doses, all are readily destroyed by proper cooking or pasteurization, all are relatively new or newly discovered agents transmitted by foods, and all are relatively difficult to culture, or are found sporadically in foods in relatively small numbers. These factors make it difficult for regulatory agencies to control their presence in foods by end product sampling only. The only effective mechanism available to regulatory agencies and the food industry to control these pathogens is to identify all means by which they enter into the food chain and effectively stop their entry when it is determined when and where they enter into the chain. This form of ensuring food safety has been endorsed by the National Advisory Committee on Microbiological Criteria for Foods (*43*) and a Consultation of Experts for the World

Health Organization (*64*), both of which have endorsed the Hazard Analysis and Critical Control Point (HACCP) System as an effective and rational means of assuring food safety from harvest to consumption. The FDA, as well as the USDA, is moving towards the adoption of HACCP systems for the assurance of the safety of foods sold in the United States.

Until HACCP procedures are instituted 100% in the food industry, the only mechanisms available to prevent gastroenteritis due to these three microbes include: avoidance of certain raw foods such as shellfish and unpasteurized milk; practicing of good kitchen and personal hygiene; and the thorough cooking of meats and poultry.

LITERATURE CITED

1. Abdul-Raouf, U. M., L. R. Beuchat, and M. S. Ammar. 1993. Survival and growth of *Escherichia coli* O157:H7 on salad vegetables. Appl. Environ. Microbiol. 59:1999-2006.
2. Abeyta, C. 1991. Incidence and survival of thermophilic *Campylobacter*s from shellfish growing waters: Media evaluation. Microbial Ecology in Health and Disease 4:S41.
3. Archer, D. L. and F. E. Young. 1988. Contemporary issues: Diseases with a food vector. Microbiol. Rev. 1: 377-398.
4. Beery, J. T., M. P. Doyle and J. L. Schoeni. 1985. Colonization of chicken cecae by *Escherichia coli* associated with hemorrhagic colitis. Appl. Environ. Microbiol. 49:310-315.
5. Belongia, E. A., M. T. Osterholm, J. T. Soler, D. A. Ammend, J. E. Braun and K. L. MacDonald. 1993. Transmission of *Escherichia coli* O157:H7 infection in Minnesota daycare facilities. J. Am. Med. Assoc. 269:883-888.
6. Besser, R. E., S. M. Lett, J. T. Weber, M. P. Doyle, T. J. Barrett, J. G. Wells and P. M. Griffin. 1993. An outbreak of diarrhea and hemolytic uremic syndrome from *Escherichia coli* O157:H7 in fresh-pressed apple cider. J. Am. Med. Assn. 269:2217-2220.
7. Beuchat, L. R. and R. E. Brackett. 1990. Inhibitory effects of raw carrots on *Listeria monocytogenes*. Appl. Environ. Microbiol. 56:1734-1742.
8. Bille, J. 1990. Epidemiology of human listeriosis in Europe, with special reference to the Swiss outbreak, pp. 71-74. *In* A. J. Miller, J. L. Smith, and G. A. Somkuti (eds.), Foodborne listeriosis. Society for Industrial Microbiology. Elsevier Science Publishing, Inc., New York, NY.
9. Blaser, M. J., F. M. LaForce, N. A. Wilson and W. L. Wang. 1980. Reservoirs for human Campylobacteriosis. J. Infect. Dis. 141:665-669.
10. Blaser, M. J., D. N. Taylor and R. A. Feldman. 1983. Epidemiology of *Campylobacter jejuni* infections. Epidemiol. Rev. 5:157-176.
11. Blaser, M. J., J. G. Wells and R. A. Feldman. 1982. Epidemiology of endemic and epidemic *Campylobacter* infections in the United States. pp. 3-4. *In* D. G. Newell (ed.). *Campylobacter*: Epidemiology, Pathogenesis and Biochemistry. MTP Press, Ltd., Lancaster, England.
12. Blenden, D. C. and F. T. Szatalowica. 1967. Ecological aspects of listeriosis. J. Am. Med. Assoc. 151:1761-1766.
13. Bruce, D., W. Zochowski and G. A. Fleming. 1980. *Campylobacter* infections in cats and dogs. Vet. Rec. 107:200-201.
14. Centers for Disease Control. 1975. *Salmonella typhimurium* outbreak traced to a commercial apple cider-New Jersey. Morbid. Mortal. Wkly. Rep. 24:87-88.
15. Centers for Disease Control. 1985. Listeriosis outbreak associated with Mexican-style cheese-California. Morbid. Mortal. Weekly Rep. 34:357-359.
16. Chalker, R. B. and M. J. Blaser. 1988. A review of human salmonellosis. III. Magnitudes of *Salmonella* infection in the United States. Rev. Infect. Dis 10:111-124.
17. Chapman, P. A., D. J. Wright and P. Norman. 1989. *Escherichia coli* infections in Sheffield: Cattle as a possible source. Epidemiol. Infect. 102:439-449.
18. Cohen, M. Centers for Disease Control. Personal communication.
19. Communicable Disease Control Section, Seattle-King County Department of Public Health. 1984. Surveillance of the flow of *Salmonella* and *Campylobacter* in a community. Report of FDA Contract 223-81-7041. Seattle-King County Department of Public Health, Seattle.
20. Deresomski, S. 1993. From hamburgers to hemolysis: *Escherichia coli* O157:H7. Infect. Dis. Alert 12:81-84.
21. Dillon, R. and T. Patel. 1992. Isolation of *Listeria* from commercially produced smoke fish. pp. 286-287. Abstracts of the Eleventh International Symposium on Problems of Listeriosis. Copenhagen, Denmark.
22. Dillon, R. M. and T. R. Patel. 1992. *Listeria* in seafood: a review. J. Food Protec. 55:1009-1015.
23. Doyle, M.P. 1985. Foodborne pathogens of recent concern. Ann. Rev. Nutr. 5:25-41.
24. Farber, J. M. and P. I. Peterkin. 1991. *Listeria monocytogenes*, a foodborne pathogen. Microbiol. Rev. 55:476-511.
25. Fox, J. G., M. C. Claps, N. S. Taylor, K. O. Maxwell, J. I. Ackerman and S. B. Hoffman. 1988. *Campylobacter jejuni/coli* in commercially reared beagles: prevalence and serotypes. Lab. Ani. Sci. 38:262-265.
26. Franco, D. A. Campylobacteriosis: the complexity of control and prevention. J. Environ. Health 52:88-92.
27. Fricker, C. R. and R. W. A. Park. 1989. A two-year study of the distribution of 'thermophilic' Campylobacters in human, environmental and food samples from the Reading area with particular reference to toxin production and heat-stable serotype. J. Appl. Bacteriol. 66:477-490.
28. Gray, M. L. and A. H. Killinger. 1966. *Listeria monocytogenes* and listeric infections. Bacteriol. Rev. 30:309-382.
29. Harris, N. V., T. Kimball, N. S. Weiss and C. Nolan. 1986. Dairy products, produce and other non-meat foods as possible sources of *Campylobacter jejuni* and *Campylobacter coli* enteritis. J. Food Protec. 49:347-351.
30. Heisick, J. E., D. E. Wagner, M. L. Nierman and J. T. Peeler. 1989. *Listeria* spp. found on fresh market produce. Appl. Environ. Microbiol. 55:1925-1927.
31. Ho, J. L., K. N. Shands, G. Friedland, P. Eckind, and D. W. Fraser. 1986. An outbreak of type 4b *Listeria monocytogenes* infection involving patients from eight Boston hospitals. Arch. Int. Med. 146:520-524.
32. Hudson, S. J., N. F. Lightfoot, J. C. Coulson, K. Russell, P. R. Sisson and A. O. Sobo. 1991. Jackdaws and magpies as vectors of milkborne human *Campylobacter* infection. Epidemiol. Infect. 107:363-372.
33. Jemmi, T., S. Guyer and A. Keusch. 1992. Frequency, behavior and epidemiology of *Listeria monocytogenes* in smoked fishes. pp. 301-302.
34. Lovett, J., D. W. Francis and J. G. Bradshaw. 1990. Outgrowth of *Listeria monocytogenes* in foods, pp. 183-187. *In* A. J. Miller, J. L. Smith and G. A. Somkuti (eds.). Foodborne listeriosis. Society for Industrial Microbiology, Elsevier Science Publishing, Inc., New York NY.
35. MacDonald, K. L. and M. T. Osterholm. 1993. The emergence of *Escherichia coli* O157:H7 infection in the United States. The changing epidemiology of foodborne disease. J. Am. Med. Assoc. 268:2264-2266.
36. MacDonald, K. L., R. F. Spengler, C. L. Hathaway, N. T. Hargrett and M. L. Cohen. 1985. Type A botulism from sauteed onions. J. Am. Med. Assoc. 253:1275-1278.
37. Martin, D. L., L. MacDonald, K. E. White, J. T. Soler and M. T. Osterholm. 1990. The epidemiology and clinical aspects of the hemolytic uremic syndrome in Minnesota. N. Eng. J. Med. 323:1161-1167.
38. Martin, M. L., L. D. Shipman, J. G. Wells, M. E. Potter, K. Hedberg, I. K. Wachsmuth, R. V. Tauxe, J. P. Davis, J. Amolai and J. Tilleli. 1986. Isolation of *Escherichia coli* O157:H7 from dairy cattle associated with two cases of hemolytic uremic syndrome. Lancet ii:1043.
39. McLauchlin, J. 1987. *Listeria monocytogenes*: recent advances in the taxonomy and epidemiology of listeriosis in humans. J. Appl. Bacteriol. 63:1-11.
40. McNamara, A.M., U. S. Department of Agriculture. Personal communication.
41. Montenegro, M. A., Mu. Bulte, T. Trumpf, S. Aleksic, G. Reuter, E. Bulling and R. Helmuth. 1990. Detection and characterization of fecal verotoxin-producing *Escherichia coli* from healthy cattle. J. Clin. Microbiol. 28:1417-1421.
42. National Advisory Committee on Microbiological Criteria for Foods. 1991. *Listeria monocytogenes*: Recommendations of the National Advisory Committee on Microbiological Criteria for Foods. Intl. J. Food Microbiol. 14:185-246.

43. National Advisory Committee on Microbiological Criteria for Foods. 1992. Hazard analysis and critical control point system. Intl. J. Food Microbiol. 16:1-23.
44. Ostroff, S. M., J. M. Kobayashi and J. H. Lewis. 1989. Infections with *Escherichia coli* O157:H7 in Washington state. The first year of statewide disease surveillance. J. Am. Med. Assoc. 262:355-359.
45. Padhye, N. V. and M. P. Doyle. 1992. *Escherichia coli* O157:H7: epidemiology, pathogenesis, and methods for detection in foods. J. Food Protec. 55:555-565.
46. Pearson, A. D. and T. D. Healing. 1992. The surveillance and control of *Campylobacter* infection. Comm. Dis. Rep. 2: R133-R139.
47. Riley, L. W., R. S. Remis, S. D. Helgerson, H. B. McGee, J. G. Wells, B. R. Davis, R. J. Herbert, E. S. Olcott, L. M. Johnson, N. T. Hargrett, P. A. Blake and M. L. Cohen. 1983. Hemorrhagic colitis associated with a rare *Escherichia coli* serotype. N. Eng. J. Med. 308:381-385.
48. Ryan, C. A., M. K. Nickels, N. T. Hargrett-Bean, M. E. Potter, T. Endo, L. Mayer, C. W. Langkop, C. Gibson, R. C. McDonald, R. T. Kenney, N. D. Puhr, P. L. McDonnell, R. J. Martin, M. L. Cohen and P. A. Blake. 1987. Massive outbreak of antimicrobial-resistant salmonellosis traced to pasteurized milk. J. Am. Med. Assoc. 258:3269-3274.
49. Schlech, W. F. III, P. M. Lavigne, R. A. Bortulussi, A. C. Allen, E. V. Haldane, A. J. Wort, A. W. Hightower, S. E. Johnson, S. H. King, E. S. Nicholls and C. V. Broome. 1983. Epidemic listeriosis-evidence for transmission by food. N. Eng. J. Med. 308:203-206.
50. Skirrow, M. B. 1981. *Campylobacter* enteritis in dogs and cats: a new zoonosis. Vet. Res. Commun. 5:13-19.
51. Skirrow, M. B., G. L. Turnbull, R. E. Walker and S. E. J. Young. 1980. *Campylobacter jejuni*/enteritis transmitted from cat to man. Lancet i:1188.
52. Solomon, H. M. and D. A. Kautter. 1986. Growth and toxin production by *Clostridium botulinum* in sauteed onions. J. Food Protec. 49:618-620.
53. Solomon, H. M. and D. A. Kautter. 1988. Outgrowth and toxin production by *Clostridium botulinum* in bottled chopped garlic. J. Food Protec. 51:862-865.
54. Southern, J. P., R. M. M. Smith and S. R. Palmer. 1990. Bird attack on milk bottles: possible mode of transmission of *Campylobacter jejuni* to man. Lancet 336:1425-1427.
55. St. Louis, M. E., D. L. Morse, M. E. Potter, T. M. DeMelfi, J. J. Guzewich, R. V. Tauxe, and P. A. Blake. 1988. The emergence of grade A eggs as a major source of *Salmonella enteritidis* infections: new implications for the control of salmonellosis. J. Am. Med. Assoc. 259:2103-2107.
56. St. Louis, M. E., S. H. S. Peck, D. Bowering, G. B. Morgan, J. Blatherwick, S. Banerjee, G. D. M. Kettyls, W. A. Black, M. E. Milling, A. H. W. Hauschild, R. V. Tauxe and P. A. Blake. 1988. Botulism from chopped garlic: delayed recognition of a major outbreak. Ann. Intern. Med. 108:363-368.
57. Steele, B. T., N. Murphy, G. S. Arbus and C. P. Rance. 1982. An outbreak of hemolytic uremic syndrome associated with ingestion of fresh apple juice. J. Pediatr. 101:963-965.
58. Svedhem, A. and G. Norkrans. 1980. *Campylobacter jejuni* /entertidis transmitted from cat to man. Lancet i:713-714.
59. Tarr, P. I. and R. O. Hickman. 1987. Hemolytic uremic syndrome epidemiology: A population-based study in King County, Washington, 1871-1980. Pediatrics 80:41-45.
60. Tauxe, R. V., D. A. Pegues and N. Hargrett-Bean. 1987. *Campylobacter* infections: The emerging national pattern. Am. J. Public Health 77:1219-1221.
61. Taylor, N. S., M. A. Ellenberger, P. Y. Wu and J. G. Fox. 1989. Diversity of serotypes of *Campylobacter jejuni* and *Campylobacter coli* isolated in laboratory animals. Lab. Anim. Sci. 39:219-221.
62. Wells, J. G., B. R. Davis, I. K. Wachsmuth, L. W. Riley, R. S. Remis, R. Sokolow and G. K. Morris. 1983. Laboratory investigation of hemorrhagic colitis outbreaks associated with a rare serotype of *Escherichia coli*. J. Clin. Microbiol. 18:512-52.
63. Winstanley, M. 1987. Give *Salmonella* the elbow. New Sci. 15(578):52-55.
644. World Health Organization. 1993. Report of the WHO consultation on hazard analysis critical control point training. WHO/FNU/FOS/93.2. World Health Organization, Geneva, Switzerland.

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Foodborne Illness (Part 7)

Clostridium botulinum

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Botulism is an intoxication (poisoning) attacking the nervous system which is caused by ingestion of specific preformed toxins produced by *Clostridium botulinum* bacteria (types A, B, C, D, E, F, G). The organisms are spore-forming obligate anaerobic bacilli, found ubiquitously in nature, and which are very heat resistant (except type E). Most human outbreaks involve types A, B and E, and rarely from F and G; type A is more lethal than B and E. The toxin is heat labile (inactivated by boiling), but inactivation of spores require much higher temperatures, heat under pressure. Type E toxin can be produced (slowly) down to 37.4°F (3°C). The organism cannot grow below a pH of 4.6 and a water activity (a_w) of 0.93.

Outbreaks (cases) occur where foods are preserved or prepared by methods that do not destroy the spores, permitting toxin production. Over the years, this has occurred mostly in home-canned vegetables and fruits and occasionally in commercial processed foods (tuna, smoked fish, mushrooms, soup, garlic). Meat products have been infrequent vehicles. This has been attributed in part to the use of sodium nitrite as a preserving/curing agent, along with a variety of other factors and interactions, such as heat treatment, pH (acidity), a_w and salt; this inhibiting action helps preserve, along with refrigeration, such products as hot dogs, canned ham, bacon, luncheon meats and comminuted meats.

Several recent outbreaks have been associated with foods prepared/mishandled in a foodservice establishment. One was from sauteed onions used on patty-melt sandwiches, where the sauteed onions, cooked in butter (providing anaerobic conditions), were kept "warm" at the side of a grill; these conditions allowed growth of the organisms, with resultant toxin formation. Two outbreaks and possibly a third involved leftover baked potatoes, wrapped tightly in foil and held at room temperature, before being used to make potato salad. Another recent concern involved commercially bottled garlic in oil (with the label indicating, in very small lettering, that the product be refrigerated) which was kept on the back of a stove, allowing a suitable temperature for the agent to grow in the anaerobic environment; to control this problem, Food and Drug Administration (FDA) now requires that acidifying agents or microbial inhibitors be added to commercial garlic-in-oil products. Another problem developed when fresh mushrooms were marketed in tight plastic overwraps to enhance keeping quality (shelf-life); the respiration rate of the mushrooms was increased by the wrap, depleting the oxygen and producing an anaerobic environment suitable to *C. botulinum* growth; the solution was to punch several holes in the wrap to allow oxygen to enter the package.

