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DAIRY, FOOD AND ENVIRONMENTAL

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On My Mind . . .

By
Steven K. Halsteacd, CAE
IAMFES
Executive Manager

. . . certification

About a year ago this time, I was working towards certification as an association executive. This certification is offered by the American Society of Association Executives (ASAE). Often referred to as the "Association of Associations." ASAE is really made up of individuals who are employed in some form of association management.

As a person who makes his living by managing associations - something I've been doing for over ten years now - membership in ASAE and my state group are very important to me and my employer. Reading the journals, attending the meetings, networking with my peers - all things you should be doing within your professional group - have helped me become a better manager.

My decision to seek the "Certified Association Executive" (CAE) designation involved many things. In some job markets, being a CAE would be a definite advantage. Seeking a position with an association in Washington or Chicago almost requires a CAE. Not so in Iowa. Of the some 250 members of ISAE, only 21 have their CAE. Nationally, there are about 1,900 CAEs of ASAE's membership of about 20,000. In my case, the economic benefits of certification were not a factor in my decision.

I knew that the IAMFES Executive Board was interested in the program because I was asked about it during my interview before I was hired by IAMFES. When I asked their permission and support to work towards certification they were enthusiastic in offering both.

My family was a factor in the decision - a negative factor. I had recently taken an accounting course, so I thought I knew how much time would be taken away from my family life. (I was wrong, of course.)

The first part of the process involved an extensive review of my experience and preparation in association management. This included my formal and informal education as well as my voluntary participation in professional and charitable/civic/religious/philanthropic organizations.

There was a maximum of 1,000 points on this section and you have to accumulate at least 600 points to continue on with the process - anything more than 600 really didn't matter.

If you were able to clear the first hurdle, you were "allowed" to sit for the test. (Any test that takes eight hours should probably be called an examination.) The examination was to cover "everything you need to know to run an association." It also was worth a total of 1,000 points and you had to score at least 750 points to pass.

If you've continued reading to this point, you're probably asking yourself, "Given the above, why did he do it?" There was one overwhelming reason. I wanted to be the best association manager I could be . There were two avenues open to me: 1) I could use self-discipline and study on my own or 2) I could seek certification. I choose the latter.

By getting up earlier, I was able to study for an hour each morning before leaving for the office. That, along with three hours of study each night plus four to six hours each on Saturday and Sunday, would be enough study time, I thought.

It might have been, except for my travel schedule. I soon learned to take my study materials with me. I actually found some high quality study time in airports and airplanes.

Before long, I found it helped to take a half-day or more of vacation each week to study. Obviously, all of this time spent studying was time away from the family. Luckily, they gave me the support I needed and kept their complaints to a minimum.

After 18 weeks of study, the big day for the exam was quickly approaching - the first Tuesday in May. On the preceding Saturday I escaped to my Dad's house for three days of intensive review.

By Tuesday I was ready - I thought. The exam consisted of 15 sections, each 25 minutes long, followed by an hour and a half essay question. I have no idea how many questions there were in total but I can tell you that darn few of them were true or false or multiple choice! I do remember writing four pages on the very first question, but I have no idea what the question was!

Eight hours of writing as fast and as hard as you can - while being totally pumped up - takes its toll. I didn't think the exam was as difficult as it might have been - we sure covered a lot more than we were tested on - but I was not prepared for the physical strain.

During lunch, the other exam takers were soaking their writing hands in ice water. I just laughed. Three weeks later, I still had no feeling in my hand wherever my pen had been touching it!

Was it worth it? YES! I'll never forget the day I received notice that I had passed. With the possible exception of the birth of my children, never had I experienced such sudden and complete joy mixed with pride and a sense of accomplishment.

My experience leads me to urge you, as strongly as possible, to seek certification within your profession—whatever that may be. Do it for your employer. Do it for yourself. Do it for your profession.

Thoughts From The President . . .

By
Damien A. Gabis
IAMFES President

I want to share more information about the long-range planning process that the Executive Board is working on. To date, we have sought proposals from three consultants who were recommended for their expertise in helping associations do their long-range planning, and we are close to selecting one of them. One word about using consultants for the planning process, the development of a strategic plan comes from the members themselves. The roles of the consultant are primarily coach, questioner, researcher, and recorder. The consultant's role is not to do our planning for us.

The Executive Board has allocated funds for the new fiscal year to cover the start up costs associated with planning. In my April column, I outlined the anticipated composition of the long-range planning task force as well as some core questions whose answers are vital to IAMFES' future: What is the essence of IAMFES today? What are the core values of IAMFES? What are the strengths and weaknesses of IAMFES? How can IAMFES make a difference in the professional lives of members and in society?

From experience with my company, the planning process is as important as the final plan itself because of the stimulation of constructive dialogue, promotion of creative thinking, and improvement in organizational consensus. I have come to believe that the most effective planning can occur only when involved members and staff work together to develop desirable goals, strategies, and specific action plans to accomplish them. In order to provide the task force with some organizational structure to start the process, the long-range planning activities will be comprised of two phases. The goals of the first phase will be to define the present status of IAMFES in the areas of history; membership profile; milestones of the past; the association's objectives; programs services and activities offered to members; definition of the membership segments and their needs. The internal functioning of IAMFES will be examined with regard to our basic values, traditions, and beliefs; financial status; organization chart; and responsibilities and accountabilities. Our strengths and opportunities, weaknesses and problems, as well as possible action steps will be defined. Factors that influence the well-being of IAMFES will be studied. Who is IAMFES' competition? What are the effects of government actions on our association? What other internal and external influences significantly affect IAMFES? What are our critical exposures—what are our risks? Finally, in the first phase, the task force will define unknown factors through appropriate research methods.

In the second phase of the planning process, the group will review the research findings about the unknown factors to try to understand the potential impacts and implications of the research findings. Working assumptions will be formulated by the group to account for the economic, technological, social, demographic, political, and organizations/governance climates that will affect IAMFES over the next several years. Hopefully, the task force will be in a position to set the long-range objectives in terms of organization, governance, communications and publications, membership, finance, and programs and services. In addition, the group should be prepared to establish the philosophical direction and strategies to guide IAMFES for the next several years. Action plans will be developed to accomplish the objectives. The action plans will be implemented through specific programs or projects, schedules will be established, responsibilities and accountabilities will be determined, and appropriate resources will be developed and allocated to accomplish the plan.

The anticipated completion time of this long-range plan cycle is two years, that is to say, we should have a completed document ready to present to the full membership by the time of our 1994 annual meeting in Texas. The costs for the full planning cycle have not been precisely determined because there are several dependent variables to be determined. The task force has not yet been specifically developed, but will be shortly after the consultant is chosen and a proposed time schedule drawn up. To achieve the greatest effectiveness, the planning process must draw on broad representation from the various membership and stakeholder groups. I will be presenting new information to you about this extremely important issue as it becomes available.

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Association News:

ABOUT THE COVER .... *Marian Matushek, Culture Identification Specialist with Silliker Laboratories Corporate Research Department, is observing bacterial cultures to determine cellular morphology. For more information on Silliker's Research services please call (708)756-3210.*

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Wastewater Issues Associated With Cleaning and Sanitizing Chemicals

Richard L. Bakka, Klenzade, A Service of Ecolab, St. Paul, MN

As presented at the 78th IAMFES Annual Meeting, July 24, 1991, Louisville, KY

There are several key wastewater issues related to the use of cleaning and sanitizing compounds in the food industry. These include pH, phosphorous, BOD contribution, biodegradability, water usage, and toxicity. Although these issues are most commonly discussed when addressing wastewater, other factors such as fats, oils, and greases have adverse affects upon the operation of waste treatment systems.

pH

Effective sanitation of food processing equipment requires the use of both acid and alkaline cleaners or sanitizers. Alkaline cleaners are necessary for the effective removal of fats and oils by saponification. Alkaline systems are necessary for effective hydrolization of carbohydrates and proteins. A pH of 10.5-14 can be typically encountered when dealing with effective alkaline cleaning solutions. Sodium hydroxide is a common source of alkalinity. Cleaning of heavily soiled equipment may require 2% active caustic. Under certain circumstances, as high as 10% active caustic may be present in a cleaning solution.

Acid cleaners are necessary for effective removal of mineral components of food soils as well as water related deposits. Certain denatured proteins are most effectively removed under strong acid conditions. Acids are also used as a base for some sanitizers. The incorporation of an acidified rinse together with the sanitizing function in one step has become very popular. Acid cleaners and acid sanitizers provide solutions with pH's ranging from 1.5-6.0. Most acid systems utilize a phosphoric or phosphoric/nitric acid combination. Cleaning solutions for heavy mineral deposits are typically used at a 1% level. Under some circumstances, such as passivation of stainless steel, as high as a 10% nitric acid solution is encountered.

The impact upon a food plant will depend upon a combination of cleaners utilized. Consider a medium size fluid dairy plant, The "Milky Whey Dairy." In table 1, the equipment cleaned daily is summarized. The Milky Whey Dairy processes 750,000 pounds of raw milk per day. They produce fluid milk, cottage cheese, buttermilk, sour cream and a variety of dips. The types of cleaners and sanitizers used are summarized in table 2. CIP alkaline cleaner is used for cleaning trucks, raw and pasteurized tanks, and lines. Heavy duty alkaline cleaner and CIP acid are used for cleaning heat transfer surfaces such as the HTST systems as well as vats and mix tanks. Manual cleaner is used for manual cleaning of various equipment. General equipment exteriors, walls and floors are cleaned with an environmental cleaner (foaming general cleaner). Case washing compounds, conveyor lubricants, and sanitizers are also used.

In table 2, typical pH of each cleaning solution is listed. Note the high and low swings that can occur during the daily sanitation process. The pounds of equivalent caustic are also summarized. As noted, approximately 70 pounds of equiva-

TABLE 1.

MILKY WHEY DAIRY

TANKERS	16/DAY
RAW SILOS	3
RAW CREAM	1
HTST	2
VATS/MIX TANKS	6
PASTEURIZED STORAGE TANKS	7
CREAM DRESSING TANKS	2
FILLERS - MILK	4
FILLERS - CULTURED	2
CASE WASHER	1

TABLE 2.

pH - NEUTRALIZATION

CLEANER/ SANITIZER	LBS/DAY	WATER	pH	LBS CAUSTIC
CIP ALKALINE	566	13,517	11.5	55.0
HD ALKALINE	230	500	12.8	110.0
CIP ACID	50	500	1.8	-30.0
MANUAL CLEANER	35	560	10.8	3.6
ENVIRONMENTAL CLEANER	10	330	11.5	0.9
CASE WASHER	38	1,382	11.0	2.6
CONVEYOR LUBE	72	1,065	10.0	1.7
SANITIZERS				
CHLORINE	37	1,459	8.0	-0-
QUAT	15	460	7.5	-0-
ACID	234	14,128	3.0	-76.0
		33,901 GAL		67.8 TOTAL

lent caustic would be generated on a daily basis if the discharge is blended without any dilution. CIP acid and acid sanitizers reduce the equivalent caustic discharge.

Phosphorous

A major contributor to modern detergent chemistry is the use of phosphates. Phosphates provide a multiple function role in cleaning. Phosphates are a mild source of alkalinity that are effective in manual cleaners. They have the ability to condition water as well as aid in soil deflocculation, anti-redeposition and emulsification. Phosphoric acid, also a source of phosphorous is widely used in acid cleaners as well as sanitizers.

In the early 1960's, the role of phosphorous in eutrophication of surface waters was addressed. Since that time, significant reductions in phosphate contents of detergents to actual bans have occurred throughout the United States. The contribution of cleaners and sanitizers to our Milky Whey Dairy waste stream are summarized in table 3. Based on the pounds of each cleaner or sanitizer used per day, the phosphorous contribution is 46.9 pounds. The contribution of phosphorous to the plant discharge due to loss of milk is estimated at 7.0 pounds. This is calculated assuming a milk loss of only 1%, which is extremely low.

TABLE 3.

PHOSPHORUS - PHOSPHATES

CLEANER/SANITIZER	LBS/DAY	PHOSPHORUS-LBS
CIP ALKALINE	566	17.0
HEAVY DUTY ALKALINE	230	NIL
CIP ACID	50	12.3
MANUAL CLEANER	35	0.7
ENVIRONMENTAL CLEANER	10	0.3
CASE WASHER	38	NIL
CONVEYOR LUBE	72	NIL
SANITIZERS		
CHLORINE	37	NIL
QUAT	15	NIL
ACID	234	16.6
Milk Loss Contribution = 7.0 lbs.		46.9 TOTAL

Significant steps have been made to reduce phosphorous usage in detergents. From 1958-1989, the use of phosphates in all segments of detergents has been reduced by 75%. (Table 4) However, compared to fertilizers and animal feed, detergents as well as other industrial usages is relatively low.

Reduction in phosphate utilization in the detergent industry has been through the adoption of alternates. Chelates, polymers, and ionic exchange resins have all been used effectively to condition water. Phosphoric acid has been replaced in many cases by nitric, sulfuric and organic acids. Detergent properties relating to deposition, emulsification, and deflocculation have been accomplished through the greater use of surfactants. If the Milky Whey Dairy was located in an area where zero phosphorous discharge are required, a low phosphate program as shown in table 5 could be proposed. Alkaline CIP cleaner, CIP acid and acid sanitizers would be replaced with a zero phosphate alternate. Although equal performance relating to product quality and

TABLE 4.

DOMESTIC PHOSPHORUS USAGE

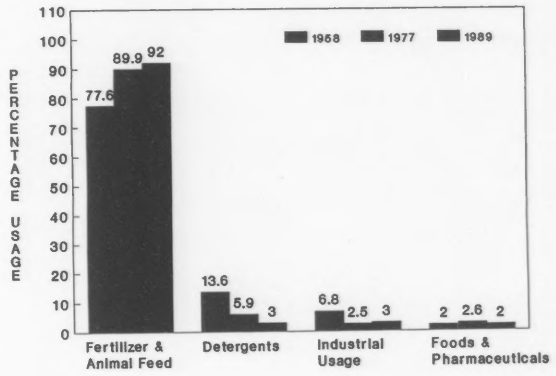

TABLE 5.

LOW PHOSPHATE PROGRAM

CLEANER/SANITIZER	LBS/DAY	PHOSPHORUS-LBS
CIP ALKALINE	566	NIL
HEAVY DUTY ALKALINE	230	NIL
CIP ACID	50	NIL
MANUAL CLEANER	35	0.7
ENVIRONMENTAL CLEANER	10	0.3
CASE WASHER	38	NIL
CONVEYOR LUBE	72	NIL
SANITIZERS		
CHLORINE	37	NIL
QUAT	15	NIL
ACID	234	NIL
		1.0 TOTAL

safety is achievable, close control of all variables are necessary.

BOD/COD

Cleaners and sanitizers can be sources of BOD/COD. Cleaners utilize surfactants, chelates, polymers, couplers, as well as organic acids or alkalis. All of these being organic, contribute to the overall BOD/COD discharge in waters from a plant. Conveyor lubricants, necessary for the lubrication of packaged conveyor systems utilize soaps, surfactants, chelates and couplers which all contribute to the BOB/COD discharge.

Sanitizers, with the exception of chlorine, also have some contribution due to organics used in their formulation to BOD/COD.

The Milky Whey Dairy BOD/COD contributions are summarized in table 6. Of a total contribution of over 44 pounds, conveyor lubricants account for almost three quarters of the total. The milk loss contribution based upon a 1% total loss would contribute to over 750 pounds. The contribution from the cleaner and sanitizer, particularly the conveyor lubricants, is rather small when compared to the milk loss contribution.

TABLE 6.

BOD/COD

CLEANER/SANITIZER	LBS/DAY	BOD - LBS
CIP ALKALINE	566	1.0
HEAVY DUTY ALKALINE	230	0.3
CIP ACID	50	NIL
MANUAL CLEANER	35	0.7
ENVIRONMENTAL CLEANER	10	1.8
CASE WASHER	38	2.7
CONVEYOR LUBE	72	36.0
SANITIZER		
CHLORINE	37	NIL
QUAT	15	1.1
ACID	234	0.8
		44.4 TOTAL

MILK LOSS CONTRIBUTION - 750 LBS BOD

Biodegradability

The fourth issue related to wastewater is the biodegradability of cleaners, sanitizers, and conveyor lubricants. There is no standard of definition for biodegradability in the U.S. The criteria used to claim biodegradability varies by test procedure. At Ecolab, we have chosen to use the European procedure identified as the OECD 301D. This is published by an Organization for Economic Cooperative Development. This procedure requires that the ratio be less than 60% of the theoretical oxygen demand (or initial COD) to a 28 day BOD. Based on this criteria, most cleaners, sanitizers and lubricants meet the criteria for claiming readily biodegradable.

Water Usage

Significant volumes of water, in many cases, the major contribution to the waste stream are necessary to provide an effective sanitation program. We can see (table 2) that in the Milky Whey Dairy the cleaning solutions contribute almost 34,000 gallons of water. This is only part of the story. Equipment must be rinsed prior to cleaning and rinsed following cleaning. Rinsing of floors, equipment exteriors, and other areas contribute additional volumes of water. As much as 80,000 to 100,000 gallons of water could easily be accounted for in the cleaning and sanitizing of equipment and environmental surfaces within the Milky Whey Dairy.

Much can be done to control water usage in sanitation. Plant layout and design of CIP systems together with the monitoring of rinses by a conductivity and pH can be effective. Foam cleaning together with high pressure, low volume rinsing further provides means for control. However, the key factor in any of these steps is to maintain these systems in an efficient manner. Once effective programs have been established, they must be monitored so that they do not get out of control later.

Toxicity

Cleaners and sanitizers once used are discharged to waste treatment facilities and in some cases our environment. The toxicity of these materials to the waste treatment facility and our environment is of concern. Many of the ingredients used in cleaners and lubricants used in food plants are generally recognized as safe as food additives. Concerns regarding wastewater treatment facilities are related to high and low pH swings and possible long term exposure of trace heavy metals.

Sanitizers by definition are toxic. They are designed to kill microorganisms. On the other hand, they meet the requirements of the FDA as an indirect food additive. Dilution of sanitizers, as well as reaction with organic compounds encountered in their discharge rapidly reduce there toxic properties to a safe level. Cleaners and sanitizers as part of a food plant sanitation program can contribute to waste issues. However, these can be controlled and waste minimized through plant design, optimization of cleaner and sanitizer concentrations, alternate procedures and reuse or reclaim of non-critical items. Alternate choices are also available to provide a phosphate free program, provide improved biodegradability, and to minimize pH contributions where necessary.

When asked in a 1989 Time/CBS news poll whether you agree or disagree with the statement "Protecting the environment is so important that the requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost" over 80% agreed. This is a significant increase in concerns from the less than 50% agreement to the same statement in 1981.

Cleaners, sanitizers, and conveyor lubricants, account for less than 10% of the BOD/COD contributions from a food processing plant. Water volumes associated with sanitation from a food processing plant could account to as much as 30% of total water discharge. Effluent pH problems have been more of a concern than BOD/COD.

Sanitation programs must address food safety. It is the first objective in the production of a safe and wholesome food product. However, we must look beyond that to the safety of our environment. Significant steps have been taken in meeting these issues through advancements in cleaning and sanitizing products. Much more can and will be done.

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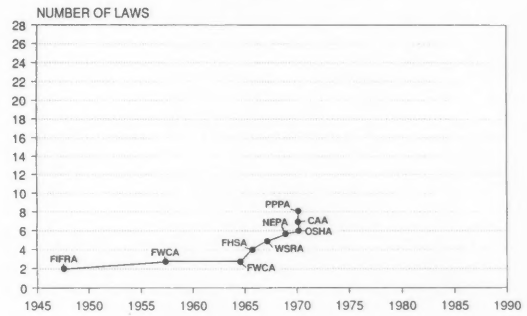
Dairy, Food and Environmental Sanitation, Vol. 12, No. 5, Pages 277-279 (May 1992)

EPA: Pollution Prevention Strategy and Related Legislative Acts

Bob Carter, Supervising Engineer,
Waste Reduction Resource Center for the Southeast

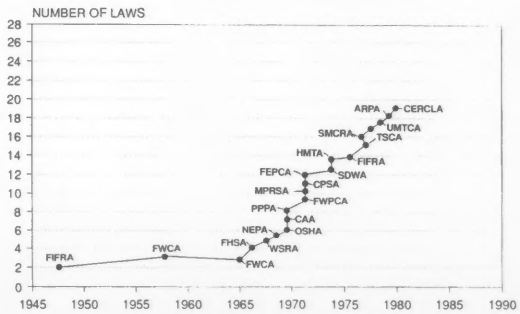
To understand the Environmental Protection Agency's (EPA), Pollution Prevention Program as it exists today, it helps to look at what preceded its creation. EPA was an outgrowth of the massive public demonstrations which occurred on Earth Day, April 1970. Congress was forced to take action to initiate legislation to correct past mistakes and to protect the environment. The Environmental Protection Agency was created by the National Environmental Policy Act of 1970.

U.S. ENVIRONMENTAL LEGISLATION THROUGH 1970



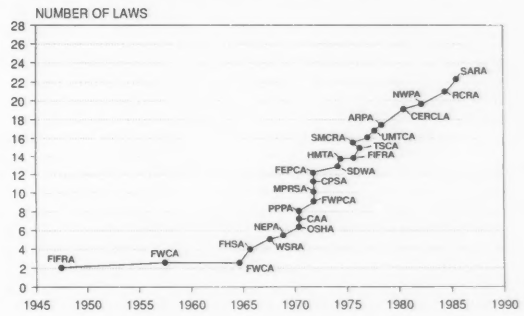
Legislation continued to blossom from those to protect individual media such as air, water, and solid waste to legislation governing multi-media wastes such as toxic and hazardous as well as comprehensive enviromnental recovery acts such as CERCLA. Implementing regulations were often difficult to understand or were not acceptable to industry resulting in protracted litigations.

U.S. ENVIRONMENTAL LEGISLATION THROUGH 1980



These figures depict the growth of regulatory laws. Implementing regulations often were not only confusing but were too stringent requiring repeated amendments or new acts. In the '80s, new concepts were introduced such as cradle-to-grave tracking and responsibility under RCRA. The first requirement to begin waste reduction planning originated with the Hazardous and Solid Waste Act (HSWA) Amendments of 1985.

U.S. ENVIRONMENTAL LEGISLATION THROUGH TODAY



In 1986, EPA finally got on board the movement which changed emphasis from end of pipe treatment to preventing waste from being generated in the first place. States had led this initiative by developing direct, free non-regulatory technical assistance to industry to eliminate waste by stopping its generation at the source. The following summarizes EPA's Pollution Prevention Program initiation and new direction as reported in its annual report to Congress in 1986.

- To provide technical assistance programs on waste minimization to waste generators and the states.
- To assist states in developing technical assistance programs.
- To develop a waste minimization information system to disseminate information to producers and the states.
- To implement waste reduction throughout EPA across all media programs.

To implement EPA's proposed redirection as stated above, Region IV's Hazardous Waste Roundtable, including heads of the region's state programs, representatives of the Tennessee Valley Authority, the Department of Energy, and the Southern States Energy Board decided on a two pronged effort to meet EPA's stated objectives.

RECOMMENDATION FROM THE 1986 EPA REPORT TO CONGRESS ON MINIMIZATION OF HAZARDOUS WASTE

- **To provide technical assistance programs on waste minimization to waste generators and the states.**
- **To assist states in developing technical assistance programs.**
- **To develop a waste minimization information system to disseminate information to generators and the states.**
- **To implement waste reduction throughout EPA across all media programs.**

The States were to start technical assistance programs in waste reduction for industries, local government, and the general public. A central clearinghouse of waste reduction information, staffed with experts who could assist states in getting started, was needed. This gave rise to the Waste Reduction Resource Center funded and staffed principally by EPA, Region IV but with assistance by TVA.

The Center was collocated with the N. C. Pollution Prevention Pays Program to take advantage of N.C.'s extensive waste reduction library and the expertise of its engineers, developed over many years of providing assistance to N. C. industry. The Center opened its door, with an 800 number, for business on April 1, 1989.

EPA's Pollution Prevention Office and Program were finally initiated in 1988 four to five years after many states started similar programs - and after Region IV - sponsored a program for the entire region.

