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DAIRY, FOOD AND ENVIRONMENTAL

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Purpose

1. To encourage graduate students to present their original research at the IAMFES annual meeting.
2. To foster professionalism in graduate students through contact with peers and professional members of IAMFES.
3. To encourage participation by graduate students in IAMFES and the annual meeting.

Who Is Eligible

Graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Criteria

1. A short abstract of the paper must be submitted to the IAMFES office by January 1 of each year. (Use the blue abstract forms from the October issue, if possible.)
2. The author must indicate on the abstract form the desire to be considered for the competition.
3. The paper and the student must be recommended and approved for the competition by the major professor or department head.
4. The paper must represent original research done by the student and must be presented by the student.
5. An extended abstract form will be sent to all who enter the competition, and must be completed and returned by the deadline date on that form.
6. Each student may enter only one (1) paper in the competition.
7. Papers are to be presented as oral papers and should be approximately fifteen (15) minutes in length with an additional five (5) minutes allowed for questions, for a total of twenty (20) minutes.
8. The use of slides or other visual aids is encouraged.
9. The papers will be judged by an independent panel of judges.
10. Awards will be presented at the annual IAMFES Awards Banquet.

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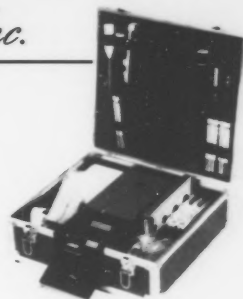
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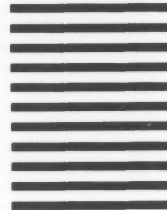
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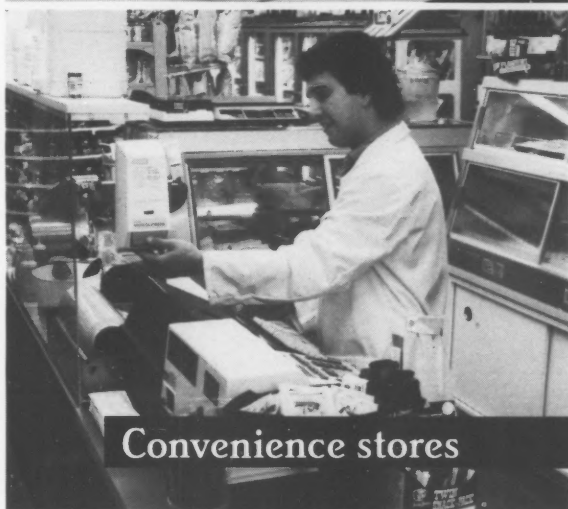
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Thoughts From the President . . .

By
Ron Case
IAMFES President



What is the purpose of an Association such as IAMFES? During the interviewing process for our Executive Manager, a candidate suggested that one of the main purposes of any association is to disseminate information. This is true of IAMFES. One of the objectives of our association, as given in the Constitution is, "Disseminate information regarding the protection of milk, food and the environment."

To meet this objective, IAMFES does a number of things.

- We publish the *Journal of Food Protection*, a premier international journal concerned with an adequate food supply that is safe, wholesome, nutritious and palatable. The original research published in this journal provides current information which is used in protecting and improving the food supply.

- We publish *Dairy, Food and Environmental Sanitation*, a less technical journal which provides practical information the professional sanitarian can use on the job. Articles dealing with recent food or environmental problems, pest control, waste treatment, new products, changes in regulations and standards, and association news provide information to our members.

- We publish other items such as the 3-A Sanitary Standards and Procedures to Investigate manuals which are considered the authorities in their areas.

- We hold an Annual Meeting with symposia and technical sessions on items of current interest such as the solid waste challenge, Salmonella outbreaks, new laboratory methods and modernizing dairy operations. The assembling of people from education, government and industry to discuss common concerns provides an opportunity for understanding seldom found elsewhere. Our affiliates also hold similar meetings to provide information on items of interest to the local members.

- We have the IAMFES Audio-Visual Lending Library containing numerous items that are available to members free of charge. These videos, slides, and audio tapes are in great demand for training programs and meetings.

How well is IAMFES doing in meeting our objective of disseminating information? From the items listed above, it appears that we are doing quite well. However, our view may be limited. In a professional organization, we tend to feel our audience is only the professionals, and therefore we address all of our information towards them. IAMFES's concern with the environment and food supply affects everyone. We must find ways to get our information to the public as well as our members. Means for doing this have not yet been developed, but I feel they must be in the near future if we are to adequately do our job of protecting and improving the environment and food supply. Your comments and suggestions are more than welcome in working toward that final goal.

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Dairy, Food and Environmental Sanitation

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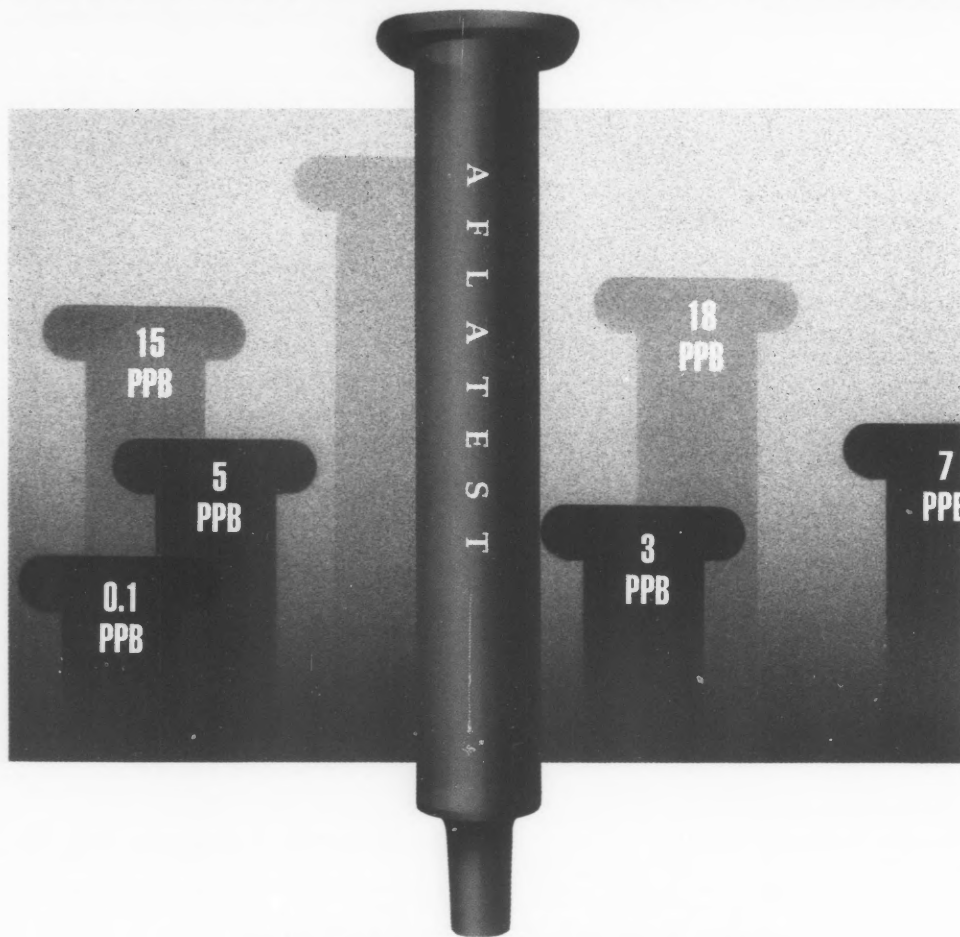
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Foodborne Illnesses of Tomorrow Are Here Today

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ABSTRACT

Major foodborne outbreaks occurring in the United States are considered. Factors which may be contributing to the widespread occurrences are: newly established pathogens including *Salmonella dublin*, *Y. enterocolitica*, *A. hydrophila*, Hemorrhagic *E. coli* and *L. monocytogenes*. The economic impact of foodborne illness is reviewed. Proper handling of food products including the use of adequate cooling temperatures must be emphasized to minimize the growing number of foodborne illnesses.