Botulism results from consuming a food in which *C. botulinum* has multiplied and produced the toxin. Symptoms develop within 12 to 72 h, possibly with vomiting and diarrhea/constipation occurring initially; then neurological manifestations develop: blurred or double vision, difficulty in breathing and dry mouth are the initial signs, with paralysis of muscles following; fever is usually absent. The shorter the incubation period, the more severe the illness and the higher the fatality rate, which has been below 10% in recent years. Death is usually by paralysis of respiratory muscles.

The only treatment for the illness is administration of the specific antitoxin; appropriate supportive respiratory care would be indicated. Illness duration ranges from 1 to 10 days, depending upon the amount of toxin ingested and the host's resistance; recovery may be slow, taking several weeks to months.

CONTROL. Conditions that favor growth of *C. botulinum* in foods include low acid (pH above 4.6), a relatively high-moisture content (a_w above 0.93), low salt, food devoid of oxygen and stored unrefrigerated for a time. Chemical and physical treatments are used by food processors to destroy/control growth of the organism. Some control measures include:

- Effective control of the heat processing methods used for commercial canned low-acid foods that destroys spores.
- Addition of chemicals, acidifying agents and microbial inhibitors to foods to control growth of spores.
- Maintain and use proper cold storage facilities for vacuum-packaged items that need refrigeration.
- Avoid consuming foods (including tasting) in contain-

ers that 1) Bulge, leak or are severely damaged, including extensive rust; 2) Foam or spurt liquid when the container is opened; and 3) Have abnormal appearance or smell.

- Education of home-canners regarding proper time, temperature and pressure required to destroy botulinum spores.
- Stirring thoroughly, boil home-canned foods for 3 to 5 min before serving.

Finally, for the illness to develop, the contaminated food must be served without an adequate heating process before being consumed because the toxin is inactivated at 140 F (60°C) within 5 min.

As a point of information, there are two other clinical forms caused by the agent, infant and wound botulism, which are beyond the scope of this fact sheet.

BIBLIOGRAPHY

1. Appleton, H. 1990. "Foodborne Illness. Foodborne viruses." Lancet. 336:1362-1364.
2. Baird-Parker, A.C. 1990. "Foodborne Illness. Foodborne salmonellosis." Lancet. 336:1231-1235.
3. Benenson, A. S. 1990. "Control of Communicable Diseases in Man." 15th ed. American Public Health Association, Washington, DC.
4. Cliver, D. O. 1990. "Foodborne Diseases." Academic Press, Inc., San Diego, CA.
5. Doyle, M. P. 1989. "Foodborne Bacterial Pathogens." Marcel Dekker, Inc., New York, NY.
6. Doyle, M. P. 1990. "Foodborne Illness. Pathogenic *Escherichia coli*, *Yersinia enterocolitica* and *Vibrio parahaemolyticus*." Lancet. 336:1111-1115.
7. Finley, J. W., S. F. Robinson and D. J. Armstrong. 1992. "Food Safety Assessment." (ACS Symposium Series). American Chemical Society, Washington, DC.
8. Food Safety and Inspection Service. 1990. "FSIS Facts. Bacteria That Cause Foodborne Illness" (FSIS-40). U. S. Department of Agriculture, Washington, DC.
9. Institute of Food Technologists. 1988. "Bacteria Associated with Foodborne Diseases." A Scientific Status Summary by the Institute of Food Technologists' Expert Panel on Food Safety & Nutrition. Food Technol. 42(4):181-200.
10. Institute of Food Technologists. 1988. "Virus Transmission via Foods." A Scientific Status Summary by the Institute of Food Technologists' Expert Panel on Food Safety & Nutrition. Food Technol. 42(10):241-248.
11. Lund, B. M. 1990. "Foodborne Illness. Foodborne disease due to *Bacillus* and *Clostridium* species." Lancet. 336:982-986.
12. National Restaurant Association. 1992. "Applied Foodservice Sanitation." 4th ed. John Wiley & Sons, Inc., New York, NY.
13. Roberts, D. 1990. "Foodborne Illness. Sources of infection: Food." Lancet, 336:859-861.
14. Skirrow, M. B. 1990. "Foodborne Illness. *Campylobacter*." Lancet. 336:921-923.
15. Snyder, O. P. and D. M. Poland. "America's 'Safe' Food," Dairy, Food and Environ. Sani. Part I, 10(12):719-724, December 1990. Part II, 11(1):14-20, January 1991.
16. Todd, E. 1990. "Foodborne Illness. Epidemiology of foodborne illness: North America." Lancet. 336:788-790.

Part seven of the Foodborne Illness Series will be published in the May 1994 issue of Dairy, Food and Environmental Sanitation.

Updates . . .

Federal Register, April 7, 1994, **Fish and Fishery Products Hazards and Controls Guide; Availability; Extension of Comment Period**

The Food and Drug Administration (FDA) is extending to **May 31, 1994** the comment period on a notice that appeared in the Federal Register of March 18, 1994 (59 FR 12949) and the April 1994 Dairy, Food and Environmental Sanitation. The document announced the availability of a draft guidance document entitled "Fish and Fishery Products Hazards and Controls Guide." In response to several requests, FDA is publishing a document to extend the comment period on the proposal to adopt regulations to ensure the safe processing and importing of fish and fishery products, including procedures for the monitoring of selected process in accordance with Hazard Analysis Critical Control Point (HACCP) principles (59 FR 4142, January 28, 1994). Because the Fish and Fishery Products Hazards and Controls Guide was developed to serve as an adjunct to the proposal, the agency believes that it would be appropriate also to extend the comment period on it. For further information contact Donald W. Kraemer, Center for Food Safety and Applied Nutrition (HFS-401), Food and Drug Administration, 200 C St., S.W., Washington, DC 20204, 202-254-3885.

Announcement of the 1994 IAMFES Workshops

This year IAMFES will be offering two workshops in conjunction with its Annual Meeting. Both workshops will be held at the Hyatt Regency Riverwalk in San Antonio, Texas. They will each be a day-and-a-half in length, beginning at 1:00 p.m. on Friday, July 29, and concluding at 5:00 p.m. on Saturday, July 30. The IAMFES Annual Meeting will begin on Sunday, July 31, and end on Wednesday, August 3.

The two workshops are vastly different and are meant to appeal to different segments of the IAMFES membership. At the same time, they share a common theme – Food Safety. This is in keeping with the IAMFES Mission of "Providing Food Safety Professionals worldwide with a forum to exchange information on protecting the food supply."

See pages 298-299 for more information on these workshops and registration information. Sign up *NOW* and take advantage of the early registration discount!

In Memory of Elmer L. Thomas – 1916-1994

Elmer L. Thomas, Professor Emeritus in the Department of Food Science and Nutrition at the University of Minnesota, and long-standing IAMFES member, died on March 19, 1994, at Crestview Nursing Home in Columbia Heights, Minnesota, of complications from emphysema. Dr. Thomas earned his M.S. and Ph.D. degrees in dairy technology at the U of M and joined the faculty in 1951 as an assistant professor. He became associate professor in 1955, professor in 1961 and retired in 1981. Following retirement, he worked for many years as a part-time consultant for Schwan's Sales Enterprises in Marshall, Minnesota.

During his years in the Department he developed and taught courses in dairy manufacturing, worked in the area of sensory testing of foods and in dairy products judging, advised numerous undergraduate and graduate students (including present leaders of the dairy industry), and was author or coauthor of 67 research publications. He was recognized as one of the world's foremost experts on fluid milk and ice cream, their processing, texture and flavor.

Thomas coached every U of M dairy products judging team from 1949 to 1980 except in 1970 and 1977 when he was on sabbatical leave. His teams never finished out of the top ten in national competition. They won first place in the All Products category on two occasions and in individual product areas almost every year.

In addition to advising students, he was also consulted by alumni on the hiring of new graduates, and for many years he acted as the department's informal placement officer. He was chair of the scholarship committee and coordinator of the Professional Experience Program activities.

In 1977 he was given the Milk Industry Foundation Teaching Award. He received the Distinguished Alumni Award of Ohio State in 1974, was named Honorary State Farmer by the Minnesota FFA in 1968, and in 1955, in recognition of his services rendered at the International Trade Fair in Bogota, Colombia, he was designated U. S. Dairy Ambassador by the Dairy Society International.

Dr. Thomas was active in professional organizations and in his community. He chaired several committees of the American Dairy Science Association, served as president of the Minnesota Dairy Technology Society, was a member of the Joint Conference and Long-Range Planning committees of St. John's Hospital, and was a long-term member of its Board of Directors.

He is survived by his children: David and his wife, Mary, Alexandria, Virginia; Carol Sue and her husband, Bob Ostergren, Madison, Wisconsin; Jim and his wife, Joanne, of Fridley, Minnesota; seven grandchildren; and his sister, Ethel Lobaugh, of Columbus, Ohio. Memorials are preferred to The Dr. Elmer L. Thomas Scholarship Fund at the University of Minnesota.

News

Label Approval Process

Although generally supportive of a U.S. Department of Agriculture (USDA) proposal to simplify its prior label approval system for meat and poultry products, the American Frozen Food Institute (AFFI) urged the agency to adopt a more flexible process with clearly defined guidelines.

The AFFI's comments to USDA's Food Safety and Inspection Service (FSIS) were in response to a proposed regulation intended to provide a more efficient process for pre-approving the labels of meat and poultry products. This regulatory review is being undertaken in conjunction with revised labeling regulations for use in developing labels appearing on packages on or after July 6, 1994. The Food and Drug Administration does not have a prior label approval process.

Specifically, the FSIS proposal calls for a sketch labeling approval system, through which a company would simply submit a sketch of a label for approval prior to mass production of the label.

"Sketch approval would provide manufacturers the assurance that their labels meet applicable regulatory requirements, and would ensure for all manufacturers regulatory consistency among local inspection personnel," said AFFI President Steven C. Anderson in the comments to FSIS. "However, AFFI encourages the agency to adopt a sketch approval system with significantly more flexibility than currently is included in the proposal."

Among its many recommendations, AFFI urged the agency to:

- accept black and white sketch approval so photocopies of the label could be submitted in lieu of final color proofs, allowing manufacturers to obtain agency approval earlier in the process and make label changes in a more efficient manner;
- clarify the meaning of the terms "sketch," "printer's proof" and "indication of final color" to indicate more clearly what manufacturers are required to submit;
- review the proposed size limitation for sketch labels since most are larger than 8 1/2" x 14";
- continue to assign approval numbers to labels submitted, allowing manufacturers to ship product following approval but prior to receiving the label approval documentation; and
- expand the maximum amount of time given to temporary approvals from 6 months to twelve to accommodate label changes and label inventory conversion at the plants.

Furthermore, AFFI supported the agency's proposal to remove the Inspector-in-Charge (IIC) from the label approval process in conjunction with the implementation of a generic label auditing program. However, AFFI requested that the label oversight role of the IIC be more clearly defined.

"Local inspection personnel must be educated sufficiently in regulatory interpretation in order to avoid inappropriate label challenges and to ensure consistency in regulatory application," said Anderson. "AFFI urges the agency to limit labeling oversight by local inspection personnel to only those situations in which there is a safety risk or gross negligence in labeling by the manufacturer."

The AFFI also encouraged FSIS to expand the list of labels subject to generic approval so no prior approval would be required for those labels.

The AFFI is the national trade association that has represented the interests of the frozen food industry for over 50 years. Its 525 corporate members account for more than 90% of the total U.S. production of frozen foods.

For more information contact Traci Carneal at (703) 821-0770.

Major Manufacturers and Supplier Groups Sponsor Food Safety Campaign

A select group of the foodservice industry's leading suppliers have pledged to sponsor the Industry Council on Food Safety's national food safety campaign. Formed by The Educational Foundation of the National Restaurant Association in September 1993, the Industry Council is a coalition of foodservice operators, manufacturers, suppliers and associations committed to addressing food safety.

Sponsors recognized by The Foundation for making the maximum financial contribution to the Industry Council on Food Safety are the Beef Industry Council; Campbell Soup Company; ECOLAB, Inc.; Heinz U.S.A.; Nabisco Foods Group; SYSCO Corporation; and Tyson Foods. These organizations have been designated Campaign Sponsors. Others making a significant financial commitment as Program Sponsors are the American Egg Board, the Food Handler Division of Island Poly and Rymer Foods.

"These organizations clearly share with the rest of the foodservice community the realization that food safety is one of the most critical issues we face," said Daniel A. Gescheidle, FMP, president of The Educational Foundation. "The generous support by these companies for food safety training and for communicating the industry's continuing commitment to such training distinguishes them as leaders in a positive effort to benefit the entire industry."

Backed by the financial support of sponsors and other contributors, the Council is spearheading a national food safety campaign to encourage proper training in the safe handling and preparation of food, and to inform the public of the foodservice industry's commitment to food safety.

According to industry leaders, comprehensive training is the most effective way to ensure food safety in foodservice operations. The Educational Foundation's SERVSAFE Serving Safe Food Program is widely recognized and the industry's most complete and up-to-date food safety and sanitation training program. Over one million foodservice employees have been trained with SERVSAFE. It meets standards of over 95% of all state and local jurisdictions that require training and testing.

To participate in the Industry Council, operators must use the SERVSAFE Program and have a SERVSAFE-certified manager or supervisor on duty at all times. Other foodservice associations that have signed on to participate in the Council will provide SERVSAFE training for members.

"We must make this training truly industry-wide with the goal that anyone who serves food to the public will be trained in food safety," said Jackie Trujillo, FMP of Harman Management Corporation, and chair of the task force that developed the Industry Council.

To increase awareness of the national food safety campaign and the Industry Council, The Educational Foundation is launching an extensive communications program, highlighted by the release of a 16-page advertorial in major foodservice industry publications in mid-April. The communications campaign will also begin educating consumers about the foodservice industry's actions to protect them from foodborne illness.

Sponsors stressed how important it was for industry leaders to take action now; "Food safety has always been an important issue, but it's even more critical in the public's eye today," said Robert Plank, SYSCO vice president of marketing.

"It's the number one issue facing foodservice right now," agreed William Bathurst, assistant product manager for ECOLAB's Institutional Division.

Council sponsors stressed the importance of food safety awareness at every stage of the food distribution process, from field to table.

"Our industry can only continue to succeed and grow if consumers have confidence that everyone in the supplier-operator chain can deliver safe, wholesome food consistently," noted Ronald E. Elmquist, president of Global Food Service for Campbell.

Industry leaders agree that until SERVSAFE training is more nearly universal, food safety will continue to be a pressing issue for foodservice.

"Only hands-on, up-to-date training will ensure that proper food safety practices are implemented," commented Mary Adolf, the Beef Industry Council's vice president of promotion and advertising.

Tyson Senior Vice President of Sales & Marketing Greg W. Lee said that his company strongly supported the Council's SERVSAFE requirement "because it expresses and is consistent with our own corporate approach to quality. Quality is something that goes all the way through a program. This is the approach that we see rubbing off on the restaurant community and building credibility with the consumer."

In addition to their financial commitment to the current food safety campaign, Council sponsors are also active in supporting food safety in other ways.

Heinz technical personnel assisted The Foundation by reviewing some of the SERVSAFE Serving Safe Food Program materials during the development process.

The Nabisco Foods Group plans SERVSAFE training for some of its own sales executives. "Companies like ours have to take a proactive stance in helping foodservice operators deal with the food safety issue," said Vice President of Marketing Chuck Klemballa. "If we wait until people start questioning food safety practices, it will drive them back into their homes."

The Educational Foundation, established in 1987, is a non-profit organization dedicated to being the leading source of educational products and services for the foodservice industry.

3-A Forms New Committees

As the dairy and food industries grow so does the need for the 3-A Sanitary Standards Committees to expand their responsibilities. In response to industry needs, 3-A is requesting participation from processors and suppliers interested in any of the following new standards committees:

1 - High Shear Mixers
2 - Sanitary Welding Requirements
3 - Dry Ingredient Feeders

The objective of the 3-A Sanitary Standards Committees is to formulate standards and accepted practices for equipment and systems used to process milk, milk products and other perishable foods. Through the participation of equipment manufacturers, dairy and food processors, and sanitarians including representation by the United States Public Health Service, the 3-A program has resulted in the adoption of more than 60 voluntary 3-A Sanitary Standards and 3-A Accepted Practices.

Those interested in these new 3-A activities should contact Susan Shaw, of DFISA, at 301-984-1444 or fax 301-881-7832.

New Nutrition Label Will Have Many Formats

By May 8, a new nutrition label called Nutrition Facts will appear on most packaged foods in supermarkets.