Between its establishment in October of 1988 and passage of the Pollution Prevention Acts of 1990, the EPA's Pollution Prevention Offices' efforts were largely outreach. These included funding research, putting on training courses, funding twenty-five (25) state technical assistance programs, and planning on how to integrate pollution prevention in all EPA programs.

Last year many new acts were introduced which will have a lasting impact on the way we address waste problems in the future. The new Clean Air Act, The Pollution Prevention Act of 1990, The National Environmental Policy Act Amendments, the pending Federal Facility Compliance Act and updates to CERCLA and RCRA all place new requirements on all waste streams.

CLEAN AIR ACT OF 1990

LAEL

MACT

REGULATES EMMISSIONS FROM OVER 200 CHEMICALS AND PROCESSES

$CO_2/SO_2/NO_x$

CFCs

CLEAN AIR ACT AMENDMENTS 1990

TITLE I NON-ATTAINMENT AREAS

TITLE II MOBILE SOURCES

TITLE III AIR TOXICS LAEL MACT

TITLE IV ACID RAIN

TITLE V PERMITTING
(COODINATES PERMITTING FOR I, II & III)

TITLE VI STRATOSPHERIC OZONE PROTECTION
CONTROL OF PRODUCTION & USE OF CFCs

TITLE VII ENFORCEMENT

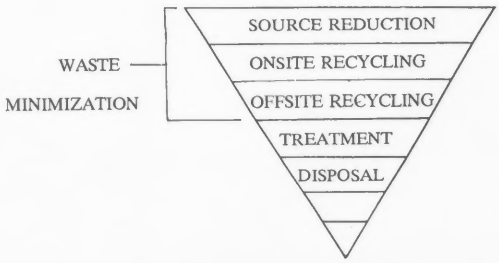
The Pollution Prevention Act of 1990 establishes pollution prevention as a "national objective." The Act establishes a hierarchy of environmental protection priorities as follows:

SOURCE REDUCTION
RECYCLING ON-SITE - OFF-SITE
TREATMENT
DISPOSAL

New responsibilities of EPA's Pollution Prevention Office are listed in the next two figures. Pollution Prevention, particularly source reduction will become an integral part of all EPA programs, regulatory and non-regulatory.

EPA RESPONSIBILITIES DEFINED IN ACT

- ESTABLISH PP OFFICE INDEPENDENT OF SINGLE MEDIA PROGRAMS
- FACILITATE ADOPTION OF SOURCE REDUCTION TECHNIQUES
- DEVELOP TOOLS TO MEASURE SOURCE REDUCTION
- DEVELOP PROCUREMENT GUIDELINES
- DEVELOP METHODS TO EASE PUBLIC ACCESS TO DATA
- DEVELOP TRAINING PROGRAMS IN SOURCE



WASTE MANAGEMENT
HIERARCHY

Other new initiatives include the voluntary 33/50 toxics reduction initiative; 1991 Small Business Grants for pollution prevention projects; and a new $8 million State Grant Program which funds sixteen (16) new state programs (50% state match for initial grants now reduced to 10% match). Form R reporting becomes a regulatory part of The Pollution Prevention Act of 1990. A Municipal Pre-treatment Program grant will attempt to demonstrate that pretreatment regulators and non-regulatory technical assistance programs work-

OTHER INITIATIVES

- EXECUTIVE ORDER 12088
- 33/50 VOLUNTARY TOXICS PROGRAM
- SMALL BUSINESS GRANTS
- RESEARCH AND DEVELOPMENT
- OUTREACH

Policy

"Congress Declares It To Be The National Policy Of The United States That, Wherever Feasible, The Generation Of Hazardous Waste Is To Be Reduced Or Eliminated As Expeditiously As Possible"

ing together at the local level can reduce waste at the source sufficiently to keep POTW'S in compliance with discharge limits.

In addition to EPA, States have independently initiated legislation to require waste reduction plans and the establishment of specific waste reduction goals in constrained time frames for specific waste streams. Wise generators are initiating waste reduction plans and goals for all waste streams.

The Waste Reduction Resource Center provides those services listed on the Services Available handout. The Center primarily serves the State Waste Reduction Programs of Region IV, industries and the general public within those states. They provide assistance to requestors outside of Region IV on a non-interference basis.

Waste reduction makes sense economically, environmentally, and socially. If you need help getting started or addressing difficult waste reduction problems, please call. The contact number is 1-800-476-8686.

Dairy, Food and Environmental Sanitation, Vol. 12, No. 5, Pages 280-281 (May 1992)

Water Issues in Food Processing

John E. Rushing, North Carolina State University, Box 7624, Raleigh, NC 27695-7624

This paper was presented as part of the Symposium "Water in Food Processing" at the 78th IAMFES Annual Meeting, July 21-24, 1991, Louisville, KY

The issues of water as they relate to food processing are a small part of a larger issue. America was settled by those searching for opportunity. The freedoms she offered along with vast resources were legion. Personal initiative in the exploitation of those resources resulted in a phenominal industrial empire. It seemed like the resources were limitless.

As our nation entered it's 200th year, EPA reported that 402 million tons of pollutants from human sources was entering the Nation's waterways annually. That was 2 tons for everyone in the US. The pollutants included bacteria, viruses, organic materials, fats, oils, acids, metals, pesticides and other chemicals plus hot water from power plants and other industrial operations.

Enough was enough. Congress had enacted the Federal Water Pollution Control Act Amendments in 1972. These amendments had as their purpose "to restore and maintain the chemical, physical and biological integrity of the nation's waters."

Two goals established for the act were ideas each of us would have voted for

1. By 1983, to achieve water quality that's clean enough for swimming and other recreational use and clean enough to protect fish, shellfish, and wildlife.
2. By 1985, to eliminate discharge to our waters.

These goals were accomplished with varying degrees of success. We still have work to do.

One of the most effective tools given to the EPA to enforce the clean-up of our waterways was a permitting system called the National Pollutant Discharge Elimination System (NPDES). This system makes each discharger, municipal system, or industrial discharger, responsible for his contribution to the waste stream. This is a contract which many food processing plants have entered lightly, only to find that they have promised more than they can deliver. This system also provides a mechanism for municipal treatment facilities to limit the discharge of its industrial users.

We all know that an abundant supply of wholesome water is necessary for the operation of food processing plants. We flume in it, we process in it, we use it as an ingredient, we heat with it, cool with it, and clean with it. The supply of water and the ability to discharge it are prerequisites to plant location. Here in Kentucky, it is said that the presence of water from limestone formations is the reason for the state's distilling industry.

All water issues are not those of pollution and compliance as our colleagues from California can attest. However, many of them, if not most of them, are.

One of the major issues facing our industry at the present is the availability of clean, wholesome water. The water must be of adequate quality, chemically and biologically for the use in plants. The actual treatment of water by chlorination and other means may raise points of public health. Though most process waters are properly treated, we have reason to be concerned about the quality of water used on minimally processed foods throughout the production cycle. Cholera is a very real threat in South America at this time and it continues to spread.

Recycling and reuse of process waters has attracted a high level of interest recently. Issues regarding residues, pathogens and the wholesomeness of the water need to be resolved. Appropriate regulatory guidance and some enabling regulations will be required as the technologies progress.

Ability to monitor and control the basic parameters of discharge accurately is a current need. Measuring toxicity is an inexact science fraught with variability. The standard parameters of TSS, BOD, and FOG are not readily monitored by food plants. Indeed the simple pH test exhibits varying degrees of dependability when applied to continuous monitoring and neutralization of a waste stream. Flow rate, itself, is difficult to measure with many discharges.

Cost is an issue that many food processing plants have not worked out. We know that most of the BOD contribution is wasted and lost products. To deal with these losses, it is necessary to improve equipment and procedures in plants. In the long run this improves productivity.

Many plants which have in the past discharged directly into municipal waste treatment facilities find themselves facing the necessity of pretreating prior to discharge. Costs and operating efficiency are pretreatment issues which should make every plant attempt to avoid it's own pretreatment. Once instituted, the further concern is what to do with the residuals as they may need further processing prior to disposal.

Land application, long a standby for discharge of some food processing wastes, is limited. Hydraulic loads that are high may make the amount of land necessary for application unreasonably large. Runoff and proper utilization of nutrients may restrict the vegetation. Buildup of minerals and

other materials in the soil has the potential for long-term liability for residues possibly as yet undiscovered.

Nuisance laws are changing. At one time, one had no claim if he moved near an active food processing plant to an existing odor problem. Recent court decisions indicate that such may no longer be the case. As yet, the measurement and classification of unwanted odors is inexact. Violations are hard to cite, but research is rapidly improving techniques.

As you can see, the issues regarding food processing waters are varied and complex. We know that they require immediate attention. Many require action. The food processing industry has as its major advantage that it is discharging food mixed with water. Its characteristics are such that properly treated, it is not a hazard to human health. It is usually compatible with the treatment systems. Typically the waste is characterized by high BOD. This results in an opportunity for food processors to decrease yield losses and possibly to recover by-products.

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Understanding Bacteriocins and Their Uses in Foods

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Abstract

Bacteriocins are potential food additives. With regard to their antagonistic effects particularly against food spoilage and pathogenic microorganisms, extensive research has demonstrated numerous advantages of their use as food preservatives. However, because of sources, purification levels, and structural compositions, these substances require more investigation to determine risk of toxicity and additional properties. This summary intends to familiarize food processors, researchers, or regulatory agents concerned with the safety of our daily food supply with bacteriocins and their potential uses.

Bacteriocins

I. Introduction

In 1925, Gratia discovered a **protein released by *E. coli*** that could **inhibit growth** of other strains of the organism (Davis et al., 1990). Subsequent studies reported a number of **proteinaceous compounds (BACTERIOCINS)** (Tagg et al., 1976) in other bacteria that have similar **antibiotic-like properties** against a narrow spectrum of bacteria (Davis et al., 1990; Klaenhammer, 1988).

II. Bacteriocins

1. Definition:

Small single or complex proteins or proteinaceous substances that show bacteriocidal activity against a limited range of organisms, usually closely related to the producer (Klaenhammer, 1988; Schillinger, 1990).

2. Nomenclature

Their names are derived from the genus (or species) of bacteria producing them, accompanied by a letter of classification (Eckner, 1991)

e.g. nisin from *Lactococcus lactis*
colicin from *E. coli*
enterocin from *Enterococci*
pediocin A from *Pediococcus acidilactici*
pediocin AcH from *Pediococcus pentosaceous*
sakacin from *Lactobacillus sake*

This material is based upon work supported by the Cooperative State Research Service, USDA under agreement No. 89-34187-4511 Contribution No 92-336-J, Kansas Agricultural Experiment Station, Manhattan, KS 66506

3. Production

Most bacteriocins are plasmid mediated (Davis et al., 1990; Hansen et al., 1990; Klaenhammer and Sanozky, 1985; Pucci et al., 1988)

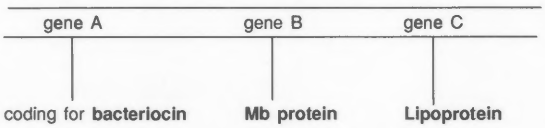
a. Plasmids or **BACTERIOCINOGENS**

These are **extrachromosomal DNA**. Phasmids are also plasmids, which have an autonomous DNA replication (Davis et al., 1990).

b. Structure and function of genes (of plasmids)

Under **normal conditions**, the genes (Fig. 1) coding for a given bacteriocin have a **repressive effect** (chromosomal gene) on the formation of the bacteriocin (Davis et al., 1990).

Figure 1. General structure of a plasmid



The membrane (Mb) protein makes the producer immune to the bacteriocin produced. The small **lipoprotein makes the cell membrane permeable to allow exit of the bacteriocin released. When growth conditions are modified** (a mutation damaging the DNA due to UV irradiation, competition for an essential nutrient), the **SOS system of the cell is turned on to overcome** (repair of DNA) **the crucial situation**. When this SOS system is on, usually the repressor of the gene coding for the bacteriocin is destroyed, resulting in production of the bacteriocin (Davis et al., 1990).

c. Genetics and genetic engineering (Davis et al., 1990; Hansen et al., 1990)

Plasmids are very important in Meiotic Recombination (Davis et al., 1990; Gonzalez and Kunka, 1985). They are used to study

- bacterial transformation (Dulbecco, 1988; Gonzalez and Kunka, 1985)
- gene transposition (Davis et al., 1990)
- transfection (Davis et al., 1990)

III. Factors Affecting Bacteriocin Production

Bacteriocin production may be influenced by several factors including

1. **Composition** of the growth **medium** (Hurst, 1983)
e.g., plantacin B (produced by *Lactobacillus acidophilus*) diffused in agar medium, but was not detectable in liquid medium (Klaenhammer, 1988).

2 **pH** of the growth medium (Davey and Richardson, 1981; Scott and Taylor, 1981b)

neutral(bacteriocin)
acidic(none)
basic (none)

3. **Phase of growth** of the producer (Davey and Richardson, 1981)

lag phase (none)
mid-log and/or log phase (bacteriocin)
stationary phase (none)

IV. Methods of Detection and Purification

Because they are small or large polypeptides (proteins) (Klaenhammer, 1988; Oxford, 1944) bacteriocins may be detected, purified, or quantitated using detection and purification methods including Protein blotting, Antibody-Antigen reactions (Immuno-fluorescence, precipitation or blotting), Enzymatic reactions (Enzyme Linked Immunosorbent Assay), and ATP-Bioluminometry (Bers and Garfin, 1985; Harper et al., 1990; Kaletta and Entian, 1989; Waites and Ogden, 1987). Protein structure determination such as Mass spectrometry may also be used (Biemann, 1990).

V. Mode of Action (Broughton, 1990; Davis et al., 1990; Henning et al., 1986)

Most bacteriocins bind to the outer membrane (OM) receptors by conjugation with other cell components (phospholipids) or by aggregation with other proteins (glycoproteins).

- Such bindings create **ion channels in the cytoplasmic membrane, making the cell permeable** (loss of intracellular electrolyte and/or pH balance).
- Some bacteriocins react as **nucleases** and affect interior proteins of the target cell.
- In another mechanism, the **immunity protein** (coded by gene B) **binds reversibly to the bacteriocin**, resulting in a complex that adsorbs to the receptors on the target cell. The immunity protein dissociates and frees the bacteriocin, which becomes enzymatically active and enters the target cell (Davis et al., 1990).

VI. Bacterial Susceptibility to Bacteriocins (Broughton, 1990; Davis et al., 1990; Morris et al., 1984)

The susceptibility of bacteria to bacteriocins depends upon

- binding (OM receptors) — — — → Ion channel
- penetration (cytoplasmic membrane)— — — — → Nuclease activity

1. Evidence 1

Experiments with **mutants lacking effective receptors** showed **resistance to bacteriocins**.

2. Evidence 2

Mutants that had their **cytoplasmic membrane altered** were found to be **resistant to bacteriocins**.

3. Bacterial spectrum

Gram-positive organisms have **single** membranes (e.g., *Listeria*, *Staphylococcus*) and, thus, most are **sensitive to bacteriocins** (Daeschel, 1989; Schillinger, 1990).

Gram-negative (**double** membrane organisms) are **mostly not affected** (Schillinger, 1990).

VII. Bacteriocins of Lactic Acid Bacteria (LAB) (Klaenhammer, 1988; Tagg et al., 1976)

LAB are antagonistic to many bacteria through

1. acid production (lowering of pH)
2. hydrogen peroxide (H_2O_2) (molecular oxygen O_2 is lethal to anaerobes)
3. bacteriocins

Most LAB produce one or more types of bacteriocins (Daeschel, 1989; Eckner, 1991; Tagg et al., 1976; Klaenhammer, 1988), but the most beneficial in the food industry are those produced by "food grade bacteria" (Daeschel, 1989; FDA, 1988, 1989).

LAB constitute a large group of bacteria producing many types of bacteriocins (see table 1).

Table 1. Some useful bacteriocins for the food industry

genus of bacteria	bacteriocin produced
Pediococcus	pediocins
P. acidilactici	pediocin PA-1, AcH
P. pentosaceus	pediocin A
Lactococcus lactis spp *lactis*	nisin A, E
Lactobacillus sake	sakacin A
Lb. plantarum	plantaricin
Lb. helviticus	helviticin J

VIII. Properties of Bacteriocins (produced by LAB)

1. **pH**

Chemical and physical properties of partially purified or purified bacteriocins may change with changes of pH (Daeschel, 1989; Klaenhammer, 1988; Liu and Hansen, 1990)

2. **Sensitivity to proteases**

Because of their nature (protein or proteinaceous compounds) most bacteriocins (Davey and Richardson, 1981) except nisin are sensitive to proteases. Nisin is sensitive to alpha-Chymotrypsin (Jarvis and Mahoney, 1969).

3. **Heat tolerance**

Most remain active at high temperatures when the pH is low (Tramer, 1964). Some may withstand autoclaving without loss of activity. Diplococcin partially purified showed no detectable loss in activity when heated at 100°C for 1 h. (Davey and Richardson, 1981). Heat sensitivity is dependent upon

a) purity of the bacteriocin

Partially purified form of diplococcin was more stable than the purified form (Davey and Richardson, 1981).

b) pH (Broughton, 1990; Hurst, 1983)
c) protective molecules (Scott and Taylor, 1981b)
d) ionic strength (Schillinger, 1990)

4. **Use of LAB bacteriocins in foods** (Broughton, 1990; Chung et al., 1989; Daeschel, 1989)

Bacteriocins are used for their preservative effects. When artificially added to foods or naturally produced in

foods by food grade microorganisms, these substances may inhibit both spoilage and pathogenic microorganisms (Chung et al., 1989; Eckner, 1991; FDA, 1988; 1989; Pucci et al., 1988; Scott and Taylor, 1981a).

Nisin and Pediocins have a broad spectrum (Klaenhammer, 1988; Raccah, 1987). Nisin is effective in preventing the outgrowth of Gram positive bacteria (*Clostridium*, *Staphylococcus*, *Listeria*) and their spores (Broughton, 1990; Daeschel, 1989; Hurst, 1981; 1983; Scott and Taylor, 1981a,b; Schillinger, 1990). With *Cl. botulinum*, type A spores were the most resistant and require a high level of nisin. Type E spores were found to be more sensitive, and type B were intermediate (Chung et al., 1989; Scott and Taylor, 1981a). With prolonged incubation periods up to 65 d, spore outgrowth was observed, indicating some decomposition of nisin with storage. Nisin is most effective in a food environment in which the pH is low (pH<6) and protein and fat contents are low (Daeschel 1989). Other factors, such as temperature and spore load, profoundly affect the efficacy of the bacteriocin (Scott and Taylor, 1981b). Inhibition of Gram negative bacteria has not been reported for bacteriocins produced by lactic acid bacteria (Schillinger, 1990). Most bacteriocins produced by *Lactobacillus* (except Sakacin A) have a narrow inhibitory spectrum and usually affect species closely related to the producer. Sakacin A was found to be active against *Listeria monocytogenes* (Klaenhammer, 1988). The inhibition of *L. monocytogenes* by bacteriocin PA-1 (produced by *Pediococcus acidilactici* PAC 1.0) in laboratory medium was studied by Pucci et al. (1988). They found that the bacteriocin had an inhibitory and bactericidal effect on the pathogen. Although many types of bacteriocins are produced by LAB (Raccah, 1987; Daeschel, 1989), **nisin is the only bacteriocin whose use in food system has been approved by the FDA** (FDA, 1988; 1989). It is also widely used in some countries in Europe and Canada (Broughton, 1990; Hurst, 1983).

IX. Use of Nisin as a GRAS (generally recognized as safe) food additive (FDA, 1988)

The use of nisin as a milk and dairy food additive is widespread in most countries, including USA (FDA, 1988; 1989), UK, and USSR (Broughton, 1990). The maximum allowable level of addition (IU nisin/g food product) ranges largely from no limit in pasteurized milk to 100-10,000 in various types of cheeses (pasteurized or non-pasteurized), dessert dairy products, and canned food products. The uneven distribution, poor solubility, and binding of nisin onto meat particles makes its use inconvenient, particularly in cured meats. In addition, the interaction of nisin with meat components may result in off-flavors during storage (Broughton, 1990; Hurst, 1981, 1983). The effect of nisin on the growth of bacteria attached to artificially inoculated meat was studied by Chung et al. (1989) and they reported that nisin delayed bacterial growth gram-positive bacteria (*Listeria monocytogenes*, *Staphylococcus aureus*, *Streptococcus lactis*), but did not affect gram-negative bacteria (*Salmonella typhimurium*, *Serratia marcescens*, and *Pseudomonas aeruginosa*) attached to meat. According to these data, the authors concluded that nisin alone may not be sufficient to prevent meat spoilage (Chung et al., 1989).

X. Future Research

- Simpler and more rapid purification techniques
- Enhancement of the bacteriocin production and antibactericidal activity through genetic engineering
- Regulation to establish safe levels for the use of other (except nisin) bacteriocins in food system
- Consumer acceptance of genetic engineered products

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Representatives of these areas will share their experience and expertise with workshop participants.

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- Monitoring of Quality Assurance Programs
- Various Testing Methods, ie.: Air, Swab, ATP, Petrifilm®
- Acceptable Bacterial Loads
- Sanitation Consequences

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For Further Information contact: Mr. Steven K. Halstead, CAE, Executive Manager
International Association of Milk, Food and Environmental Sanitarians
502 E. Lincoln Way Ames, Iowa 50010
(800)369-6337 (U.S.), (800)284-6336 (Canada),FAX (515)232-4736

REGISTRATION FORM

❑ **Hazard Analysis at Critical Control Points (HACCP) Workshop**
Sheraton Centre — Toronto, Ontario — July 24-25, 1992

or

❑ **Monitoring/Measuring Environmental Sanitation in Food & Dairy Plants**
Sheraton Centre — Toronto, Ontario — July 25, 1992

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

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TOTAL AMOUNT ENCLOSED: $_____

(*Note: Early Registration Deadline—June 1, 1992)**
Limited Seating—RESERVE NOW. (Subject to cancellation)

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News

New Directory of Health-Related Toll-Free Numbers

Information Resources Press, publishers of reference books and textbooks in scientific, technical, and health care fields, has announced an April 1992 publication date for the *National Healthlines Directory*™, the most complete and current guide to "800" and local telephone numbers of the major United States organizations that provide direct telephone responses to questions on health topics.

The *National Healthlines Directory*™, prepared by the staff of Herner and Company, is an outgrowth of the firm's 37 years of activity in the study of use patterns in health-related information; design and management of biomedical information clearinghouses and databases; reference, bibliographic, fact-finding, and other query-response services; and the design, preparation, and dissemination of printed and computer-based information source compendia in biomedicine, health delivery, and the social and behavioral sciences.

The 212 organizational descriptions comprising the *National Healthlines Directory*™ were obtained from the following sources: records and files of Herner-operated information clearinghouses encompassing the total range of biomedicine and health services; searches of information source databases such as the National Library of Medicine's DIRLINE; merging, deduplicating, analysis, and refining of the contents of existing public-domain directories of health-related telephone information sources; and a similar treatment of the contents of the aforementioned Herner-produced published and electronic information source compendia.

An effort was made to contact directly all of the organizations included in the *Directory*. The purpose of these contacts, which were made primarily by telephone, was to confirm the currency and accuracy of each entry description with respect to the official name, address, telephone number, exact services offered, conditions and terms of availability, hours of access, and costs (if any) involved. Successful contact was made with 205 of the 212 organizations represented. The descriptions of the other seven were derived from brochures, articles, and the previously published compendia.

The descriptions in the *Directory* are arranged alphabetically by the official or preferred organizational name. In cases where there is more than one name (i.e., official and unofficial), the names are cross-referenced. All descriptions are indexed by subject(s), audiences served, and official/preferred organizational names. The 212 descriptions produced more than 600 index entries. This relatively detailed indexing was designed for fast and flexible access from every discernible user focus and requirement. To further facilitate access and use, an Acronym Index is included.