In recent years, grand scale foodborne outbreaks have been making our nation's headlines. The media has shockingly informed us of more than 18,000 confirmed cases of salmonellosis in Midwestern States. In 1983, a listeriosis outbreak in Massachusetts caused 14 deaths. *Listeria monocytogenes* in soft cheese again was responsible for 90 to 100 deaths in California. Eighty-eight cases of hepatitis have been linked to salad dressings in Oklahoma. More recently, *Salmonella* has been found in eggs in the Northeast. These are just a few of the examples leaving many more that go unmentioned. It is estimated that the actual number of foodborne illnesses occurring each year in the United States is likely to be between 69 and 275 million (Archer and Kvenberg, 1985)! In light of the overwhelming evidence of the current prevalence of foodborne illness, what then are the causative agents and contributing factors of these outbreaks?

Much of the literature speaks of the so called "emerging new pathogens". Yet these pathogens appear to have fully emerged. Amongst these are included *Salmonella dublin* with a 25% mortality, *Campylobacter jejuni*, *Yersinia enterocolitica*, *Aeromonas hydrophila*, Hemorrhagic *E. coli*, *Listeria monocytogenes* and the "Superbugs" which are antibiotic resistant bacterial strains within our food chain. Other pathogens are now appearing in unusual settings such as baked potatoes, sauteed onions (H. Solomon and D. Kautter, 1986), and chopped garlic (C. Haberstroh, 1987).

In addition, known pathogens such as *Bacillus cereus* and strains of *Salmonella* appear to have mutated and become capable of growth at temperatures as low as 41°F (CAP 1987).

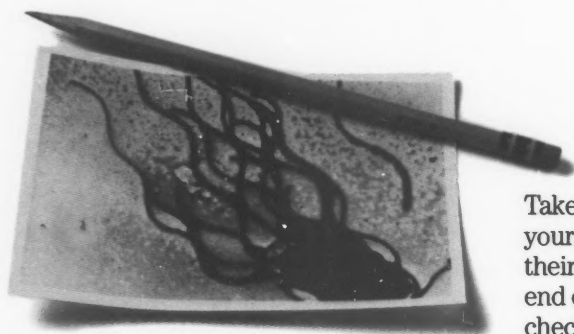
The most modern and effective defense against foodborne illness has been and continues to be the storage of foods at low temperatures. Yet organisms such as *Clostridium botulinum* type E, Enterotoxigenic *E. coli*, *Listeria monocytogenes*, *Aeromonas hydrophila*, *Yersinia enterocolitica* and *Vibrio* species have penetrated that defense! These organisms have adapted and are capable of growth in foods at temperatures of 37-41°F (CAP 1987).

Other factors which may be contributing to these outbreaks are the changes in our eating habits. The traditional methods of controlling bacterial growth in foods through the use of preservatives are now frowned upon as a result of "healthy" and "trendy" eating habits. For the sake of better nutrition, health trends also discourage the use of salt and thorough cooking practices, thus inadvertently increasing the possibilities of bacterial growth to occur. The popularity of consuming uncooked or undercooked seafoods such as sushi, sashimi, and rare tuna has increased in recent times, and at the same time provided no line of defense against bacteria. Microwaving is another contemporary food preparation method which may also lead to insufficient bacterial destruction as a result of cold spots in the cooking process (S. Kahn, 1986).

The principle factor contributing to outbreaks of foodborne illness reported in the U.S. from 1977-1982 is inadequate cooling (Bryan, 1988). As seen in Table 1, improper cooling again remained the principal factor in the CDC 1980-85 five year summary (B. Liska, 1986). A major aspect of improper cooling is holding foods at room temperature (Bryan, 1988). The lapse in time between preparation and serving of the food items was also a significant contributing factor.

Foodborne illness is a costly matter. The economic impact of an estimated 24-81 million cases per year of foodborne diarrheal disease represents an economic loss of

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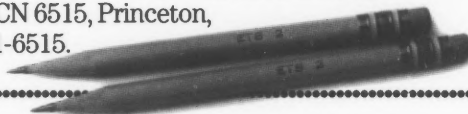
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\$5-17 billion due to medical care and lost productivity alone (Archer and Kvenberg 1985). Lawsuits associated with the listeriosis cheese outbreak in California have amounted to over \$800,000,000. The manufacturer has gone bankrupt and officers of the company were found to be criminally negligent and served prison sentences. Over \$30,000,000 have been paid in settlements for the milk *Salmonella* outbreak in the Midwest. The costs are not limited only to settlements or medical care. Afflicted individuals incur costs through loss of income and productivity. Their pain and suffering is also costly. Table 2 demonstrates the increasing number of million dollar personal injury jury verdicts from 1976-1985. The costs extend to the food industry as well through product recalls, plant closings, product liability costs, and reductions in product demands (W. Simoson, 1988). Finally, the costs also extend to public health surveillance for investigations and cleanups of outbreaks.

There appear to be no perfect solutions to this ongoing problem. Yet the risk of foodborne illness may still be reduced through first recognizing the existing threats of new or mutated organisms which have broken down traditional defenses. In light of the heartier strains which we are combating, adherence to Good Manufacturing Practices cannot be over emphasized. These practices must be carefully observed from the time food products are slaughtered or harvested, to the time they are processed, distributed, and prepared by foodservice establishments or consumers.

In-plant Quality Control programs monitoring the critical control points of the manufacturing process are essential for ensuring the safety and quality of the finished products. The success of such programs can be assessed through random microbiological testing. Development of microbiological guidelines for the various potentially hazardous food products can serve as useful alerting mechanisms for detecting a lack of adherence to Good Manufacturing Practices at any point during the processing, distribution, or storage of the products.

The use of effective cooling treatments of properly cooked foods is now, more than ever, imperative to the successful control of bacterial growth. Rapidly reducing the internal temperature of heated products from 140° to 45°F in a four hour period can greatly minimize the opportunity of organisms to establish themselves and subsequently cause foodborne illnesses. This rapid cooling can be attained through storing products in shallow pans, ice baths, or blast chillers.