"The label is packed with nutritional information to help you make wise decisions about fat content, vitamins, minerals and other nutritional concerns," says Dr. J. Lynne Brown, associate professor of food science in

Penn State's College of Agricultural Sciences. "It's hard to miss, because the name and format make it stand out on the food package. But you may see versions of it as a single column or as a column with a side panel."

The full label has three major sections. The top section has the title and lists the serving size. The middle section, between the two heavy bold lines, presents information on calories and amounts of major nutrients. The bottom section has information on vitamins as well as a table of standards for Percent Daily Values, which are the percentages of the recommended amount of vitamins and nutrients in one serving of that food.

"The bottom section also may list the calories in a gram of fat, a gram of carbohydrate and a gram of protein," says Brown. "Some manufacturers split the label so that the Percent Daily Value information is listed on the side. This format often is used on square or rectangular packages." Because there is so much information on the new label, and food package sizes vary, you won't see all this information on every food package. For instance, when space is tight, the information on Percent Daily Values and calories per gram can be dropped.

In addition, some labels don't list all the nutrients shown on a full label. If a food doesn't contain a significant amount of seven or more of the required nutrients, these nutrients can be dropped from the nutrient listing.

"However, manufacturers must indicate which nutrients have been dropped and must explain why," says Brown. "The label might say, 'Not a significant source of cholesterol, dietary fiber, sugars, vitamin A, vitamin C, calcium and iron.' Regardless of the format, all labels must list the serving size, calories and major nutrients present as well as the Percent Daily Value where appropriate."

For more information contact Rose Pruyne (814)863-2703.

BISSC Sets Strategy for the Future

The future direction and expectations of "sanitation standards for the baking industry" and the role of the Baking Industry Sanitation Standards Committee (BISSC) as the standards organization for the industry were openly discussed by 35 key baking industry and regulatory agency representatives during the BISSC Sanitary Design 2000 Forum, March 3, at the Chicago Marriott Hotel. The forum confirmed a strong need still exists for BISSC although changes need to be implemented to strengthen BISSC's future role in the baking industry.

"BISSC sanitation standards are the toughest standards in the world. Despite this, they are not well recognized," said BISSC 2000 committee co-chair, Hans van der Maarel, president, Benier, U.S.A., Inc., Lithia Springs, GA. "Engineers and up (through the executive level) must recognize the value of being BISSC-certified."

Providing the framework for the BISSC 2000 strategic planning forum was Edward D. Barlow, Jr., president, Creating the Future, Inc., St. Joseph, MI, and one of America's leading business futurists. According to Barlow, what works today will not necessarily work tomorrow. "It will no longer be business as usual. Companies and organizations must choose from their past what they should keep, modify, let go and create. One must assume the future will be very different from the past," said Barlow. "The future isn't bad, just different."

In looking at BISSC's future, forum participants agreed that the basic framework of BISSC and the support offered by seven supporting allied associations should remain. However, the concept of self-certification needed to be addressed and replaced. Modifications suggested and presented to the BISSC Board of Directors include:

- an expansion of BISSC's financial support base;
- additional sponsors;
- changing the organization's image to be more encompassing;
- revising the certification process with mandatory versus voluntary accreditation;
- revamping the challenge and inspection process; and
- embracing more industry interest and alliances.

For the organization to survive and grow, the group decided BISSC needs to consider:

- an "area guide" for applications to be added to the BISSC standards basic criteria;
- alliances with other standards groups;
- better education for smaller bakers and regulatory agencies about BISSC's role in sanitation standards;
- an umbrella organization for food standards;
- methods to evaluate resources to accomplish recommendations of BISSC 2000 Forum;
- third-part certification;
- educational opportunities for end users regarding sanitary maintenance;
- recertification process; and
- seminar/training sessions

Information gathered at the BISSC Sanitary Design 2000 Forum has helped set the future direction of the organization. Many of the short range goals outlined in the forum discussion will be acted upon by the BISSC 2000 Committee during the next several months and further reviewed at the Mid-Year Board Meeting, Friday, August 12, O'Hare Hilton, Chicago, IL.

For more information contact BISSC headquarters, 401 N. Michigan Avenue, Chicago, IL 60611; 312/644-6610.

Federal Register

Department of Health and Human Services

Food and Drug Administration

21 CFR Parts 123 and 1240

[Docket No. 93N-0195]

Proposal to Establish Procedures for the Safe Processing and Importing of Fish and Fishery Products; Extension of Comment Period

Agency: Food and Drug Administration, HHS.

Action: Proposed rule; extension of comment period.

Summary: The Food and Drug Administration (FDA) is extending to May 31, 1994, the comment period for a proposed rule that appeared in the **Federal Register** of January 28, 1994 (59 FR 4142). The document proposed to adopt regulations to ensure the safe processing and importing of fish and fishery products, including procedures for the monitoring of selected processes in accordance with Hazard Analysis Critical Control Point (HACCP) principles. HACCP is a preventive system of hazard control that can be used by food processors and importers. The FDA is taking this action in response to several requests for an extension of the comment period.

Dates: Written comments by May 31, 1994.

Addresses: Submit written comments, data or information to the Dockets Management Branch (HFA-305), Food and Drug Administration, Rm. 1-23, 12420 Parklawn Drive, Rockville, MD 20857.

For Further Information Contact: Philip C. Spiller, Center for Food Safety and Applied Nutrition (HFS-401), Food and Drug Administration, 200 C St. SW, Washington, DC 20204, 202-254-3885.

Supplementary Information: In the **Federal Register** of January 28, 1994 (59 FR 4142), FDA issued a proposed rule to adopt regulations to ensure the safe processing and importing of fish and fishery products, including procedures for the monitoring of selected processes in accordance with HACCP principles. Interested persons were given until April 28, 1994, to comment on the proposal. However, because of an inadvertent error, the date for submission of comments was incorrectly given as March 29, 1994. In the **Federal Register** of March 3, 1994 (59 FR 10085), FDA published a proposed rule to correct the comment period to April 28, 1994.

The FDA has received several requests from trade associations, State agencies and university officials for an extension of the comment period in order to better review the proposal and prepare comments. Most requests ask for a 90-day extension, although one request is for an unspecified length and another is for about 120 days. The FDA also received a request from a public advocacy organization that the comment period either not be extended at all or that it be extended no more than 30 days.

After careful review of these requests, FDA has concluded that it is in the public interest to allow an additional 30 days for comments. With the additional period, the agency is providing a total of 120 days for comment. The FDA considers that this amount of time should be more than ample for interested persons to complete and submit their comments. Accordingly, the agency is extending the comment period to May 31, 1994.

Interested persons may, on or before May 31, 1994, submit to Dockets Management Branch (address above) written comments regarding this proposal. Two copies of any comments are to be submitted, except that individuals may submit one copy. Comments are to be identified with the docket number found in brackets in the heading of this document. Received comments may be seen in the office above between 9 a.m. and 4 p.m., Monday through Friday.

For a complete listing, please contact the IAMFES office at 1-800-369-6337 or 515-276-3344.

Food and Environmental Hazards to Health

Update: Hantavirus Infection — United States, 1993

An outbreak of respiratory illnesses associated with hantavirus infection continues to be investigated by state health departments in Arizona, Colorado, New Mexico and Utah; the Indian Health Service; and Centers for Disease Control (CDC), with the assistance of the Navajo Nation Division of Health. This report updates information regarding the outbreak and presents information on a case of unexplained adult respiratory distress syndrome (ARDS) in a person who resided in eastern Texas.

Laboratory evidence of acute hantavirus infection has been confirmed in 16 patients who had onset of illness from January 1 through June 30, 1993. Of these 16 cases, 11 occurred in New Mexico, four in Arizona, and one in Colorado; 12 occurred among persons aged 20 to 40 years. Twelve patients have died. Similar illnesses in an additional 25 persons in the four-state area, 10 of whom died, are being investigated for possible hantavirus infection.

In June 1993, a fatal case of ARDS occurred following a prodrome of fever, myalgias and shortness of breath in a previously healthy 58-year-old woman who lived in eastern Texas. The woman had not traveled outside eastern Texas during the 3 months before her illness. During her hospitalization, diagnostic evaluation, including blood and sputum cultures and a transbronchial lung biopsy, did not reveal the cause of her illness. A serologic test conducted at CDC on a single serum specimen revealed an elevated hantavirus immunoglobulin M enzyme-linked immunosorbent assay titer. The Texas Department of Health and CDC are continuing to investigate this illness by examining clinical materials using additional techniques and seeking evidence of hantavirus infection in rodents in the vicinity.

Except for illnesses in the Texas patient described in this report and in a person who had traveled to the four-state area in 1992, no evidence of hantavirus infection has been detected in serologic tests conducted at CDC on specimens from 22 other persons with unexplained ARDS who resided outside the four-state area.

Editorial Note: The findings of the investigation described in this report suggest that acute hantavirus infection occurred in a resident of eastern Texas. This case suggests that ARDS associated with acute hantavirus infection can occur in areas outside the southwestern United States. The CDC continues to work with state health departments to investigate cases of unexplained ARDS.

The current outbreak appears to be caused by a newly recognized hantavirus associated with *Peromyscus maniculatus* (deer mouse). Previously, two well-characterized hantaviruses had been isolated from different species in the United States: Seoul virus from *Rattus norvegicus* (Norway rat) and Prospect Hill virus from *Microtus pennsylvanicus* (meadow vole). Antibodies reactive with these viruses have been detected in serum specimens from rodents and humans from many areas of the United States.

A previous report suggests that the prevalence of hantavirus-specific antibodies is low in humans in the United States. However, examination of the association of hantavirus infection with human disease in the United States has been limited and focused on renal disease, which is characteristic of previously described hantavirus syndromes, but not on pulmonary disease, which is characteristic of the syndrome in the current outbreak. In one recent study, serologic evidence of past hantavirus infection was associated with a diagnosis of hypertensive renal disease. Additional research is needed to define the distribution and manifestations of hantavirus infections in the United States.

MMWR 7/9/93

The *WHYS* Behind Food Safety Rules for Food Service Managers

Why are we giving you the "*whys*?" Because it's easier to follow a rule if you understand why it's necessary. Here is the scientific reasoning behind basic safe food handling rules recommended by the Food and Drug Administration in the new Food Code.

Rule: Keep It Safe, Refrigerate.
Refrigerate foods you'll use quickly, making sure the temperature is maintained at 40°F or below. Freeze raw meat, poultry or fish you won't use in a couple of days.
Why: Food temperatures of 40°F or below slow the grow of bacteria that could cause illness. Food maintained in a solidly frozen state does not support bacterial growth.

Rule: Wash Hands Before Preparing Food.
Wash hands and utensils after contact with raw meat, poultry or fish.
Why: Hands carry amazing numbers of bacteria. So wash hands before food preparation and after contact with raw meat, poultry or fish. These raw foods also may carry bacteria, so it's important to clean and sanitize any utensils or surfaces they contact between use with each product.

Rule: Cook Thoroughly.
Ground meat patties and loaves are safe when all parts reach 155°F (for 15 seconds). Ground poultry, including patties and loaves should reach 165°F for 15 seconds. For both ground meat and poultry, there should be no pink and the juices should run clear. Fish should reach 145°F for 15 seconds and should flake with a fork.
Why: Hot cooking temperatures kill most bacteria found in raw food. The heat weakens the bacteria cell and eventually destroys the cell protein and other vital structures.

Information provided courtesy of the U. S. Department of Agriculture and the Food and Drug Administration

HAZCON-Based Total Quality Management

Retail Food Operation Food Hazard Control Checklist

O. Peter Snyder, Jr., Ph.D.
Hospitality Institute of Technology and Management,
830 Transfer Road, Suite 35,
St. Paul, MN 55114

The following is the eighth installment of the Retail Food Operation Food Hazard Control Checklist mentioned in the October 1993 column. This checklist will be continued over the next several months to cover its entirety.

RETAIL FOOD OPERATION FOOD HAZARD CONTROL CHECKLIST
[40°F - 150°F (4.4°C - 65.6°C)] [1]

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
Safe preparation of single portion, thin, <2-in. thick items (Haz) The following procedures are used to cook single portion, thin, <2-in. thick items in order to meet public health codes as well as customer standards of quality. • **Eggs** - All parts of individually prepared shell eggs or pooled shell eggs are pasteurized according to the Food Pasteurization Table. - Raw shell eggs are not used in the preparation of uncooked, ready-to-eat menu items unless they have been produced from flocks of chickens that are certified to be free of *Salmonella* spp. - Pasteurized liquid and dried eggs are used in the preparation of egg dishes and other menu items whenever possible to assure the safety of these products. - When shell eggs are used in recipes where the egg does not receive pasteurization, the eggs are certified as *Salmonella*-free (no *Salmonella* in the flock of chickens producing the eggs). • **Raw Beef** - If eaten raw, must be ground from large fresh cuts held no more than 3 days at <40°F in the retail operation. - The supplier must certify that there are <100,000 Standard Plate Count (SPC) Colony-Forming Units (CFU) [86°F (30°C) incubation] per cm^2 and <10 *Escherichia coli* per cm^2 on the surface when examined by the standard surface swab procedure. • **Raw, thin foods (chicken, fish and hamburgers)** - Are cooked to a minimum center temperature of 150°F for 31.1 s or equivalent time and temperature according to the food pasteurization table. • **Poultry** (chicken and turkey products or dressing) - Is cooked until a center temperature of 165°F for >1 s is reached. • **Fish and shellfish** - Are cooked to reach a center temperature of 150°F for more than 31.1 s. - If raw fish or shellfish are served, or if these products are cooked to less than 150°F, the supplier must certify that these fish and shellfish products have such a low pathogen level that they are safe to be eaten raw. • **Meatloaves** - Are panned or formed into styles no more than 2 in. thick in a 2-1/2 in. pan, and are cooked to a center temperature of more than 160°F and held at this temperature for more than 3 s. • **Microwaving** When using this rapid cooking method, the following temperatures and procedures apply. - The center food temperature for pork items reach 170°F for 15 s. - Other raw meat, fish and poultry items reach a center temperature of (165°F) for >1 s. - Products cooked in microwave ovens are covered to prevent surface cooling and to promote even heat transfer. - Microwave heated products held covered for 2 min after cooking to promote even heat transfer.		

Abbreviations: (Haz) = Hazard; (Reg) = Regulatory; (Qual) = Quality; (OSHA) = Occupational Safety and Health Agency

[1] Temperatures, unless otherwise stated, are food temperatures. They are measured both 1/16-in. below the surface as well as at the center of food in order to determine the degree of control and stability of hot and cold systems.

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
Sauces, soups, and beverages (Haz) • Are held at >165°F for customer satisfaction. - Soups, sauces and gravies are not thickened until shortly before items are needed in order to maintain temperature uniformity.		
Controlling growth of pathogens with acid ingredients (Haz) • Acid ingredients (lemon juice, wine, vinegar) in sufficient amount to adjust the pH of the final product to less than 4.1, are used to make products such as mayonnaise, Hollandaise sauce, Bearnaise sauce and other salad dressings safe at room temperature. - Acid ingredients in mayonnaise prevent the growth of *Salmonella* spp. and other vegetative pathogens if the pH is less than 4.1. However, mayonnaise and salad dressings are refrigerated to control spoilage. • Other egg and heavy cream sauces that are not pasteurized, that do not tolerate continuous holding at 150°F, and that do not have a final acidity of less than pH 4.1, are made fresh at least every 2 h.		
Fruits, vegetables, legumes, and cereals (Haz) • Fresh fruits and vegetables are washed to remove surface contaminants (microorganisms, parasites, pesticides, insects, worms and soil). • Fresh fruit and vegetable spoilage is partially controlled by maintaining very cold food refrigeration storage temperatures (<35°F) • Cereals (eg., rice) and raw vegetables (e.g., carrots, potatoes, cabbage, mushrooms, etc.) - Are contaminated with spores and are kept cold and dry, or at <0.86 a_w, or are packaged to allow air exchange before cooking . - After cooking, all vegetables, such as green beans, baked or boiled potatoes, and cereals, such as rice will have activated spores maintained at >150°F or cooled to <40°F within 11 h (4 h for regulatory compliance).		
Bread and pastry (bakery items) (Haz) • Potentially hazardous icings and protein (milk and egg) fillings are cooled to <40°F in 11 h (4 h for regulatory compliance) before being used in items such as eclairs or custard pies. - When a hazardous topping, such as an egg white meringue is baked or browned, the center temperature of the meringue and temperature at the interface of the pie and meringue reach > 160°F for > 1 s. The pie and meringue must be cooled to <40°F in 11 h for safety (4 h regulatory compliance). • Cooked mixtures are placed on cakes, in shells and crusts, or other baked goods while still hot, > 165°F for >1 s. The topping is then added and the item baked or cooled in order to avoid microbiological contamination at the surface between the filling and pie topping.		
Hot combination dishes (Casseroles, stews, thick soups) (Haz) • Composed of cooked or pre-cooked ingredients reach a center temperature of 165°F for >1 s. - Pans of casseroles, stews and chili are heated to 165°F in <2 h to meet quality standards, and must be heated within <6 h for safety.		
Cold combination dishes (Salads and Sandwich spreads) (Haz) • Ingredients used in cold combination dishes are washed and prepared separately and kept at <40°F. • Ingredients are pre-chilled before they are combined and are maintained at or below 50°F during preparation. • Products are prepared in small batches with sanitized utensils and containers. • Flavoring and spices are added to sauces or dressings before mixing all ingredients together to produce a uniform flavor throughout the product. • Commercially sterilized spices are used in the preparation of these products. • Leftovers are not used in the preparation of cold combination dishes unless HACCP approved recipes are used in the preparation of these items.		
Frozen desserts (Reg) Ice cream, sherbets, ices, frozen yogurt, etc., are maintained at 0°F to 30°F for safety.		
Holding, Serving and Transporting		
Food holding temperatures (Reg) • Freshly prepared hot food items are held at >150°F and cold foods are held <40°F for regulatory compliance. • Adequate and approved hot holding devices or cold holding devices are used to maintain potentially hazardous foods at correct temperatures during storage, preparation, transportation and service.		