Copies of the *National Healthlines Directory*™ may be purchased for $15, plus $2.75 for postage and handling, from Information Resources Press, Suite 550, 1110 North Glebe Road, Arlington, VA 22201.
MEDIA: Review copies may be obtained by writing, on official organizational letterhead or desk-copy request form, to Ms. Gene P. Allen, Information Resources Press, Suite 550, 1110 North Glebe Road, Arlington, VA 22201.

High-Temperature Stretch Kills Listeria *in Mozzarella*

Good news for string-cheese lovers: *Listeria monocytogenes* isn't likely to survive during manufacture of Mozzarella cheese, research at the University of Wisconsin-Madison has shown. High temperatures during stretching in hot water kill the pathogen, reports E.H. Marth, emeritus professor of food microbiology at the College of Agricultural and Life Sciences.

Researchers made Mozzarella cheese with each of three strains of *L. monocytogenes*: Ohio, V7, or California. They inoculated a mix of pasteurized whole and skim milk to contain 10,000 to 100,000 cells of *L. monocytogenes* per milliliter. These levels are much higher than would normally occur in a naturally contaminated vat of milk, Marth notes.

The milk was warmed to 33 C (92 F) and *L. monocytogenes* was added shortly before the two commercial starter cultures (*Streptococcus salivarius* ssp. *thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus*). Rennet extract was added after the milk had ripened for 30 minutes, and the curd was cut about 30 minutes after that. After settling and draining, the curd was cut into blocks and turned regularly for about 75 minutes.

When the curd became elastic and its pH reached about 5.25, it was cut into long strips and placed in aluminum containers. The curd was placed in a water bath at 77 C (170 F), allowed to settle for 1 to 2 minutes, combined, and stretched for 3 to 4 minutes across an aluminum plate.

Stretching the curd in hot water killed off *L. monocytogenes* completely. The curd temperature during stretching was 58 to 65 C (136 to 149 F), and was stretched for at least 2 minutes at 65 C. Settling and stretching times were similar to those used in some industrial stretching and molding machines.

"The heat treatment given to curd freed the product from *L. monocytogenes*, as determined by our methods, even though the curd contained about 62,000 cells of the pathogen per gram," Marth says.

After stretching, the curd was formed into 2-pound cylinders and placed in cool water. Cooled cheese was held in a 23-percent salt solution at 10 C (44 F) for

about 6 hours, then vacuum-wrapped and heat-sealed. The wrapped cheese was stored for 1 to 2 days at 5 C (41 F) and then tested for *L. monocytogenes*.

Moisture ranged from 46 to 49 percent, and fat in dry matter ranged from 42 to 44.5 percent, which met federal standards for Mozzarella cheese. Yield was about 10 percent at the end of brining.

The three strains of *L. monocytogenes* behaved similarly during cheesemaking. Numbers increased somewhat during formation and shrinkage of the curd. Cooking at 40 C for 30 minutes reduced *L. monocytogenes* numbers. Although *Listeria* numbers would be expected to increase as the curd shrinks during heating, the lethal effect of the heat treatment apparently predominated, Marth says. Numbers increased during cheddaring, possibly because whey removal concentrated the entrapped cells.

L. monocytogenes can appear in leukocytes (white blood cells) in the milk from Listeria-mastitic cows, even months after clinical symptoms have disappeared. If present in large numbers of leukocytes, some Listeria cells can survive the minimum high-temperature short-time pasteurization process.

An analysis of raw milk from the Midwest showed that 13 percent of the samples contained *Listeria*, and more than 90 percent of those samples were pathogenic for mice.

While listeriosis rarely threatens healthy adults, it can sicken newborn babies, people with weakened immune systems, and pregnant women, and cause stillbirths and miscarriages. As few as 1,000 *L. monocytogenes* cells can sicken susceptible individuals. Infections can produce meningitis and encephalitis, as well as less-serious ailments.

Marth worked on this project with M.M. Buazzi, formerly a doctoral candidate in food science at UW-Madison, and M.E. Johnson, a senior scientist at UW-Madison's Center for Dairy Research.

For more information please contact Elmer Marth at (608)265-2690.

AFFI Calls on FDA to Extend Labeling Implementation Date

The American Frozen Food Institute (AFFI) has called on the Food and Drug Administration (FDA) to extend for one year the implementation period of the regulations currently being developed by the agency regarding mandatory nutrition labeling.

At a news conference held on April 9, 1992 at the National Press Club in Washington, D.C., AFFI President Steven C. Anderson said, "AFFI believes that the food label should serve as an accurate means for providing nutrition information to assist consumers in selecting foods consistent with individual dietary preferences."

"It is important that consumers receive complete and accurate information when the labeling regulations are implemented, both by the Food and Drug Administration and the Department of Agriculture [USDA]. For that reason, we are urging the federal government to have a uniform implementation date of the nutrition labeling regulations. We call on FDA to join USDA in extending the implementation period for one year," Anderson said.

"It's no wonder that the American consumer is confused when it comes to food labeling. Currently, FDA and USDA have different rules that govern the labeling of the products the two agencies regulate. We must strive for harmonization and uniformity in the labeling of food to end this confusion. This should be our number one priority," Anderson said.

On March 19, 1992, Secretary of Agriculture Edward Madigan announced that there will be an additional one-year implementation period for regulations pertaining to mandatory nutrition labeling of meat and poultry products.

Anderson continued, "There is no doubt that to comply with the proposed FDA and USDA regulations within the timeframe established by the Nutrition Labeling and Education Act of 1990 will create an undue economic burden on food manufacturers, and could be an impossibility."

"It is less than plausible to think that companies will have sufficient time to undertake the necessary analytic processes to properly label their products and then have their printers produce the new labels within a six-month timeframe," Anderson said.

Following months of intense review, AFFI submitted in February extensive comments to FDA and USDA on the agencies' food labeling proposals. In the comments, AFFI expressed support for FDA's and USDA's continuing efforts to reform food labeling, but indicated that changes are necessary to make the regulations as beneficial as possible for consumers and most economically feasible for the food industry.

"AFFI recommends that the implementation date be extended so they are the same for FDA-regulated and USDA regulated products," Anderson said. "A realistic implementation period will ensure that the planned nutrition labeling reform proceeds in an orderly fashion."

AFFI is the national trade association that has represented the interests of the frozen food industry for 50 years. AFFI's member companies account for more than 90 percent of the total frozen food production in the United States.

For more information please contact Traci D. Vasilik at (703)821-0770.

New Test Kit Performance Testing Program to Begin Accepting Applications for Review of Test Kits Intended to Detect Drug Residues in Milk

In the first phase of its Test Kit Performance Testing Program, the AOAC Research Institute, a subsidiary of AOAC International, will accept applications for kits intended to determine beta-lactams, tetracylines, sulfonamides, and gentamicin, in milk.

The Test Kit Performance Testing Program is a third-party review of proprietary, commercial kits to independently confirm manufacturer's claims for performance. The program calls for submission of a specified data package, expert technical evaluation of the data and development of a testing protocol, and independent laboratory testing of the kit. Producers whose kits pass the criteria set in the test protocol will be licensed to use the AOAC Research Institute "Performance Tested" mark.

Open dates for first phase applications will be 90 days, and will be staged in the order beta-lactams (April 1), tetracyclines (May 1), sulfonamides (June 1), and gentamicin (July 1). Applications received during each open period will be subjected to review and performance testing as a group. Applicants in this class, drug residues in milk, will continue to be accepted after the open period, but will then be reviewed on a first-come, first-served basis. Opening dates for applications for other classes of kits will be announced in the future.

Initial application fees for testing of a single kit will be $7,500. In addition, the independent laboratory testing fee will be passed through to the applicant.

For more information please contact Nancy Palmer, AOAC Research Institute, Inc., 2200 Wilson Boulevard, Suite 400, Arlington, Virginia 22201-3301, (703)522-2529, or FAX (703)522-5468.

Updates . . .

IAMFES will be in Toronto this year for the 79th Annual Meeting in July. Be sure to register now for the Monday night social event. Tours and dinner will be included along with transportation to and from the Spanish "House on the Hill."

Casa Loma, a 98-room "dream castle" - one of they many attractions to be enjoyed in cosmopolitan Toronto. Photo courtesy of Metro Toronto Convention & Visitors Association.

Be Sure to Join us at the Casa Loma for the Monday Night Social . . .

CASA LOMA.. Spanish for "house on the hill," this title is an understatement. Casa Loma is certainly on a hill but it's not simply a house; it's Toronto's only real castle. The creation of Sir Henry Pellatt, an Edwardian financier, Casa Loma was built between 1911 and 1914 at a cost of about $3.5 million. Pellatt combined the architectural styles of Europe to create this grandiose 98-room mansion. In the end. Pellatt's monument ate away at his fortune when he failed to foresee a spiralling rise in the cost of living and the doubling of his taxes following World War I. Casa Loma houses a pipe organ larger than those in many cathedrals and stables that are approached through an 244-metre tunnel where the long-gone horses fed from porcelain troughs in stalls of mahogany. Sir Henry also ensured that his castle was replete with the requisite secret passages and hidden compartments. Today the castle operates as an attraction: a monument to he sort of florid ostentation that nobody, not even the very rich, can afford anymore.

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HACCP-An Industry Food Safety Self-Control Program - Part V

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

Organizing Pathogens into Infective and Spore-Producing Microorganisms

In dealing with microbiological control systems, all pathogens in food can be categorized as either **infective vegetative cells**, which can be inactivated (i.e., killed) by adequate time-temperature pasteurization, or **toxin and/or spore producers**, which are sufficiently thermally resistant that they are not inactivated by normal pasteurization.

D Values, Z Values

While there are thousands of pathogens, only about twenty are responsible for most problems. The table, **Important Pathogens**, shows common microbiological toxin and biological poison contaminants of food. Each of these contaminants has a characteristic inactivation curve. The inactivation term is **D value** (death value). This is the time it takes, at a specific temperature, to reduce the population of a microorganism or the strength of a toxin by a factor of 10.

A good reference for pasteurization is the USDA standard for chunked and formed roast beef (USDA 9CFR, 1991). A mixed "cocktail" of 6 serotypes of salmonellae (Goodfellow and Brown, 1978) (*Salmonella typhimurium*, *Salmonella newport*, *Salmonella agona*, *Salmonella bovismorbificans*, *Salmonella muenchen*, plus an unidentified strain obtained from the University of Florida) were used to determine a safe pasteurization time and temperature standard. The D value at 130°F is 17.29 minutes; at 140°F, 1.729 minutes; at 145°F, instant (USDA, 9CFR 1991). In this case, for each factor of 10 in increased rate of inactivation, the temperature must be increased 10°F. This is called the **Z value**, or rate of change of D value inactivation with temperature.

Note that at 145°F, inactivation is not technically instant. The USDA made the decision, incorrectly, to "round off" the data. In order to make these data more universally applicable to pasteurization of all food, it is appropriate to extend the data to 160°F by using the equation:

$$t_2 = t_1 \times 10^{(T_1 - T_2)/Z}$$

where t_2 is the time in minutes that it takes for a reduction of 10:1 microorganisms at a second temperature T_2 (°F), and t_1 is a known time at a known temperature T_1 (°F) for a 10:1 reduction with a known Z value. For example, at 150°F, with a Z of 10°F:

$$t_2 = 1.729 \times 10^{(140 - 150)/10} = 0.1729 \text{ minutes.}$$

At 160°F, the D value is 0.01729 minutes (1.0374 second). A 7D would, then, be 7.26 seconds at 160°F.

For most FDA and USDA pasteurization requirements (except milk, eggs, and pork), only pasteurization temperature, and not time, has been specified. The regulations are out of date, and it is apparent that they were written by the USDA and FDA for simplicity. Specified food standards for the USDA and FDA are:

Item	*USDA*	*FDA*
Baked Meatloaf	160°F 9CFR 317.8	None specified
Baked pork cut	170°F 9CFR 317.8	150°F FSSM 2-403
Pork (to destroy trichinae)	120°F to 144°F 9CFR 318.10	150°F FSSM 2-403
Cooked poultry rolls and other uncured poultry products	160°F 9CFR 381.150	165°F FSSM 2-403
Cooked duck, salted	155°F FSIS Policy Book	None specified
Jellied chicken loaf	160°F FSIS Policy Book	None specified
Partially cooked, comminuted products	151°F-1 minute 148°F-2 minutes 146°F-3 minutes 145°F-4 minutes 144°F-5 minutes FSIS Notice 92-85	None specified
All potentially hazardous food requiring cooking	None specified	140°F FSSM 2-403

(FSSM = Food Service Sanitation Manual, 1976)

IMPORTANT PATHOGENS

FOOD	PATHOGENS		
	Infective (Inactivated by pasteurization)		Toxin and/or Spore Producers (Not inactivated by pasteurization)
Meat, Poultry, and Eggs	*Salmonella spp.* *Campylobacter jejuni* *Escherchia coli* *Y. enterocolitica*	*L. monocytogenes* Foot and Mouth virus Hepatitis A virus *Trichinella spiralis* Tapeworms	*S. aureus* (toxin) *C. perfringens* *C. botulinum* *Bacillus cereus*
Fin Fish	*Salmonella spp.* *Vibrio spp.* *Y. enterocolitica*	Hepatitis A virus Anisakis Tapeworms	*S. aureus* (toxin) *C. botulinum* Microbial by-products (Histamine poisoning)
Shellfish	*Salmonella spp.* *Vibrio spp.* *Shigella spp.* *Y. enterocolitica* Norwalk virus Hepatitis A virus		*S. aureus* (toxin) *C. botulinum* Microbial by-products (Paralytic shellfish poisoning)
Fruits and Vegetables	*Salmonella spp.* *L. monocytogenes* *Shigella spp.*	Hepatitis A virus Norwalk virus *Giardia lamblia*	*S. aureus* (toxin) *C. botulinum* *Bacillus cereus*
Cereals, Grains, Legumes, and Nuts	*Salmonella spp.* Aflatoxins (mold) Hepatitis A virus Norwalk virus		*S. aureus* (toxin) *C. botulinum* *Bacillus cereus*
Spices	*Salmonella spp.*		*S. aureus* (toxin) *C. botulinum* *Bacillus cereus* *C. perfringens*
Milk and Dairy Products	*Salmonella spp.* *Y. enterocolitica* *L. monocytogenes* *Escherichia coli*	*C. jejuni* *Shigella spp.* Hepatitis A virus Norwalk virus	*S. aureus* (toxin) *C. perfringens* *Bacillus cereus*

In commercial food processes whereby one product is handled at a time, the time and temperature can be uniquely specified for the product. Research to determine these times and temperatures can cost thousands of dollars for one item, and is not practical in retail food operations.

Assume that All Raw Food is Contaminated

In retail food operations, one wants to find the unique pathogens among the many that, when controlled, will assure control of all pathogens. This approach follows the basic assumption that unless raw ingredients are certified by suppliers as being safe to eat without processing, they are potentially hazardous. This means that if meat, fish, poultry, vegetables, etc. are eaten raw, a normally healthy person would be at risk from infective pathogens. In the case of spores, their numbers must be below a threshold that will cause a problem because they cannot be inactivated by normal food preparation procedures. Spores cannot be allowed to multiply to hazardous levels. In the case of toxins and biological poisons, which cause only a small number of illnesses and deaths each year, one must be able to rely on suppliers and the government for safety assurance.

MAJOR PATHOGEN CONTROL DATA SUMMARY

Low Temperature Control 32°F

The table, **Major Pathogen Control Data Summary**, lists the major pathogenic organisms that must be considered in designing pasteurized food microbiological control processes. First, in terms of low temperature standards, it is evident that there are two pathogens which begin to multiply at 32°F: *Yersinia enterocolitica* and *Listeria monocytogenes*.

MAJOR PATHOGEN CONTROL DATA SUMMARY

Microorganisms	Temperature range for growth	pH range and minimal (a_w) water activity for growth	G = Growth or doubling time D = Death rate or 10 : 1 reduction time
Infective Microorganisms			
1. *Yersinia enterocolitica*	32° - 111°F (0° - 44°C)	4.6 - 9.0 pH	G [32°F (0°C)] = 2 days G [40°F (4.4°C)] = 13 hours D [145°F (62.8°C)] = 0.24 - 0.96 min.
2. *Listeria monocytogenes*	32° - 112°F (0° - 44°C)	4.5 - 9.5 pH	G [32°F (0°C)] = 5 days G [40°F (4.4°C)] = 1 day D [140°F (60°C)] = 2.85 min.
3. *Vibrio parahaemolyticus*	41° - 109.4°F (5° - 43°C)	4.5 - 11.0 pH 0.937 a_w	D [116°F (47°C)] = 0.8 - 48 min.
4. *Salmonella* spp.	41.5° - 114°F (5.5° -45.6°C)	4.1 - 9.0 pH 0.95 a_w	D[140°F (60°C)] = 1.7 min.
5. *Campylobacter jejuni*	90° - 113°F (30° - 45°C)	4.9 - 8.0 pH	D [137°F (58.3°C)] = 12 - 21 sec.
Toxin Producers and/or Spore-formers			
6. *Clostridium botulinum*, Type E and other non-proteolytic strains	38° - 113°F (3.3° - 45°C)	5.0 - 9.0 pH 0.97 a_w	Spores D [180°F (82.2°C)] = 0.49 - 0.74 min. Toxin destruction D [185°F (85°C)] = 5 min. for any botulinal toxin
7. *Staphylococcus aureus*	43.8° - 122°F (6.5° - 50°C) Toxin production 50° - 114.8°F (10° - 46°C)	4.5 - 9.3 pH 0.83 a_w 5.15 - 9.0 pH 0.86 a_w	Vegetative cells D [140°F (60°C)] = 5.2 - 7.8 min. Toxin destruction D [210°F (98.9°C)] = > 2 hours
8. *Bacillus cereus*	39.2° - 122°F (4.0° - 50°C)	4.3 - 9.0 pH 0.912 a_w	Vegetative cells D [140°F (60°C)] = 1 min. Spores D [212°F (100°C)] = 2.7 - 3.1 min. Toxin destruction Diarrheal: D [133°F (56.1°C)] = 5 min. Emetic: Stable at [249.8°F (121 C)]
9. *Clostridium botulinum*, Type A and Proteolytic B strains	50° - 118°F (10° - 47.8°C)	4.6 - 9.0 pH 0.94 a_w	Spores D [250°F (121.1°C)] = 0.3 - 0.23 min. Toxin destruction D [185°F (85°C)] = 5 min. for any botulinal toxin
10. *Clostridium perfringens*	59° - 127.5°F (15° - 52.3°C)	5.0 - 9.0 pH 0.95 a_w	Vegetative cells G [105.8F (41°C)] = 7.2 min. D [138°F (59°C)] = 7.2 min. Spores D [210°F (98.9°C)] = 26-31 min.

Therefore, for raw foods to be safe, they must be held at temperatures below 32°F. Note that yeasts and molds begin to grow at 14°F, and spoilage microorganisms begin to multiply at 23°F. Meat, poultry, fish, and most entrees thaw at 28.5°F. Therefore, it is best for foods to be kept at as close to 29°F as possible in order to minimize spoilage. Nonetheless, **when food is thawing, food is spoiling**. During typical 40°F refrigeration thawing of a 35-lb. can of pasteurized whole eggs, there can be a 1:256 (9 generations) multiplication of spoilage microorganisms. Hence, when possible, thawing should be done in a rapid thaw box at 40°F with an air velocity of more than 500 feet per minute, so that it thaws in 12 hours. Thawing also can be done in a dielectric or microwave oven. *Listeria monocytogenes*, because of its probably low infective dose and lethal consequences with immune-compromised people, is the "organism of choice" for establishing a low temperature threshold.

Salad Dressings

Salmonella spp. does not begin to multiply until 41.5°F. However, *Salmonella* spp. will multiply in foods that have a pH as low as 4.1. Hence, when any shelf stable salad dressing or acidified product that is to be held above 41.5°F is made, it must have a pH below 4.1 in order to ensure the control and eventual destruction of *Salmonella* spp. Characteristically, this standard is used in the manufacture of dressings in which there is no pasteurization step, in order to ensure that the pathogens found on the spices and in egg ingredients are inactivated or controlled.

Infective Microorganisms Pasteurization

While *Listeria monocytogenes* is more difficult to inactivate at 140°F, with a D value (i.e., length of time it takes to destroy one log cycle of a pathogen at a given temperature) of 2.85 minutes, than *Salmonella* spp. with a D value of 1.7 minutes, the USDA has declared that pasteurization means a reduction of 10^7 *Salmonella* spp., and 10^4 *Listeria monocytogenes* per gram of product (USDA-FSIS, January 31, 1990). Since much more is known about *Salmonella* spp. than *Listeria monocytogenes*, *Salmonella* spp. is used as the pasteurization control standard. Using the USDA time-temperature inactivation standard for chunked and formed beef and solid roasts, which has been used for more than twenty years to produce millions of pounds of safe cooked deli roast beef, the following 7D time-temperatures are prescribed.

***Salmonella* spp. 7D with Z = 10°F**

Temperature	*D (minutes)*	*7D (minutes)*
130°F	17.29	121.0
135°F	5.47	38.26
140°F	1.729	12.1
145°F	0.547	3.826
150°F	0.1729	1.21
155°F	0.0547	0.3826
160°F	0.01729	0.121

Toxin Producers and/or Spore Formers

Once food is pasteurized and all pathogens are reduced to below 1 per 25 grams (the standard test for *Salmonella* spp.), the only organisms to survive will be spores.

Non-Proteolytic *Clostridium botulinum*

Unless the temperature is raised to above 180°F for approximately 10 minutes, one must assume that *Clostridium botulinum* type E and other non-proteolytic strains of *Clostridium botulinum* (D180°F = .74 minute) will survive. Since non-proteolytic *Clostridium botulinum* begins to multiply at 38°F, pasteurized food should be stored below 38°F in order to ensure safety from the multiplication of non-proteolytic *Clostridium botulinum.*

Bacillus cereus

Bacillus cereus, which begins to multiply at 39.2°F, is not effectively destroyed until it reaches 212°F for over 30 minutes. *Bacillus cereus* is a very common contaminant of food. Therefore, if pasteurized food is to be stored for a period of more than 5 days, it must be stored at a temperature below 38°F.

Staphylococcus aureus

Staphylococcus aureus begins to multiply at 43.8°F. However, it does not produce a toxin until the temperature is 50°F. Since it is often expedient to mix large volumes of salads with hands in order to avoid damaging sensitive products such as potatoes, salads can be mixed safely with hands if the salad ingredients are kept at less than 50°F in order to prevent *Staphylococcus aureus* toxin production. Note that it is not the *Staphylococcus aureus* vegetative cell that causes illness; 1,000 *Staphylococcus aureus* per gram is not a threat to people. Illness occurs when the cells multiply to 1,000,000 per gram, thereby producing enough toxin to cause illness.

Proteolytic *Clostridium botulinum*

Proteolytic *Clostridium botulinum*, which survives pasteurization, begins to multiply at 50°F. Proteolytic *Clostridium botulinum* is a common contaminant of vegetables and fruits. Therefore, 50°F is a critical temperature for fruit and vegetable storage. It is common practice today to buy pre-prepared vacuum-packed vegetables. All vegetables, if they are packed anaerobically (e.g., vacuum packed, gas packed) must be stored below 50°F in order to prevent the multiplication of proteolytic *Clostridium botulinum.*

Clostridium perfringens

The upper temperature for microbiological hazard control is defined by *Clostridium perfringens*, which multiplies up to a temperature of 127.5°F.

32°F to 127.5°F Hazardous

Temperatures between 32°F and 127.5°F are hazardous. Shelf stable foods that have not been pasteurized to destroy *Salmonella* spp. must have a pH of less than 4.1 so that the *Salmonella* spp. is prevented from multiplication and eventually is destroyed with acid. *Campylobacter jejuni* is easy to destroy, as shown by the table, but because it exists at such high levels on food, it must be considered to be a major source of cross-contamination in the kitchen.

Food Contact Surfaces: *Campylobacter jejuni*

Washing procedures on food contact surfaces must be designed to reduce pathogens to a safe level. It is also a very hazardous procedure to wash poultry in a separate kitchen sink because *Campylobacter jejuni* is likely to be spread throughout the kitchen and sinks where raw fruits and vegetables must be processed.