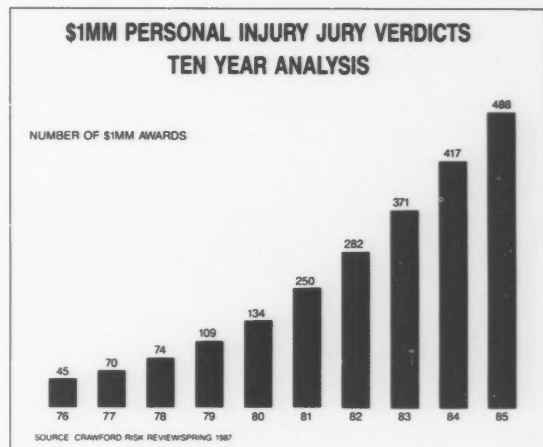
If we are to win the battle against widespread foodborne disease, priority must also be given to the continued education and training in proper food handling practices for all food handlers including the consumer. Educational programs which address the hazards and critical control points of food processing must be made available to personnel in processing plants and foodservice establishments. Not only must we ensure that safe, quality products enter our homes and restaurants, but we must also ensure that all additional processing is conducted under safe practices.

Through the cooperative efforts of all food handlers and the careful observance of Good Manufacturing Prac-

TABLE 1. FACTORS CONTRIBUTING TO FOODBORNE OUTBREAKS - CDC FIVE YEAR SUMMARY 1980-1985

FACTORS	% OF OUTBREAKS
Improper cooling	46
Lapse in time between preparing and serving	21
Infected persons touching food	20
Inadequate processing, cooking	16
Improper hot storage	16
Inadequate reheating	12
Contaminated raw food	11
Cross-contamination	7
Improper cleaning	7
Use of leftovers	4

TABLE 2.



tices and proper temperature controls, we can better meet the consumer's demand for product excellence by preserving the freshness, safety, and quality of perishable food products at all levels of food processing.

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The Scientists Tell Me . . .

Shelf Life of Corn Tortilla Extended by Preservatives

By Robert L. Haney
TAES Science Writer

Column 670, Dept. of Agricultural Comm., Texas A&M Univ. System, College Station, TX 77843

Tortillas are a staple food throughout Mexico and Central America. In the United States, they are used in a variety of ethnic foods such as tacos, enchiladas, tostadas, and tortilla chips.

Growing demand for fresh table tortillas and preservation and marketing problems prompted a recent study by scientists with the Texas Agricultural Experiment Station (TAES).

Most tortillas sold in the U.S. in the past were distributed or marketed under refrigerated conditions to extend shelf life. However, because of consumer marketing trends and expanded volume, tortillas were moved from refrigerated areas to dry storage shelves of supermarkets.

This forced tortilla manufacturers to find alternative methods to control the staling rate and bacterial activity to extend the product's shelf life. But there was very little practical information available for tortilla manufacturers on the use of preservatives, according to Dr. Gary Acuff, Texas Agricultural Experiment Station food microbiologist at Texas A&M University.

"The most popular method to extend shelf-life of corn tortillas is to produce a product highly alkaline (pH 9 or above) by addition of hydrated lime (calcium hydroxide). However, addition of lime affects the appearance of the tortillas, producing a yellow product," Acuff said.

"Little information is available on the effect of lime content on the microbiological shelf life of corn tortillas. Addition of antimicrobial agents, waxes and gums to prevent staling and extend shelf life of tortillas also is a common practice in industry," he said.

"Our study presents information on the use of common antimicrobial agents to extend shelf life," Acuff said.

Tortillas were collected fresh, on the day of production, from three tortilla factories by the TAES researchers (Acuff, Alfredo Tellez-Giron, Drs. Lloyd Rooney and Ralph Waniska). Each factory used different amounts of various preservatives in preparing of the tortillas.

The commercial tortilla manufacturers who supplied the product conducted cleaning operations after each production shift. But the plants lacked adequate sanitation and

proper ventilation of the facilities, Acuff said. During production hours, windows and the service back doors leading to the loading docks and alleys were left open to cool the production areas.

The shelf life of most of the commercially-produced corn tortillas was under eight days. However, mold and yeast counts for one of the products did not increase during the storage period, and this product did not spoil through the duration of the study (14 days).

This particular product was kept under visual observation for 45 additional days without visual spoilage. The extended shelf life of this product was probably obtained by the addition of an extra 1.0 percent of a commercial antimicrobial mix to the corn flour, which already contained an undisclosed amount of other antimicrobials," Acuff said.

Analysis of these tortillas in the laboratory showed they contained four times more propionic acid and twice the amount of fumaric acid than recommended by commercial antimicrobial suppliers.

At Texas A&M's food laboratories, tortillas containing different amounts of preservatives were manufactured, Acuff said. Six different preservative treatments were tested in the manufacture of nonacidified tortillas and eight different preservative treatments, each acidified with 0.45 percent fumaric acid, were also studied.

The tortillas were packaged and stored at 77° F and 39° F for a maximum of 60 days. Visual checks for mold growth were made daily and storage was discontinued if visible spoilage (mold) was present.

"Results of this study indicated that refrigerated storage extends the shelf life of corn tortillas substantially and could be an alternative to addition of preservatives," Acuff said.

"However, this option would have to be justified by high consumer demand since the high cost of refrigeration, the low profit margin of corn tortillas, and the reduced availability of refrigerated display space for tortilla products in supermarkets may make this option impractical," he said.

"Alternatively, addition of antimicrobials can increase

shelf life substantially, particularly when used in acidified tortillas. Manufacturing and preservative standards need to be established and observed in producing this important food," Acuff said.

Many tortilla manufacturers lack information and knowledge regarding the correct use of antimicrobial agents and may not follow "good manufacturing practices."

Importance of adequate storage practices, proper sanitation and ventilation of the facilities should be stressed and strongly recommended to manufacturers to reduce the high initial microbial counts and amounts of preservatives presently used with corn tortillas, Acuff said.

Editor's Note: Any question regarding this column should be addressed to Science Writer, Department of Agricultural Communications, Texas A&M University, College Station, Texas 77843.

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By Gene Rosov, President
 WaterTestSM Corporation of America

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Gene Rosov

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Selfcare, Self Inspection and S. A. F. E. Program in Food Related Health Services

Satyakam Sen, M.A., M.S., D. Phil, R.S.
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The understanding of food-health interactions is extremely critical to maintain a normal state of health, as well as recovery from an illness. The food-health relationship is a complex phenomenon. The societal focus for the remedy of health matters is always changing. At present, society is placing more emphasis for caring the victim rather than spending the money, time, and energy to search the suspect, especially when identification is difficult. To a layman, the risk is unpredictable, but the victim's experiences are known facts from which food-health related variables should be taken care of. Besides, WHO's 2000 AD "Health for all" slogan directs us towards health services that will achieve the normal or well being state in primary health care services.