FOOD SAFETY CONTROL REQUIREMENTS	PERFORMANCE EVALUATION	NEEDED TO ASSURE SAFETY
Serving, packaging and transporting (Haz) • Food is kept covered as much as possible to maintain surface temperatures and prevent surface dehydration. • During transport, hot food is maintained >150°F and cold food <40°F. • The surface temperatures of food that is open on a buffet or service line are <150°F. - Individual portions of food on a buffet line are replaced with fresh portions every 20 min; casserole items are replaced every hour. • Cold items (at <40°F when going on the line) are used within times specified in the food holding table (Safe Holding Times at Specified Temperatures). • Cold food is never displayed under hot display lights.		
Salad bar (Haz) • Cold food items are at 40°F or less, before being placed into the salad bar because salad bar units are not designed to cool food. • Ice in a non-refrigerated salad bar is filled to the level of food in the containers. In a refrigerated salad bar, ice is not needed. • Leftover salad bar product is never added to fresh product. - Some of the left over salad bar items (e.g., carrot sticks, chopped onions, celery sticks) may be used in a recipe (stews or soups) in the kitchen if still within the use-by-date.		
Handling food and money (Reg) • Persons in positions that require preparation and service of food, as well as bussing dishes and collecting money in plain view of the customers, for appearance sake, do not touch food being served to customers with their hands. • Tongs, spoons or paper wrappers are used to prepare and serve the foods. • Personnel wash their hands often, whenever they become contaminated by touching dirty surfaces.		
Dishware (Reg) • Personnel do not touch food contact surfaces of dishware and serving utensils. • Servers touch the rims of plates, bottoms of glasses, and handles of cups and utensils. • All dishware is double-checked for a clean, spot-free appearance before it is used. Any unsatisfactory dishware is returned to the dishwashing area. • Dishware that is chipped, cracked or surface-scarred is discarded. - Disposal of the item(s) is recorded.		
Food tasting (Reg) • Each time food is tasted, a clean saucer or clean disposable container and clean spoon or fork (plastic or metal) are used. - Personnel never dip their fingers into food in order to evaluate any prepared product.		
Foods causing allergic reactions (Haz) • Employees are informed of allergic reactions existing in a small portion of the population that is caused by ingestion of certain foods or food components. • A listing of all ingredients used in the preparation of food items is available to serving personnel, so that they can correctly answer customer questions, if requested to do so. • If any ingredients are substituted in a recipe, employees are informed.		
Carry-out and banquet food (Haz) • The freshest possible food with the lowest bacterial counts is provided for carry-out service. • Customers are told to keep hot food >150°F, or keep cold food <40°F, or to consume it within 2-1/2 h. • All catered food is maintained at temperatures >150°F or <40°F until it is served.		

*This **Retail Food Operation Food Hazard Control Checklist** will continue in subsequent issues of* Dairy, Food and Environmental Sanitation. *The June installment will cover: **Storing Prepared Food.***

New IAMFES Members

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Industry Products

New 1993 Laboratory Catalog

Kernco Instruments Co., Inc. is pleased to offer its new 1993 laboratory catalog complete with specifications, prices and pictures describing over 250 instruments designed for use by analytical and research laboratories, industrial users for process control, as well as for use by other industries such as: food, beverages, breweries, milk, environmental sanitarians and many others.

Some of the instruments included are: hand portable testers to measure pH, ORP, total dissolved solids, conductivity, specific sodium ions, temperature and salinity. Test simulators for pH and ORP testing are available, as well as a new 4-in-1 portable meter that measures pH, ORP, conductivity and temperature. Chemical test kits also available for D.O., alkalinity, iodine, hardness and chloride.

In addition to the handheld testers, the catalog describes data on our bench type laboratory and process control type meters designed to measure and control pH, ORP, conductivity, temperature, dissolved oxygen and relative humidity. Other instruments available and described are a wide line of pumps that offer pH and ORP controllers with built-in pump feature. They are offered with alarm contacts. 4-20 mA output or contact for auxiliary pump, valve or mixer. Other lab equipment includes high-precision Abbe refractometers, half and full circle polarimeters, and contact angle meters for wetability, and surface tension and adhesion analysis studies. A complete line of portable refractometers are also shown.

Other products included are: magnetic stirrers (16 models), autospeed magnetic stirrers (15 models), pH and ORP electrodes (34 different types), thermometer testers (22 models), and test solutions and buffers for pH, ORP, conductivity, TDS, D.O., salinity, pNA, as well as cleaning and electrolyte solutions.

Kernco Instruments Co., Inc. - El Paso, TX

Please circle No. 247 on your Reader Service Card

HACCP Quality Support

Lancaster Laboratories offers comprehensive microbiology analytical capabilities in support of HACCP quality programs. Services include finished product testing, environmental pathogen testing (*Listeria monocytogenes*, *Escherichia coli*, *Salmonella* Species), and equipment sanitation swabs analysis (Aerobic Plate Count and Coliforms). Transport swabs, sponges and instructions for environmental sampling are available. Lancaster Laboratories has over 20 years of experience in the food sciences and serves many of the nation's largest food processors.

Lancaster Laboratories, Inc. - Lancaster, PA

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High Quality Microbiological Testing and Chemical Analyses

Dairy & Food Labs, Inc. (DFL), established in 1925, is a client driven, service laboratory offering the highest quality microbiological testing, chemical analyses and nutrition labeling services. DFL can assist you in your HACCP, Quality Control and Regulatory needs. Specialty technical services provided: *Salmonella, Listeria, Escherichia coli* O157:H7, *Yersinia*, Vitamin A&D, sugars and fatty acid profiles, infrared milk analysis, microscopy, shelf-life studies, consultation, environmental programs, quality control programs, pathogen screens, on-site training programs and rapid microbiology methods.

Dairy & Food Labs, Inc. - Modesto, CA

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Photosynthesis Meter

A new photosynthesis meter, developed by Columbus Instruments, allows measurement of gas production or consumption in plants, fruit and bacteria in either atmospheric or aquatic-based environment under any illumination level. Results are accomplished by periodically circulating a sample of the plant air through a pair of O_2 and CO_2 sensors before returning the sample to the test chamber. This design permits the extreme sensitivity of up to 0.2 µL/h when determining gas volume exchanges without altering the sample conditions. The Photosynthesis Meter determines both change in cumulative gas volumes and the rate of gas exchange. Results may be normalized to the sample volume, plant mass or total leaf area.

The breakthrough in technology involves the integration of multiple sensors, which enable the researcher to track the exchanges of both oxygen and carbon dioxide. This permits the measurement of carbon dioxide consumption, which is impossible for instruments using CO_2 scrubbing agents. The Photosynthesis Meter is also designed to measure photosynthesis iin a range of air atmospheres (e.g., air enriched with CO_2 or N_2).

Photosynthesis of multiple samples in up to 80 chambers is measured concurrently by a single instrument. The experimenter maintains a great degree of flexibility in determining an ideal chamber volume and optimum illumination techniques. Controlled by an IBM-AT compatible computer, this instrument is capable of displaying results and graphs in real time as well as outputting data to a diskette in a spreadsheet format.

Columbus Instruments - Columbus, OH

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Labconco's RapidStill II for Kjeldahl Distillation is Made in U.S.A.

Labconco Corporation, Kansas City, Missouri, offers the RapidStill II as an automatic steam distillation unit for labs performing rapid Kjeldahl protein/nitrogen determinations. It serves as a companion to Labconco Rapid Digestors. The RapidStill II is made in America with domestically produced components.

The RapidStill II has a built-in dispenser switch which allows the operator to control the amount of sodium hydroxide being added to the sample. A manually set audible timer alerts the operator when distillation is complete. Each distillation takes five to ten minutes.

The RapidStill II fits conveniently on a counter top or shelf and is ideal for labs requiring fast turnaround of KNA determinations. The RapidStill II produces steam using an 11,000 watt heater element surrounding a 1,000 ml flask. The condenser is equipped with a ventilation valve which prevents any siphoning of distillate back into the condenser chamber.

Labconco Corporation - Kansas City, MO

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Neogen Introduces New Pesticide Detection Kit

Neogen Corporation recently introduced a new test for the detection of the three most widely used insecticides. The Agri-Screen® Ticket was designed for the U.S. Army to test for the presence of organophosphate, carbamate and thiophosphate chemical agents and insecticides.

In the not too distant past if you wanted to run a test for pesticides, you needed to send the sample to a laboratory, pay hundreds of dollars and wait. Now, in 5 min, with no technical training, you can determine the presence or absence of many commonly used insecticides in the field for as little as $6.00.

The Agri-Screen® Ticket is easy to use, inexpensive and reliable. Suitable for field or laboratory use, the Ticket can be used to detect pesticides in air, water, soil, produce, grains and on surfaces. The ticket detects the major organophosphate, thiophosphate and carbamate insecticide groups including: malathion, Temik®, Sevin®, Furadan®, Systox®, Vapona®, Phosdrin®, Metasystox®, Guthion®, Actellic®, Dursban® and diazinon.

The Agri-Screen Ticket is stable at room temperature with a three year shelf-life. The test works with a basic 1-2-3 procedure.

With easy to follow step-by-step directions and Neogen's 24-h technical support hotline, no technical training is necessary.

Neogen Corporation - Lansing, MI

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Test Detects Staphylococci in about 80 Minutes

bioMérieux-Vitek's VIDAS® Staph Enterotixin (SET) Assay allows owners of the VIDAS® instrument to quickly screen for the most common causes of food poisoning.

Although Staphylococci can be destroyed by heat treatment, the preformed toxins are heat stable and can survive heat processing and even retorting.

The VIDAS SET Assay, a qualitative enzyme-linked fluorescent immunoassay, is performed in the fully autoamted VIDAS® or mini VIDAS® instruments. Following a simple extraction protocol of the food sample, results are available in approximately 80 min.

VIDAS SET detects Staphylococcal enterotoxins A, B, C1, C2, C3, D and E.

bioMérieux Vitek, Inc. - Hazelwood, MO

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Unipath Announces New AnaeroGen™ Anaerobic Atmosphere Generation System

Unipath Limited is pleased to announce a new Anaerobic Atmosphere Generation System, the first product in the new Oxoid brand Atmosphere Generation System.

The unique Oxoid AnaeroGen System employs new technology that replaces oxygen with carbon dioxide in a sealed jar more easily, quickly and safely than with any other system. With no water, hydrogen or catalyst to add, the AnaeroGen sachet absorbs oxygen (to a final atmosphere of less than 1% oxygen) from a 3.5 L jar in 30 to 40 min. No hydrogen is generated, heat does not exceed 65°F, and no hazardous pressure build-up occurs.

The fast action of the AnaeroGen System aids presumptive identification by improving colony growth during the first 24 to 48 h, especially with fastidious and obligate anaerobes.

The Oxoid AnaeroGen System includes everything needed for the transport, culture, selective isolation and susceptibility testing of anaerobic organisms: Oxoid AnaeroGen sachets in 2.5 L or 3.5 L format; 3.5 L anaerobic jar; wide range of special, high quality Oxoid dehydrated and prepared culture media and selective supplements.

Unipath provides the industrial food industry with a complete line of dehydrated culture media, an innovative range of selective culture media, and a wild range of diagnostic kits for the identification of organisms and/or their toxins.

Unipath - Ogdensburg, NY

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EM Science Introduces the Reflectoquant® Analysis System

EM Science has announced the development of the Reflectoquant System for contamination monitoring and analysis. The technologically advanced system features the revolutionary new RQflex Meter, a hand-held instrument for use with Reflectoquant Test Strips.

The Reflectoquant System enables the user to obtain test results on the parts-per-million level using a test strip read by a meter, with results available in 60 s. The RQflex Meter reads test strips for 30 different analytes, including chromium, nitrate and peroxide. The instrument features programming by the bar code method and result storage. Best of all, it fits in your pocket!

The Reflectoquant System analyzes a complete line of analytes and measure concentration based on reflected light from the test strip. A total of 30 test strip chemistries will be available with the system.

The Reflectoquant System features applications for a broad spectrum of industries and disciplines, including industrial and environmental laboratories, environmental field screening and waste water management, the food and beverage industry, electroplaters and other industries requiring process control and environmental monitoring.

The Reflectoquant System encompasses all the necessary testing components for rapid analysis and is applicable to a wide variety of analytes. The system requires little or no reagent mixing and is simple and easy to use without any special laboratory training.

EM Science, an Associate of E. Merck, Darmstadt, Germany, offers more than 4,000 reagents, high-purity solvents, safety supplies and other laboratory products, including Merck's ISO 9001 Certified TLC Plates, Inorganic Reagent Salts, High-Purity Acids, Standards, Chromatography Sorbents and Quick Test Kits.

EM Science - Gibbstown, NJ

Please circle No. 255
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Mercury-Free COD Test Reagents Introduced by Bioscience, Inc.

A new line of mercury-free test reagents for determining Chemical Oxygen Demand (COD) in wastewaters has been introduced by the Analytical Products Division of BIOSCIENCE, INC.

The new reagents, which supplement the company's existing COD test products, reduce waste disposal costs and eliminate technician exposure to mercury. Mercury-free COD reagents are designed for non-reporting purposes and for waste streams with low-chloride content.

The mercury-free reagents are part of BIOSCIENCE's new accu-TEST® line which also include test kits for chloride and ammonia.

BIOSCIENCE, INC. - Bethlehem, PA

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Shelf-Stable Standards for Infra Red Milk Analyzers and Somatic Cell Counters

Food Analytics, Inc. of Massena, NY introduces its shelf-stable standards for use with Infra-Red Milk analyzers and Somatic Cell counters.

The standards for milk analyzers are available in powdered from enabling a shelf-life exceeding 1 year. These same standards can also be supplied in re-constituted form. The standards are available in a narrow butterfat range representing "raw milk" or in a more diverse range representing "pasteurized milk." There are six standards in each set.

Somatic cell standards are presented in a set of three values in the ranges 200,000, 400,000 and 600,000 cells/ml. A set will enable the checking of a single somatic cell counter once per day for a month. These standards have a 1 year shelf-life.

Food Analytics, Inc. - Massena, NY

Please circle No. 257
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E. coli *O157:H7 — A Rapid and Accurate Single-Step Screening Test*

There remains great concern about the presence of *Escherichia coli* O157:H7 in ground beef. Weber Scientific has a rapid immunoassay that provides presumptive results in just 15 min after a 6 to 8 h sample pre-enrichment.

The test consists of a single plastic dipstick. Due to the nature of this assay, washing steps are not necessary. The membrane on the dipstick has one horizontal "test zone" located near the bottom of the membrane which contains polyclonal antibody against *E. coli* O157. The antibody converts the binding reagent bound on the support from colorless to red/purple, resulting in a narrow red/purple line in the "test zone" rectangular window if *E. coli* O157 is present. The sample continues to migrate through the support unit until it encounters binding reagent bound to the support in the "control zone" semi-oblong window, always resulting in the formation of a horizontal red/purple line, whether or not *E. coli* O157 is present in the sample.

This test will react in the presence of 10^4 to 10^6 CFU/ml *E. coli* O157:H7 only, with no cross reactivity to similar organisms.

This single-step screening test has gained wide acceptance as rapid, cost effective and reliable.

Weber Scientific - Hamilton, NJ

Please circle No. 258
on your Reader Service Card

Where to Find It

See our Ad on page 249.

Where to Find It

See our Ad on page 253.

IAMFES Offers the Northeast Dairy Practices Council (NDPC) *"Guidelines for the Dairy Industry"*

At the urging of our **Dairy Quality and Safety Professional Development Group,** IAMFES has entered into an agreement with the Northeast Dairy Practices Council (NDPC) to distribute their *"Guidelines for the Dairy Industry."*

NDPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout 15 northeastern/mid-Atlantic states. Interestingly, its membership and subscriber rosters list individuals and organizations throughout the United States, Canada and Japan.

For the past 25 years, NDPC's primary mission has been the development of and the distribution of educational guidelines directed to proper and improved sanitation practices in the production, processing, and distribution of high quality fluid milk and manufactured dairy products.

The NDCP Guidelines are written by professionals who comprise five permanent Task Forces. Prior to distribution, every Guideline is submitted for approval to the key milk control sanitarian in each of the 15 states which are now active participants in the NDPC process. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

Although the Guidelines are developed east of the Mississippi River, clearly they have a high degree of applicability wherever cows are milked and milk is transported, processed and distributed.