OPTIMAL BACTERIAL GROWTH TIME-TEMPERATURES

It is impossible, in a typical foodservice kitchen, to keep all food below 32°F or above 127.5°F. Therefore, time must be factored into the storage of raw food and food preparation.

HITM has compiled hundreds of growth data values, in order to determine approximate growth rates for the pathogenic organisms over the range of less than 32°F to 127.5°F. (See table.)

OPTIMAL BACTERIAL GROWTH TIME-TEMPERATURES

These data do not include lag times. In the temperature range of 38°F to 40°F, lag time is often 36 to 40 hours. These optimal multiplication times will all be reduced if any suboptimal pH, a_w, or other barriers are introduced.

Temperature °F	Spoilage bacteria 1 G	*Yersina enterocolitica* 1 G	*Listeria monocytogenes* 1 G	*Salmonella* spp. 1 G	*Clostridium perfringens* 1 G
28	40.0 h	NG	NG	NG	NG
32	24.0 h	2.0 d	5.0 d	NG	NG
35	16.7 h	24.0 h	2.0 d	NG	NG
40	10.0 h	13.0 h	1.0 d	66.7 h (41°F)	NG
50	4.6 h	5.8 h	9.2 h	13.3 h	NG
60	2.3 h	2.8 h	4.2 h	6.0 h	10.0 h
70	1.3 h	1.6 h	2.1 h	3.0 h	2.3 h
80	50.0 m	1.0 h	1.3 h	1.5 h	42.0 m
90	37.0 m	40.0 m	46.0 m	54.0 m	15.0 m
95	36.0 m	7	38.0 m	40.0 m	10.0 m
100	?	?	40.0 m	32.0 m 26 m (104°F)	7.2 m
110	?	?	?	?	7.2 m
115	NG	NG	NG	NG	7.3 m
120	NG	NG	NG	NG	10.0 m
124	NG	NG	NG	NG	30.0 m
127.5	NG	NG	NG	NG	NG

G = doubling time
d = days
h = hours

NG = no growth
? = data not sufficient to determine growth rate
m = minutes

Control of Time between 32°F and 127.5°F

If multiplication cannot be stopped, then it must be determined how much growth is allowed. HITM has designated 5 generations, or a multiplication factor of 1:32, as being acceptable for practical purposes. A multiplication factor of 1:1,000, or 10 generations, is unacceptable because for both infective organisms and spores, normal contaminants could multiply to a high enough level to cause a serious foodborne illness.

Cold Holding: 40°F, 5 Days Control

Considering 40°F as being a normal operating refrigerator temperature, *Listeria monocytogenes*, the most lethal of the low-temperature vegetative cells, will multiply at this temperature about once every day. Therefore, raw food held at this temperature must be used within 5 days in order to prevent multiplication of this organism 1:32, assuming that the food contains less than 10 *Listeria monocytogenes* microorganisms per gram.

Display Food: 50°F to 60°F, 1 Day Control

At 50°F to 60°F, which is a typical temperature range

for food displays (e.g., salad bars), *Listeria monocytogenes* multiplies one generation in approximately 4 to 5 hours. Considering the 5-generation standard, if leftover salad bar food were discarded at the end of the day, there would be no problem with *Listeria monocytogenes* causing a food-borne illness. There would be a hazard, however, if leftover salad bar ingredients were added to fresh ingredients the following day. Hence, a critical hazard control rule is: **add no old food to fresh**. Old food is always used up or discarded.

At 80°F, pathogen multiplication is approximately 1 generation per hour. Critical temperatures, then, are approximately between 80°F and 120°F. At 104°F, *Salmonella* spp. can multiply about once every 26 minutes. At 115°F, *Clostridium perfringens* multiplies once every 7.3 minutes.

Food Heating: 40°F to 130°F within 6 Hours

Based on growth studies with *Clostridium perfringens* (Shigahisa et al., 1985), HITM has determined that food will be safe if it is heated from 40°F to 130°F in less than 6 hours, because *Clostridium perfringens* will not be able to multiply. Shigahisa et al. (1985) also showed that cooling from 120°F to 54°F in less than 4.8 hours controlled *Clostridium perfringens*.

Food Cooling: 130°F to 40°F within 11 Hours

Remember, the USDA standard for cooling chunked and formed and solid roast beef from 120°F to 55°F has been 6 hours. This has been shown to be a safe cooling standard. The author has graphically extrapolated this from 130°F to 40°F, which results in a time of 11 hours.

Data from Shigahisa et al. (1985) show that if food is cooled from 130°F to 40°F in less than 11 hours, *Clostridium perfringens* growth will be prevented, and the food will be safe to consume.

The FDA 4-hour cooling standard established in the 1976 model Food Service Sanitation Manual is not based on correct scientific reasoning. The FDA used three studies (Longree and White, 1955) (McDivitt and Hammer, 1958) (Miller and Smull, 1955) on which to base its 4-hour standards. In these studies, live, rapidly multiplying cultures of *Staphylococcus aureus* or *E. coli* were introduced into food at about 110°F. The data implies that actually, approximately 6 hours would be sufficient to control multiplication. Note that when one practices HACCP, live cultures will not be introduced into food, and only *Clostridium perfringens* will be a potential hazard.

Clostridium perfringens, a Low Hazard

Clostridium perfringens is considered by the National Research Council as being a low-hazard microorganism because it rarely causes death, and only causes simple bouts of diarrhea. Hence, even if some multiplication of this organism occurred, as a result of the above heating and cooling times being exceeded, the contaminated food would not be considered highly hazardous. Other spores multiply much slower than *Clostridium perfringens*, and will not be a problem unless there is gross abuse of the food, which would be prevented by a company's hazard control program.

INTEGRATION OF PATHOGENIC MICROORGANISM HAZARD CONTROL INFORMATION

Infective Microorganisms

The table, **Infective Microorganisms**, provides an integration of the control information for infective microorganisms.

INFECTIVE MICROORGANISMS

Hazard
Low levels ($1 - 10^3$/g) are hazardous.

Control
Get supplier certification of safe pathogen levels in food products, if possible.
Heat makes food safe. [*Salmonella* spp. 7D pasteurization: 140°F (60°C) for 12.1 minutes; 150°F (65.6°C) for 1.21 minutes; or 160°F (71.1°C) for .121 minute]

1. *Shigella* spp., *Giardia lamblia*, Hepatitis A virus and Norwalk virus

Hazard
- Very low levels (3 to 10 microorganisms / gram) in a food item can be dangerous. They will get onto food from hands or water contaminated with human or animal feces

Control
- Double washing of fresh fruits and vegetables removes surface contamination to a safe level.
- Double hand washing by employees with a fingernail brush in the first wash insures removal of fecal pathogens to a safe level.
- A "safe" water supply must be used in food preparation and production.
- These microorganisms can and must be kept out of food.

2. *Salmonella* spp., *Yersinia enterocolitica*, *Listeria monocytogenes*, *Vibrio* spp., *Escherichia coli*, etc.

Hazard
- Expected contamination level is < 10/ g.
- *L. monocytogenes* begins to multiply at 32 F.
- Resistant person illness level is > 1,000 / g.

Control
- Heat inactivation of pathogens during pasteurization
- Control growth of these pathogens: five (5) generations (1:32) of multiplication are safe; 10 generations (1:1,024) of multiplication are dangerous.
- If food is stored at < 32°F, it can be held until spoiled. If stored at 40°F, it should be used within < 5 days

3. *Campylobacter jejuni*

Hazard
- Expected contamination level on pork and poultry is > 1,000 / g.
- Resistant person illness level is < 5 / g.

Control
- Easily inactivated by *Salmonella* spp. pasteurization.
- Must reduce pathogen contamination on raw food contact surfaces > 100,000 : 1 by correct washing in clean, hot solution of detergent or soap and water.
- Avoid cross-contamination by frequent cleaning ("clean-as-you-go").

Spore Forming and Exotoxin Forming Microorganisms

The table, **Spore Forming and Exotoxin Forming Microorganisms**, provides an integration of the control information for spore forming and exotoxin forming microorganisms.

SPORE FORMING AND EXOTOXIN FORMING MICROORGANISMS

Hazard
Heat does not control the spore or toxin hazard.

Clostridium perfringens sets standards for heating and cooling rates because of its rapid multiplication rate of doubling every 7.2 minutes at 105.8°F (41°C).

Five (5) generations (1:32) of multiplication are safe, 10 generations of multiplication (1:1,024) are dangerous.

Must multiply to high levels ($10^5 - 10^6$/g) in food (normally in cooked food) to be hazardous.

Microorganism	Contamination Level /g	Hazard Level /g
Staphylococcus aureus	1,000	1,000,000
Clostridium botulinum	<1	10,000
Bacillus cereus	< 100	100,000
Clostridium perfringens	< 100	1,000,000

Control
Heat food from 40°F to 130°F in < 6 hours control *Clostridium perfringens*.

Cool food to 40°F in 4 hours [FDA standards] / 11 hours [USDA regulations)] to control *Clostridium perfringens*.

Hold at < 38°F if non-proteolytic *Clostridium botulinum* spores were not inactivated by cooking to 180°F > 10 min. Hold at < 39°F if these are destroyed and *Bacillus cereus* is the hazard.

Chill ingredients for salad to 40°F and mix all chilled ingredients within a time that does not permit the temperature to rise above 50°F in order to inhibit the production of toxin by *Staphylococcus aureus*.

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Sanitary Design

A Mind Set (Part XI)

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Processing Systems

One of the best known food processing systems designed to destroy bacterial contamination in food products is found in the canning industry. Millions of dollars have been spent developing, installing and operating equipment to thermally process low acid foods and acidified foods in hermetically sealed containers to destroy harmful bacteria. Entire sections of the Food and Drug Regulations are devoted to dealing with thermal processing, container integrity, design and operation of pressure vessels for thermal processing, and record keeping for both the canning of human and pet foods (21 CFR, parts 113 and 507). Entire businesses, as well as business and academic careers, have been built of the narrow but far-reaching field of making canned goods commercially sterile. The key words are "commercially sterile." Commercial sterility is defined as the "condition when equipment and containers are free of viable organisms with public health significance as well as those of non-health significance capable of reproducing under normal conditions of storage and distribution." By definition then, foods processed in hermetically-sealed containers may contain spores of organisms that are of non-health significance but will not grow in "normal" storage conditions. Thermophilic organisms (those that will grow above 113 degrees F) in the spore stage can often be isolated in low acid canned products. Their importance is economic since they will cause products stored at an elevated temperature to spoil. Canners have known for years that the way to prevent thermophilic spoilage in warehouses where temperatures can reach 113 degrees is to pre-process their product in such a way to reduce the loading of thermophilic spores. To accomplish this reduction, vegetable canners especially rely on the use of vast quantities of water to transport the product and at the same time cleanse it of the bacterial load. Blanching also reduces the load. Canners of other products use precooking and hot fill to accomplish reduced bacterial loading as well as for other reasons related to product mixing and quality.

A lesson on sanitary design of processing lines and equipment can be taken from the dairy industry. Dairy processing conjures up a mind's eye view of ceramic tile walls, smooth ceilings, acid brick floors, stainless steel tanks, pipelines and other equipment. The purpose of a sanitary facility to handle a perishable product such as milk is to reduce the bacterial load so that it stays unspoiled throughout the distribution chain for a specified period of time. When milk is delivered from the farm to the processing facility, the bacterial counts are usually fairly high allowing for a very short shelf life even under refrigeration. The bacteria present in the raw milk must be destroyed during the processing since some of them may cause food borne illness. The equipment used to process raw milk must be designed to prevent the commingling of unprocessed with processed milk, be easily cleanable with smooth nonreactive, nontoxic, noncorrosive contact surfaces and meet the requirements of the Pasteurized Milk Ordinance and the 3-A Sanitary Standards.

Deviations from sanitary design of equipment and processes can lead to disaster for the processor and to illness for some customers. For example, a cross connection allowed unpasteurized milk to leak into pasteurized milk resulting in hundreds of people becoming ill from drinking the contaminated milk. Another famous incident concerned soft cheese which became contaminated with Listeria from raw milk resulting in the deaths of around 40 people. When sanitary design principles for the manufacture, installation and use of processing equipment are not followed, the results can be serious to all concerned.

Food processing industry ingredient suppliers are being required to provide products that will not add to the microbiological load of the product being processed or to the finished product of their customers. Starch and sugar supplied to the canners of cream-style corn have had to adhere to microbiological standards (thermophiles and thermophilic flat sour spores) for many years. To maintain these standards, starch producers have had to design their systems to preclude the contamination of the finished product by installing sanitary handling systems, including dust control, and being continually aware that their end product is, indeed, a food product.

Other ingredient suppliers are becoming aware of the need to upgrade their facilities if they are going to remain as suppliers to many of the major food processors. With the continual development of spoilage-sensitive products, all po-

tential sources of bacterial loading are being scrutinized. This scrutiny includes colors and flavors, emulsifiers, spices and seasonings, flavor enhancers, salt, starches and sugars, as well as most other ingredients that are added in relatively low amounts. Many of these ingredients are produced in facilities that were originally built and operated as chemical plants and were not thought of as producing a food product. Today these plants are being viewed in a new light and are being upgraded to incorporate the requirements for food contact surfaces, dust control, good pest control, elimination of dead legs in pipelines, cleanable floors, walls and ceilings, elimination of flat overhead surfaces, and HVAC systems for conditioning the plant air. In addition, they are taking a long look at their processing equipment with the thought to either replacing or remodeling it to incorporate the principles of sanitary design.

When discussing sanitary design in an article such as this one, it has to be discussed in generalities since each product and process has its own specific criteria. In situations that call for processes using equipment requiring sanitary design, the possession of the sanitary design mind-set stressed through this series of articles is the discriminator that results in equipment of clean design which can be easily cleaned while yielding end product of low bacteria counts. So far the discussion has been concerned with microbiological contamination and has ignored the two other legs of HACCP considerations-chemical and physical contamination. Microbiological contamination is, of course, the one of most concern to regulatory agencies. Chemical and physical contamination, however, can cause just as many problems but usually are more easily controlled. Metal detectors are often placed in dry ingredient plants and the incidence of metal contamination is normally very low. Chemical contamination is more insidious and can come from motor drive oil dripping from units positioned in the product zone (an area extending 12 inches either side and below the product or the product contact surface, extending all the way to the top of the enclosure), or from grease that has been overapplied through the grease fittings and oozes out and falls into the product. Chemical contamination can originate from unrinsed product contact surfaces after cleaning with detergents. It can also originate from the improper use and application of pesticides within the plant.

Physical contamination can come from insect infestation and rodent infestation in a facility not designed to exclude these pests. Pest control has already been discussed previously in the March issue of *Dairy, Food and Environmental Sanitation*.

Physical contamination can emanate, and often does, from employees that do not follow the rules concerning the wearing of hair nets, not wearing jewelry, emptying shirt pockets and the prohibited use of empty food containers for things other than the product for which they are designed. Poorly designed equipment can also contribute to physical contamination problems. There are numerous examples of equipment with parts that can easily fall off into the product zone. For example, parts with wing nuts located on the top of the equipment, so that if the wing nut works loose it and the bolt it was holding in place fall into the product. Most processors and ingredient suppliers are aware of the need to make sure physical contaminates are kept out of their end product.

All three hazards play a major role when designing a sanitary process and must be kept in mind when the engineers design the processing procedures.

Storage Bins

Sanitary design and avoiding ingredient contamination can start with the storage conditions and facilities. Grain processors, flour mills, etc., all seem to like flat topped bins. The design of a storage bin, if it does not have a head house or some other feature dictating a large surface, should have sloped sides equal to the angle of repose of the product it is intended to hold. If the bin or silo is filled from the top and the sides are not sloped to equal the angle of repose, the bin will never completely fill. The upper corners will always be empty and make ideal areas for insects to establish themselves. If there is a temperature differential and condensate forms in that area, then mold can also establish a foothold and contaminate the product. That specific area is extremely difficult to clean and is a prime location for pests and initial product and process contamination. The ideal bin is a cylinder with sloped top, and if it is to hold processed or partially processed product, it should be stainless steel. Storage bins for dry raw ingredients are often constructed of mild steel of welded construction design and should include continuously welded butt seams. All interior welds should be ground flush. Exterior welds need to be chipped and brushed to minimize dust collection.

The girts used to support the bins should also be of sanitary design. Many times they are angle iron with an extended flat lip which makes one more flat surface that requires cleaning. The next evolution turned the angle iron over so the top side sloped 45 degrees and was continuously welded to the bin. The final evolution is to make an unequal leg angle so the top of the girt slopes 60 degrees and the bottom leg is shortened. Both legs are then continuously welded to the bin and the ends welded shut creating an easily cleaned brace. If at all possible, the bins should be hung from above rather than being supported from the floor. The supports create one more area to clean. The ideal bin would be a mass-flow type where the product empties in the same sequence that it fills so you do not get separation of particle sizes if they exist. If the bins are square or rectangular they should be constructed with no sharp corners which allow product to hang up. The inner walls should be smooth and never painted. The interior zones of the bins should be free from any horizontal ledges where product can collect.

Use and holding bins should be constructed of stainless steel and welded construction. Butt welded seams should be continuously welded and ground smooth on the inside. The interiors of the bins should be smooth and free of weld splatter, pits, checks and any horizontal support members.

Tanks for most liquids in process should be stainless steel for ease of cleaning, low corrosion, and low reactivity with food products. The ideal design for these tanks has a domed top with a closeable manhole and is equipped for CIP cleaning. There are exceptions to the stainless steel recommendation. In some instances fiberglass tanks can be used for highly concentrated products that will not support microbial growth. The tanks should either have a cone bottom for complete draining or a bottom sloped toward the drain. The tank bottoms should be free of low spots; drains should be free of dead ends and fitting wells where liquids can accumulate. Vertical tanks that need to be cleaned frequently should have access doors that can be opened without tools. Gaskets should be food grade which are nonabsorbent and nonporous. All corner junctions should be rounded with a radius of threequarters to one inch. If the tanks are to be used for dairy products then they must conform to 3-A Sanitary Standards.

Federal Register

Department of Health and Human Services

Food and Drug Administration

Indirect Food Additives: Adjuvants, Production Aids, and Sanitizers

Agency: Food and Drug Administration, HHS.
Action: Final Rule.

Summary: The Food and Drug Administration (FDA) is amending the food additive regulations to provide for the safe use of phosphoric acid; octenyl succinic acid; *N,N*-dimethyloctanamine; and a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid) as components of a sanitizing solution to be used on food-processing equipment and utensils, including dairy-processing equipment. This action is in response to a petition filed by Diversey Corp. (formerly Diversey Wyandotte Corp.).

Dates: Effective April 7, 1992; written objections and requests for a hearing by May 7, 1992.

Addresses: Written objections to the Dockets Management Branch (HFA-305), Food and Drug Administration, rm. 1-23, 12420 Parklawn Drive, Rockville, MD 20857.

For further information contact: Sandra L. Varner, Center for Food Safety and Applied Nutrition (HFF-335), Food and Drug Administration, 200 C St. SW., Washington, DC 20204, 202-254-9511.

Supplementary Information: In a notice published in the Federal Register of April 13, 1989 (54 FR 14865), FDA announced that a food additive petition (FAP 8H4092) had been filed by Diversey Wyandotte Corp., 1532 Biddle Avenue, Wyandotte, MI 48192, proposing that section 178.1010 *Sanitizing Solutions* (21 CFR 178.1010) be amended to provide for the safe use of phosphoric acid; octenyl succinic acid; octyldimethylamine; and a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 95 percent C_8 and C_{10} *n*-acids) as components of a sanitizing solution to be used for sanitizing food-contact surfaces. The agency has determined that octyldimethylamine is better identified as *N,N*-dimethyloctanamine. The agency has also determined that the mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 95 percent C_8 and C_{10} *n*-acids) is better identified as a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid).

I. Safety and Functional Effect of Petitioned Use of the Additives

Sanitizing solutions are regulated as mixtures of chemicals which function together to sanitize food-contact surfaces. Each listed component in a sanitizing solution has a functional effect. In addition, FDA regulations permit the addition to a sanitizing solution of any component that is generally recognized as safe (GRAS) (§178.1010(b)). The subject sanitizing solution contains phosphoric acid; octenyl succinic acid; *N,N*-dimethyloctanamine; and a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid). The function of each component and the basis for FDA's determination of the safety of each component are described below.

A. Phosphoric Acid

Phosphoric acid functions as the antimicrobial agent in the subject sanitizing solution. Phosphoric acid GRAS (21 CFR 182.1073). It is also listed as a component in sanitizing solutions listed in 21 CFR 178.1010 (b)(35) and (b)(36). On the basis of the data submitted in support of these already regulated uses, the data contained in the food additive petition submitted in support of this sanitizing solution, and other available data, FDA finds that the use of phosphoric acid is safe in the subject sanitizing solution.

B. Octenyl Succinic Acid

Octenyl succinic acid functions as a stabilizer in the subject sanitizing solution. Octenyl succinic acid is not currently regulated. On the basis of the data contained in the food additive petition submitted in support of the listing of this sanitizing solution, FDA finds that the use of octenyl succinic acid in the subject sanitizing solution is safe.

C. N,N-dimethyloctanamine

N,N-dimethyloctanamine functions as a coupling/emulsifying agent and a stabilizing agent in the subject sanitizing solution. *N,N*-dimethyloctanamine is not currently regulated. On the basis of the data contained in the food additive petition submitted in support of the listing of this sanitizing solution, FDA finds that the use of *N,N*-dimethyloctanamine in the subject sanitizing solution is safe.

D. Mixture of n-Carboxylic Acids (C_6-C_{12}, Consisting of Not Less Than 56 Percent Octanoic Acid and Not Less Than 40 Percent Decanoic Acid)

The mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid) functions as an antifoaming agent and an emulsifying agent in the subject sanitizing solution. Octanoic acid and decanoic acid are listed as components of regulated sanitizer solutions under §178.1010 (b)(27), (b)(35), and (b)(36). (Octanoic acid is also affirmed as GRAS under its chemical name, caprylic acid, pursuant to 21 CFR 184.1025.) On the basis of the data submitted in support of the listing of this sanitizing solution and other data available in agency files, FDA finds that the use of a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid) in the subject sanitizing solution is safe.

As discussed above, FDA has evaluated that data in the petition and other relevant materials. On the basis of this evaluation, the agency concludes that these data and materials establish the safety of the level of use and the effectiveness of the additive as a sanitizing solution and that the regulations should be amended in §178.1010 as set forth below. The agency also finds that the data in this petition support the use of the subject sanitizing solution on dairy-processing equipment as well as on other food processing equipment and utensils.

In accordance with §171.1(h) (21 CFR 171.1(h)), the petition and the documents that FDA considered and relied upon in reaching its decision to approve the petition are available for inspection at the Center for Food Safety and Applied Nutrition by appointment with the information contact person listed above. As provided in

21 CFR 171.1(h), the agency will delete from the documents any materials that are not available for public disclosure before making the documents available for inspection.

II. Environmental Impact

The agency has carefully considered the potential environmental effects of this action. FDA has concluded that the action will not have a significant impact on the human environment, and that an environmental impact statement is not required. The agency's finding of no significant impact and the evidence supporting that finding, contained in an environmental assessment, may be seen in the Dockets Management Branch (address above) between 9 a.m. and 4 p.m., Monday through Friday.

III. Filing of Objections

Any person who will be adversely affected by this regulation may at any time on or before May 7, 1992 file with the Dockets Management Branch (address above) written objections thereto. Each objection shall be separately numbered, and each numbered objection shall specify with particularity the provisions of the regulation to which objection is made and the grounds for the objection. Each numbered objection on which a hearing is requested shall specifically so state. Failure to request a hearing for any particular objection shall constitute a waiver of the right to a hearing on that objection. Each numbered objection for which a hearing is requested shall include a detailed description and analysis of the specific factual information intended to be presented in support of the objection in the event that a hearing is held. Failure to include such a description and analysis for any particular objection shall constitute a waiver of the right to a hearing on the objection. Three copies of all documents shall be submitted and shall be identified with the docket number found in brackets in the heading of this document. Any objections received in response to the regulation may be seen in the Dockets Management Branch between 9 a.m. and 4 p.m., Monday through Friday.

List of Subjects in 21 CFR Part 178

Food additives, Food packaging.