Food safety, food selection, and food therapy are three major health care practices which are an integral part of Public Health, Health Promotion, and Medicine respectively. Self care practice is a valuable food-health connection tool which provides a strategy in promoting health and the well being of an individual. The selfcare practices are prevalent in health promotion and medicine, but could easily be extended to disease prevention (public health) activities through the S.A.F.E. approach. S.A.F.E. would enable all food consumers to develop the surveillance ability to monitor safe foods, to develop a good perspective on and judgement of food selection, and develop the coping auto-therapeutic skills to reverse health disorders to a state of well being.

Food-Health Relationships

Food substances and the health of the human body are two different arenas for discussion, although they are intimately linked by the environmental and health factors in the background of the time dimension. The three major variables; the body or the physiological functional mechanism, food substances, and the time clock, all have an impact on the order-disorder state (well being or illness condition) of the human body, mind, and spirit. Besides, it should be noted that the relationship of ingested food substances to health state is based on genetic, physiological, and environmental factors which vary from individual to individual.

The individual's health component requires positive action of the ingested food substance based on the synchronization - desynchronization factors of various interacting

processes of basic and other interrelated variables. The preventative measures of foodborne disease outbreaks in a food service establishment are aimed at proper food hygiene and sanitary practices by adopting regulatory measures. For this reason the food movement in a food service establishment from the receiving area to the service table is monitored to ensure quality assurance. It is interesting to note that the processing of food substances inside the human body are similar to the functional activities of different segments of food service operation. The mouth or food intake point is the receiving area.

The food substance moves to the stomach, the storage area, through the esophagus, the push cart or conveyor belt, and from the stomach the ingested particles enter into the small intestine which is a food preparation area, which supplies the cooked product to billions of consumers, the body cells. After cooking, the waste products are thrown into the large intestine, the waste receptacle or dumpster. After accumulation it goes to its final destination, the anus, which is the ultimate disposal site. The action and interaction of cooked products on the cell bodies gives us the signal through which the normal-abnormal body performs a conditional and behavioral response, which is popularly known as normal health state or illness.

The role food plays with the use of safety measures, the proper selection and therapeutic practices for illness management, health maintenance and disease prevention is significant for achieving a harmonious balance of environmental ingredients and human body properties in the context of the time clock.

Safety, Selection, and Therapy

The aim of food safety is to protect humans from injury and illness due to consumption of unwholesome and contaminated food. Public Health Services include sanitary measures of foodborne microbiological contamination by surveillance activities of enforcement professionals. The present trend is to focus environmental monitoring on certain check points in the food chain process rather than listing of code violations by megascopic observation.

Food selection on the other hand is the use of judgement on the part of the consumer to provide a perfect balance

between the external and internal environment by the food that is ingested. A balanced diet with the right type of food intake according to body need accelerates circulation and rejuvenates the organs, body tissue, and cells. The proper food intake strengthens the natural functioning processes of the body and promotes the healing capabilities of the physiological system. Improper food intake produces stress beyond the tolerance limit and disrupts the functioning mechanism. The food intake and its relationship with the time clock is significant because some food lubricates the clock and some food clogs it.

Food has been prescribed for treatment in medicine in all times. Recently the role of food as a therapeutic element in intervening chronic-degenerative and specific illnesses has widely been accepted by clinical practitioners and the public at large. Food being the first line of defense in its relationship with an abnormal state of health is explored. During the era of exploration, the individual's self help and coping skills confronted by illness receive considerable attention in therapeutic intervention. Food therapy, therefore, is vital in healing and intervening with illnesses.

SelfCare and Self Inspection

Selfcare is a self-insured, self evaluated, and self reinforced life style. In selfcare practice the individual assumes the responsibility of performing procedural tasks. The proper diet constitutes an important element today for health maintenance and the recovery from illnesses. Selfcare health practice is an integral part of food selection and therapeutic intervention. Though the safety of the food is an environmental issue, it has an enormous scope to reduce the health related risk factors of contamination and toxicity.

The self-inspection is a kind of selfcare in a food service establishment to ensure consumer safety and wholesome food, and minimize the risk of foodborne illness. Self inspection, as stated in the National Restaurant Association's (NRA) brochure entitled *Make a S.A.F.E. Choice*, is a "voluntary control" within the establishment for "complying government regulations to avoid crisis and costs." The sanitary self-inspection improves the quality of food substances during processing, storage, and service, but cannot guarantee the morbidity of the consumers, which is intimately interlinked with health state variables. The environmental monitoring of food substance, the food handler's health, hygienic practices, and the consumers adjustment of the menu with health state, etc. are all important parameters of the self assessment of food preparation activities in a food service establishment.

S.A.F.E.

S.A.F.E. is an abbreviation of Sanitary Assessment of Food Environment, a modification of the Hazard Analysis Critical Control (HACCP), introduced by the National Restaurant Association (NRA). The S.A.F.E., HACCP and IRF (Inspection Report Form) are the three approaches to provide safe food and to minimize the occurrence of food-

borne outbreaks to consumers. The IRF evaluates the food environment by identification of contamination sources through megascopic observation. The HACCP evaluates the microbiological risk contamination factors associated with the flow process steps. The evaluation objective of S.A.F.E. is quality assurance through self-inspection and self regulation. S.A.F.E. is designed to simplify the HACCP investigation procedures, which emphasizes food-contaminant related factors, although undermining many areas of food-health linkages.

S.A.F.E. is an auditing system which unconsciously accepts the concept of self regulation through a self inspection program. It establishes the connection with selfcare health practices which are interlinked with the illness and well being.

S.A.F.E. terminology needs a slight readjustment by replacing the word "sanitary" by self and extending the connotation of the term "environment" for serving all areas of food-health related factors. The term "environment" would include the food chain process prior to food intake and the food movement and its relationship with physiological functional mechanisms inside the human body after food consumption.

S.A.F.E., with the inclusion of the word "self" and also the extended terminology of environment (external and internal body environment), has attained the flexibility to contribute to the preventive, curative, and promotional health related services. S.A.F.E., with a selfcare component, would



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present an effective liaison between the quality of the food environment and the status of health.

The Future

Consumers derive benefit for their health and well being from the three types of health care services, which are preventive care, selfcare, and curative or therapeutic care. The preventive care came into existence during the end of the eighteenth and nineteenth century with the advent of industrialization and urbanization. As a result of it environmental sanitation was practiced especially in urban areas to improve the sanitary conditions and standards of living of the poor. Prior to World War II, the preventive care and curative care constituted to the entire spectrum of the health care delivery system. Since World War II, the primary health care and health promotion activities to upgrade the health status of the people have received considerable attention.

The last decade of this century will witness more resistance to change because the established professionals are apprehensive of losing financial security and the market of their clientele. There should be no disarray or confusion for health oriented food service practitioners. Food safety, food selection, and food therapy are all interwoven and contribute to the health and well being of humans.

Consumer oriented health care services are the blue print for the health structure of the future. Selfcare is an

indispensable element in all types of health care systems. Selfcare can always address new sets of health related food consumption problems.

Selfcare through food helps in all situations of mortality, morbidity and well being conditions. Self assessment of the Food Environment or S.A.F.E. promises the future by reducing the risk factors of foodborne illnesses, the right judgement in selecting food for well being, and life extension and recovery from illness and damages of the body.