The Guidelines are renown for their common sense, useful approach to proper and improved sanitation practices. We think that they will be a valuable addition to your professional reading library.

The entire set consists of 48 guidelines including:

1. Dairy Cow Free Stall Housing
2. Effective Installation, Cleaning and Sanitizing of Milking Systems
3. Selected Personnel in Milk Sanitation
7. Sampling Fluid Milk
8. NE Ext. Publ., Conferences, Short Courses, Correspondence Courses and Visual Aids in Dairying
9. Fundamentals of Cleaning and Sanitizing Farm Milk Handling Equipment
10. Fluid Milk Shelf Life
11. Sediment Testing and Producing Clean Milk
13. Environmental Air Control & Quality for Dairy Food Plants
14. Clean Room Technology
16. Handling Dairy Products From Processing to Consumption
17. Causes of Added Water in Milk
18. Abnormal Milk--Fieldman's Approach
21. Raw Milk Quality Tests
22. Control of Antibacterial Drugs and Growth Inhibitors in Milk and Milk Products
23. Preventing Rancid Flavors in Milk
24. Troubleshooting High Bacteria Counts of Raw Milk
25. Cleaning and Sanitizing Bulk Pickup and Transport Tankers
28. Troubleshooting Residual Films on Dairy Farm Milk Handling Equipment
29. Cleaning and Sanitizing in Fluid Milk Processing Plants
30. Potable Water on Dairy Farms
31. Composition and Nutritive Value of Dairy Products
32. Fat Test Variations in Raw Milk
33. Brucellosis and Some Other Milkborne Diseases
34. Butterfat Determinations of Various Dairy Products
35. Dairy Plant Waste Management
36. Dairy Farm Inspection
37. Planning Dairy Stall Barns
38. Preventing Off-flavors in Milk
39. Grade A Fluid Milk Plant Inspection
40. Controlling Fluid Milk Volume and Fat Losses
41. Milkrooms and Bulk Tank Installation
42. Stray Voltage on Dairy Farms
43. Farm Tank Calibrating and Checking
44. Troubleshooting Dairy Barn Ventilation Systems
45. Gravity Flow Gutters for Manure Removal in Milking Barns
46. Dairy Odor Control
47. Naturally Ventilated Dairy Cattle Housing
48. Cooling Milk on the Farm
49. Postmilking Teat Dips
50. Farm Bulk Milk Collection Procedures
51. Controlling the Accuracy of Electronic Testing Instruments for Milk Components
52. Emergency Action Plan for Outbreak of Milkborne Illness in the Northeast
53. Vitamin Fortification of Fluid Milk Products
54. Selection and Construction of Herringbone Milking Parlors
56. Dairy Product Safety (Relating to Pathogenic Bacteria)
57. Dairy Plant Sanitation
58. Sizing Dairy Farm Water Heater Systems

If purchased individually, the entire set would cost $174. We are offering the set, packaged in three loose leaf binders for $125 plus $9 shipping and handling (outside the US, $21 for shipping and handling).

Information on how to receive new and updated Guidelines will be included with your order.

To purchase this important source of information, complete the order form below and mail or FAX (515-276-8655)it to IAMFES.

Please enclose $125 plus $9 shipping and handling for each set of Guidelines. Shipments outside the US are $125 plus $21 shipping and handling.

Payment in US $ drawn on a US Bank or by credit card.

Name: _____ Phone No. _____

Company: _____

Street Address: _____

City, State/Provence, Code: _____

VISA/MC/AE No.: _____ Exp. Date: _____

REGISTRATION TIMES

Saturday, July 30 ..... 12:00 - 5:00 p.m.
Sunday, July 31 ..... 8:30 a.m. - 7:00 p.m.
Monday, August 1 ..... 8:00 a.m. - 4:00 p.m.
Tuesday, August 2 ..... 8:00 a.m. - 4:00 p.m.
Wednesday, August 3 ..... 8:00 a.m. - 12:00 p.m.

EXHIBITOR HOURS

Sunday, July 31 ..... 7:45 - 10:00 p.m.
(Following the Opening Session)
Monday, August 1 ..... 9:30 a.m. - 3:30 p.m.
Tuesday, August 2 ..... 9:30 a.m. - 3:30 p.m.

IAMFES BOARD MEETINGS

Saturday, July 30 ..... 8:00 a.m. - 5:00 p.m.
Tuesday, August 2 ..... 7:00 a.m. - 8:30 a.m.
Thursday, August 4 ..... 7:00 a.m. - 9:00 a.m.

COMMITTEE/PROFESSIONAL DEVELOPMENT GROUP MEETINGS

SUNDAY, JULY 31

7:00 - 10:00 a.m.	Affiliate Council
10:00 - 11:00 a.m.	Dairy Quality & Safety (Farm Section)
10:00 - 11:00 a.m.	Audio Visual Library
10:00 - 11:00 a.m.	Baking Industry Sanitary Standards
10:00 - 11:00 a.m.	Past Presidents Advisory
10:00 - 12:00 a.m.	Poultry Safety and Quality
10:00a.m - 5:00 p.m	Communicable Diseases Affecting Man
11:00 - 12:00 a.m.	Dairy Quality and Safety (Plant Section)
11:00 - 12:00 a.m.	Foundation Fund
11:00 - 12:00 a.m.	Nominating
1:30 - 2:30 p.m.	Constitution and By-Laws
1:30 - 2:30 p.m.	Sanitary Procedures
1:30 - 3:00 p.m.	Meat Quality and Safety
1:30 - 3:00 p.m.	Dairy, Food & Environmental Sanitation
1:30 - 3:30 p.m.	Seafood Safety and Quality
1:30 - 3:30 p.m.	Applied Laboratory Methods
1:30 - 3:30 p.m.	Food Service Sanitation
3:00 - 4:00 p.m.	Environmental Issues in Food Safety
3:00 - 4:30 p.m.	Journal of Food Protection Management
3:00 - 5:00 p.m.	Food Safety Network
4:00 - 6:00 p.m.	Program Advisory

WEDNESDAY, AUGUST 3

12:00 - 4:00 p.m. Program Advisory (members only)

9:15 **Comparison of a Micro Identification System to Conventional Biochemical Procedures for the Identification of *Salmonella, Escherichia coli* and other Gram Negative Enterobacteriaceae from Food Origin** - M. KNIGHT, M. Newman and J. Agin, Q Laboratories, Inc., Cincinnati, OH

9:30 **A New Rapid Coliform Detection Method. Petrifilm 2000 Coliform Count Plate** - G. KREJCAREK, K. Hesselroth, P. Mach, and Y. Yang, 3-M Company, St. Paul, MN

9:45 **A Murine Monoclonal Antibody Specific to D-serogroup *Salmonella*** - A. MASI and J. Zawistowski, University of Manitoba, Winnipeg, Manitoba, Canada

10:20 **ATP Luminescence as a Means to Rapidly Detect Microbial and Fecal Contamination on Carcass Tissue** - G. SIRAGUSA and C. Cutter, U. S. Department of Agriculture, ARS, Clay Center, NE

10:35 **Rapid Assessment of *Listeria* Control Using Bioluminescence** - A. WALKER, G. Stewart and J. Holah, Campden Food & Drink Research Assn., Chipping Campden, Glos., U.K.

10:50 **Effect of Monolaurin on *L. monocytogenes* Scott A at 37 and 8°C** - M. JOHNSON, D. Scott and A. Bhunia, University of Arkansas, Fayetteville, AR

11:05 **An isolation method for *Arcobacter butzleri* from Poultry** - A. LAMMERDING, Agriculture and Agri-

9:15 **Growth Inhibition of *Penicillium* species by Lactic Acid Bacteria** - H. GOURAMA, The Pennsylvania State University, Reading, PA

9:30 **Mechanism of Inhibition of Aflatoxin Biosynthesis by *Lactobacillus Casei Pseudoplantarum*** - H. GOURAMA and L. Bullerman, The Pennsylvania State University, Reading, PA

9:45 **Optimization of Parameters for Production of Nisin and Inhibition of *Lactobacillus plantarum* in a Model Mixed-Culture Fermentation** - L. HARRIS and M. Vieira, University of Guelph, Guelph, Ontario, Canada

10:20 **Control of *Salmonella, Listeria monocytogenes, Campylobacter jejuni*, and Psychrotrophs on Chicken Skin with Lactic Acid and Sodium Benzoate** - C. HWANG and L. Beuchat, University of Georgia, Griffin, GA

10:35 **Influence of Sodium Chloride on Thermal Inactivation and Recovery of Non-proteolytic *Clostridium botulinum* Type B Spores** - V. JUNEJA, B. Marmer and B. Eblen, U. S. Department of Agriculture, ARS, Philadelphia, PA

10:50 **A Field Study Evaluating the Effectiveness of Different Hand Soaps and Sanitizers** - M. MILLER, L. James-Davis and L. Milanesi, General Mills Restaurants, Inc., Orlando, FL

11:05 **Development of Bacteriocin-Based Packaging to Re-**

SUNDAY EVENING, JULY 31

Opening Session

7:00 **Welcome to the 81st Annual Meeting** - H. BENGSCH, President of IAMFES and, R. RICHTER, Chairperson of the Local Arrangements Committee

7:15 **Introduction of the Ivan Parkin Lecture** - D. CLINGMAN, President-Elect of IAMFES

7:20 **Ivan Parkin Lecture**

The Ivan Parkin Lecture is sponsored by the IAMFES Foundation Fund and is supported by the Sustaining Members

8:00 **Nachos and Margaritas Reception** - Held in the Exhibit Hall. An opportunity to greet old friends, make new ones and view the excellent technical displays.

MONDAY MORNING, AUGUST 1

Quantitative Risk Assessment in Food Microbiology
Sponsored by the ILSI North America Technical Committee on Food Microbiology

8:30 **Overview - the International Commission on Microbiological Specifications for Foods (ICMSF) Approach** - T. ROBERTS, Institute of Food Research, Reading, U.K.

9:00 **Risk Assessment Terms and Definitions** - M. POTTER, Centers for Disease Control and Prevention, Atlanta, GA

9:30 **Health Risk Analysis of Food in Canada** - E. TODD and J. Harwig, Health Canada, Ottawa, Ontario, Canada

10:20 **Process Reliability and Risk - A Food Industry Perspective** - M. COLE, Unilever Research, Bedford, U.K.

10:50 **Assessment of Risks Associated with Foodborne Pathogens – an Overview of a CAST (Council for Agricultural Science and Technology) Report** - P. FOEGEDING, North Carolina State Univ., Raleigh, NC

11:20 **Risk Analysis and Its Application in Food Regulation** - T. KINDRED, U.S. Dept. of Agriculture, Washington, DC

Technical Session — Dairy

8:30 **Vitamin Fortification of Milk** - R. BYRNE, International Dairy Foods Assn., Washington, DC

8:45 **Shelf-life of Commercial Conventionally Packaged Cottage Cheese** - S. MURPHY, R. Ledford, D. Bandler, S. Kozlowski, Cornell University, Ithaca, NY

9:00 **Computer Models for Thermal Inactivation of Native Milk Enzymes** - R. McKELLAR, Agriculture & Agri-Food Canada, Ottawa, Ontario, Canada

Technical Session — Risk Assessment

9:15 **Application of Sewage Sludge to Food Crops** - H. EMERY, San Antonio Water System Regulatory Programs Dept., San Antonio, TX

9:30 **Effect of Hydrostatic Pressure, in Combination with Heat and/or Irradiation, on the Survival of *Clostridium sporogenes* in Chicken** - Y. CRAWFORD and E. Murano, Iowa State University, Ames, IA

9:45 **Safety and Food Excellence (S.A.F.E.): A Program for Food Service Workers and Care Givers, who prepare Food for the Chronically Ill** - R. GRAVANI, D. Scott, P. Kendall and D. Schmidt, Cornell University, Ithaca, NY

10:20 **Environmental Testing for *Listeria*: the Quantitative Edge** - B. JACKSON, VICAM, Watertown, MA

10:35 **The Practical and Educational Role of Environmental Monitoring of Food Premises** - I. LINJACKI, University of Guelph, Guelph, Ontario, Canada

10:50 **Food Facility Plan Review** - J. SCHRADE, Food and Drug Administration, Brooklyn, NY

11:05 **Regulatory Inspection HACCP vs. Food Operation HACCP Self-Control** - O. SNYDER, Hospitality Institute of Technology, St. Paul, MN

11:20 **Growth of *Shigella flexneri* in Foods: Comparison of Observed and Calculated Growth Kinetics Parameters** - L. ZAIKA and O. Scullen, U.S. Department of Agriculture, ARS, Philadelphia, PA

Technical Session — Analytical

8:30 **Comparison of Enrichment Protocols for Use with VIDAS to Detect Salmonellae** - J. BAILEY and N. Cox, U. S. Department of Agriculture, ARS, Athens, GA

8:45 **Fluorometric Acid Phosphatase Method for Verifying End-Point Temperature in Cooked Poultry** - C. DAVIS, W. Townsend and C. Lyon, U. S. Department of Agriculture, ARS, Athens, GA

9:00 **Improved Medium and Method for Growing *E. coli*** - R. FIRSTENBERG-EDEN, S. Allen, M. Averill and N. Sullivan, Difco Laboratories, Inc., Ann Arbor, MI

9:15 **Comparison of a Micro Identification System to Conventional Biochemical Procedures for the Identification of *Salmonella, Escherichia coli* and other Gram Negative Enterobacteriaceae from Food Origin** - M. KNIGHT, M. Newman and J. Agin, Q Laboratories, Inc., Cincinnati, OH

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11:20 **Improved Enrichment Recovery of *Campylobacter* spp. from Broiler Chicken Carcasses** - N. STERN, U. S. Department of Agriculture, ARS, Athens, GA

11:35 **DNA Probe-HGMF Methods to Detect Enterohemorraghic *E. coli* and *Shigella* in Foods** - E. TODD, R. Szabo, J. Khattra, L. Dube, D. Helmerson, D. Granville, A. Boville, H. Lior and J. MacKenzie, Health Protection Branch, Ottawa, Ontario, Canada

Technical Session — Antimicrobials

8:30 **Decontamination of Beef Carcass Tissue with Bacteriocins Using a Model Carcass Washer** - C. CUTTER and G. Siragusa, U. S. Department of Agriculture, ARS, Clay Center, NE

8:45 **Evaluation of Methods to Deliver Bacteriocins during Wiener Manufacturing for Controlling *Listeria monocytogenes*** - A. DEGNAN and J. Luchansky, Food Research Institute, Madison, WI

9:00 **Chemical and Microbiological Qualities of Restructured Vacuum-Packaged Lamb Roasts Containing Sodium or Potassium Lactates** - D. FUNG, I. Sl-Sheddy and C. Kastner, Kansas State University, Manhattan, KS

9:15 **Growth Inhibition of *Penicillium* species by Lactic Acid Bacteria** - H. GOURAMA, The Pennsylvania State University, Reading, PA

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11:05 **Development of Bacteriocin-Based Packaging to Reduce Pathogenic Organisms in Fresh Poultry** - N. NATRAJAN and B. Sheldon, North Carolina State University, Raleigh, NC

MONDAY AFTERNOON, AUGUST 1

Microbiology vs. Epidemiology: Complementary or Incompatible Disciplines Symposium

1:30 **Worldwide Surveillance of Foodborne Disease Based on Epidemiological and Microbiological Findings** - E. TODD, Health Protection Branch, Ottawa, Ontario, Canada

2:00 **Microbiology Versis Epidemiology: Who Do You Trust?** - D. SIMPSON, State Epidemiologist, Austin, TX

2:30 **Human and Armadillo Leprosy in the Southern United States** - M. HUGH-JONES, Louisiana State University, Baton Rouge, LA

3:20 **A Microbiological Paradox: Viable but Non-Culturable Bacteria** - R. COLWELL, Maryland Biotechnology Institute, College Park, MD

3:50 **Hazard Analysis: The Link between Epidemiology and Microbiology** - F. BRYAN, Food Safety Consultation and Training, Lithonia, GA

4:20 **Microbiology, Chemistry and Epidemiology: the Setting of Food Safety Policy** - S. MILLER, Health Sciences Center, San Antonio, TX

4:50 **Panel of the Speakers: Questions and Conclusions**

Technical Session — General Food Microbiology

1:30 **Incidence of *Arcobacter* spp. in Ground Pork** - C. COLLINS, I. Wesley and E. Murano, Iowa State University, Ames, IA

1:45 **Commercial Field Trials Demonstrating Salmonellae Reduction in Broilers Using a Mucosal Competitive Exclusion Treatment** - N. COX, J. Bailey and N. Stern, U. S. Department of Agriculture, ARS, Athens, GA

2:00 **The Attachment of Viable and Nonviable *Salmonella typhimurium* to Poultry Skin** - K. KIM, H. Lillard, J. Frank and S. Craven, University of Georgia, Athens, GA

2:15 **Effect of Irradiation of Survival of *Salmonella enteritidis* in Whole Eggs and Liquid Eggs** - L. SERRANO and E. Murano, Iowa State University, Ames, IA

2:30 **Microbiological Evaluation of Reprocessed Broiler Carcasses** - C. POWELL, G. Blank and R. Gallop, University of Manitoba, Winnipeg, Manitoba, Canada