Therefore, under the Federal Food, Drug, and Cosmetic Act and under authority delegated to the Commissioner of Food and Drugs and redelegated to the Director, Center for Food Safety and Applied Nutrition, 21 CFR part 178 is amended as follows:

PART 178-INDIRECT FOOD ADDITIVES: ADJUVANTS, PRODUCTION AIDS, AND SANITIZERS

1. The authority citation for 21 CFR part 178 continues to read as follows:

Authority: Secs. 201, 402, 409, 706 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 321, 342, 348, 376).

2. Section 178.1010 is amended by adding new paragraphs (b)(39) and (c)(34) to read as follows:

§178.1010 Sanitizing solutions

(b) * * *

(39) An aqueous solution containing phosphoric acid (CAS Reg. No. 7664-38-2); octenyl succinic acid (CAS Reg. No. 28805-58-5); *N,N*-dimethyloctanamine (CAS Reg. No. 7378-99-6); and a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid). This solution may be used on food-processing equipment and utensils, including dairy-processing equipment.

(c) * * *

(34)Solutions identified in paragraph (b)(39) of this section shall provide when ready for use not less than 460 parts per million and not more than 625 parts per million of phosphoric acid, and all components shall be present in the following proportions: 1 part phosphoric acid to 0.25 octenyl succinic acid to 0.18 part *N,N*-dimethyloctanamine to 0.062 part of a mixture of *n*-carboxylic acids (C_6-C_{12}, consisting of not less than 56 percent octanoic acid and not less than 40 percent decanoic acid).

Dated: March 31, 1992.

Fred R. Shank, *Director, Center for Food Safety and Applied Nutrition.*

(FR Doc. 92-7849 Filed 4-6-92; 8:45 am)

Federal Register/Vol. 57, No. 67/Tuesday, April 7, 1992/ Rules and Regulations.

Food and Environmental Hazards to Health

Colera—New York, 1991

Through June 26, 1991, cholera has been reported from seven countries in the Western Hemisphere: Brazil, Chile, Colombia, Ecuador, Mexico, Peru, and the United States. In the United States, a total of 14 confirmed cases of epidemic-associated cholera have been reported among persons in Florida (one), Georgia (one), New Jersey (eight), and New York (four). This report summarizes information regarding the four cases reported in New York and describes a new laboratory procedure used to confirm the vehicle of transmission in this outbreak.

On April 26, 1991, a 57-year-old man (patient B) was hospitalized in New York City with a 2-day history of diarrhea; stool culture yielded *Vibrio cholerae* O1. An investigation by the New York City Department of Health identified additional cases among his family and friends. The first person to become ill was a man (patient A) who had returned from Ecuador on April 21 and had onset of watery diarrhea April 22. Although he sought care from a physician, he was not hospitalized, and a stool culture was not obtained.

On April 24, three other persons (patients B, C, and D) had onset of diarrhea. All patients had laboratory evidence of infection with *V. cholerae* O1. A stool culture from patient C, a woman, yielded *V. cholerae* O1. Convalescent phase blood samples from patient D, a woman, and patient A had vibriocidal antibody titers ≥1:640, indicating recent *V. cholerae* O1 infection. The New York City Department of Health Laboratory and CDC identified the isolates as toxigenic *V. cholerae* O1, biotype El Tor, serotype Inaba—the serotype that is causing epidemic cholera in South America.

Patients B, C, and D had not recently visited South America. However, on the evening of April 22 they had eaten a salad containing crab meat from crabs that had been brought from Ecuador by patient A. The crabs had been purchased by patient A at a pier in Guayaquil, Ecuador, on April 20, then boiled and shelled; meat and claws were then stored in a plastic bag in a freezer. On April 21, when patient A returned to New York, he carried the bag in his suitcase; on arrival, the meat and claws were still frosted and were placed in a freezer overnight. On April 22, the crab meat was thawed in a double-boiler for 15-20 minutes. Two hours later, without further cooking, the crab was served in a crab salad and as cold crab in the shell. The crab was consumed during a 6-hour period by patients B, C, and D and by four persons who remained well. Patient A had onset of diarrhea before eating the crab meat but ate after patients B, C, and D had eaten; he did not assist in preparing the food.

Four samples of crab were obtained for culture, including a claw, two pieces of meat that had remained in the plastic bag, and juice saved when the crab meat was thawed for the crab salad. Standard culture procedures were negative for *V. cholerae* O1 at the New York City Department of Health and CDC. However, use of the polymerase chain reaction (PCR) technique with primers recently constructed at CDC enabled dection of the *V. cholerae* O1 toxin gene in one of the pieces of crab meat from the plastic bag.

Editorial Note: Epidemic cholera had not been reported in South America during the 1900s until January 1991, when cholera was reported from several locations in Peru. As of July 24, 1991, 257,399 probable cholera cases and 2697 cholera-associated deaths have been reported to the Pan American Health Organization from seven countries. The cases in New York bring to 14 the total number of confirmed cholera cases in the United States associated with the epidemic in South America; in addition, these cases are the second episode of transmission of *V. cholerae* O1 associated with crabs brought back by a traveler from South America. The Food and Drug Administration monitors seafood imported into the United States; no cases of cholera in the continental United States have been linked to commercially imported food products.

Patient A probably became infected with *V. cholerae* O1 while in Ecuador because he had onset of illness within 24 hours of returning to New York. Patients B, C, and D were probably infected by eating the crab. Patient A was unlikely to have contaminated the crab because his illness began after the crab had been cooked, frozen, and packaged, and he touched the crab meat again only after the others had eaten. Secondary spread from patient A is unlikely because person-to-person spread of cholera is infrequent—especially in settings where adequate access to water for washing and sanitation facilities exist. Since 1961, more than 100 domestically acquired and imported cases of cholera have been reported to CDC; none of these cases has been associated with person-to-person spread (CDC, unpublished data).

Crabs are a likely vehicle for transmission of cholera and may be contaminated with *V. cholerae* O1 before or after harvest. Vibrios can survive in crabs boiled for up to 8 minutes, and undercooked crabs have caused several previous outbreaks. *V. cholerae* O1 biotype El Tor strains multiply rapidly at room temperature in cooked shellfish . In this report, vibrios that survived boiling in Ecuador or that contaminated the meat during shelling may have multiplied during transport or while the crab salad was held at ambient temperature.

Standard culture procedures can detect only viable organisms; in contrast, PCR can detect DNA from nonviable organisms. Because of the freezing and thawing, *V. cholerae* O1 organisms in the crab may not have been viable. However, PCR analysis indicated that the crabs from the outbreak had been contaminated with toxigenic *V. cholerae* O1. The PCR procedure and other new laboratory tests are potentially important tools for investigating outbreaks of cholera.

The cholera outbreaks in New Jersey and New York prompted an ongoing educational campaign to discourage travelers from returning from infected areas (including Peru,

Ecuador, and Colombia) with perishable seafood and other high-risk food items. This campaign includes publication by CDC of a travel advisory in English and Spanish and the distribution of letters to airline passengers traveling to and returning from these countries. Newspapers and radio and television stations in the New Jersey/New York area have also helped publicize this message. No additional cases of cholera associated with food brought back from South America have been reported.

A CDC "travelers' hot line" is available in English and Spanish for persons planning travel to Central and South America: the telephone numbers are (404) 332-4559 (English) and (404) 330-3132 (Spanish).

MMWR 8/2/91

Eastern Equine Encephalitis—Florida, Eastern United States, 1991

The Florida Department of Health and Rehabilitative Services (HRS) has confirmed five human cases of eastern equine encephalitis (EEE) in elderly residents of Bradford, Duval, and Washington counties in northern Florida. Dates of illness onset were in mid-June and early July. One patient partially recovered and has residual neurologic deficits, two patients remain comatose, and two patients died.

From July 1 through July 19, the Duval, Bradford, Leon, and Saint Johns county health departments issued public health alerts after high seroconversion rates in sentinel chicken flocks were detected or after human or equine cases were confirmed.

On July 26, the Florida HRS issued an alert for all counties in the state's panhandle. Local mosquito-control districts in affected counties have increased applications of adulticides.

Although human EEE cases have been reported only from northern Florida, an extensive epizootic in horses has been observed over a wide area of the southeastern United States. As of July 29, 246 laboratory-confirmed equine cascs and more than 80 unconfirmed but histopathologically compatible equine cases have been reported. The Florida Department of Agriculture and Consumer Services has reported 173 equine cases scattered statewide; 70 of these were reported by the beginning of July—the most ever reported in a season by this timely. Subsequently, a new state rule requiring reporting of equine cases was promulgated.

Other states reporting equine cases are Georgia (41 cases), South Carolina (19 cases), Alabama and North Carolina (five cases each), Mississippi and New York (two cases each), and Kentucky (one case). In Georgia, epornitic infections were reported in commercial quail, and fatal cases occurred in two dogs and 70 piglets.

In the northeast, a localized EEE epizootic has been reported in counties bordering the Cicero swamp in upstate New York. EEE was confirmed in one fatal equine case from Oswego County, and four suspected cases from Onondaga and Oswego counties are under investigation. Mosquito surveillance in the two counties detected six EEE viral isolates from *Culiseta melanura*, the principal enzootic vector; three isolates from *Coquillitidea perturbans*; and one isolate from *Aedes canadensis*. The latter two species can function as epizootic vectors. The counties sprayed the swamp preemptively in June and twice in July.

Editorial Note: In the United States, EEE is the rarest of the mosquitoborne arboviral infections. A median of five sporadically occurring infections among humans are reported annually; however, the illness is fatal in 30% of cases overall, and even higher case-fatality rates are observed at the extremes of age.

Numerous mosquito species have been implicated as potential epizootic vectors of EEE. In the southeast, these species include salt-water—marsh mosquitoes such as *Aedes sollicitans*, which are abundant in coastal areas, and freshwater mosquitoes, such as *Culex nigripalpus*, *Coquillitidea perturbans*, and *Aedes atlanticus*. Heavy spring rains in northern Florida have led to exceptionally large populations of *Culiseta melanura*, the principal vector of EEE virus in the enzootic cycle, and floodwater species that potentially are epizootic vectors.

An effective EEE vaccine for horses is commercially available, but cases continue to occur because of failures to vaccinate foals and to revaccinate older horses. An experimental EEE vaccine for humans is available to laboratory workers. In many areas where EEE is enzootic, control programs to reduce vector mosquitoes rely on larvicides and adulticides and long-term projects to reduce breeding sites. Personal protective measures to reduce mosquito bites are an important approach to prevention. These measures include the use of repellents, appropriate dress, and avoidance of outdoor activity during twilight hours when many mosquitoes are most active.

MMWR 8/9/91

Dermatitis Among Workers Cleaning the Sacramento River After a Chemical Spill—California, 1991

On July 14,1991, a train tanker car derailed in northern California, spilling 19,000 gallons of the soil fumigant metam sodium (sodium methyldithiocarbamate) into the Sacramento River north of Redding. The major breakdown product of metam sodium, methylisothiocyanate (MITC), is a known skin irritant at high concentrations (>1%). By July 21, the concentration of MITC in the river, at multiple test sites, measured 20-40 parts per billion (0.01%). On August 6, Shasta County health officials notified the California Department of Health Services (CDHS) of an outbreak of dermatitis among Shasta County jail inmates and crew leaders who had assisted in removing dead fish from the river on July 21-22 in >100 F (>38 C) ambient temperature.

To determine whether the outbreak was related to the chemical spill, during August 12-14, CDC and the CDHS conducted a retrospective cohort study of 42 inmates and crew leaders who participated in the cleanup and 48 state and federal employees who also worked in the river July 21-22. Dermatitis was defined as a self-reported rash on the feet or ankles with onset July 21-August 11 and duration of at least 4 days.

Of the 42 inmates and crew leaders, 27 (64%) had dermatitis; none of the 48 state and federal workers interviewed reported dermatitis. Onset of rash was noted 0-18 days after exposure in the river, peaking at 3-4 days. Rash affected the ankles (89%), feet (74%), legs (56%), hands (15%), and arms (11%). Reported symptoms included redness (96%); itching (81%); scaling (78%); bumpiness (56%); pain, burning, or stinging (37%); warmth (30%); and blistering (26%).

Rash occurred among 25 (76%) of 33 inmates and crew leaders who had lower extremity water contact compared with two (22%) of nine whose feet remained dry. In addition, the risk of rash for inmates and crew leaders was related to time spent in the river (36% for those in the water ≤3 hours compared with 92% for those in the water >11 hours.

The prevalence of water contact and the duration of time in the river were similar for inmates and crew leaders when compared with state and federal workers. However, of the 31 state and federal workers who had lower extremity water contact, 23 (74%) changed immediately to dry clothing before returning to work; in comparison, of the 33 inmates who had water contact, none changed immediately and nine (27%)changed to dry clothing at the end of the work day—after their feet had been wet up to 10 hours.

By August 14, the dermatitis was resolving for all patients.

Editorial Note: Although laboratory studies indicate that MITC is both a strong primary skin irritant and a mild skin sensitizer (allergen) in animals, its irritant and allergenic effects on humans have not been clearly distinguished. Both irritant and allergic contact dermatitis have been reported for MITC, primarily among agricultural workers. In California, reports to the Pesticide Illness Reporting System for 1990 included six cases of presumed irritant dermatosis associated with exposure to metam sodium that had been sprayed on crops.

Because it hydrolyzes rapidly, metam sodium is transported as a concentrated 33% solution in water. Metam sodium further diluted in water and in the presence of oxygen decomposes principally to the active pesticidal product MITC. In the incident described in this report, decomposition of MITC or of river flora and fauna killed by MITC may have produced other chemicals, concentrations of which were not determined; therefore, an etiologic role for another chemical cannot be completely excluded. The high attack rate of rash and the low probability of previous sensitization to MITC among persons exposed in this episode is consistent with irritant dermatitis.

Irritant contact dermatoses account for 65%-80% of all cases of contact dermatitis. Risk factors for irritant dermatitis include exposure of skin to humid or wet environments, repetitive friction, heat, soaps or detergents, and skin occlusion. Among the inmates and crew leaders, dermatitis was associated with lower extremity water exposure and the duration of time spent in water. In addition, based on comparison with the state and federal workers, prolonged water exposure may have promoted the development of dermatitis. Although the prevalence of water contact with workers' upper extremities was high (90%), few inmates reported dermatitis on their hands (15%) and arms (11%) indicating additional factors (e.g., occlusive boots and friction due to weight-bearing) may have contributed to the occurrence of lower extremity rash.

To minimize the risk of irritant dermatitis, special precautions are necessary during prolonged exposure to water—particularly in the presence of concentrations of a potentially irritant chemical. Such precautions include maintaining dry skin in areas of substantial friction (e.g., by wearing watertight waders or boots of appropriate height and gloves) and changing immediately to dry clothes.

MMWR 12/6/91

Book Review

Applied Food Service Sanitation a certification coursebook, Fourth Edition, presented by the Educational Foundation of the National Restaurant Association is a text designed for food service managers, supervisors and employees aspiring to management positions, regulatory personnel, and instructors in academic institutions.

The text is arranged into five main units: The Sanitation Challenge, The Flow of Food Through the Operation, Clean and Sanitary Facilities and Equipment, Accident Prevention and Crisis Management, and Sanitation Management. Throughout this part of the text numerous illustrations, charts, and pictures are utilized.

Some of the many topics pertain to principals of food microbiology, important foodborne diseases, regulatory standards, and applied measures for the prevention of foodborne diseases. The fourth edition has incorporated new information, concepts, and procedures vital to food safety, including but not limited to: changes in FDA standards, information on emerging pathogens, and a new chapter on crisis management.

The remainder of the text contains Appendixes (dealing with food quality and storage of food), an excellent Glossary, and the Educational Foundation Course Study Assignments and Answer Sheets.

The primary difference in the fourth edition (versus earlier editions) is the incorporation of new materials on implementing a food service sanitation management system known as Hazard Analysis of Critical Control Points (HACCP). The HACCP process is presented in a simple and detailed manner so that it may be easily incorporated into operating procedures.

The development of *Applied Food Service Sanitation*, fourth edition, was aided by a great number of food service industry members, educators, and regulatory representatives all of whom are appropriately acknowledged.

In recommending this text, I refer to the Educational Foundation's message. "The Educational Foundation of the National Restaurant Association is dedicated to the advancement of professionalism in the food service industry through education and training." "Earlier editions of *Applied Food Service Sanitation* have firmly established it as the nations leading text for food service manager training programs."

Applied Food Service Sanitation a certification coursebook, Fourth Edition, continues and enhances this message!!

Kevin Anderson
Sanitarian, City of Ames
Ames, IA

Letter to the Editor

Dear Editor:

Your review of food labeling changes in the February issue cites data from the Food and Drug Administration regarding the cost to relabel under the Nutrition Labeling and Education Act of 1990.

In fact, FDA has underestimated by 100 percent the cost of the changeover, and has assumed that the cost will be spread over a 20-year period.

A study by the National Food Processors Association reveals that the actual cost of the changeover will be $3.36 billion, and that the cost impact will be felt mainly in the first six months to one year as food companies struggle to meet the tight deadlines established under the NLEA.

Because of the added cost burden imposed by the deadlines, we have asked FDA for the one-year hardship extension it may extend under NLEA, and we have supported that request with sound data.

An objective analysis of our survey results will result in a decision by the FDA to approve our request.

Regards,
Lester M. Crawford, Ph.D.
Executive Vice President
Scientific Affairs
National Food Processors Association
1401 New York Avenue, NW
Washington, DC 20005

Industry Products

Metro Introduces New Labs/ Clean Rooms Brochure

Laboratry/Clean Room solutions for materials storage and handling are addressed in a new brochure from InterMetro Industries Corporation. Full color application photography illustrates the use of Metro's shelving and storage systems including MetroMax(TM) and MetroLite(TM) polymer shelving and Super Erecta(TM) wire shelving. Stainless steel clean tables, mobile storage and handling units, utility carts, drying and curing cabinets and a wide variety of Metro products designed for the efficient use of space in lab and clean room settings are also featured.

For a free copy of "Laboratory/Clean Room Solutions", contact your Metro representative or phone toll free 1-800-433-2232.

InterMetro Industries Corporation - Wilkes-Barre, PA

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Environmental and Agricultural Contaminant Diagnostic Kits

Bioman Products Inc. introduces an innovative line of envirodiagnostic and agridiagnostic immunoassay kits designed to test for the presence of contaminants in water, soil, plant tissue, milk, food, serum, and urine. These kits are available for on-site analysis and are particularly suited for emergency testing, quality control sampling and pre-procurement testing. On-site kits yield semi-quantitative results in less than ten minutes and can be performed with minimum training. Quantitative results for hundreds of samples can be achieved in the lab within two hours. This is an extremely economical and efficient means of screening out negative samples prior to GC/MS or high pressure liquid chromatography confirmation.

A variety of diagnostic kits are available for a range of pesticides, herbicides, fungicides, insecticides, and PCB's. Kits are also available for mycotoxins and antibiotics and are available with sensitivities as low as 0.1 ppb depending on the contaminant.

BIOMAN PRODUCTS INC. - Mississauga, Ontario

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New Hach Guide Helps Analysts Select Chlorine Testing Instruments

When it comes to disinfection and biofouling control, chlorine is the prevailing choice—for water, wastewater, industrial cooling water, and swimming pool water. Analysts often ask which methods and instruments best suit their applications. Hach's new *Chlorine Testing Guide* helps analysts select a system that will measure chlorine accurately and conveniently. The new guide from Hach covers

- **Spot-checking.** Hach single-parameter, portable test kits provide simple, inexpensive tools for screening residual chlorine.
- **Field testing.** For fast, accurate measurements, Hach offers several portable colorimeters, a spectrophotometer and portable laboratories using USEPA-approved DPD chemistry.
- **Laboratory testing.** Hach offers quality laboratory instruments such as an amperometric titrator and spectrophotometers to accurately determine residual chlorine.
- **On-line testing.** Hach's low-maintenance, on-line analyzer saves money by reducing time and labor spent testing individual samples.
- **Multi-parameter test kits.** When analysts need to measure more than residual chlorine, Hach's test kits speed water quality testing.
- **Using chlorine standards.** Helpful, illustrated instructions show how to verify test results and check the performance of reagents, the instrument and the procedure.
- **Ordering information.** All the information needed to order reagents and apparatus for chlorine testing.

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Model 200T X—Ray Tube Excited XRF Analyzer

ASOMA Instruments, Inc. introduces a new, low cost bench top ED-XRF Analyzer. This is the first low cost "universal" analyzer that uses an X-ray tube for sample excitation rather than radioisotopes. The unit can be set up for different analyses and completely calibrated by the operator, using the instrument's built-in keypad.

The X-ray tube allows a higher source flux, particularly in the light element (Al to K) region which results in better detection limits. Also, a wide range of elements (Al to U) can be analyzed with a single source; excitation parameters (voltage and current) can be set for optimum response to a single element or narrow element range.

Additionally, radiation safety considerations for isotope sources are somewhat reduced with the X-ray tube, since the tube does not emit X-rays when the power is off.

The unit is available with a great variety of accessories.

ASOMA Instruments - Austin, TX

Please circle No. 256
on your Reader Service Card

New Series of Ultra-Hygienic Five-Lobe Pumps Eliminates Crevices, Offers Standard-Setting Cleanability

A new series of ultra-hygienic pumps, offered by Gelber Industries, Inc., sets new sterility standards for clean-in-place (CIP) and sterilize-in-place (SIP) applications. Unlike all other pump designs, the Pureflo 55 Series eliminates common contamination-harboring crevices through such design features as special gasket-type joints, external rotor retainers and front-mounted shaft seals. This combination makes the 55 Series positive displacement rotary lobe pumps ideal for handling delicate, viscous and particulate-laden fluids in industries with stringent cleanliness requirements.

Dual five-lobe rotors gently handle shear-sensitive material and maintain the integrity of microbial and particulate product structure. The

unique rotor design also provides effective solids handling ability and better low flow resolution than tri-lobe pumps, which well suits it for precise metering applications. In addition, a special rotor bore design ensures complete self-draining, eliminating costly hold up of expensive product and cleaning fluids.

The 55 Series pumps contain no bacteria-harboring cavities in the fluid contact zone. Externally secured rotors eliminate all internal crevices associated with bolts, nuts, screws or splines. The hygienic end cover has no recesses and a special gasket design eliminates the need for 'O' rings at all process sealing points. For ease of maintenance, front-mounted mechanical seals are fully exposed to the CIP/SIP process and can be serviced without removing the pump head. In addition, rotor removal and refitting is simplified, requiring removal of the end cover only.

Pureflo 55 Series pumps, manufactured by ITT Jabsco and distributed in the U.S. exclusively by Gelber, are made of FDA-approved materials throughout, including low-carbon 316L stainless steel (less than 0.03 percent carbon content) for wetted metal components. All wetted surfaces are finished to USDA 3A standards with optional mirror polish to 0.3 micron.

For the most stringent biotechnology and aseptic processing requirements, Pureflo 55 Series pumps are available with secondary containment barriers at all possible ingress points to ensure zero bacterial penetration through seals, ports and casing joints.

Gelber Industries - Wilmington, DE

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on your Reader Service Card

In-Line Ball Valves

Sanitary two-way and three-way valves, ranging in size from 1/2" to 4", are available from Fluid Transfer, Division of Lee Industries, Inc., Philipsburg, PA.

The Fluid-Flow line of sanitary ball valves is designed for rigid, corrosion-resistant, highly-sanitary applications in the food, cosmetic, pharmaceutical, beverage, and chemical industries. The solid construction of Fluid-Flow valves provides maximum reliability and failure-free performance under the most extreme operating conditions. Cleanup and maintenance costs are substantially reduced, due to a unique, simple design that allows extremely fast breakdown by hand, no tools required, in seconds. All Fluid-Flow valves feature Type 316 S.S. construction with standard, fully-encapsulating, Mica-Filled Teflon seals which provide maximum reduction in product entrapment, while Full-Flow port eliminates product flow restrictions.

Sizes of 1/2", 3/4", 1-1/2", 2", and 3" are available, with working pressures to 300 PSIG and a maximum temperature of 450°F.