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AUSTIN M. FRISHMAN, Ph.D., Specialist in Structural Pest Control reports . . .

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Veterinary Public Health and the Challenge of Effective Foodborne Disease Control Education-Training-Information Programs

John R. Molenda, PH.D., M.P.H.
Dean, School of Science, Salisbury State College, Salisbury, Maryland 21801

INTRODUCTION

The well-established causes of bacterial foodborne disease, such as *Salmonella* and *Staphylococcus*, have been joined by recently appreciated species of bacteria such as *Listeria*, *Campylobacter*, and *Yersinia*. These agents represent sleeping giants in the world of foodborne illness. More information on them will have to be accumulated through research. The fruits of these efforts, then, will have to be meaningfully translated and incorporated into Education-Training-Information Programs so that everyone concerned with food handling can understand their spread and thereby help in the control of these potential menaces. Following is a closer look at each of these microorganisms with particular emphasis on their role as foodborne pathogens.

Listeria monocytogenes

Infection with *L. monocytogenes* is especially hazardous during pregnancy since it can be transmitted to the fetus, resulting in abortion or an infection of the newborn which can have a fatality rate from 30-50%. Mothers so infected usually recover uneventfully postpartum. The course of Listeriosis in normal adults is usually one of a mild febrile illness. However, in the elderly or immunocompromised, an acute meningoencephalitis can occur with varying rates of fatality.

Infection can occur through direct contact with materials contaminated with animal fecal matter. It can also result from the ingestion of contaminated vegetables, milk, or cheese, as is witnessed by the following episodes.

In 1981, Schlech *et al* investigated an outbreak of adult and perinatal infection caused by *L. monocytogenes* in Canada. Their findings suggested that the outbreak which involved 41 cases, 34 of which were perinatal, was associated with the ingestion of coleslaw. A total of 18 deaths, representing a mortality rate of 44%, occurred in this outbreak. Investigations revealed that cabbage used to make coleslaw was grown on a farm in fields that had been fer-

tilized with manure obtained from a flock of sheep that had experienced Listeriosis. Cabbage, which was harvested late in the fall, was stored in a cold storage shed during the winter. In early spring, some of it was shipped to a plant where it was made into coleslaw. The process did not involve any cooking of the cabbage.

The optimum temperature for this bacterium is 37° C; however, growth takes place over a wide range and can occur as low as 2.5° C. Therefore, the organism had ample opportunity to grow during the overwinter storage. The organism was isolated from ill individuals as well as stored samples of coleslaw.

During the summer of 1983, the first well-documented foodborne outbreak attributed to *L. monocytogenes* occurred in the United States in Massachusetts. The vehicle was identified as pasteurized milk, which raised questions about the ability of pasteurization to effectively eradicate all *Listeriae* from a heavily-contaminated milk sample. Survival during pasteurization was suspect because defects were not found in the pasteurization process, nor could any source of post-pasteurization contamination be identified.

The milk involved in this outbreak came from farms on which Listeriosis was present. The organism was found in raw milk prior to pasteurization as well as in milk filters in the plant, but was not isolated from any pasteurized samples. Statistical analysis, however, did significantly incriminate pasteurized milk as the vehicle of this outbreak. The outbreak involved 49 cases, 42 of which were classified as adult cases, while seven occurred in mother-infant pairs. The case fatality rate in the adult category was 29% in that 12 of 49 individuals died. All of the individuals in this adult category had pre-existing illnesses or conditions which resulted in immunosuppression. These included among others, various forms of cancer, diabetes, and renal transplants. In the mother-infant cases, there were two deaths out of 12 cases representing a case fatality rate also of 29%. It was speculated that because of the ability of this organism to exist as an intracellular parasite, possibly a few organisms might have survived pasteurization in a heavily contaminated sample. Coupling this with the fact that this

microorganism multiplies at refrigeration temperature could have accounted for illness.

Another major foodborne outbreak of Listeriosis occurred in the United States in 1985. The vehicle in this incident was identified as Mexican-style soft cheese produced by a California manufacturer. Most of the cheese produced by the plant was distributed in Los Angeles and Orange Counties; however, products made by this same plant were distributed to most parts of California and 16 other states.

The outbreak involved 142 cases of which 47 died, for a mortality rate of 33%. There were 29 fetal and neonatal deaths, and 18 deaths in immunocompromised patients respectively accounting for 61.7 and 38.3% of the deaths.

The incriminated microorganism was *L. monocytogenes* serotype 4b. Isolations were made from the ill and from packages of the incriminated cheese which were purchased from markets in Los Angeles. In addition, the agent was isolated from several environmental samples collected in the incriminated plant. Contracting this agent is particularly risky during pregnancy since it can be transmitted to the fetus. In addition, since immunocompromised patients are also at high risk, it probably poses a significant threat to AIDS patients.

The controversy surrounding the survival of this agent during the pasteurization process is one which must be resolved since research reports present conflicting views on this matter. Regarding the animal reservoir of this bacterium, since it has been found as a freelifving agent in mud and water, it can readily contaminate silage. Therefore, improperly fermented silage which has over-wintered could lead to infection of animals. This in turn could serve as a means of introducing this agent into the human food chain.

Campylobacter jejuni

The causative agent of *Campylobacter* enteritis is *Campylobacter jejuni*. It was formally known as *Campylobacter fetus* subspecies *jejuni*. However, the name was changed to its present designation in 1981.

The first outbreak of *Campylobacter* enteritis in the United States occurred in June of 1978 in Vermont. The outbreak took place in a town that had a population of 10,000, and it was estimated that about 2,000 residents were afflicted. Epidemiologic investigation revealed a statistically significant association between illness and the consumption of the town's drinking water. The water was chlorinated, but not filtered. However, it was found that the water at several points in the town during the outbreak showed no detectable chlorine.

Also in June of 1978, a Colorado farm family of five experienced an outbreak of *Campylobacter* enteritis. Three members of the family were afflicted and *C. fetus* subspecies *jejuni* was found in their stools. All three ill family members consumed raw milk obtained from the family cow. The organism was isolated from stools of the cow.

In the following year, a series of *Campylobacter* outbreaks occurred in Iowa. In one of these a 14-year old boy

developed severe diarrhea for which he was hospitalized. *C. fetus* subspecies *jejuni* was isolated from his stool. He gave a history of plucking chickens four days prior to becoming ill. Fecal cultures on the chickens from the farm were positive for causative agent. In addition, consumption of undercooked barbecued chicken was suspected as being the source of infection in a few other outbreaks of *Campylobacter* enteritis which also occurred in Iowa during this same year.

In March of 1981, an outbreak of *Campylobacter* enteritis occurred in Kansas among individuals who regularly consumed raw milk produced by one dairy farm. In a study of 55 individuals who regularly consumed raw milk from the incriminated dairy, 39 or 71% became ill. The organism was isolated from their stools as well as from rectal swabs obtained from cows on the implicated dairy farm. However, it was not recovered from any raw milk samples. Two outbreaks of *Campylobacter* enteritis occurred in May of 1983 among Pennsylvania school children who visited dairy farms on school field trips. In one incident, 64 first grade students and their accompanying teachers were served raw milk and cookies as refreshments. Eleven became ill. The organism was recovered from the stools of an ill child. Raw milk collected on the farm was cultured, but was not found to contain the organism.