2:45 **Cider Composition versus Heat Resistance of *Escherichia coli* O157:H7** - D. SPLITTSTOESSER, J. Churey and M. McLellan, Cornell University, Geneva, NY

3:20 ***Staphylococcus intermedius*: Etiologic Association with Foodborne Intoxication from Butter Blend and Margarine** - R. BENNET, F. Khambaty and D. Shah, Food and Drug Administration, Washington, DC

3:35 **Irradiation Inactivation of *Listeria monocytogenes* and *Staphylococcus aureus* in Ground Beef as Affected by Fat Content and Temperature** - J. MONK, M. Clavero, L. Beuchat, M. Doyle and R. Brackett, University of Georgia, Griffin, GA

3:50 **Trichinosis Outbreak Associated with Smoked Wild Boar Meat, Ontario, Canada** - B. MARSHALL and S. Isaacs, Wellington-Dufferin-Guelph Health Unit, Guelph, Ontario, Canada

4:05 **Enterobacteriaceae from the Chicken Intestine that use Phosphatidylserine for Growth and Inhibit *Salmonella typhimurium*** - S. CRAVEN, U. S. Department of Agriculture, ARS, Athens, GA

4:20 **Characterization of Pyocyanine Produced by *Pseudomonas Aeruginosa*** - N. NABBUT, American University of Beirut Medical Center, Beirut, Lebanon

4:35 **Effects of Ionizing Radiation and Anaerobic Refrigerated Storage on Indigenous Microflora, *Salmonella* and *Clostridium botulinum* types A and B in Mechanically-deboned Chicken** - D. THAYER, G. Boyd and C. Huhtanen, Eastern Regional Research Center, Philadelphia, PA

4:50 **Efficacy of Cultured Whey of Antagonistic Microorganisms to Inhibit Psychrotrophic Pathogens in Refrigerated, Cooked Beef and Poultry** - Y. HAO, R. Brackett and M. Doyle, University of Georgia, Griffin, GA

Stainless Steels for Dairy and Food Equipment Symposium

1:30 **Utilizing Stainless Steels in the Food and Dairy Industries** - P. ELLIOTT, P.E. Corrosion and Materials Consultancy, Inc., Colts Neck, NJ

2:00 **Fabrication and Application of Stainless Steel Equipment for Sanitary Applications** - V. MILLS, Evergreen Packaging Equipment, Cedar Rapids, IA

2:30 **Orbital Welding of Stainless Steel Tubing for Food and Dairy Applications** - B. HENON, ARC Machines, Inc., Pacioma, CA

3:20 **The Effect of Surface Finish on the Behavior of Stainless Steel in Food and Dairy Science** - A. TUTHILL, Tuthill Associates, Inc., Blacksburg, VA

3:50 **Hygiene and Other Health and Safety Aspects of Stainless Steel in Food-Handling and Processing Plants** - J. LILLY, Nickel Development Institute, Toronto, Ontario, Canada

Meat Quality and Safety: Effect of Production and Processing on the Microbial Quality of Meat Symposium
Sponsored by the Ontario Food Protection Assn.

1:30 **Innovations in Australian Meat Processing Practices and Slaughter Operations: Their Impact on Microbial Status** - B. SHAY, CSIRO Australia, Meat Safety Laboratory, Bristane, Queensland, Australia

2:00 **Verocytotoxigenic *Escherichia coli*: The Dairy Farm as a Model for Animal - Human Transmission** - R. CLARKE, Agriculture and Agri-Food Canada, Guelph, Ontario, Canada

2:30 **FSIS Nationwide Beef Microbiological Baseline Data Collection Program: Survey of Steers and Heifers** - A.M. McNAMARA, U. S. Department of Agriculture, FSIS, Washington, DC

3:20 **Canadian Meat Industry Perspectives on How to Address Foodborne Illness** - G. SUNDEEN, Canadian Meat Council, Islington, Ontario, Canada

3:50 **HACCP from Pen to Plate** - R. USBORNE, Caravelle Foods, Mississauga, Canada

Monday Poster Session

- **Summary of Standard Plate Counts of Plant Obtained Chocolate Milk and Drinks After 14 Days at 7.2°C (45°F)** - S. BARNARD and R. Bicher, The Pennsylvania State University, University Park, PA
- **Rapid Colorimetric Method for Estimation of Rancidity in Dairy Products** - T. BAUER and P. Vasavada, University of Wisconsin, River Falls, WI
- **Survival of *Brucella abortus* in the Mexican White Soft Cheese** - M. DÍAZ, Centro De Investigacion En Alimentacion y Desarrolla, Sonora, Mexico
- **S-Value and Epifluoresence Determination of Bacterial Attachment on the Cleaning Brush of an Automatic Milking System*** - C. LIU and D. Westhoff, University of Maryland, College Park, MD
- **Effect of Temperature and Cell Concentration on Radiosensitivity of *Listeria monocytogenes*** - L. ANDREWS, D. Marshall and R. Grodner, Louisiana State University, Baton Rouge, LA
- **Rapid Detection of Enterotoxigenic *Clostridium perfringens* in Beef Using an Alkaline Phosphatase Microcolony Technique** - L. BAEZ and V. Juneja, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Development of Two Simple Methods for the Recovery of *Salmonella* from Food for Detection by PCR** - W. BARBOUR and H. Zanecosky, DuPont Co., Wilmington, DE
- **Comparative Study for Detection of *Listeria monocytogenes* in Foods by a Colorimetric DNA Method and Conventional Culture Methods** - G. DURBIN, K. Keough and G. Reynolds, GENE-TRAK Systems Corp., Framingham, MA
- **Rapid Assay System for the Detection of Betalactam Residues in Milk** - S. FAUST, S. Clark and L. Chaney, IDEXX Laboratories, Westbrooke, ME
- **Reduction of Hydroxymethylfurfural of Honey Exposed to Different Sources of Radiation** - J. FARIA, Campinas State University, Campinas, Brazil
- **Estimation of Coliform Counts using the BacT/Alert Microbial Detection System** - S. JEFFREY, K. Read and B. Robison, Organon Teknika Corp., Durham, NC
- **Enrichment Procedures Affecting the Sensitivity of the EHEC-Tek™ ELISA System** - S. JEFFREY, R. Durham, B. Robison, Organon Teknika Corp., Durham, NC
- **Efficacy of the Microcolony Immunoblot Technique to Detect Heat-Injured *Listeria monocytogenes*** - J. PATEL and L. Beuchat, University of Georgia, Griffin, GA
- **Use of the BacT/Alert® Microbial Detection System to Monitor Sterility of Aseptically Processed Pudding** - B. ROBISON, Organon Teknika Corp., Durham, NC
- **The Development of a PCR Based Assay for the Detection of *Salmonella*** - G. TICE, M. Jensen, R. Jackson and J. Noxzek, DuPont Co., Wilmington, DE
- **Identifying and Typing Listeria Species with Patterns of Eco R1 Fragments Containing Ribosomal RNA Operon Sequences** - J. WEBSTER, E. Cole, J. Bruce, C. Iem and R. Hubner, DuPont Co., Wilmington, DE
- **A 43 hour Test for Detecting *Listeria* in Foods Using the Unipath *Listeria* Clearview Immunoassay** - R. HOLBROOK, T. Briggs, J. Anderson, J. Blades and P. Sheard, Unilever Research, Bedfordshire, U.K.
- **The Rapid Clearview™ Listeria Immunoassay for Detection of *Listeria* Species** - S. PARRY, T. Briggs, J. Blades, M. Gani and J. Piron, Unilever Research, Bedforshire, U.K.
- **Optimization of Commercial Sterility Testing** - M. ROBART, J. David, S. Alles, T. Weaver, S. Chang and T. VanArman, Gerber Products Co., Fremont, MI
- **Cold Temperature Stress Response of Psychrotrophic *Bacillus cereus*** - E. BERRY and P. Foegeding, North Carolina State University, Raleigh, NC
- **Model for the Non-Thermal Inactivation of *Listeria monocytogenes* in a Reduced Oxygen Environment** - R. BUCHANAN and M. Golden, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **The Synergistic Effect of Sodium Acetate or Sodium Propionate Used in Combination with EDTA and Ascorbic Acid on the Inactivation of *Listeria monocytogenes*** M. GOLDEN, R. Buchanan and R. Whiting, U. S. Department of Agriculture, ARS, Philadelphia, PA
- ***Aeromonas hydrophila* and Psychrotroph Population of Case- and Pond-Raised Channel Catfish** - Y. HUANG, C. Huang and G. Burtle, University of Georgia, Athens, GA
- **The Use of Response Surface Methodology to Model Non-Linear Survival Curves and to Predict the Effects of Temperature, pH and Sodium Chloride on the Heat Resistance of *Listeria monocytogenes* Scott A** - R. LINTON, W. Carter, C. Gennings and M. Pierson, Virginia Tech University, Blacksburg, VA
- **Validation of Predictive Mathematical Models to Demonstrate Applicability to Foods** - I. WALLS, V. Scott and D. Bernard, National Food Processors Assn., Washington, DC
- **The Economics of Federal HACCP Regulations** - D. ZORN, Food and Drug Administration, Washington, DC
- **An Expert System for HACCP Implementation** - F. BARRON and J. Acton, Clemson University, Clemson, SC
- **Influence of Temperature on Hemorrhagic *Escherichia coli*: Verotoxin Production and Minimum Temperature of Growth** - S. PALUMBO, F. Schultz and A. Williams, U. S. Department of Agriculture, Philadelphia, PA

TUESDAY MORNING, AUGUST 2

Applications For Predictive Microbiology Symposium
Sponsored by the ILSI North America Technical Committee on Food Microbiology

8:30 **Overview — Risk Assessment and Predictive Microbiology** - R. BUCHANAN, U. S. Department of Agriculture, Philadelphia, PA

9:00 **Modeling Applications** - T. McMEEKIN and T. Ross,, University of Tasmania, Hobart, Tasmania, Australia

9:30 **Food Micromodel Update - UK and European Perspectives** - T. ROBERTS, Institute of Food Research, Reading, U.K.

10:20 **Model Validation (and Confidence in Models) — an Industry Perspective** - M. COLE, Unilever Research, Bedford, U.K.

10:50 **Cold Storage Temperature Fluctuations and Predicting Microbial Growth** - C. GILL, Agrifood and Agriculture Canada, Lacombe, Alberta, Canada

11:20 **Predictive Microbiology and HACCP** - P. ELLIOTT, Campbell Soup Company, Camden, NJ

Reduction of Foodborne Pathogens on Poultry Symposium

8:30 **Salmonellae Importance and Detection in Poultry Feeds** - A. WALDROUP, University of Arkansas, Fayetteville, AR

9:00 **Control of Salmonellae During Poultry Production** - J. BAILEY, U. S. Department of Agriculture, ARS, Athens, GA

9:30 **The Application of Process Modifications, Chemical Treatments, and Biopeptides to Inhibit Foodborne Pathogens Associated with Poultry Products** - B. SHELDON, North Carolina State University, Raleigh, NC

10:20 **Reduction of Foodborne Pathogens on Poultry by Treatment with Ionizing Radiation** - D. THAYER, U.S. Department of Agriculture, ARS, Philadelphia, PA

10:50 **Development of a Comprehensive Total Quality Assurance Program for use in Fully Integrated Poultry Companies** - M. ROBACH, Continental Grain, Duluth, GA

11:20 **Foodservice Industry Perspective on Pathogen Reduction in Poultry** - R. HARRINGTON, National Restaurant Assn., Washington, DC

Pesticides in the Food Industry Symposium

8:30 **The Impact of Sanitation on Pest Control in the Food Establishments** - R. GRAVANI, Cornell University, Ithaca, NY

9:00 **IPM — Trends in Pesticide Use and Indoor Environmental Quality** - A. FRISHMAN, AMF Pest Management Services, Inc., Farmingdale, NY

10:20 **Rodent Control for Food Processing** - E. MARSHALL, Lipha Tech, Milwaukee, WI

10:50 **Future of Pesticides for Use in Food Handling Establishments** - J. TUCKER, Urban Entomologist, Houston, TX

Meat Quality and Safety: Concerns and Solutions throughout Distribution Systems Symposium

8:30 **Update on Epidemiology of Food Poisoning Outbreaks Caused by Meat Products** - P. SPARLING, Centers for Disease Control and Prevention, Atlanta, GA

9:00 **Microbiological Controls for Safety and Quality of Meats During Manufacture** - J. MARSDEN, The American Meat Institute, Washington, DC

9:30 **Status of Consumer Education Programs Regarding the Safety of Meat Products** - S. CONLEY, U. S. Department of Agriculture, FSIS, Washington, DC

10:20 **The Challenge of HACCP Implementation in Fast Food Operations** -R. HARRINGTON, National Restaurant Assn., Washington, DC

10:50 **Safety and Quality of Meat Products at Retail and Deli Operations** - J. FARQUHAR, The Food Marketing Institute, Washington, DC

TUESDAY AFTERNOON, AUGUST 2

General Session — The New FDA Model Food Code: How Will We Implement It?

1:30 **The New FDA Food Code** - J. KVENBERG, Food and Drug Administration, Washington, DC

1:45 **The Restaurant Industry Perspective** - R. HARRINGTON, National Restaurant Assn., Washington, DC

2:00 **The Food Store Perspective** - J. FARQULAR, Food Marketing Institute, Washington, DC

2:15 **The Vending Machine Industries Perspective** - L. EILS, National Automatic Merchandising Association, Chicago, IL

2:30 **The Agricultural Agencies Perspective** - E. HEFFRON, Michigan Department of Agriculture, Lansing, MI

2:45 **The Health Agencies Perspective** - D. SOWARDS, Texas Department of Health, Austin, TX

IAMFES Annual Business Meeting

3:15 **Welcome and Introduction** - D. CLINGMAN, President-Elect

3:30 **Report from the President** - H. BENGSCH

3:45 **Business Meeting** - H. BENGSCH, Presiding
- Moment of Silence in Remembrance of Departed Association Members
- Minutes of Previous Business Meeting
- Report of Executive Manager
- Affiliate Council Report
- Journal Management Committee Report
- Old Business
- New Business
- Presentation of Resolutions - M. DOYLE, Past President

Tuesday Poster Session

- **Purification and Characterization of a Bacteriocin Produced by *Carnobacterium piscicola* LK5** - L. BAGI and R. Buchanan, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Biofilm formation by *Escherichia coli* O157:H7 on Stainless Steel Surface: Effect of Chemical Agents** - R. DEWANTI and A. Wong, Food Research Institute, Madison, WI
- **Cooling Rate and Outgrowth of *Clostridium perfringens* Spores in Cooked Ground Beef** - V. JUNEJA, O. Snyder and B. Eblen, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Isolation and Characterization of Enterocin EL1 A Bacteriocin Produced by a Strain of *Enterococcus faecium*** - W. LYON, E. Murano and D. Olson, Iowa State University, Ames, IA
- **Effect of Temperature, Salt and pH on Growth Inhibition of *Listeria monocytogenes* by Sodium Polyphosphate** - O. SCULLEN and L. Zaika, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Evaluation of Different Phosphates to Control Microbial Growth in Meat Products** - S. SUMNER, L. Flores, D. Peters and R. Mandigo, University of Nebraska-Lincoln, Lincoln, NE
- **Inhibitory Activity of Caffeic Acid Against *Clostridium botulinum* Spores** - A. WILLIAMS, B. Bowles, and A. Miller, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Antimicrobial Effect of Sodium Lactate, Trisodium Phosphate, and Sodium Glutamate Monohydrate Pre-Treatments in Combination with Organic Acids on *Escherichia coli* O157:H7** - P. WIXOM and J. Dickson, Iowa State University, Ames, IA
- **Microbiological Shelf-Life Stability of Textured Supro™ Granules** - V. COLLETT, Ralston Purina Co., St. Louis, MO
- **Shelf-life and Microbial Ecology of Precooked Poultry Stored Under Modified Atmosphere at 4°C** - R. BARAKAT and L. Harris, University of Guelph, Guelph, Ontario, Canada
- **Effect of Water Activity and Humectant Identity on the Growth Kinetics of *Escherichia coli* O157:H7** - R. BUCHANAN and L. Bagi, U. S. Department of Agriculture, ARS, Philadelphia, PA
- **Resistance of Acid Adapted Salmonellae to Organic Acid Rinses on Beef** - J. DICKSON and M. Kunduru, Iowa State University, Ames, IA
- **Survival of *E. coli* O157:H7 in Refrigerated and Frozen Low Fat Ground Beef and Thermal Inactivation by Microwave Energy** - L. FLORES, S. Sumner and L. Bullerman, University of Nebraska, Lincoln, NE
- **The Fate of *Listeria monocytogenes* and *Clostridium botulinum* in Minimally-Processed Packaged Vegetables** - J. FARBER, Y. Cai, C. Addison, B. Blanchfield, S. Wang and K. Dodds
- **Use of Time-Temperature Indicator to Monitor the Shelf-Life of Packaged Fresh Catfish** - L. HE and Y. Huang, University of Georgia, Athens, GA
- **Recovery of Arcobacter from Broiler Carcasses** - H. LILLARD and N. Stern, U. S. Department of Agriculture, ARS, Athens, GA
- **Monoclonal Antibody for Rapid Detection of *Clostridium botulinum* Toxin Type B** - R. CRAWFORD, J. Ferreira, S. McCay and H. Hamdy, Food and Drug Administration, Atlanta, GA
- **Susceptibility of *Listeria* sp. to Cell Bound Pediocin AcH in BHI Broth, Turkey Frank Slurries, and on Chicken Breast Meat** - J. FERGUSON, A. Bhunia and M. Johnson, University of Arkansas, Fayetteville, AR
- **The Fate of *Listeria monocytogenes* during the Manufacture of Manchego Cheese with Bacteriocin-producing Lactic Acid Bacteria and Commercial Lactic Starters** - E. GARCÍA, J. Rodríguez, P. Gaya, M. Medina and M. Nunez, Tecnología de Alimentos, Madrid, Spain
- **Microbial Changes of Osmotically Dehydrated Green Beans Coupled with Modified Atmosphere Packaging Stored at 10°C** - W. TAN, D. Grinstead, J. Mount and F. Draughon, University of Tennessee, Knoxville, TN
- **Mold Content of Stored Popcorn** - L. BULLERMAN and S. Katta, University of Nebraska, Lincoln, NE
- **Effect of Dry Milling on *Fusarium* Counts and Fumonisins in Corn** - A. CAGAMPANG and L. Bullerman, University of Nebraska, Lincoln, NE
- **Isolation of the Zearalenone-producing Strains from Agricultural Products in Southern Korea** - D. CHUNG, S. Kim and S. Kim, Gyeongsang National University, Gyeongnam, Korea
- **Inhibition of Phosphate on Mold Growth and Mycotoxin Production (T-2 Toxin, Zearalenone)** - D. CHUNG, I. Kim and S. Chung, Gyeongsang National University, Gyeongnam, Korea
- **Immunolocalization of Aflatoxin B1 in Liver of Chick Embryo Intoxicated with Aflatoxin B1** - Y. KO, S. Shu, J. Che and D. Chung, Hanyang University, Seoul, Korea