These USDA accepted valves are available with complete jacketing for assurance in keeping hot or cold flow through the valve, whichever your needs may be. The newly introduced C.I.P. (Clean-In-Place) valves are designed for excellent cleansing of valve and downstream piping. Aseptic valves are also available in 1-1/2" to 4" sizes. Double-acting (air-to-air) and spring-return, pneumatic rack and pinion actuators are available options on the Fluid-Flow valve line for automated operations.

Lee Industries' Fluid Transfer Division manufactures a complete line of USDA accepted sanitary ball valves. All are available with a wide variety of finishes and end connections.

Fluid Transfer, Division of Lee Industries, Inc. - Philipsburg, PA

Please circle No. 258
on your Reader Service Card

New Multi-Point™ Process Switch 4-20 mA Set-Point Control

A new King-Gage(R) Multi-Point™ process switch is announced by King Engineering Corp., Ann Arbor, MI.

Designed as a process control trigger, this new module provides an economic alternative to PLCs and greater accuracy than conventional alarm trips. It provides single channel analog set-point control for continuous monitoring of a typical process loop.

The switch's 4 individual set-points may be used for balance tank applications and control levels within processing vessels. It is capable of controlling any process function (pressure, level, etc.) where two-wire 4-20 mA transmitters are employed.

Control output relays are included for each set-point. The unit has an adjustable deadband range, and an automatic overload reset feature. Repeatability is rated better than 0.05% FS and each set-point is continuously adjustable over the full input range.

The switch can be used to control process operations, and provide fail-safe limiting or alarm functions. In a level application, it can actuate pumps or outlet valves, and can initiate CIP cycles. It is designed to monitor variables within any Industrial control environment.

Available through distributors who are tank gauging specialists.

KING ENGINEERING CORP. - Ann Arbor, MI

Please circle No. 259
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Plastic Bulkhead Fittings Make No-Leak Connections Safe and Simple

An exceptionally heavy buttress thread distinguishes the Hayward Safe-T-Loc™ bulkhead fitting from ordinary bulkhead fittings or tank adapters. This heavy buttress thread on the outside body and nut is designed to prevent any possible leakage due to poor thread engagement. Also, the unique hex-shaped body end enables just one person to install the fitting, rather than two, which saves both time and money.

Installing a Safe-T-Loc fitting is a simple three-step process: a hole is drilled in the tank wall, the fitting is installed, and then tightened in place. The design allows both socket and threaded piping connections to be made either inside or outside of the tank.

Engineered for demanding industrial applications, Safe-T-Loc fittings work with plastic, metal or fiberglass tanks. They are of all plastic construction and cannot corrode or contaminate the fluids that come in contact with them. PVC, CPVC, PPL materials are available, with an EPDM seal, in sizes from 1/2 inch to 4 inches.

Hayward Industrial Products, Inc. - Elizabeth, NJ

Please circle No. 260
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Affiliate News

Robert G. Arnold, St. Louis County Health Department holds the Monarch Award for excellence, outstanding service and significant contributions in field sanitation.

Executive Board Members and new officers left to right are: Charles W. Sanders, Past President; F. Jerry Brown, President; Calvin Badding, President Elect; Janet P. Murray, Secretary; Terry Long, Vice-President; David Stull, Treasurer.

Upcoming IAMFES Affiliate Meetings

1992

JUNE

•**2-3, Texas Association of Milk, Food & Environmental Sanitarians Annual Meeting** will be held at the Howard Johnson South Plaza, 3401 South IH-35, Austin, TX. For more information contact Janie Park, P.O. Box 2363, Cedar Park, TX 78613-2363; (512)458-7281.

•**5, Tennessee Association of Milk, Water & Food Protection's Annual Meeting** will be held at the Ramada Airport, Nashville, TN. For more information contact Dennis Lampley, 7346 Sack Lampley Road, Bon Aqua, TN 37025; (615)360-0157.

SEPTEMBER

•**17-18, Minnesota Sanitarians Association, Inc. Annual Meeting** will be held at the Earl Brown Center, St. Paul, MN. For more information, please contact Paul Nierman (612)785-0484.

•**23-24, Wisconsin Association of Milk & Food Sanitarians, Wisconsin Environmental Health Association and Wisconsin Dairy Plant Fieldmen's Association Joint Educational Conference** will be held at the Holiday Inn-Downtown, Eau Claire, WI. For more information contact Neil M. Vassau, P.O. Box 7883, Madison, WI 53707; (608)267-3504.

OCTOBER

•**7-9, Kansas Association of Sanitarians Annual Meeting** will be held at the Holidome, Great Bend, KS. For more information contact John Davis, Wichita - Sedgewick Co., 1900 E. 9th, Wichita, KS 67214; (316)268-8351.

Gary Hanman, Chief Executive Officer, Mid-America Dairy Incorporated provided the MMFEHA Educational Conference Keynote Address "Protection of Our Food Supply—an Industry, Regulatory and Academic Effort."

Missouri Milk, Food & Environmental Health Association's 1992 Annual Conference Report

The 1992 Annual Education Conference for the Missouri Affiliate of IAMFES took place in Columbia, Missouri on April 1-3, 1992. Over 200 attendees gathered as forty presenters shared their knowledge and expertise in the areas of milk, food and environmental health, institutional health programs, and personal well being. At the Awards Banquet, Janet P. Murray, R.S., Environmental Sanitarian III, was presented the first Wilbur S. Feagan Award. The award was presented by its sponsor Wilbur S. Feagan, President of F & H Food Equipment Company, Springfield, Missouri. A plaque and $500 honorarium, is given each year to an outstanding regulatory field sanitarian. Robert G. Arnold was presented the Monarch Sanitarian Citation Award sponsored by the Monarch Division of H.B. Fuller Company.

This award recognizes outstanding professional, education and personal activities which make up significant contributions in the field of sanitation.

Carol J. Breeding, doctoral candidate at the University of Missouri-Columbia was presented the J. E. Edmondson Scholarship Award ($500). Breeding is currently doing research in the function of fractionated milk fat in ice cream. Special Recognition Awards for outstanding service and commitment to public health in the State of Missouri were awarded to Erwin Gadd, Fred Unnewehr, and John Norris. An Honorary Life Membership Award was given to Kent Frieze. Roger Milalko, Dode Charles, and William St. Gemme received Distinguished Service Awards.

Officers elected were President, F. Jerry Brown; President Elect, Calvin Badding; Vice President, Terry Long; Treasurer, David Stull; Secretary, Janet Murray; and Auditors, Gerald Worley and Linda Wilson.

Nebraska Association of Milk and Food Sanitarians Hold 5th Annual Meeting

The Nebraska Association of Milk and Food Sanitarians held their 5th Annual Meeting March 26-27, 1992 at the University of Nebraska-Lincoln. The two day program was titled "Introduction to Methodologies for Microbiologists and Sanitarians" and allowed the 35 participants the opportunity to get hands on experience with the latest in rapid identification techniques.

The program was designed to offer presentations, demonstrations and exhibits of the latest in microbiological and sanitation testing procedures. The program was divided into 3 sessions. Session A, "Pathogens", featured a presentation by Dr. Mike Curiale, Silliker Labs. He spoke on "Commercially Available Rapid Methods for Detection of Pathogens in Foods". Session A also included demonstrations and exhibits of genetic probe techniques, ELISA and other rapid test kits by BioControl, Gene Trak, Organon Teknika and Oxoid. Microbial enumeration/Sanitation topics were discussed in Session B. This session included in-depth discussion and hands on demonstrations of methodologies used by microbiologists and sanitarians to ensure the safety of the food supply. Demonstrations and exhibits included conductance (Malthus), ATP (Promega), air sampling, 3M petri film, Spiral plater, laser colony counter, and dip/contact methods. Antibiotic rapid test kits, aflatoxin test kits, and microbial identification test kits were demonstrated by Charm, Oxoid, Vitek, API, Minitek, BioControl, and Organon Teknika in session C.

On Thursday, the program featured Dr. Jerry King, A&L Labs as the luncheon speaker. He gave an excellent presentation on "Environmental Testing" and really set the mood for an exciting meeting.

At the NAMFS annual business meeting, the following slate of officers was elected for 1992: President, Susan Sumner, University of Nebraska-Lincoln; President-elect Fred Cook, ConAgra Frozen Foods; and Secretary/Treasurer Allan Ackerman, Nebraska Department of Health. Susan Sumner was also elected to a 3 year term as the NAMFS delegate to the national meeting.

Everyone in attendance agreed that the topics presented were informative and educational. The program committee would like to thank all of the company representatives who attended the meeting and all of the companies who sent samples of their products to be displayed at the meeting. The Nebraska affiliate continues to grow in numbers and scope. Each year the program becomes more diversified to include topics of interest to regulatory sanitarians as well as industry and university members.

Representing IAMFES at the affiliate meeting was Dee Buske, IAMFES Affiliate Liaison. The 1993 meeting will be held during the month of April in Omaha.

NYSAMFS President's Corner

by Leonard H. Jones
President, New York State Association of Milk and Food Sanitarians

Looking back to the 1991 NYSAMFS Annual Conference, it shouldn't come as a surprise that our total attendance was down by 50-60 from the year before. When discussing this with various hotels, this is pretty normal for other conferences that they book. This does not affect the Association budget to the point that we may have to consider raising registration fees.

There is a lot of interest in the 1992 IAMFES Annual International Conference being held July 26-29 at the Sheraton Centre Hotel in Toronto, Canada. This is being hosted by the Ontario Food Protection Association. The location of this conference makes it attractive for quite a few of our members to attend. Some NYSAMFS members will be assisting OFPA & IAMFES during the conference.

Our Association has been very actively involved in the *Milk and Dairy Beef Quality Assurance Program.* The Penn York Affiliate Association kicked off an informative workshop at the Guthrie Inn, Sayre, PA on February 17, 1992. Milk plants and Sanitarians are very much involved in this program.

The 1993 NYSAMFS Annual Conference will be in Rochester at the Holiday Inn, Genesee Plaza. The Association Executive Board held a meeting here on February 6, 1992 and toured the facility . . . *very nice.*

Jo and I were able to attend Ken Slentz' retirement party on January 10th at the Nelson Inn, Nelson, NY. It was my privilege to be able to award Ken an honorary Life Membership. As I told Ken, I knew there would be rewards being President of NYSAMFS, but this had to be one of the best.

There is starting to be quite a bit of enthusiasm for the 1992 Annual Conference September 22-24 being held at the Ramada Renaissance, Saratoga Springs, NY. This is a great facility and I'm told there is so much to do and see in Saratoga. Dave Bandler assures me that the shopping is great. Having been in touch with Local Arrangements Chairman, Marty Monahan, they're excited about having the conference in Saratoga.

Reprinted from New York State Association of Milk and Food Sanitarians Newsletter, Vol. 36, No. 1, March 1992.

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Synopsis of Papers for the 79th Annual Meeting

The following are abstracts of papers to be presented at the 79th Annual meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc., to be held in Toronto, Ontario, July 26-29, 1992.

ADAPTATION TO ACID PROMOTES SURVIVAL OF *SALMONELLA* IN CHEESE, Greg J. Leyer, Research Assistant, and Eric A. Johnson, University of Wisconsin-Madison, Food Research Institute, 1925 Willow Drive, Madison, WI 53706

Salmonella has been implicated as the causative agent of foodborne illness in several dairy foods including cheese, and continues to pose a concern to the dairy industry. Rapid acid production by starter bacteria is important for the control of *Salmonella* and other pathogens in cheese. Since *Salmonella* has an adaptive response to acid, we investigated if acid adaptation influenced resistance of *S. typhimurium* to organic acids and survival during dairy fermentations. Recovery of acid-injured cells was enhanced ~10,000-fold by 0.1% pyruvate supplementation in tryptose phosphate agar. Acid-adapted cells were more resistant to inactivation by lactic, propionic, and acetic acids. The acid-adapted cells also survived better than non-adapted cells during milk fermentation by *Streptococcus salivarius* subsp. *thermophilus* and *Lactobaciillus helveticus* (used iin Swiss cheese fermentation). Acid-adapted salmonellae persisted much better than unadapted salmonellae when surface inoculated onto commercial cheeses (Cheddar, Mozzarella and Swiss) which were incubated at 4-6°C. Acid adaptation also was observed in other species of salmonellae inclcuding *Salmonella enteritidis*, *Salmonella heidelberg*, and *Salmonella javiana*. The results of this study suggest that acid adaptation is an important survival mechanism enabling *Salmonella* to persist in fermented dairy products.

MICROBIOLOGICAL SAFETY OF BLUE AND CHEDDAR CHEESES CONTAINING NATURALLY MODIFIED MILK FAT, S. Schaffer*, Graduate Research Assistant, S. R. Tatini, and R. J. Baer, MN-SD Dairy Center, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108

Blue and stirred curd Cheddar cheeses (two trials) were made from milk obtained from cows fed normal, soyabean oil and sunflower oil rations. Cheese was made from milk standardized to 3.6% milk fat, pasteurized and inoculated with *Listeria monocytogenes* (Scott A and V7) and *Salmonella typhimurium* and *S. senftenberg*. Listeriae and salmonellae populations were monitored on oxford and xylose lysine deoxycholate agars, respectively, during manufacture and aging (up to 120 days). With 10^3/ml in milk, *L. monocytogenes* reached 1 x 10^4/g in all fresh Cheddar or Blue cheeses regardless of milk fat composition. Listeriae decreased to < 100/g after 120 days in Cheddar, and in Blue cheeses to < 1/g after 60 days. With 10^2/ml in milk, salmonellae reached 10^3-10^4/g in fresh Cheddar and 10^2-10^4/g in Blue cheeses and decreased to 1/g after 90 days in all Cheddar and after 30 days in all Blue cheeses regardless of milk fat composition. Thus, Cheddar and Blue cheeses made from milk of naturally modified milk fat present no unusual or enhanced risk from Listeriae or salmonellae.

BEHAVIOR OF *LISTERIA MONOCYTOGENES* IN COLDPACK CHEESE CONTAINIING NISIN DURING STORAGE, Diran Ajao*, Research Assistant, T. L. Yezzi, and E. A. Zottola, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108

The effect of nisin on the survival of *Listeria monocytogenes* in cold-pack cheese was examined. Two batches of cold-pack cheeses were prepared with 40 and 50% moisture respectively. Cheddar cheese containing a known concentration of nisin was blended with an appropriate amount of Colby cheese. The resulting cheese samples contained nisin ranging from 50 to 800 international units nisin (IU)/g. Samples were inoculated with *Listeria monocytogenes* at a level of ca 5 x 10^3 colony forming units (CFU)/g, and stored at 7, 21 and 32°C. Samples were evaluated every 2d during the first two weeks of storage, then every 5d thereafter for a period of 5 weeks. *L. monocytogenes* populations were enumerated by surface plating on Oxford Listeria Agar, and incubating at 30°C for 24-48 hrs. Listeria populations decreased in cheese containing nisin at 21 and 32°C. At 19d *Listeria* were not recovered in these samples. At 7°C *Listeria* populations remained constant. These results, suggested that the use of nisin-containing cheese in the manufacture of cold-pack cheese could be an effective method for controlling *Listeria* outgrowth.

EXTENSION OF SHELF-LIFE OF COTTAGE CHEESE USING MONOLAURIN, Derrick Bautista*, M. Durisin, and M. W. Griffiths, Department of Food Science, University of Guelph, Guelph, Ontario N1E 2W1

Shelf-life problems due to contamination of cottage cheese result in approxinately 5% return of product to the manufacturer each year. Whereas preservatives are not permitted, it may be possible to use naturally-occurring compounds to extend the storage life of cottage cheese. The monoglyceride, monolaurin has been shown to possess anti-microbial properties as well as being an emulsifying agent. Incorporation of monolaurin into cottage cheese at levels of 250 and 500 p.p.m. resulted in inhibition of both *Pseudomonas* spp. (enumerated by plate counts on- *Pseudomonas* Selective Agar) and coliforms (enumerated using Violet Red BileAgar) during storage at 6, 15 and 21°C. There was also an inhibition of growth of yeasts and moulds in the presence of monolaurin as evidenced by reductions in counts on Potato Dextrose Agar. These results suggest that the use of monolaurin as an emulsifying agent in cottage cheese will also have beneficial effects on shelf-life.

THE USE OF EPIFLUORESCENT AND PHASE MICROSCOPY IN EVALUATING MIXED BIOFILMS, Kyle Sasahara*, Research Assistant, E. A. Zottola, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108

Listeria spp. may be involved in the formation of biofilms on food processing equipment and processing plant environments. The ability of *Listeria* spp. to survive the sanitizing processes could be responsible for contamination of final product. *Listeria monocytogenes* and *Pseudomonas fragi* attachment to glass cover slips (GCS) grown in tryptic soy broth at 22C, separately and in combination, were studied. Two systems were used: a continuous flow slide chamber (CFSC) and submersion in an agitated vessel. After 24 hr, epifluorescent and phase microscopy, as well as a modified Gram stain procedure, were used to evaluate attachment. Attachment of *Listeria monocytogenes* to GCS in these dynamic environments was not successful. The microorganisms either attached as single cells without further division or the cells desorbed. However, combined with *Pseudomonas fragi*, attachment of *L. monocytogenes* and subsequent microcolony formation were enhanced. *P. fragi* may act as a primary colonizer attracting and entrapping *L. monocytogenes* within its acidic mucopolysaccharides. Image analysis could be used to differentiate and quantify gram-positive and gram-negative cells within a biofilm.

IAMFES

Preliminary Program

79th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.

In Cooperation with the Ontario Food Protection Association

The Sheraton Centre, Toronto, Ontario
July 26-29, 1992

REGISTRATION TIMES

Saturday, July 25	12:00 - 5:00 p.m.
Sunday, July 26	12:00 - 7:00 p.m.
Monday, July 27	8:00 a.m. - 4:00 p.m.
Tuesday, July 28	8:00 a.m. - 4:00 p.m.
Wednesday, July 29	8:00 a.m. - 12:00 p.m.

EXHIBITOR HOURS

Sunday, July 26	7:45 - 10:00 p.m.
(Following the Opening Session)	
Monday, July 27	9:30 a.m. - 3:30 p.m.
Tuesday, July 228	9:30 a.m. - 3:30 p.m.

PRE-MEETING WORKSHOPS*

HAZARD ANALYSIS AT CRITICAL CONTROL POINTS

Instructor: Frank Bryan

Friday, July 24 - 1:00 - 5:00 p.m.
Saturday, July 25 - 8:00 a.m. to 5:00 p.m.

and

MONITORING/MEASURING ENVIRONMENTAL SANITATION IN FOOD AND DAIRY PLANTS

Instructor: J. Russell Bishop

Saturday, July 25 - 9:00 a.m. to 5:00 p.m.

*Separate Workshop Fee Applies

IAMFES BOARD MEETING

Friday, July 24	8:00 a.m. - 5:00 p.m.
Saturday, July 25	8:00 a.m. to 12:00 p.m.

COMMITTEE MEETINGS

You need not be a committee member to attend.

SATURDAY, JULY 25

1:00 - 5:00	Affiliate Council

SUNDAY, JULY 26

9:30 - 10:30	Dairy Quality and Safety (Farm Section)
10:00 - 11:00	Audio Visual Library
10:00 - 11:00	Baking Industry Sanitary Standards
10:00 - 11:00	Past Presidents Advisory
10:00 - 5:00	Communicable Diseases Affecting Man
10:30 - 11:30	Dairy Quality and Safety (Plant Section)
11:00 - 12:00	Sanitary Procedures
11:00 - 12:00	Foundation Fund
11:00 - 12:00	Nominating
1:30 - 2:30	Dairy, Food & Environmental Sanitation
1:30 - 3:30	Applied Laboratory Methods
2:30 - 3:30	Environmental Issues in Food Safety

WEDNESDAY, JULY 29

12:00 - 4:00	Program Advisory

SUNDAY EVENING, JULY 26

OPENING SESSION

7:00 **Welcome to the 79th Annual Meeting** - D. GABIS, President of IAMFES and M. BRODSKY, chairperson of the Local Arrangements Committee

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

7:20 **The Ivan Parkin Lecture - "Global Issues in Food Safety"** - J. B. MORRISSEY, Assistant Deputy Minister, Agriculture Canada, Ottawa, Ontario

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

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

MONDAY MORNING, JULY 27

TECHNICAL SESSION
FOODBORNE PATHOGENS
Co-Conveners: J. SCOTT and K. GLASS

8:30 **Isolation of *Salmonella enteritidis* from Pooled Egg Samples as a Screening Method for Detecting Infected Laying Hens** - R. GAST, USDA, ARS, Southeast Poultry Research Lab, Athens, GA

8:45 **Survival of *Listeria monocytogenes* on the Surface of Egg Shells and During Frying of Whole and Scrambled Eggs** - R. BRACKETT and L. Beuchat, University of Georgia, Griffin, GA

9:00 **Heat Stability of *Listeria monocytogenes* in Liquid Egg** - F. BARTLETT, A. Hawke, and G. Millard, Centre for Food and Animal Research, Agriculture Canada, Ottawa, Ontario

9:15 **Health Risk Assessment of Undrawn (New York Dressed) Poultry in Ontario** - P. JOHNSON, T. Baker, M. Getz, J. Lynch, and M. Brodsky, Ontario Ministry of Agriculture & Food, Guelph, Ontario

9:30 **A Comparison of Antilisterial Activity of Two Lactic Starter Cultures in Chicken Summer Sausages** - A. MAURER, G. Baccus-Taylor, K. Glass, and J. Luchansky, University of Wisconsin, Madison, WI

9:45 **Control of *Escherichia coli* O157:H7 by Fermentation** - K. KONE and D. Fung, Kansas State University, Manhattan, KS

10:00 Break

10:15 **Thermal Destruction of *Listeria monocytogenes* in Reduced Salt Uncured-Restructured Meat Product** - H. THIPPAREDDI and D. Fung, Kansas State University, Manhattan, KS

10:30 **Bacterial Growth and Survival in Vacuum Packaged Beef During Extended Refrigerated Storage** - R. HART, P. Kenney, G. Jordan, H. Thippareddi, K. Kone, R. Campbell, C. Kastner, and D. Fung, Kansas State University, Manhattan, KS

10:45 **Effect of Growth Nutrients on Attachment of *Listeria monocytogenes* to Stainless Steel** - K. KIM, and J. Frank, University of Georgia, Athens, GA

11:00 **Simultaneous Growth of *Listeria monocytogenes* and *Listeria innocua* in Pure Culture and Food Systems** - R. PETRAN, and K. Swanson, Grand Metropolitan Food Sector, Minneapolis, MN

11:15 **Accelerated Growth of *Listeria monocytogenes* by Moulds** - L. MCINTYRE, and M. Griffiths, University of Guelph, Guelph, Ontario

11:30 **The 1991 Cholera Epidemic in Latin America and the FDA Actions in Response** - T. SCHWARZ, Food and Drug Administration, Washington, DC

TECHNICAL SESSION
DAIRY MICROBIOLOGY
Convener: R. DAGGS and P. VASAVADA

8:30 **Detection of Latent Coliforms in Pasteurized Milk** - R. HOLLEY, R. Ledford, E. Wolff, and K. Scofield, John Labatt Limited, London, Ontario

8:45 **Identification of Milk Enzymes for Monitoring Heat-Treatments Applied to Milk** - Y. HURVI, and M. Griffiths, University of Guelph, Guelph, Ontario

9:00 **Adaption to Acid Promotes Survival of *Salmonella* in Cheese** - G. LEYER, and E. Johnson, University of Wisconsin, Madison, WI

9:15 **Microbiological Safety of Blue and Cheddar Cheeses Containing Naturally Modified Milk Fat** - S. SCHAFFER, S. Tatini, and R. Baer, University of Minnesota, St. Paul, MN

9:30 **Behavior of *Listeria monocytogenes* in Cold-pack Cheese Containing Nisin During Storage** -

A. AJAO, T. Yezzi, and E. Zottola, University of Minnesota, St. Paul, MN

9:45 **Extension of Shelf-Life of Cottage Cheese Using Monolaurin** - D. BAUTISTA, M. Durisin, and M. Griffiths, University of Guelph, Guelph, Ontario