In the second Pennsylvania outbreak, 26 of 45 kindergarten children and their teachers who visited a dairy farm became ill. They were also served raw milk and cookies. One ill child was hospitalized whose stool proved to contain *C. jejuni*.

In these two outbreaks it was noted that none of the individuals in either of the farm families reported being ill, though they routinely drank raw milk.

Two similar incidents occurred in California (10,12). In the first incident, which occurred in 1984, 28 kindergarten children and seven adults visited a certified raw milk bottling plant. They were served ice cream, kefir, and certified raw milk. After the visit, nine children and three adults became ill. *C. jejuni* was recovered from stools of nine of the ill. The second California outbreak occurred in 1985 and also involved a group of students and teachers who made a field trip to a dairy where they were served raw milk.

In view of the many incidents of *Campylobacter* enteritis that were related to school children who were served raw milk on field trips to dairy farms or plants, the United States Food and Drug Administration issued an advisory to state school officials in June of 1985 which recommended that children not be permitted to consume raw milk on such trips.

There are several references throughout the literature which indicate that *C. jejuni* is probably the most common cause of enteritis. It is reported to be responsible for more enteritis than *Salmonellae* or *Shigellae*. Worldwide interest in this form of foodborne illness was evidenced by the many papers presented on this topic at the Second World Congress on Foodborne Infection and Intoxication held in Berlin in May, 1986. Papers were presented by individuals from

several countries including: Scotland, the Federal Republic of Germany, Australia, Israel, Great Britain, Trinidad, and Egypt.

Regarding control, pasteurization will reduce the spread of this agent through milk, and the same protective measures which prevent the spread of *Salmonellae* in food will also prevent the spread of foodborne campylobacteriosis.

Yersinia enterocolitica

The first major foodborne outbreak caused by *Y. enterocolitica* in the United States occurred in 1976. This incident involved 218 school children from five Oneida County Schools in New York State. Thirty-three children were hospitalized with suspected appendicitis, of whom 13 underwent appendectomies. The illness was associated with consumption of chocolate-flavored milk in school. It was produced at a local dairy where the chocolate flavor was added after the milk had been pasteurized. The bacterium was isolated from one of four stored containers of chocolate milk.

Following this, in December of 1981 and January of 1982, an outbreak occurred in the State of Washington. The vehicle in this outbreak was *tofu*, which is an oriental soybean curd product which in this incident was packed in untreated spring water. There were 87 cases of which 56 were culture positive. Seventeen patients were hospitalized, of which two underwent appendectomies.

The largest foodborne outbreak in the United States caused by this agent occurred in an interstate outbreak during June and July of 1982. Epidemiologic investigation incriminated pasteurized milk bottled at a plant in Memphis, Tennessee, as the vehicle of infection; however, the organism was not found in milk samples. There were 172 culture positive cases, most of which required hospitalization. There were 17 appendectomies among the afflicted. Subsequent epidemiologic investigation revealed that outdated milk from the incriminated dairy plant was sent to a hog farm where it was utilized as feed. The same serotype found in the outbreak was isolated from a milk crate found on the hog farm. It was speculated that the microorganism found its way into the dairy plant environment through crates that were contaminated on the hog farm and then returned to the plant.

Laboratory attempts to isolate this microorganism are enhanced by cold enrichment in buffered saline at 4° C which helps facilitate recovery, especially in cases of carriers who are shedding only minimal numbers of the agent. This indicates that this microorganism survives and multiplies well at refrigeration temperatures. Therefore refrigeration after post-pasteurization contamination with this microorganism would not prevent infection upon human consumption.

It is generally felt that *Y. enterocolitica* will not survive pasteurization temperatures; however, post-pasteurization contamination or faulty pasteurization is conducive to disease production since this organism has been found in raw

milk.

The distribution of *Y. enterocolitica* is worldwide; the main reservoir seems to be poultry and swine. Its mode of transmission is fecal to oral, or by consumption of fecally contaminated food or water.

Since infection with this agent can mimic appendicitis, proper diagnosis is important to prevent the risks associated with unnecessary surgery. More serious implications would be involved in a misdiagnosis of appendicitis as yersinosis.

Education-Training-Information Programs In Foodborne Disease Control

The preceding discussion dealt with three species of relatively recently appreciated foodborne pathogens. It contained a vast amount of information of considerable public health significance. It was pointed out that *Listeria monocytogenes* can cause fatal infections in man; that *Campylobacter jejuni* probably represents the most common cause of enteritis; and that *Yersinia enterocolitica* can lead to unnecessary surgery by causing infections that mimic appendicitis.

The circumstances surrounding the outbreaks previously discussed represent significant and interesting public health occurrences. Yet there seems to be difficulty in incorporating material such as this or similar information on other pathogens into effective foodborne disease Education-Training-Information Programs. These programs are essential components in the overall scheme of foodborne disease control, yet they often represent the weakest links in the control chain.

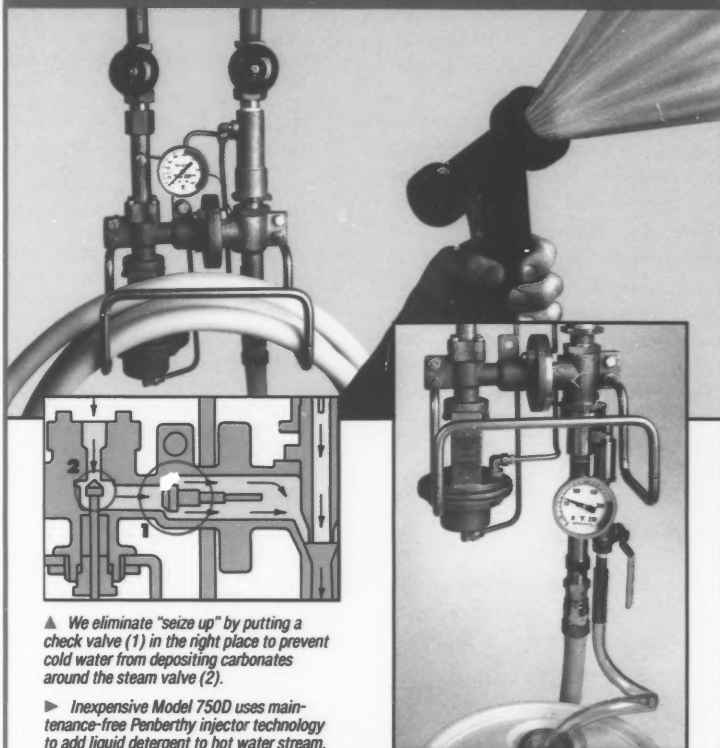
As witness to this ineffectiveness, there has been a decline in the emphasis of food hygiene in some programs at institutions of higher learning. Dr. W. R. Miller pointed out the deemphasis of food hygiene that has occurred over the past few decades in the United States in schools of veterinary medicine. In addition, college and university-level courses in nutrition are taken by students in many varied fields. However, food safety and food hygiene are not considered significant topics as can be witnessed by a simple perusal of the tables of contents of nutrition textbooks used in today's classrooms.