- **The Mycoflora and Mycotoxin-Producing Potential of Fungi from Foods in Burundi** - C. MUNIMBAZI and L. Bullerman, University of Nebraska, Lincoln, NE
- **Application of Immunohistochemical Technique to Visualize Zearalenone Formation of *Fusarium greaminearum*** - J. KANG, S. Kang and D. Chung, Jinju Junior College, Gyeongnam, Korea
- **Use of TECRA® Unique™ for the Detection of *Salmonella* in a Range of Food Products within 22 hours** - D. KERR, M. Ash, D. Hughes and C. Fitzgerald, TECRA Diagnostics, Roseville, Australia
- **A Predictive Model with Improved Statistical Analysis of the Interactive Effects of Factors Affecting the Growth of *Staphylococcus aureus* 196E** - J. EIFERT, C. Gennings, W. Carter and C. Hackney, Virginia Tech, Blacksburg, VA
- **Automated Detection of Foodborne Pathogens Using the TECRA® OPUS® System** - M. ASH, D. Chee and U. Gasanov, TECRA Diagnostics, Roseveille, Australia
- **Agglutination Behavior of Lactic Starter Cultures** - S. IBRAHIM and A. Nabulsi, University of Jordan, Jordan

WEDNESDAY MORNING, AUGUST 3

A Symposium on Risk Management
Sponsored by the Grocery Manufacturer's of America

RISK ASSESSMENT
The Risk Analysis Approach

8:30 **Risk Analysis and Management Defined**

9:00 **Risk Analysis and Foodborne Illness**

Issues in the Assessment of Food Safety Risks

9:30 **Infectious Dose and Susceptible Populations**

10:20 **The Role of Epidemiology in Estimating Risk and Risk Exposure**

10:50 **Acceptable Risk and the Risk/Benefit Equation**

11:20 **The "Cost" of Foodborne Disease**

Safety and Quality-Related Research – Dairy Foods and Research Centers Symposium

8:30 **Introduction** - J. BISHOP, Wisconsin Center for Dairy Research, Madison, WI

8:40 **A Comparison of Thermal Death Kinetics from Continuous Flow and Batch Leading Systems** - P. FOEGEDING, Southeast Dairy Foods Research Center, Raleigh, NC

9:25 **Shelf-Life Extension of Modified Atmosphere Packaged Cottage Cheese** - J. HOTCHKISSand J. Chen, Cornell University, Ithaca, NY

10:10 **Bacteria of Concern in Extended Shelf-Life Milk** - B. WEIMER, M. Blake, D. McMahon and P. Savello, Western Dairy Foods Research Center,Utah State University, Logan, UT

10:55 **Knowing and Controlling Cheese Pathogens** - J. LUCHANSKY, Wisconsin Center For Dairy Research, Madison, WI

11:40 **Dairy Product Safety System (HACCP) Designed Specifically for the Industry** - J. BISHOP and R. Byrne, Wisconson Center for Dairy Research, Madison, WI

Natural Antimicrobials and Inhibitors for Food Applications
Sponsored by the ILSI North American Technical Committee on Food Microbiology

8:30 **Bacteriocins for *Listeria* Control** - P. MURIANA, Purdue University, West Lafayette, IN

9:00 **Potential for Use of Bacteriocin-producing Lactic Acid Bacteria in the Preservation of Meats** - L. MCMULLEN and M. Stiles, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

9:30 **Efficacy of Naturally Occurring Food Flavors as Inhibitors of Foodborne Pathogens** - B. BOWLES and A. Miller, U. S. Department of Agriculture, Philadelphia, PA

10:20 **Regulatory Perspectives on the Use of Bacteriocins in Foods** - F. FIELDS, U.S. Food and Drug Administration, Washington, DC

10:50 **USDA's Regulatory Perspective on the Use of Bacteriocins in Foods** - R. POST, U. S. Department of Agriculture, FSIS, Washington, DC

11:20 **Industry Perspective on the Use of Natural Antimicrobials and Inhibitors for Food Applications** - G. GOULD, formerly Unilever Research Laboratory, Bedford, U.K.

The Quality and Safety of Aquacultured Fishery Products Symposium

8:30 **Introduction of Aquaculture** - R. MARTIN, National Fisheries Institute, Fairfax, VA

8:50 **Chemical/Physiological Perspectives** - G. FINNE, Silliker Laboratories of Texas, College Station, TX

9:10 **Microbiological Perspective – Fin-Fish** - D. WESTHOFF, University of Maryland, College Park, MD

9:30 **Microbiological Perspective - Crustaceans** - R. NICKELSON, Silliker Laboratories, Homewood, IL

9:50 **Microbiological Perspective - Molluscan** - G. RODRICK, University of Florida, Gainesville, FL

10:30 **Residues in Aquacultured Products** - I. HIGUERA, Consultores En Alimentos, Sonora, Mexico

10:50 **Value-Added Aquaculture Products** - Y. HUANG, University of Georgia, Athens, GA

11:10 **HACCP in Aquaculture** - E. GARRETT, National Marine Fisheries Service, Pascagula, MS

WEDNESDAY AFTERNOON, AUGUST 3

A Symposium on Risk Management (cont.)
Sponsored by the Grocery Manufacturer's of America

RISK MANAGEMENT
Control Practices and Their Impact

1:30 **Managing Risks from the Industry Perspective**

2:00 **Economic Impact of Control Practices**

Education and Communication of Risks

2:30 **Education and the Public's Understanding of Risk – the Role of Industry, Government and Academia**

3:00 **Communicating Food Safety Risks to the Public**

Current Regulatory Approaches

3:50 **Short Presentation and Roundtable**

Dairy Symposium

Topics to be announced

European Food Processing Equipment Hygiene Standards Symposium

1:30 **Food Industry Perspective** - M. MOSTERT, Unilever Research Laboratorium, Vlaardingen, The Netherlands

2:00 **Equipment Manufacturers Perspective** - P. SKUDDER, APV Baker Ltd., Crawley, U.K.

2:30 **CEN and EHEDG Perspective** - D. TIMPERLY, Campden Food and Drink Research Association, Chipping Campden, U.K.

3:20 **The Government Perspective** - B. MITCHELL, Ministry of Agriculture, Fisheries & Food, London, U.K.

3:50 **Test Methods and Their Development** - J. HOLAH, Campden Food and Drink Research Association, Chipping Campden, U.K.

4:20 **The 3-A Viewpoint on European Standards** - T. GILMORE, Dairy and Food Industries Supply Association, Rockville, MD

4:50 **The Challenge - Harmonization of Hygienic Design Criteria** - R. MALLER, Thomas J. Lipton Co., Englewood Cliffs, NJ

Current Food and Health Related Safety Issues Symposium

1:30 **The Impact of International Free Trade on Food Safety Standards** - K. TING, U. S. Department of Agriculture, Washington, DC

2:00 **International Food Safety and Quality Standards** - C. CARNEVALE, Food and Drug Administration, Washington, DC

2:30 **Does International Fair Trade Mean Compromised Food Safety Standards? — Impact on Seafood Safety** - C. HACKNEY, Virginia Polytechnic Institute and State University, Blacksburg, VA

3:20 **Poultry Safety After NAFTA** - J. MARCY, University of Arkansas, Fayetteville, AR

3:50 **Hantavirus Pulmonary Syndrome (HPS) — An Emerging Public Health Threat** - R. GRINNEL, United States Public Health Service, Albuquerque, NM

4:20 **Use of Foodborne Disease Data for HACCP Risk Assessment: A New Approach in the State of New York** - J. GUZEWICH, New York State Department of Health, Albany, NY

81st IAMFES Annual Meeting
Spouse/Companion Tours and Special Events

BIENVENIDOS

Sunday, July 31 — 9:00 a.m. - It's up to you
Cost: $25 ($30 on-site) Lunch on your own

Welcome to San Antonio . . . one of America's four unique cities . . . where the east meets the west, where the romance and tradition of old Spain meet the sound and energy of a high tech society, where the river dances through the heart of the city and the fiesta never ends. A chartered transit bus will be your magic carpet and Convention Coordinators guide will be your key as you are met at the Hyatt Regency Riverwalk at 9:00 o'clock in the morning for this introductory tour.

First, we'll drive through Hemisfair Plaza to the Institute of Texan Cultures. This "hands-on" museum is for the interpretation and assimilation of Texas history and folk culture and tells about the 26 ethnic groups who were the pioneers of this great state.

We'll drive through the King William Historic District, which was one of San Antonio's early residential neighborhoods. Built at the turn of the century by German "merchant princes," the area has been "re-awakened" and is once again a gracious and friendly old-fashioned neighborhood.

On to the new IMAX Theater, featuring "Alamo - The Price of Freedom," located in Rivercenter Mall. The movie is a stunning experience, shown on a six-story screen with a six-track sound system that lets you "feel" the action. "Alamo - The Price of Freedom" is the most historically accurate depiction of the famous battle in existence. The 45-minute movie "puts you in the middle of the battle of the Alamo."

Walk next door to the "Cradle of Texas Liberty," the Alamo, tucked in among downtown hotels, office buildings and crowded streets. The Alamo's roughly pitted, sandstone facade belies its quiet, churchlike limestone interior where even the most casual visitor experiences an awe while viewing the names of the Alamo heroes inscribed in bronze on the walls.

Continue to San Jose, Queen of the Texas Missions, for a tour of the Indian compound in this extensively restored mission. You will see Indian living quarters, Spanish officer's quarters, the convent, the beautiful church with its elaborately carved entrance, and the famous Rosa's Window.

There will be time for lunch on your own, shopping and browsing in El Mercado where the shops are loaded with curios from the Southwest. Items include: Dresses, shirts, pinatas, dolls, jewelry, straw hats, leather goods, and many other "goodies." Our guide will tell us how to ride the trolley back to the hotel for ten cents. Return to the Hyatt at your leisure.

LBJ RANCH & FREDERICKSBURG

Monday, August 1 — 8:45 a.m. - 4:30 p.m.
Cost: $25 ($30 on-site) Lunch on your own

The beautiful Texas Hill Country has never been so well known as when Lyndon B. Johnson was President of the United States. His barbecues under the oak and pecan trees of his ranch were seen by all in those days. So that you can taste a little of "Pedernales country" for yourselves, we have arranged a day in this legendary part of Texas. A chartered motor coach with a Convention Coordinators guide on board will meet you at the Hyatt Regency Riverwalk at 8:45 in the morning for the drive to the LBJ Ranch. There will be a 90 minute educational tour of this National Historic Park including the Junction School, the Johnson birthplace and cemetery, the LBJ ranchlands with its registered Hereford cattle, the Show Barn, and the exterior of the Texas White House where Mrs. Johnson still resides.

On to the historic Fredericksburg for lunch on your own, shopping and browsing on Main Street in this quaint German town, or visiting the Admiral Chester Nimitz Museum of the War of the South Pacific (a Recorded Texas Historic Landmark) with the Japanese Peace Garden.

See the historic "Sunday Houses", where farmers and ranchers stayed on weekends. Return to the hotel at 4:30 in the afternoon.

MIL COLORES

Tuesday, August 2 — 9:00 a.m. - 3:00 p.m.
Cost: $25 ($30 on-site) Lunch on your own

Capture the spirit and the many colors of San Antonio as you depart the Hyatt Regency Riverwalk at 9:00 in the morning. We'll follow the Mission Trail, pausing at Mission Concepcion, and San Jose, Queen of the Texas Missions. We'll proceed to historic Fort Sam Houston, established in 1876, and now Headquarters for the Fifth Army. We'll see the enormous parade field, the Quadrangle where Chief Geronimo was once held captive, and General's Row where many famous military personalities have resided.

On to the San Antonio Botanical Center, 38-acres representing, in miniature, the diverse Texas landscape - from the wild flowers of the Texas Hill Country to the formal rose gardens of East Texas. A Biblical Garden, Children's Garden, and a Fragrance Garden are also featured. A highlight of the center is the new underground conservatory, with rare and exotic plants and flowers.

There will be time for lunch on your own and shopping at Los Patios, an oasis on the banks of Salado Creek. Shop in the boutiques located on the park-like grounds, including: The Flower Forest, Marisol Boutique, Tejas Gifts, Tienda, Big Sky Clothing Company, The Gallery, Vega's Jewelry and Lo Singular. Enjoy lunch at the Gazebo, the Hacienda or the Brazier Restaurants.

The McNay Art Museum is a "treasure house of art," religiously dedicated to discriminating taste. Housed in a magnificent Mediterranean mansion built around a lush courtyard and reflecting pool, you'll view works by Van Gogh, Gauguin, Matisse, Picasso, Renoir - to name a few. The McNay is rated one of the best small museums in the country.

We'll pause on Alpine Drive which affords a beautiful view of the city skyline and the Japanese Sunken Garden below. Arrive back at the Hyatt Regency Riverwalk at 3:00 in the afternoon.

SHOPPER'S PARADISE

Wednesday, August 3 — 9:00 a.m. - 4:00 p.m.
Cost: $20 ($25 on-site) Lunch on your own

"Shop till you drop!" Today you will see some of the most interesting shops in the area as you depart the Hyatt Regency Riverwalk at 9:00 a.m. in a chartered motorcoach to search for bargains galore! First, we'll journey to San Marcos, Texas, to a new and exciting outlet mall, one of the nation's largest. Clothing, accessories, housewares - in such shops as Adolpho, Perry Ellis, Coach, Mikasa, Eddie Bauer, Etienne Aigner, Nike, Sara Coventry, Fitz & Floyd - and much, much more. On to the Tanger Factory Outlet Center where you'll find items for the entire family. Buy directly from 31 upscale designers and manufacturers outlet stores and save 30 to 70% off retail prices.

Then to the quaint German town of New Braunfels, Texas where "Life is Beautiful." The Langston House, a symmetrical Greek Revival style house, was built in 1854 by Franz Moreau. The log and "fachwerk" construction was common in those days. The house was later occupied by the Gross family, the Frieze Family and then the Langston Family.

We'll continue to the nearby town of Gruene, founded in 1872 by Henry D. Gruene from Germany, who built a home and cotton gin and the town grew. It was known for its dance hall and saloon built in the 1880's which is the oldest dance hall in Texas still in existence. Death came to Henry Gruene in 1920 and this also marked the end of the development of the town. In 1925 the boll weevil and the depression struck and it became a ghost town. The untouched town was purchased in 1974 and businesses were once again established in the old buildings. We'll enjoy stepping back in time as we visit the many shops in town including: Texas Homegrown, The Bush Whacker, Nature's Alliance, The Gruene Antique Company, The Back Porch, Buck Pottery and others. Guests can eat on their own at one of the three restaurants located in Gruene. Arrive back at the Hyatt Regency Hotel at 4:00 o'clock in the afternoon.

Monday Night Social Event

"A LITTLE BIT TEXAN"

August 1 — 6:00 - 10:00 p.m.
Cost: Adults $35 ($40 on-site)
Children $20 ($25 on-site)

Git your boots, jeans, western shirts and cowboy hats (no six-shooters, please) and head on out for a "little bit of Texas — The Rio Cibolo Ranch."