10:00 Break

10:15 **The Use of Epifluorescent and Phase Microscopy in Evaluating Mixed Biofilms** -K. SASAHARA, E. Zottola, University of Minnesota, St. Paul, MN

10:30 **Elimination of Surface-Attached Bacteria by Detergent Washing and Chemical Sanitation in a Dynamic Flow System** - M. CZECHOWSKI, and M. Banner, Diversey Corporation, Wyandotte, MI

10:45 **A Novel System of Sanitation, Disinfection and Sterilization Effective Against Biofilms** - D. KRAMER, Sterilex Corporation, Owings Mills, MD

11:00 **Effect of Cold Temperature on Germicidal Efficacy of Quaternary Ammonium Compound, Iodophor and Chlorine on *Listeria*** - E. TUNCAN, ConAgra Frozen Foods, Columbia, MO

11:15 **Assessment of Handling Conditions and Quality of Milk in Oregon Public Schools** - F. BODYFELT and A. Gatherum, Oregon State University, Corvallis, OR

11:30 **A Comparison of Commercially Processed Fluid Milks Held at 7.2°C (45°F) for 10, 12 and 14 Days** - S. BARNARD and R. Smeltz, Pennsylvania State University, University Park, PA

SYMPOSIUM
MILK QUALITY*
Convener: K. LESLIE

8:30 **Rational Antibiotic Therapy for Mastitis - A Residue Avoidance Perspective** - R. ERSKINE, Michigan State University, East Lansing, MI

9:00 **Factors Associated with Inhibitor Violations on Ontario Dairy Farm** - S. MCEWEN, University of Guelph, Guelph, Ontario

9:30 **Cowside Antibiotic Residue Tests: Current Status on Availability, Use and Interpretation** - W. SISCHO, Pennsylvania State University, University Park, PA

10:00 Break

10:20 **Verotoxigenic *E. coli* Contamination of Milk and Associated Risk Factors** - J. WILSON, University of Guelph, Guelph, Ontario

10:45 **Milk Quality Improvement Initiatives for the Ontario Dairy Industry** - A. GODKIN, Ontario Ministry of Agriculture and Food, Fergus, Ontario

11:15 **Dynamics and Trend Analysis of Bulk Milk Quality Data** - K. LESLIE, University of Guelph, Guelph, Ontario

11:40 **Relationship of Milking Machine Design and Function to Milk Quality** - S. SPENCER, Pennsylvania State University, University Park, PA

***Co-sponsored by the National Mastitis Council**

SCIENTIFIC POSTER SESSION
Authors Present: Breaks and Lunch on Monday and Breaks on Tuesday a.m. (Teardown Tues. noon)
Convener: B. LANGLOIS

Growth and Survival of *Vibrio* spp. as Determined by pH, Acidulant, Time and Temperature - M. AROCHA, S. Loder, J. Rupnow, and L. Bullerman, Universidad Santa Maria, El Paraiso, Caracas, Venezuela

Rapid Assay for *Bacillus* Proteinases in Raw Milk as Detected by a Simple Casein Denaturation Method - F. BODYFELT, S. Feijoo, and C. Gonzalez, Oregon State University, Corvallis, OR

Application of a Recording Thermometer to Monitor Cleaning and Sanitizing Procedures for Farm Raw Milk Transport Lines - J. BRUHN, L. Collar, C. Collar, and T. Schultz, University of California, Davis, CA

Microbial and Chemical Analysis of Mexican White Soft Cheese and its Relationship with the Content of Histamine and Tyramine - M. DIAZ-CINCO, R. Okada, and J. Taylor, Centro de Investigación en Alimentación y Desarrollo, Mexico

Survival of *Salmonella typhimurium, Escherichia coli* O157:H7 and *Listeria monocytogenes* Scott A During Storage on Beef Sanitized with Organic Acids - J. DICKSON and G. Siragusa, USDA, ARS, Clay Center, NE

Use of Phenols and Liquid Smoke to Control *Listeria monocytogenes* - N. FAITH, A. Yousef, and J. Luchansky, University of Wisconsin, Madison, WI

Fate of *Listeria monocytogenes* in Modified-Atmosphere Packaged Turkey Roll - J. FARBER and E. Daley, Microbiology Research Division, Bureau of Microbial Hazards, Ottawa, Ontario

Fate of *Escherichia coli* O157:H7 in Fermented, Dry Sausage and in Modified Atmosphere Packaged Beef - K. GLASS, J. Loeffelholz, J. Ford, and M. Doyle, University of Wisconsin, Madison, WI

Frequency of False Presumptive Positive Results Obtained using a Commercial ELISA Kit to Screen Retail Ground Beef for *Escherichia coli* O157:H7 - S. INGHAM and L. Sernowski, University of Saskatchewan, Saskatoon, Saskatchewan

Incidence of Low Levels of Enterotoxin-Producing *Bacillus cereus* in Routine Surveillance Food Samples - S. JACKSON, Ontario Ministry of Health, Hamilton, Ontario

Dimorphism in *Shigella sonnei* as it Relates to Retention of Biochemical and Serological Characteristics - G. ALLEN-JUNE, P. Sherrod, W. Andrews, T. Hammack, and L. Koopman, Food and Drug Administration, Washington, DC

Accessibility to Chlorine of Bacteria Attached to or Entrapped in Poultry Skin - H. LILLARD, USDA, ARS, Athens, GA

Low Dose UV and Gamma Radiation on Shelf-life of Peaches - J. LU, S. Lukombo, S. Stevens, V. Khan, C. Wilson, and P. Pusey, Tuskegee University, Tuskegee, AL

Incidence of Bacteria on Smear-Ripened Cheeses Able to inhibit *Listeria monocytogenes* - E. RYSER, S. Maisnier-Patin, J. Gratadoux, and J. Richard, INRA, Jouy-en-Josas, France

Effectiveness of a Modified Salmonella-Tek™ Enzyme Immunoassay for the Recovery of *Salmonella* from Selected Low-Moisture Foods - P. SHERROD, G. Allen-June, T. Hammack, L. Koopman, and W. Andrews, Food and Drug Administration, Washington, DC

Microbial Growth Rate of Two Minimally Processed Vegetables Packaged in Modified Atmosphere Package - S. WANG, Horticultural Research Institute of Ontario, Vineland Station, Ontario

Ultrasonic Killing of *Listeria monocytogenes* and *Salmonella typhimurium* in Milk - D. WRIGLEY and N. Llorca, Mankato State University, Mankato, MN

Evaluation of PC Based Software in the Dairy Q.C. Laboratory - D. BLOMQUIST and R. Bakka, Klenzade, Tampa, FL

Improvement of Lactic Cultures Through Organic Solvent Treatment - C. FERREIRA, DTA-UFV, Viscosa, MG, Brazil

Virulence of an *Escherichia coli* O157:H7 Sorbitol Positive Mutant - P. FRATAMICO, USDA, ARS, ERRC, Philadelphia, PA

Quantitative Effects of pH and Lactic Acid Concentration on the Kinetics of *Listeria monocytogenes* Inactivation - M. GOLDEN, R. Buchanan, and R. Whiting, USDA, ARS, ERRC, Philadelphia, PA

Survey of Spoilage Bacteria in Raw Milk at Egyptian Markets and Farms - H. EL-HADY and R. Hafez, Cairo University, Giza, Egypt

Fate of Enterotoxigenic Staphylococci in Fish Subjected to Curing - S. SANJEEV and P. Surendran, Central Institute of Fisheries Technology, Cochin, India

Actual and Perceived Incidences of Perforation in Surgical and Examination Gloves - J. ISON, University of Kentucky, Lexington, KY

The Effect of Ultraviolet Light-C on Storage Rots and Ripening of Tomatoes - C. STEVENS, J. Liu, V. Khan, J. Lu, C. Wilson, O. Adeyeye, M. Kabwe, L. Pusey, E. Chalutz, and T. Sultana, Tuskegee University, Tuskegee, AL

VIDEO THEATRE

Monday & Wednesday - 8:30 - 12:00 and 1:30 - 5:00,
Tuesday morning 8:30 - 12:00

A list of titles and presentation times
will be published at a later date

MONDAY AFTERNOON, JULY 27

UPDATE ON FOODBORNE PATHOGENS SYMPOSIUM*
Co-Conveners: A. LAMMERDING AND J. SMITH

1:35 **Cholera in the Americas: A Foodborne Hazard?** - T. POPOVIC, O. Olsvik, and K. Wachsmuth, Centers for Disease Control, Atlanta, GA

2:05 ***Listeria monocytogenes*: Current Issues in Perspective** - J. FARBER, Health and Welfare Canada, Ottawa, Ontario

2:35 **Isolation of Verocytotoxin - Producing *Escherichia coli* from Animals and Food Products** - R. CLARKE, S. Read, J. Wilson, and H. Lior, Health of Animals Laboratory, Agriculture Canada, Guelph, Ontario

3:05 Break

3:20 **Foodborne Toxoplasmosis** - J. SMITH, USDA, ARS, ERRC, Philadelphia, PA

3:50 ***Salmonella* Control in Canada** - R. IRWIN, Agriculture Canada, Guelph, Ontario

4:20 **Update on the Status of *Salmonella enteritidis* in the U.S.A.** - J. MASON and E. Ebel, Salmonella Task Force, Hyattsville, MD

***Co-Sponsored by the Canadian College of Microbiologists**

TECHNICAL SESSION
LABORATORY METHODS
Convener: J. DICKSON

1:30 **Effective Method for Dry Inoculation of *Salmonella* Cultures** - C. HOFFMANS and D. Fung, Kansas State University, Manhattan, KS

1:45 **Evaluation of Enrichment and Plating Media for Isolation of Virulent *Yersinia enterocolitica* from Ground Meat** - L. YU and D. Fung, Kansas State University, Manhattan, KS

2:00 **Comparison of 25g and 375g Composite Samples for Detection of *Listeria*** - S. DECKER, D. Evanson, D. McIver, E. Richter, K. Jost-Keating, B. McMorrow, Silliker Laboratories, Garwood, NJ

2:15 **Development of Culture Media for the Rapid Detection of *Lactobacillus* Species in High Acid Foods Using Impedance Microbiology** - C. GRAVENS, F. Hoag, P. Rule and W. Ericsen, bioMerieux Vitek, Hazelwood, MO

2:30 **Effective Recovery of *Campylobacter* in the Presence of Mixed Culture** - F. NIROOMAND and D. Fung, Kansas State University, Manhattan, KS

2:45 **Recovery of *Campylobacter* spp. from Poultry through Enrichment in 10 ml or 100 ml Volumes** - N. STERN, USDA, ARS, Russell Research Center, Athens, GA

3:00 Break

3:15 **Rapid Method for Assessing Microbiological Quality of Egg Washwater Using Resazurin** - J. TETRO and F. Bartlett, Centre for Food and Animal Research, Agriculture Canada, Ottawa, Ontario

3:30 **Rapid Fluorometric Analysis of Acid Phosphatase Activity in Cooked Poultry Meat** - C. DAVIS and W. Townsend, USDA, ARS, Athens, GA

3:45 **Fluorometric Analysis of Alkaline Phosphatase Inactivation Correlated to *Salmonella* and *Listeria* Inactivation** - K. ECKNER, Silliker Laboratories Group, Chicago Heights, IL

4:00 **Shelf Life Prediction of Pasteurized Fluid Milk Using the Charm II System** - S. TRIVEDI, H. Zarrin, E. Zomer, and S. Charm, Charm Sciences, Malden, MA

SANITATION AND DISASTER CONTROL SYMPOSIUM
Convener: M. BANNER

1:30 **Oh God, We're Going to Die - Food Safety at Disaster Time** - D. CLINGMAN, General Mills Restaurants, Inc., Orlando, FL

2:00 **Ready? or Sorry!! The Need to Exercise Emergency Plans** - C. BYRNE, St. Louis Department of Community Health and Medical Care, Clayton, MO

2:30 **Hurricane Hugo and its Aftermath (Sanitation and Disaster Control)** - J. HALL, South Carolina Department of Health and Environmental Control, Columbia, SC

3:15 **Disaster Control/Prep. Canada** - H. QUINNELL, Health and Welfare Canada, Ottawa, Ontario

TUESDAY MORNING, JULY 28

TECHNICAL SESSION
FOODBORNE MICROBIOLOGY
Co-Conveners: P. COOK and M. CIRIGLIANO

8:30 **Predictive Modeling of Psychrotrophic *Bacillus cereus*** - J. BAKER and M. Griffiths, University of Guelph, Guelph, Ontario

8:45 **Microbial Ecology of Modified Atmosphere Packaged Pork** - L. MCMULLEN and M. Stiles, University of Alberta, Edmonton, Alberta

9:00 **Method for Classifying Foods with a Similar Microbiological Risk** - A. FRASER, C. Sawyer, S. Andrews and J. Youatt, Michigan State University, East Lansing, MI

9:15 **Processing and Fermentation of Soy Yogurt Made from Rapid Hydration Hydrothermal Cooked Soy Milk** - P. TUITEMWONG, L. Erickson, D. Fung and K. Tuitemwong, Kansas State University, Manhattan, KS

9:30 **Microbiology HACCP Determination at a Poultry Processing Plant** - G. BROCK, E. Barrett, D. Theno, and J. Lee, University of California, Davis, CA

9:45 **Combined Effects of Glycerol Monolaurate, Ethanol, and Lactic Acid Against *Listeria monocytogenes*** - D. OH and D. Marshall, Louisiana State University, Baton Rouge, LA

10:00 Break

10:15 **Lethal Effect of Dimethyl Dicarbonate on *Listeria* and *Salmonella*, and its Potential for Use in the Treatment of Fresh Produce** - M. CIRIGLIANO and P. Rothenberg, Thomas J. Lipton Company, Cresskill, NJ

10:30 **Simultaneous Production of Yeast Polygalacturonase and Lactate Dehydrogenase from Sauerkraut Brine** - J. SCHWARZ and Y. Hang, Cornell University, Geneva, NY

ACTIVITIES OF THE NATIONAL ADVISORY COMMITTEE ON MICROBIOLOGICAL CRITERIA FOR FOODS SYMPOSIUM
Co-Conveners: F. SHANK and R. CROSS

8:30 **Introductory Remarks** - F. SHANK, CFSAN, FDA, Washington, DC

8:40 ***Listeria*** - J. KVENBERG, FDA, Washington, DC

9:10 **Fresh Meat and Poultry** - D. THENO, Theno & Associates, Modesto, CA

9:35 **Hazard Analysis and Critical Control Points** - M. PIERSON, VPI & SU, Blacksburg, VA

10:00 Break

10:20 ***Campylobacter*** - R. GRAVANI, Cornell University, Ithaca, NY

10:50 **Food Handling Practices** - M. ROBERTS, Florida Department of Agriculture, Tallahassee, FL

11:20 **Concluding Remarks** - R. CROSS, USDA, FSIS, Washington, DC

AUTOMATION IN DAIRY PROCESS CONTROL SYMPOSIUM
Co-Conveners: D. SEIBERLING

8:30 **Process Design and Extended Shelf Life of Dairy Products** - D. SEIBERLING, Seiberling & Associates, Roscoe, IL

9:00 **Documentation of Automated Processes** - J. HYDE, Seiberling & Associates, Roscoe, IL

9:30 **Automatic Cleaning and Sanitation in the 90's** - R. FLOH, Diversey, Inc., Mississauga, Ontario

10:00 Break

10:15 **A New Distributed Valve Control System** - P. PERSSON, SattControl, Scarborough, Ontario

10:45 **Regulatory Aspects/Inspections - Fed. Department Agriculture Canada** - R. PULYK, Alberta Agriculture, Wetaskiwin, Alberta

TUESDAY AFTERNOON, JULY 28

GENERAL SESSION - INTERNATIONAL FOOD STANDARDS
Co-Conveners: J. SCOTT and R. HOLLEY

1:00 **The International Dairy Federation - Development of IDF Standards and Bulletins** - H. WAINESS, H. Wainess & Associates, Northfield, IL

1:30 **Food Standards and Food Safety in Japan** - N. TANAKA, U.S.-Japan Science Consulting Services, Delmar, NY

2:00 **International Labeling and Advertising Requirements: The Effect on Trade** - L. CRAWFORD, National Food Processors Association, Washington, DC

2:30 **Food Safety Issues in Europe - An Update** - M. STRINGER, Campden Food and Drink Research Association, Gloucestershire, England

ANNUAL IAMFES BUSINESS MEETING

3:15 **Welcome and Introduction** - M. DOYLE, President-Elect

3:30 **Report from the President** - D. GABIS

3:45 **Business Meeting** - D. GABIS, 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** - R. SANDERS, Past President

WEDNESDAY MORNING, JULY 29

SEAFOOD REGULATORY SYMPOSIUM
Co-Conveners: C. HACKNEY and E. TODD

8:30 **The United States Food and Drug Administration's Office of Seafood; Update on Activities** - P. SPILLER, Food and Drug Administration, Washington, DC

9:00 **Canadian Seafood Inspection** - B. EMBERLY, Department of Fisheries & Oceans, Ottawa, Ontario

9:30 **Seafood Issues Within CODEX** - S. GARRETT, NMFS's National Seafood Quality and Inspection Laboratory, Pascagoula, MS

10:00 Break

10:15 **Voluntary Retail Seafood Program within the U.S. FDA** - L. EDWARDS, Food and Drug Administration, Washington, DC

10:45 **National Advisory Committee for Microbiological Critera for Foods: Seafood Issues Update** - J. KVENBERG, Food and Drug Administration, Washington, DC

11:15 **ICMFS: Update on Seafood Issues** - M. DOYLE, University of Georgia, Griffin, GA

DAIRY SYMPOSIUM
Co-Conveners: D. HENNING and M. GRIFFITHS

8:30 **Psychrotropic *Bacillus* spp. - More Than Just Spoilage Organisms?** - J. BAKER, F. Bodyfelt, and M. Griffiths, University of Guelph, Guelph, Ontario

9:00 **Bioluminescence: An Enlightening Technology** - M. GRIFFITHS, University of Guelph, Guelph, Ontario

9:30 **Bifidobacteria in Dairy Products** - V. MISTRY, South Dakota State University, Brookings, SD

10:00 Break

10:15 **Biofilms, a Cleaning and Sanitizing Perspective** - B. CORDS, Ecolab, St. Paul, MN

10:45 **Laboratory Management System (Microbiology)** - M. LAMMERS, Diversey Corporation, Wyandotte, MI

CONSUMER'S AND SCIENTIST'S VIEWS ON IRRADIATION AND FOOD SAFETY SYMPOSIUM
Co-Conveners: M. BRODSKY and N. STERN

8:30 **The Consumer's View of Food Safety** - R. JACKSON, Consumers' Association of Canada, Kitchener, Ontario

9:00 **Food Safety - An Epidemiologist's Perspective** - J. HOCKIN, Laboratory Centre for Disease Control, Ottawa, Ontario

9:30 **Limitations of Our Current Approach for Assessing Microbiological Food Safety** - R. BUCHANAN, USDA, ARS, ERRC, Philadelphia, PA

10:00 Break

10:15 **Safety Ramifications of Food Irradiation** - J. BORSA, AECL Research, Pinawa, Manitoba

10:45 **Public Perceptions Toward Irradiation of Foods** - Media Presentation

11:15 **Round Table Discussion - Closing the Gap Between Perception and Reality or, How Do We Get There from Here?**

WEDNESDAY AFTERNOON, JULY 29

SEAFOOD SAFETY SYMPOSIUM
Co-Conveners: C. HACKNEY and E. TODD

1:30 **Enteric Viruses and Seafood Safety** - M. KILGEN, Nicholls State University, Thibodaus, LA

2:00 **Bacterial Pathogens** - C. HACKNEY, VPI & SU, Blacksburg, VA

2:30 **New Insights into Seafood Toxin Research** - E. TODD, Sir Frederick G. Banting Research Centre, Ottawa, Ontario

3:00 Break

3:15 **Chemical Contaminants** - J. RODRICKS, Environ Corporation, Arlington, VA

3:45 **Seafood HACCP Programs** - R. MARTIN, National Fisheries Institute, Arlington, VA

FOOD IRRADIATION SYMPOSIUM
Convener: J. BORSA

1:30 **Food Irradiation: Introductory Overview** - J. BORSA, AECL Research, Pinawa, Manitoba

2:00 **Safety and Wholesomeness of Irradiated Food** - D. THAYER, USDA, ARS, Philadelphia, PA

2:30 **Reduction of Foodborne Disease Through the Use of Radiation Processing** - R. ENGEL, International Programs, FSIS, USDA, Washington, DC

3:00 Break

3:15 **International Regulatory Status and Harmonization of Food Irradiation** - D. DERR, USDA, FSIS, S&T, Washington, DC

3:45 **Marketing Irradiated Food** - W. HARGRAVES, Vindicator, Plant City, FL

4:15 **Status on United States Regulations for Irradiation as a Quarantine Treatment** - R. ROSS and J. Fons, USDA Animal and Plant Health Inspection Service, Washington, DC

COMPUTER/PREDICTIVE MODELLING
Conveners: R. BUCHANAN and D. WHITING

1:30 **The Use of Probability Models in Assessing the Safety of Foods with Respect to *Clostridium botulinum*** - K. DODDS, Health & Welfare Canada, Ottawa, Ontario

2:00 **The Development and Validation for the Growth of Foodborne Bacteria** -- R. BUCHANAN, USDA, ARS, ERRC, Philadelphia, PA

2:30 **Modeling Bacterial Inactivation/Survival** - R. WHITING, M. Golden, and B. Marmer, USDA, ARS, ERRC, Philadelphia, PA

3:00 Break

3:15 **Predicting Microbial Behavior Under Changing Conditions** - C. CUSTER, USDA, FSIS, S&T PPID, Washington, DC

3:45 **The Application of Microbial Modeling in the Food Industry - Modeling Dairy Products** - M. GRIFFITHS, University of Guelph, Guelph, Ontario

Special Events

Sunday, July 26, 1992

8:00-10:00 Early Bird Reception - Cheese & Wine

Monday Evening, July 27, 1992

7:00 CASA Loma Dinner

Wednesday Evening, July 29, 1992

6:00-7:00 Reception
7:00 Annual Awards Banquet

Events by Invitation

Monday Morning, July 27, 1992

7:00 IAMFES Committee Chairperson Breakfast Meeting

Tuesday Evening, July 28, 1992

5:30-6:30 Presidential Reception
7:00 Past Presidents' Dinner

1992 IAMFES Annual Meeting Exhibitors

(as of April 15, 1992)

Advanced Instruments, Inc.,	Needham Heights, MA
Anderson Instruments, Inc.,	Fultonville, NY
Aquionics, Inc.,	Erlanger, KY
Atkins Technical, Inc.,	Gainesville, FL
Becton-Dickinson Microbiology Systems,	Cockeysville, MD
L.J. Bianco and Associates, Inc.,	Northbrook, IL
BDH, Inc.,	Toronto, Ontario
Biotrace, Inc.,	San Diego, CA
bioMérieux Vitek, Inc.,	St. Louis, MO
Capitol Vial, Inc.,	Fultonville, NY
Charm Sciences, Inc.,	Malden, MA
Custom Control Products, Inc.,	Racine, WI
DQCI Services, Inc.,	St. Paul, MN
Difco Laboratories,	Mississauga, ON
Diversey Inc.,	Mississauga, ON
Foss Food Technology Corp.,	Brampton, ON
Gist-brocades Food Ingredients, Inc.,	King of Prussia, PA
Glengarry Biotech,	Cornwall, ON
Idetek, Inc.,	Sunnyvale, CA
IDEXX Laboratories, Inc.,	Portland, ME
Klenzade, A Service of Ecolab, Inc.,	St. Paul, MN
Meritech, Inc.,	Englewood, CO
Meyer Service & Supply Ltd.,	Long Sault, ON
NASCO - Whirl-Pak,	New Hamburg, ON
Nelson-Jameson, Inc.,	Marshfield, WI
Organon Teknika Corporation,	Durham, NC
Promega Corporation,	Madison, WI
Radiometer America, Inc. (Bach Simpson, Ltd.),	Westlake, OH
Raven Biological Laboratories, Inc.,	Omaha, NE
R-TECH (Results Technology),	Minneapolis, MN
Rio Linda Chemical Co., Inc.,	Sacramento, CA
Silliker Laboratories Group, Inc.,	Chicago Heights, IL
SmithKline-Beecham Animal Health,	Exton, PA
3-A Symbol Council,	Cedar Rapids, IA
3M Microbiology Products,	St. Paul, MN
Unipath Co., Oxoid Division,	Ogdensburg, NY
Walker Stainless Equipment Co., Inc.,	New Lisbon, WI
Weber Scientific,	East Windsor, NJ

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IAMFES Chairperson ..... Mike Doyle
Scientific Content ..... Mark Banner
Program Coordinator ..... Michael Brodsky

LOCAL ARRANGEMENTS COMMITTEE

Hospitality Suite ..... Krista Mountjoy
Registration Desk ..... Sherry Hagino
Exhibitor Coordinator ..... Mike Brock
Door Prize Coordinator ..... Bob Tiffin
Dairy Products and Refreshments ..... Coleen Stevens
Photographer and Historian ..... Bill Boylen
Goody Bag Stuffers ..... Bob Tiffin
Sunday Wine and Cheese ..... Coleen Stevens
Patrick Kwan
Monday Night Gala ..... Coleen Stevens
Patrick Kwan
Tuesday Night Past Presidents Dinner . Doug Cunningham
Bill Kempa
Patrick Kwan
Coleen Stevens
Wednesday Night Awards Banquet ..... Patrick Kwan
Coleen Stevens
Publicity ..... Karen Beaudoin
Program ..... Jeff Farber
Anna Lammerding
Audio-Visual ..... Carolyn Langford
Richard Ledford

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Managing Editor ..... Steven Halstead, Ames, IA

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Associate Editor ..... Margie Marble, Ames, IA
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Spouse/Companion Tours

A Get-Acquainted Tour of Toronto and CN Tower

Monday, July 27, 1992
9:00 a.m. - 12:00 noon
Cost: $17 (US), $20 (CDN)

Explore the unique personality of the world's "newest great city" on this get-acquainted tour of Toronto!