Training programs taken in food hygiene by professional food handlers are often considered boring and not a very interesting phase of their professional development. Participation is very often motivated by guideline requirements that must be met.

Consumer information programs are usually sporadic and short lived, and usually follow on the heels of an outbreak that received a lot of attention in the news media.

It is obvious that the aforementioned program areas are in need of revitalization. Programs dealing with foodborne disease control must be reviewed not only to include up-to-date information on newly appreciated pathogens, but also to include recently acquired information on the changing epidemiologic picture of some of the more classic foodborne pathogens such as *Clostridium botulinum*.

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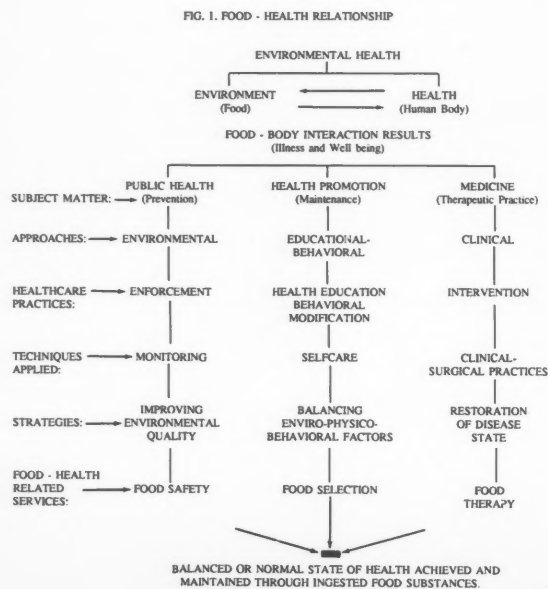
To help alleviate some of these problems when specific training programs for professional food handlers are being established or reviewed, one of the main planning considerations should be the target population. The program should be easily understood by the audience and should contain examples of actual foodborne outbreaks to which they can identify. Outbreaks should be discussed which the participants are apt to encounter in their actual workplace. This would help establish relevance and help capture attention. The example outbreak should first be presented and then critically analyzed during which time breaks in proper food handling procedures can be identified so as to establish cause. Once this is done, preventative steps should be discussed; hence, the concept of prevention established. In this way, some very basic principles of foodborne disease control can be established. These being - having the participants identify with an outbreak of foodborne disease, recognize cause, and recommend preventative measures.

Regarding improvement of education programs at institutions of higher learning, curricula will have to be reviewed and food hygiene given the attention that it rightfully deserves. Consumer enlightenment programs will also have to be reviewed and enriched with information that is timely, interesting, relevant, and understandable by the general populace.

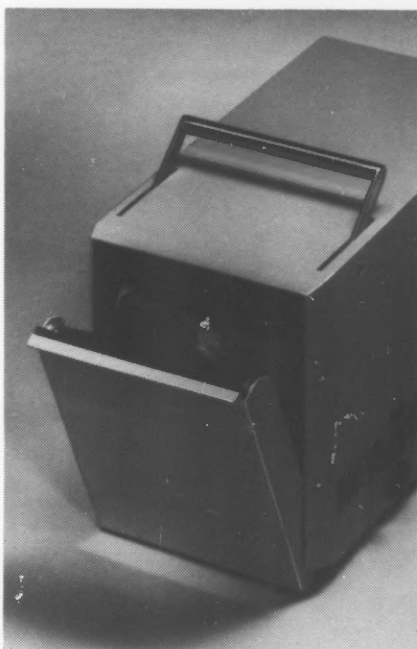
Everyone eats, yet too many people know too little about foodborne disease. This situation must be changed. Therein lies the challenge to the Veterinary Public Health Community.

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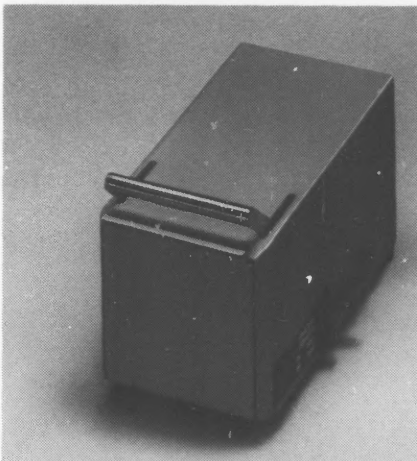
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Contact Bob Gravani, 8A Stocking Hall, Cornell Univ., Ithaca, NY 14853 with information on your nominees. Present Executive Board members are not eligible for the 1990 awards.

The awards are as follows:

*Sanitarian's Award. This is a \$1000 award and plaque presented to any Sanitarian for outstanding professional contributions during the past seven years.

*Harold Barnum Industry Award. This \$500 award and plaque will go to an industry representative in 1990. It is presented for service to food safety and sanitation.

*Educator Award. This \$1000 award and plaque will be presented to an educator. It is presented to a person who has shown outstanding service to food safety and sanitation.

*Citation Award. This plaque will be presented to an IAMFES member for dedicated service to the Association in helping fulfill its objectives.

*Shogren Award. This \$100 award and certificate will go to the affiliate organization with the best state or regional program and participation in IAMFES.

*Honorary Life Membership. A plaque is presented to a member who has shown long and extensive service to IAMFES along with a lifetime membership to the Association.

*Certificate of Merit. This is presented to members who are active within their state and international group.

Annatto Food Colorings, Starter Distillate Unlikely Sources of Listeria Contamination

Listeria monocytogenes does not live long in certain commercial food colors and flavorings. Even if contaminated during manufacture, these products should be safe after going through shipping and distribution networks, according to University of Wisconsin-Madison food microbiologists F.E. El-Gazzar and E.H. Marth.

Listeria monocytogenes is a widespread pathogen that has caused a number of outbreaks of foodborne illness. The bacterium can grow at refrigerator temperatures.

The researchers studied the survival of *Listeria* in different food colorings - four water- or oil-soluble annatto extracts and a water-soluble turmeric extract.

They also examined *Listeria* survival in a starter distillate, which is a food flavoring distilled from cultured milk. Starter distillate is used in cottage cheese, process cheese, ice cream, butter and margarine, yogurt, and other foods.

They studied three strains of *Listeria* - Scott A, V7, and California. Four levels of inoculation, from 1,000 to 1 million cells per milliliter, represented moderate to severe contamination.

All cells died immediately when added to the water-soluble annatto extract and turmeric extract. *Listeria* can't grow at a pH above 9.6, and the annatto extract was highly alkaline (pH 13.3). Propylene glycol in the turmeric extract probably killed the bacteria, El-Gazzar said.