We'll board our Grey Line buses at 6:00 p.m. and head for the wild, wild east. A short ride later, we'll cross the Rio Cibolo River and pull into the ranch. A Texas style Barbeque dinner - beef brisket and chicken quarters, cole slaw, beans, relish tray, bread and butter and fruit cobbler — will await us.

Work up an appetite by learning or dancing the Texas National past-time — line dancing. A band and dance instructor will be there to show you how its done — the real way. Or there's the Rol-A-Roper, horse shoes, volleyball, basketball, cow-chip toss or wagon rides. Or just chat with your friends under a beautiful Texas sky — (it isn't really any bigger, it just seems like it!)

We'll mosey on back to the Hyatt Regency between 9:30-10:00 p.m.

Traditional IAMFES Gatherings

IVAN PARKIN LECTURESHIP

Sunday, July 31 — 7:00 p.m.

Followed by the **Nachos and Margaritas Reception** for the Opening of the Education Exhibits.
An opportunity to greet old friends, make new ones and view the excellent technical displays.

IAMFES ANNUAL AWARDS RECEPTION AND BANQUET

Wednesday, August 3

Reception: 6:00 p.m.
Banquet: 7:00 p.m.
Cost: $30 ($35 on-site)

81st IAMFES Annual Meeting Registration Form

Hyatt Regency Riverwalk — San Antonio, Texas — July 31 - August 3, 1994
(Use photocopies for extra registrations)

FOR OFFICE USE _____ _____
Date Rec'd._____ First initial Last name
Registration # _____

***Sign up to become a NEW member** and take advantage of the member discount.

First Name (will appear on badge) (please print) Last Name

Title Employer

Mailing Address (Please specify: Home Work)

City State Zip

Fax # Area Code & Telephone

Please check where applicable:
- ___ IAMFES Member
- ___ Non-Member
- ___ Local Arrangements
- ___ 30 Yr. Member
- ___ 50 Yr. Member
- ___ Past President
- ___ Executive Board
- ___ Speaker
- ___ Honorary Life Member
- ___ Exhibitor

Credit Card payments may be sent via Fax today! 515-276-8655

					Total Amount
Registration			Amount		
	IAMFES Member (Banquet included)		$150 ($185 on-site)		_____
	Non-Member (Banquet included)		$210 ($245 on-site)		_____
	IAMFES Student Member		$ 20 ($ 25 on-site)		_____
	IAMFES Member One Day (Circle: Mon/Tues/Wed)		$ 80 ($100 on-site)		_____
	Non-Member One Day (Circle: Mon/Tues/Wed)		$105 ($130 on-site)		_____
	Spouse/Companion (Name):_____		$ 25 ($ 25 on-site)		_____
	Children (14 & Under), Name: _____		FREE		_____
***New Membership Fees:**	Membership (*Dairy, Food & Environmental Sanitation*)		$ 50		_____
	Membership *Plus* (*Dairy, Food & Env. Sanitation* & *Journal of Food Protection*)		$ 80		_____
	*Student Membership ❒ *Dairy, Food & Env. San.* **or** ❒ *Journal of Food Protection*		$ 25		_____
	*Student Membership *Plus* (*Dairy, Food & Environmental Sanitation* & *Journal of Food Protection*)		$ 40		_____
	**Full-time student verification required.*				
	POSTAGE CHARGES: OUTSIDE THE U.S. - SURFACE RATE		$ 22.50 per journal		_____
	AIRMAIL		$ 95.00 per journal		_____
				# of tickets	
Other Fees: (Per Person)	Nachos and Margaritas Reception (Sun., 7/31)		FREE	_____	_____
	Rio Cibolo Ranch Evening (Mon., 8/1)	Adult	$ 35 ($ 40 on-site)	_____	_____
		Child	$ 20 ($ 25 on-site)	_____	_____
	IAMFES Awards Banquet (Wed., 8/3)		$ 30 ($ 35 on-site)	_____	_____
Spouse/Companion Events:	Bienvenidos (Sun., 7/31)		$ 25 ($ 30 on-site)	_____	_____
	LBJ Ranch & Fredericksburg (Mon., 8/1)		$ 25 ($ 30 on-site)	_____	_____
	Mil Colores (Tues., 8/2)		$ 25 ($ 30 on-site)	_____	_____
	Shopper's Paradise (Wed., 8/3)		$ 20 ($ 25 on-site)	_____	_____

❒ Please indicate here if you have a disability requiring special accommodations.

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Registration Information

Send payment with registration to IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322. Make checks payable to IAMFES. Pre-registration must be post-marked by July 1, 1994. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337.

Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $25 processing fee, will be refunded for written cancellations post-marked at least two (2) weeks prior to the start of the meeting. No refunds will be made for cancellations made less than two (2) weeks prior to the start of the meeting, however, the registration may be transferred to colleague with written

Exhibitor Information

An exhibition of products and consultant services will be at the Hyatt Regency Riverwalk. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337.

To receive information on membership with IAMFES Circle 360 on this card

IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc

DFES
5/94

Reader requests for information are sent to the appropriate company. Follow-up on reader requests are the responsibility of the company advertising.

The Advertisements included herein are not necessarily endorsed by the International Association of Milk, Food and Environmental Sanitarians, Inc.

Name _____ Title _____

Company _____

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City _____ State/Prov _____

Country _____ Zip _____

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Please send information on items circled below: Deadline 60 days from issue date

101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

This second Reader Service Card is provided to allow co-workers to also respond to companies of interest.

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103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

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HOTEL RESERVATIONS
IAMFES

81st Annual Meeting
July 31-August 3, 1994
Hyatt Regency Riverwalk
San Antonio, Texas

Please check accommodation requested:

❑ Single (1 person) ❑ Triple (3 persons)
❑ Double (2 persons) ❑ Quad (4 persons)

Bed type:

❑ King Bed
❑ 2 Queen Beds

Special Requests _____

❑ Please indicate here if you have a disability requiring special accomodations.
All room rates are subject to prevailing taxes.
Reservations must be received by hotel prior to arrival.

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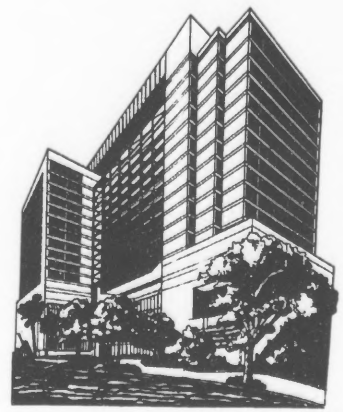

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1994 IAMFES Workshops

This year, the International Association of Milk, Food and Environmental Sanitarians will be offering two workshops in conjunction with its Annual Meeting. Both workshops will be held at the Hyatt Regency Riverwalk in San Antonio, Texas. They will each be a day and a half in length, beginning at 1:00 PM on Friday, July 29 and concluding at 5:00 PM on Saturady, July 30. The IAMFES Annual Meeting will begin on Sudnaday, July 31 and end on August 3.

The two workshops are vastly different and are meant to appeal to different segments of the IAMFES membership. At the same time, they share a common theme--Food Safety. This is in keeping with the IAMFES Mission of "Providing Food Safety Professionals worldwide with a forum to exchange information on protecting the food supply."

"HTST Pastuerization" Workshop

This is a shorten version of the High-Temperature Short-Time Pasteurization workshop that has been put on in Texas for a number of years.

Our instructor, Al Votion, was a milk safety specialist for the Texas Department of Health until recently. In that role he inspected milk processing plants throughout the state and was been involved in all phases of implementing HTST processes.

Workshop participants will have the opportunity to interact with state of the art HTST equipment and to view slides of a wide variety of installations.

The texts for the worksphop are the Food and Drug Administration's "Milk Pasteurization Controls and Tests" and the "Grade 'A' Pasteurized Milk Ordinance." Each participant will receive copies of both books.

Registration fees are: $180 for IAMFES members; $240 for non-members. Register before June 1, 1994 and receive a $30 discount on your Workshop Registration Fee.

Included in the registration fees are the two books and any other hand-outs, and three breaks. Registration for this workshop is limited to fifty participants.

For further information, please contact IAMFES at (800)369-6337 (U.S. and Canada), (515)276-3344, FAX (515)276-8655

REGISTRATION FORM

❑ HTST Pasteurization Workshop

Hyatt Regency Riverwalk – San Antonio, TX – July 29-30, 1994

First Name (will appear on badge) (please print) **Last**

Title **Employer**

Mailing Address (Please specify: Home Work)

City **State/Province** **ZIP/Postal Code**

Area Code & Telephone # **FAX #**

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REGISTRATION:

	Before 6/1/94	After 6/1/94
IAMFES Member	**$150**	**$180**
Non-Member	**$210**	**$240**

TOTAL AMOUNT ENCLOSED: $ _____

US FUNDS on US BANK

Limited Seating—RESERVE NOW. (Subject to cancellation)

Exp. Date _____

Signature: _____

1994 IAMFES Workshops

This year, the International Association of Milk, Food and Environmental Sanitarians will be offering two workshops in conjunction with its Annual Meeting. Both workshops will be held at the Hyatt Regency Riverwalk in San Antonio, Texas. They will each be a day and a half in length, beginning at 1:00 PM on Friday, July 29 and concluding at 5:00 PM on Saturady, July 30. The IAMFES Annual Meeting will begin on Sudnday, July 31 and end on August 3.

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"GMP/HACCP/TQM—the Road to ISO 9000" Workshop

This workshop will tie together those things your company has been doing to establish its top quality products in the market place and show you how they fit into the coming global standards of quality.

Our instructor, Dr. Subhash C. Puri, was until recently, with Agriculture Canada where his job was to work with food processors to improve their product quality. Of late, he has been consulting with US and Canadian firms that are seeking ISO 9000 certification. Peer into Dr. Puri's crystal ball to see where the cry for global standards of quality is leading us.

Dr. Puri has written many articles and has authored six textbooks. His latest book "ISO 9000 Certification and Total Quality Management" will be the basis for this workshop. Each workshop participant will receive a complimentary copy of this book.

Registration fees are: $225 for IAMFES members; $285 for non-members. Register before June 1, 1994 and receive a $30 discount on your Workshop Registration Fee.

Included in the registration fees are Dr. Puri's book and any other hand-outs, and three breaks. Registration for this workshop is limited to fifty participants.

For further information, please contact IAMFES at (800)369-6337 (U.S. and Canada), (515)276-3344, FAX (515)276-8655

REGISTRATION FORM

❑ GMP/HACCP/TQM — the Road to ISO 9000 Workshop

Hyatt Regency Riverwalk – San Antonio, TX – July 29-30, 1994

First Name (will appear on badge) (please print) **Last** _____

Title **Employer** _____

Mailing Address (Please specify: Home Work) _____

City **State/Province** **ZIP/Postal Code** _____

Area Code & Telephone # **FAX #** _____

Charge Card Payments: VISA/MASTERCARD/AMERICAN EXPRESS

Account # _____

Name on Card: _____

REGISTRATION:

	Before 6/1/94	After 6/1/94
IAMFES Member	**$195**	**$225**
Non-Member	**$255**	**$285**

TOTAL AMOUNT ENCLOSED: $ _____

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A rapidly growing developer and manufacturer of food pathogen/toxin tests is seeking a technical sales/support person. This position represents an exciting opportunity to sell and support a new generation automated technology as well as existing EIA-based products. Excellent career potential for an individual interested in the ground floor development of a new North American sales program. Technical proficiency is a must, including food microbiology laboratory experience and BS or higher degree. Send resume to **Dr. Robert Ward, International BioProducts, Inc., P.O. Box 2728, Redmond, WA 98073.**

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Employment Sought

Microbiologist

with B.S. Degree and 10 Years Experience in QA/AC and R&D seeks Laboratory of Quality Assurance position with food industry.

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- Vendor and Sanitation Audits
- Shelf Life Studies
- Laboratory Supervisory Experience
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- Vitek Microbiological System

Prefer Midwest
(Illinois, Wisconsin, Indiana, Missouri, Michigan)

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Employers: *To respond to "Employment Sought" ads, circle the appropriate number on your Reader Service Card and mail to IAMFES, or contact the IAMFES office at (800) 369-6337 (US), (800) 284-6336 (Canada), (515) 276-3344 or FAX (515) 276-8655. Your inquiries will be passed on to the advertiser in confidence.*

Employment Sought Advertising is a service provided to IAMFES Members free of charge.

Coming Events

1994

June

•2, **Tennessee Association of Milk, Water and Food Protection's Annual Meeting** will be held at the Nashville Ramada Airport. For more information please contact Dennis Lampley at (615)360-0157.

•6-9, **Safety School,** sponsored by the American Institute of Baking, will be held at AIB, 1213 Bakers Way, Manhattan, KS 66502. For more information please contact AIB at (913)537-4750, (800)633-5137.

•6-10, **Baking for Allied and Non-Production Personnel,** sponsored by the American Institute of Baking, will be held at AIB, 1213 Bakers Way, Manhattan, KS 66502. For more information please contact AIB at (913)537-4750, (800)633-5137.

July

•8-15, **Rapid Methods and Automation in Microbiology International Workshop XIV**, to be held at Kansas State University, Manhattan, KS. For more information contact Dr. Daniel Y. C. Fung at (913)532-5654, FAX (913)532-5681. A mini-symposium will occur on July 8th and 9th.

•31-August 3, **81st Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians** will be held at the Hyatt Regency Hotel, San Antonio, TX. For more information, contact: Julie Heim — Registration; Scott Wells — Exhibits; at (800)369-6337 (US or Canada) or (515)276-3344.

August

•20-25, **41st International Congress of Meat Science and Technology**, hosted by the American Meat Science Association, to be held in San Antonio, TX. For more information contact Ken Johnson, ICoMST Secretariat at (312)467-5520.

•23-24, **Microbiological Concerns in Food Plant Sanitation & Hygiene,** a two--day interactive lecture course, sponsored by Silliker Laboratories Group, Inc., will be held in Chicago, IL. For further information, contact Silliker Laboratories, Education Services Department at (800)829-7879.

September

•14-16, **International Dairy Federation Annual Sessions** to be held in Adelaide, Australia. **18-22 International Dairy Congress** to be held in Melbourne, Australia. For more information please contact IDF, 1601 Malvern Road, Glen Iris 3146, Victoria, Australis, Telephone (03)885-9781, FAX (03)885-0017.

•18-21, 1995 **National Educational Conference, sponsored by the Canadian Institute of Public Health Inspectors, "Approaching the 21st Century - Challenges in Health Protection",** to be held in Victoria, British Columbia, Canada. For more information please contact Mr. R. W. Bradbury (604)478-0523, FAX (604)478-9363.

•19-21, **Indiana Environmental Health Association Fall Annual Educational Conference** will be held in Muncie, IN. For additional information, contact Tami Barrett at (317)633-8400.

•20-22, **New York State Association of Milk and Food Sanitarians Annual Conference,** Sheraton Inn-Buffalo Airport, Buffalo, NY. For more information contact Janene Gargiulo (607)255-2892.

October

•5-7, **New York State Registry of Sanitarians 1994 Educational Conference** will be held at the Villa Roma Resort Hotel, Callicoon, NY. For more information please contact Susan Jones (516)727-8947 or Michele Hecht (516)349-5816.

•5-8, **1994 International Dairy Show,** sponsored by the International Dairy Foods Association, Milk Industry Foundation, National Cheese Institute and International Ice Cream Association, co-sponsored by the American Butter Institute, will be held at the Minneapolis Convention Center, Minneapolis, MN. For more information, contact International Dairy Show Convention Management at (703)876-0900.

•12-13, **Iowa Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Best Western Starlite Village (formerly the Ramada Hotel), Waterloo, IA. For more information, call Dale Cooper at (319)927-3212.

•19-20, **North Central Cheese Industries Association Annual Conference** to be held at the Holiday Inn, Brookings, South Dakota. For further information contact E. A. Zottola, Executive Secretary, NCCIA, Box 8113, St. Paul, MN 55113.

•21-22, **Breakfast Cereal Technology**, sponsored by the American Association of Cereal Chemists, will be held in Minneapolis, MN. For more information, please contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612)454-7250, FAX (612)454-0766.

•25-26, **HACCP for Meat and Poultry Processors,** a two-day interactive workshop designed for those responsible for implementing a HACCP plan in a processing plant, will be held in Dallas, TX. Sponsored by Silliker Laboratories Group, Inc., more information is available by calling Silliker's Education Services Dept. at (800)829-7879.

November

•2-3, **North Dakota Environmental Health Assn. Annual Educational Conference** will be held at the International Inn, Williston, ND. For more information, contact Deb Larson at (701)221-6147.

1995

January

•**3-5, Milling for Cereal Chemists,** sponsored by the American Association of Cereal Chemists, will be held in Kansas State University, Manhattan, KS. For more information, please contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612)454-7250, FAX (612)454-0766.

•**16-17, Wheat Gluten: Chemistry and Technology,** sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, please contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612)454-7250, FAX (612)454-0766.

•**18, Dough Modifiers,** sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, please contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612)454-7250, FAX (612)454-0766.

•**19, Food Surfactants,** sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, please contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612)454-7250, FAX (612)454-0766.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322.

ADVERTISING INDEX

IAMFES

International Association of Milk, Food and Environmental Sanitarians, Inc.

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