With emphasis on the blending of residential, commercial and recreational facilities and the eye-catching combination of old and new, your guide will share interesting and unusual anecdotes about Toronto and its residents as you tour through distinct areas of the city, including: the downtown financial district with its stunning skyline of skyscrapers, many of which are constructed from a different material (for example, the Royal Bank building with windows containing real gold dust); the midtown section, where fashionable boutiques and galleries of Yorkville are just a stones' throw from the Victorian Gothic of the Ontario Parliament Buildings; and uptown Toronto, where the playing fields of two of Canada's most prestigious private schools back on to the residences of a few of its more famous personalities!

Some of the other attractions included in today's look at Toronto will be the Royal Ontario Museum and McLaughlin Planetarium; Roy Thomson Hall; Old Towne of York, where Toronto had its beginnings; O'Keefe and St. Lawrence Centre for the Arts; Old and New City Halls; Ontario Parliament Buildings; the Eaton Centre, with its stunning glass domed galleria; Chinatown; the Art Gallery of Ontario and innovative Village by the Grange residential and shopping developments; parks; theatres, and numerous other places of interest in and around the city.

Then to complete your morning, "Zoom" to the clouds via a thrilling 58-second ride in a glass sided elevator up the CN Tower, the world's tallest free standing structure and marvel at modern technology. Whilst revelling in the magnificent bird's eye panoramic view of Toronto from 1,150 feet above the ground, your knowledgeable guide will also conduct a unique aerial tour of the city and its surrounding area.

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

IAMFES

DFES
5/92

International Association of Milk, Food and Environmental Sanitarians Inc

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 _____

Address _____

City _____ State/Prov. _____

Country _____ Zip _____

Phone Number _____

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

Place
Stamp
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IAMFES

502 E. Lincoln Way
Ames, Iowa 50010

Place
Stamp
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IAMFES

502 E. Lincoln Way
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Historic Tour of Downtown and Restored Theatres

Monday July 27, 1992
2:00 p.m. to 5:00 p.m.
Cost: $12 (US), $14 (CDN)

Take an exciting tour "behind the scenes" and discover the hidden world that transforms fantasies to realities! Third in the world behind New York and London, Toronto is proud of its first class theatres and concert halls, however, the ultimate treasures are found in two magnificently restored vaudeville houses of the 1920's. Look back to a time of extravagance with visits to the historic Elgin and Winter Garden Theatres the only active stacked theatres in the world. The restorations for this complex began in March 1987 and lasted for 33 months with artists, historians, carpenters, plasterers, painters and many others painstakingly repairing or re-creating every detail of the original theatres' design. Vaudeville was presented here until 1930 when the Elgin became exclusively a movie house. Situated directly above is the Winter Garden Theatre, which opened in February 1914. As this theatre was strictly a vaudeville house, it too became passé and had its last performance in 1928, after which its doors were simply closed and the theatre left to slumber for sixty years. Walking through the Winter Garden Theatre with its hand painted walls and leaves suspended from the ceiling is reminiscent of a stroll through an English fantasy garden. Both the Elgin and the Winter Garden Theatres are designated national historic sites.

Following your theatre tour, this Historic walking tour of Downtown will continue by highlighting two of Toronto's most imposing buildings which are reflections of the city's past and present - The Old and New City Halls. Located across the street from each other, these two buildings share an important part of the city's architectural and historic identity. Begin your walking tour at New City Hall with a view of the Peace Garden, Henry Moore's famous sculpture "The Archer", and finally the beautiful rotunda inside.

Across the street from new City Hall, but light-years removed in architectural style, stands Old City Hall. It was completed just in time to ring in the 20th century at 1/10 the cost of the New City Hall. Marvel at the magnificent wood paneling, high ceilings and marble columns, and elaborate 300 foot high clock tower.

Finally, your guide will escort you to the Church of the Holy Trinity which, set against the Eaton Centre's high-tech glitter, looks more impressive today than it did even a century ago. Right next door is the home of the first rector of Holy Trinity, Rev. Henry Scadding. This Georgian/Gothic style house was built in 1857 and its intriguing balcony once commanded a view down to the harbour and around the entire town.

Niagara Falls and Niagara-on-the-Lake

Tuesday, July 28, 1992
8:00 a.m. to 5:00 p.m.
Cost: $42 (US-Adults), $30 (US-Children)
$49 (CDN-Adults), $35 (CDN-Children)

This spectacular showcase of Niagara has been specially designed to offer delegates attending the IAMFES 1992 Convention an excellent opportunity to experience first hand, the beauty and excitement of the Niagara Peninsula.

Begin your day with a pleasant journey to the Niagara Peninsula and feel the thrill of excitement and anticipation as your approach the majestic and thunderous Falls! Upon arriving at this magnificent splendor, your first impressions will be that of the powerful surging waters of the Canadian and American Falls. First your guide will take you on a short orientation tour of the area, pointing out such attractions as the Oaks' amphitheatre, the scenic tunnels, the Maid of the Mist and superb gardens. Then time will be available for those who wish to climb aboard the *Maid of the Mist* tour boat for a thrilling and exciting close-up look at the base of the thundering falls. (Tour boat ride at your own expense).

On leaving the Falls for Niagara-on-the-Lake, journey along the Niagara Parkway, where participants will have a chance to see the impressive Niagara Gorge, with its swirling whirlpool rapids; the massive power stations which provide hydro-electricity to southern Ontario and the north-eastern part of New York; the floral clock, one of the largest of its kind in North America.

A picnic lunch today will take place in the area of one of the famous battlefields of the war of 1812 between British and American armies at Queenston Heights Park. The picnic area is located on the brow of the Niagara escarpment and has a spectacular view of the broad Niagara River and fruitlands.

After lunch you will continue your trip on to Niagara-on-the-Lake, a charming 19th Century town which, as the first capital of Upper Canada, has a rich history and culture. The home of the world renowned Shaw Festival which draws both international performers and audiences, this tranquil town offers participants an opportunity to meander through quaint boutiques and tree-lined streets. Visit an old fashioned apothecary, explore some of the fine examples of 19th Century homes, and perhaps indulge in freshly made fudge and preserves.

Blue Jay Baseball and dinner at Windows

Tuesday, July 28, 1992
7:30 p.m. to 11:00 p.m.
Cost: $40 (US), $47 (CDN)

Let's go Blue Jays!

Enjoy an evening watching the Toronto Blue Jays play in the fabulous SkyDome Stadium. The SkyDome-billed as "like no other in the world" is being talked about by virtually every sports fan in North America. This incredible multi-use facility provides 55,000 to 70,000 fans with spectacular views in all directions and outstanding sight lines for a variety of activities, including all major sporting events and star-studded concerts. It is more than merely a sports stadium. This magnificent complex also includes a 450 room hotel with 77 rooms overlooking the playing field, a health club, a movie theatre, bars and restaurants.

Windows on SkyDome is an elegant, three tiered restaurant overlooking the stadium and features a delicious buffet dinner. A section of this unique restaurant, has been specially reserved for delegates attending the IAMFES 1992 Convention. Some tables offer full viewing of the playing field and others offer monitor viewing only, therefore seating will be assigned on a "first come-first serve" basis.

Guest Room Committment
GOOD UNTIL JULY 2, 1992
Make Your Reservation Now

HOTEL RESERVATIONS
IAMFES

79th Annual Meeting
July 26-29, 1992
The Sheraton Centre
Toronto, Ontario, Canada

Please check accommodation requested:

❑ Single (1 person)
❑ Double (2 persons 2 beds)
❑ King (2 persons 1 bed)
❑ Triple ❑ Quad

Special Requests _____

All room rates are subject to prevailing taxes. (5% PST and 7% GST and city occupancy levy).
Reservations must be received by hotel prior to arrival.

NAME _____

SHARING WITH (Name) _____

COMPANY NAME _____

ADDRESS _____

_____ CITY _____

STATE/PROVINCE _____ COUNTRY _____ ZIP _____

TELEPHONE _____

ARRIVAL DATE _____ (Check-In Time is after 3 p.m.) DEPARTURE DATE _____ (Check-out Time is 12 p.m.)

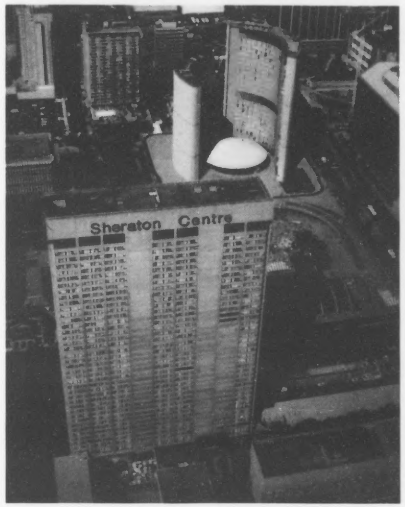
SPECIAL REQUESTS _____

After July 2, 1992 reservations will be accepted on a space availability basis only. Reservations will be held until 4:00 p.m. on the date of arrival, unless guaranteed by one night advance deposit, payable by money order, certified check or a Major Credit Card.

CREDIT CARD #_____ CREDIT CARD_____

EXPIRATION DATE _____

CARD HOLDERS SIGNATURE _____



SPECIAL CANADIAN ROOM RATES for this convention $90 Canadian plus tax . . . single/double occupancy,
$130 Canadian plus tax . . . triple/quad occupancy

****Suite Rates****
$225 - Small Suite
$325 - Large Suite

For Reservations Call:
(416)361-1000
or FAX (416)947-4801

MAIL DIRECTLY TO:

THE SHERATON CENTRE
C/O RESERVATIONS
123 QUEEN STREET, W.
TORONTO, ONTARIO,
CANADA M5H 2M9

79th IAMFES Annual Meeting Registration Form - Canadian Funds

Sheraton Centre Hotel — Toronto, Ontario — July 26-29, 1992
(Use photocopies for extra registrations)

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

If you wish to use a Credit Card, please use the U.S. Form.

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

Title Employer

Mailing Address (Please specify: Home Work)

City State Postal Code

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

Registration		Amount	Total Amount
	IAMFES Member (Banquet included)	$115 ($155 on-site)	
	Non-Member (Banquet included)	$172 ($213 on-site)	
	IAMFES Student Member	$ 29 ($ 29 on-site)	
	IAMFES Member One Day (Circle: Mon/Tues/Wed)	$ 58 ($ 80 on-site)	
	Non-Member One Day (Circle: Mon/Tues/Wed)	$ 86 ($109 on-site)	
	Spouse/Companion (Name): _____	$ 23 ($ 23 on-site)	
	Children (16 & Under), Name: _____	$ 23 ($ 23 on-site)	

Membership Information: For information on becoming a Member of IAMFES, please contact Julie at (800)284-6336.

			# of tickets	Total Amount
Other Fees: (Per Person)	Cheese & Wine Reception (Sun., 7/26)	FREE		
	CASA Loma Dinner (Mon., 7/27) - Adult	$ 47 ($ 52 on-site)		
	IAMFES Awards Banquet (Wed., 7/29)	$ 30 ($ 35 on-site)		
Spouse/Companion Events:	A Get-Acquainted Tour of Toronto and CN Tower (Mon., 7/27)	$ 20 ($ 25 on-site)		
	Historic Tour of Downtown and Restored Theatres (Mon., 7/27)	$ 14 ($ 19 on-site)		
	Niagara Falls and Niagara-on-the-Lake (Tues., 7/28) - Adult	$ 49 ($ 54 on-site)		
	Children (16 & Under) --	$ 35 ($ 40 on-site)		
	Blue Jay Baseball and dinner at Windows (Tues. P.M., 7/28)	$ 47 ($ 52 on-site)		

CANADIAN REGISTRATION FORM

Total Amount Enclosed $_____
CANADIAN FUNDS ON CANADIAN BANK

Registration Information

Send payment with registration to IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666. Make checks payable to IAMFES. Pre-registration must be post-marked by July 1, 1992. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337, 1-800-284-6336 (Canada).

Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $15.00 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 a colleague with written notification to IAMFES."

Exhibitor Information

An exhibition of products and consultant services will be at the Sheraton Centre Hotel. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337 (US), 1-800-284-6336 (Canada).

79th IAMFES Annual Meeting Registration Form - U.S. Funds

Sheraton Centre Hotel — Toronto, Ontario — July 26-29, 1992
(Use photocopies for extra registrations)

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Registration	IAMFES Member (Banquet included)	$100 ($135 on-site)		_____
	Non-Member (Banquet included)	$150 ($185 on-site)		_____
	IAMFES Student Member	$ 25 ($ 25 on-site)		_____
	IAMFES Member One Day (Circle: Mon/Tues/Wed)	$ 50 ($ 70 on-site)		_____
	Non-Member One Day (Circle: Mon/Tues/Wed)	$ 75 ($ 95 on-site)		_____
	Spouse/Companion (Name):_____	$ 20 ($ 20 on-site)		_____
	Children (16 & Under), Name: _____	$ 20 ($ 20 on-site)		_____
***New Membership Fees:**	Membership (*Dairy, Food & Environmental Sanitation*)	$ 50		_____
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Other Fees: (Per Person)	Cheese & Wine Reception (Sun., 7/26)	FREE	_____	_____
	CASA Loma Dinner (Mon., 7/27)	$ 40 ($ 45 on-site)	_____	_____
	IAMFES Awards Banquet (Wed., 7/29)	$ 25 ($ 30 on-site)	_____	_____
Spouse/Companion Events:	A Get-Acquainted Tour of Toronto and CN Tower (Mon., 7/27)	$ 17 ($ 22 on-site)	_____	_____
	Historic Tour of Downtown and Restored Theatres (Mon., 7/27)	$ 12 ($ 17 on-site)	_____	_____
	Niagara Falls and Niagara-on-the-Lake (Tues., 7/28)	$ 42 ($ 47 on-site)	_____	_____
	Children (16 & under)	$ 30 ($ 35 on-site)	_____	_____
	Blue Jay Baseball and dinner at Windows (Tues. P.M., 7/28)	$ 40 ($ 45 on-site)	_____	_____

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An exhibition of products and consultant services will be at the Sheraton Centre Hotel. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337, 1-800-284-6336 (Canada).

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1	-	600 Gal. Dome Top Pressure Wall Processor
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Coming Events

1992

June

•**2-3, Milk Procurement Workshop**, sponsored by the organizations of the International Dairy Foods Association, will be held at the Loews Giorgio Hotel Denver, Denver, CO. For more information contact IDFA Marketing & Training Institute, Attn: Registrations, 888 Sixteenth Street, NW, 2nd Floor, Washington, DC 20006-4103; (202)296-4250.

•**2-3, Texas Association of Milk, Water and Food Protection's Annual Meeting** will be held at the Howard Johnson South Plaza, Austin, TX. For more information please contact Janie Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**2-4, Short Course on "Feta and Other White Brined Cheeses"**, offered by the Minnesota-South Dakota Dairy Foods Research Center, will be held in the Department of Food Science and Nutrition, University of Minnesota, St. Paul. For more information, contact Sybil Woutat at (612)624-1764.

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

-•**8-12, Management of Underground Storage Tank Systems: IInstallation, Leak Detection and Corrective Action** sponsored by Georgia Tech, will be held on the Georgia Tech campus in the Space Science building. For more information contact The Georgia Institute of Technology at (404)894-2400, FAX (404)894-8925.

•**10-12, Freezing & Freeze-Drying of Microorganisms**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/ Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**14-17, International Conference on Seafood Irradiation** to be held at the Omni Royal Orleans, New Orleans, LA. For more information contact M. Kilgen or M. Cole at (504)448-4700, Nicholls State University, Thibodaus, LA 70310.

•**20-24, Institute of Food Technologists' Annual Meeting and Food Expo,** will be held at the New Orleans Convention Center, New Orleans, LA. For more information contact Daniel Weber, Insitute of Food Technologists, 221 N. LaSalle Street, Chicago, IL 60601.

•**22-July 3, Postharvest Technology Short Course**, sponsored by the University of California, will be held on the UC-Davis campus. For detailed information, contact Dr. Adel Kader at (916)757-8899.

July

•**10-17, International Workshop on Rapid Methods and Automation in Microbiology XII** and Mini-Symposium (July 10-11) at Kansas State University. Contact Daniel Y.C. Fung, Director, (913)532-5654 or FAX (913)532-5681, 207 Call Hall, KSU, Manhattan, KS 66506.

•**14-16, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Holiday Inn, Emerald Beach, 1102 S. Shoreline Blvd., Corpus Christi, TX. For registration information contact Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**26-29, 79th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians** will be held at the Sheraton Centre, Toronto, Ontario. For more information, please contact Julie at IAMFES, (800)369-6337 (US), (800)284-6336 (Canada) or FAX (515)232-4736.

August

•**4-7, Fermentation Microbiology**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

-•**9-14, The 49th Annual Meeting of the Society for Industrial Microbiology**, Workshop I - "Controlling Biotechnology Risks: A Holistic Approach to Safety and Environmental Protection" (August 9); and Workshop II - "Clean Room Management" (August 9), to be held at the Town & Country Hotel, San Diego, CA. For more information contact the Society for Industrial Microbiology at (703)941-5373 or FAX (703)941-8790.

•**10-14, Biotechnology: Principles and Processes** to be held at the Massachusetts Institute of Technology. For more information contact the Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139, Phone: (617)253-6721.

•**11-14, Fermentation Microbiology**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**24-28, Advanced Recombinant DNA Methodology**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/ Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**25-28, International Dairy Federation** Seminar on "Milkfat & Protein Processing" will be held in Munich. For more information contact Verband der Deutschen Milchwirtschaft, c/o Mr. T. Kützemeier, Meckenheimer Allee 137, D-5300 Bonn 1 (Germany), Tel: 228/638270; FAX: 228/638425.

September

•**1-4, Diagnostic Virology**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**14, Radiation Safety Seminar**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**14-15, Food Safety for Zero Defects**, sponsored by ASI Food Safety Consultants', will be held in St. Louis, MO. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

•**16, Reclamation and Environmental Concerns in the Food Industry**, sponsored by ASI Food Safety Consultants', will be held in St. Louis, MO. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

•**17, Employee Health, Hygiene and Practices in the Food Industry**, sponsored by ASI Food Safety Consultants', will be held in St. Louis, MO. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

•**17-18, Minnesota Sanitarians Associatoin, Inc. Annual Meeting** will be held at the Earl Brown Center, St. Paul, MN. For more information, please contact Paul Nierman (612)785-0484.

•**23-24, Wisconsin Associatioin of Milk & Food Sanitarians, Wisconsin Environmental Health Association and Wisconsin Dairy Plant Fieldmen's Association Joint Educational Conference** will be held at the Holiday Inn-Downtown, Eau Claire, WI. For more information contact Neil M. Vassau, P. O. Box 7883, Madison, WI 53707; (608)267-3504.

•**23-25, Freezing & Freeze-Drying of Microorganisms**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**24, Consumer Food Trends**, sponsored by the American Association of Cereal Chemists, will be held at AACC, 3340 Pilot Knob Road, St. Paul, MN. For more information, contact Marie McHenry, AACC Short Course Coordinator, (612)454-7250; FAX (612)454-0766.

October

•**5-6, The Eleventh Annual Midwest Food Processing Conference "Consumers: Driving Force For Our Future"** sponsored by the Chicago, Iowa, Minnesota and Wisconsin IFT sections, will be held at the Radisson Hotel in LaCrosse, Wisconsin. For more information, contact Ellen Bragg, MFPC Publicity Chairperson, Cargill, Inc., Salt Division, P.O. Box 5621, Minneapolis, MN 55440; phone: (612)475-6929.

•**7-9, Kansas Association of Sanitarians Annual Meeting** will be held at the Holidome, Great Bend, KS. For more information contact John Davis, Wichita-Sedgewick Co., 1900 E. 9th Wichita, KS 67214; (316)268-8351.

•**14-15, Annual Conference of the North Central Cheese Industries Association** will be held at the Holiday Inn, Brookings, SD. For further information, contact E. A. Zottola, Executive Secretary, NCCIA, P O Box 8113, St. Paul, MN 55108.

•**20-22, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For registration information contact Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**26, GMPs for the Food Industry**, sponsored by ASI Food Safety Consultants', will be held in Chicago, IL. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

November

•**5, Food Industry Sanitation and Food Safety Workshop**, presented by the University of California Cooperative Extension, will be held at the Anaheim Plaza Resort Hotel, 1700 S. Harbor Blvd., Anaheim, CA. For more information contact Heidi Fisher, Food Science and Technology, University of California, Davis, CA 95616; (916)752-1478.

•**8-12, PACK EXPO 92, The World of Packaging Technology**, sponsored by Packaging Machinery Manufacturers Institute (PMMI), will be held at the McCormick Place, Chicago, IL. For more information contact Bonnie E. Kilduff, Exposition Manager, PMMI at (202)347-3838 or FAX (202)628-2471.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

IAMFES

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

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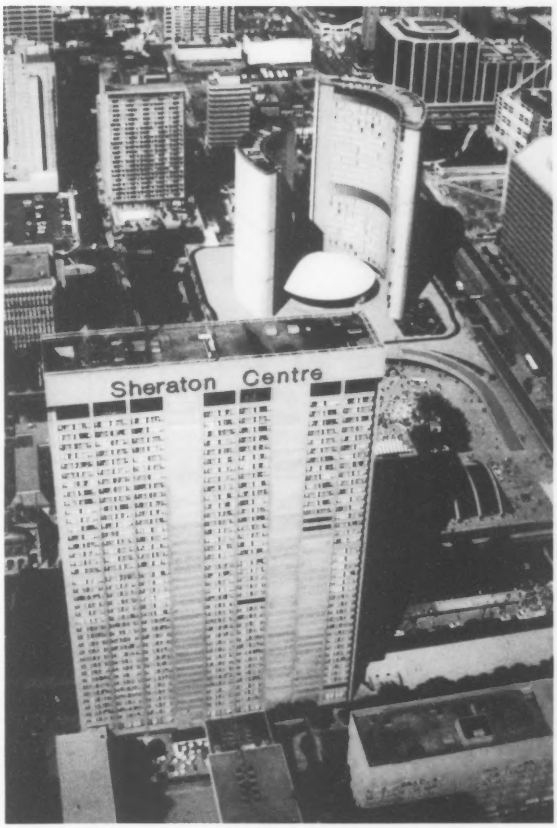

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