Most California-strain cells died immediately when added to the three fat- or oil-soluble extracts. El-Gazzar said *Listeria* numbers dropped from about 1 million per ml to 800 or less per ml as soon as he added the inoculants to the extracts. He found no surviving cells after a week of storage at room temperature. Other ingredients in the extracts - propylene glycol, mono- or diglycerides, or potassium hydroxide - probably killed the cells, he said.

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In the starter distillate, all levels of the California strain were greatly reduced but not eliminated after one day of storage at 7 degrees C (45 F). Increasing the inoculum from 100,000 to 1 million increased the number of surviving bacteria, El-Gazzar reported. He found no surviving cells at any level of inoculation after a week of storage.

Stains of V7 and Scott A appeared to be more resistant to the effects of the starter distillate. They both survived in small numbers after a week of storage at 7 degrees C, even at low inoculation levels. Both strains were gone after 28 days, however.

Storing these types of colorings for seven days, and flavorings for 28 days, is probably long enough to inactivate any *Listeria* that may have contaminated the fresh product, El-Gazzar said. "Commercial colorings and flavorings of this type should be safe after going through shipping and distribution networks, unless they're recontaminated at the food processor and then immediately added to a product. Even then, *Listeria monocytogenes* will probably not survive in the highly alkaline annatto-based colorings that we tested," he concluded.

El-Gazzar discussed these findings at the joint annual meeting of the American Dairy Science Association and the American Society of Animal Science in Lexington, Ky.

For more information, contact Fathy El-Gazzar, (608) 262-0545.

For Trade Journals

A meeting of Commission C2 of the International Institute of Refrigeration (IIR) on "Chilling and freezing of new fish products" will be held in Aberdeen, Scotland from 18-20 September 1990. It is being organized by Torry Research Station, Aberdeen, the UK Government centre for research/fish technology. The meeting of Commission C2, which is concerned with Food Science and Technology, will in addition to covering chilled and frozen storage of fish generally, give prominence to the more recent developments in surimi technology, fish and shellfish farming and packaging. It is hoped that the papers presented will cover the following topics.

- a. Chilled fish and shellfish
- b. Frozen fish and shellfish
- c. Farmed fish and shellfish
- d. Fish gel products (surimi/kamaboko)
- e. Pre-cooked and microwaveable products
- f. Legislation, labelling and regulatory aspects

For further information contact Dr. I Mackie, IIR Organizing Committee, Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen AB9 8DG, Scotland, UK.



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Fred Einerman Appointed Manager, Environmental Health and Safety, Rockefeller Center Management Corporation

Fred Einerman has been named manager, environmental health and safety, Rockefeller Center Management Corporation (RCMC).

Since joining the company in 1983 as staff sanitarian, Mr. Einerman has held positions of increasing responsibility. In his new position, he will continue in his role as staff sanitarian as well as provide the day to day supervision and monitoring of all aspects of the RCMC safety program including development, continuing education, compliance to city, state, and federal regulations, and inspections of employee work areas.

Recently, at the request of the People to People Citizen Ambassador Program, Mr. Einerman was chosen as part of a delegation that went to China for two weeks to consult with the Chinese Association for Science and Technology on Environmental Health and Safety Problems.

Prior to joining RCMC, he was the senior supervising sanitarian for the City of New York Department of Health. Mr. Einerman is a past president of the Empire State Environmental Health Association Inc., and is presently on the board of directors of the New York State Registry of Sanitarians, Inc. In addition, he is a member of the Central Atlantic States of Food and Drug Officials, the National Environmental Health Association, the International Association of Milk, Food and Environmental Sanitarians, Inc. and the American Public Health Association.

He holds a BA degree from Richmond College, and has completed course work at Hunter College toward his Masters of Public Health.

Mr. Einerman, his wife and son reside in New York City.

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New BST Information Reported By Monsanto and University Scientists

New information regarding bovine somatotropin (BST) for dairy cows from Monsanto Company-sponsored research was presented at a joint annual meeting of the American Dairy Science Association and the American Society of Animal Science, July 31 through Aug. 4.

BST is a naturally occurring protein hormone that is essential to a cow's milk production. BST now can be manufactured through biotechnological methods. It is a potential new product designed as a management tool intended to lower production costs for dairy farmers.

Milk and meat from cows involved in BST research already are authorized as safe for human consumption by the U.S. Food and Drug Administration (FDA). BST now must be approved by FDA officials as safe and effective for long-term use in cows.

"The data in these papers represent the fourth consecutive year of multiple research studies on BST by Monsanto to assess the product's safety. Again, we are encouraged with our findings," say Dr. Robert Collier, Dairy Research Director, and Dr. Colin Peel, Product Development Manager, of the Animal Sciences Division, Monsanto Company, St. Louis.

Several papers from more than 25 Monsanto-sponsored studies were presented by academic or company scientists. The studies involved more than 1,000 cows over the past four years. Some of the studies were completed at Monsanto's research farm near St. Louis, and others were done in cooperation with: Cornell University; Michigan State University; University of Arizona; University of California-Davis; University of Florida; University of Ghent, Belgium; University of Munich, Germany; Utah State University, USDA's Agricultural Research Service, Beltsville, Md.; and ESALQ/USP, Brazil.

The studies examined the effects of BST on milk production, cow physiology, feed efficiency, cow health and reproduction, and milk composition and safety. Following are some key results from various studies.

1. Milk flavor and functionality were not changed with supplemental BST use.

--No significant changes transpired in seven of the eight taste tests conducted by 24 panelists.

--Supplemental BST had no effect on the organism used in making Cheddar cheese.

2. Average cholesterol content of milk fat did not change with BST administration, and was found to be within standard USDA estimates.

--Injections began 60 days after the cows had given birth and continued for the fall lactation.

--In nine cows given BST injections every 14 days, percentages of cholesterol and melting properties were similar to the control group.

3. A field trial study in four herds totaling 266 cows indicated:

--Supplemental BST increased milk yield an average of 20 percent (12.3 pounds of milk per cow per day).

--BST transiently increased milk fat in two of four herds.

--No significant difference in the percent milk protein was seen.

--Response to BST was similar at all stages of lactation in all primiparous cows (ones who have calved only once).

--Supplemental BST usage did not alter the somatic cell count (SCC) in cows' milk.

--Consistent with the performance of high milk producing cows, the cows treated with BST had a lower pregnancy rate when treatment was begun before breeding.

4. A short-term field trial involving three Holstein herds showed that supplemental BST administration increased milk production by 21 percent (or 14.3 pounds of milk per cow per day).

--Cows were milked three times daily.

--No differences existed for milk fat, milk protein, somatic cell counts and health, but some loss of body condition occurred in the 84-day study.

5. Data from four university sites involving a total of 255 cows that were administered with BST dosages of 0, 250, 500, 750 milligrams once every 14 days in a prolonged released system injected subcutaneously (just below the hide) indicated that:

--Feed efficiency of cows administered supplemental BST was improved by a range of 4 to 6 percent in a herd of 109 cows that had calved once, and within 6 to 14 percent of 146 cows with multiple births.

--Dry matter intake increased to support this milk production response with an average increase of 11 percent (14.9 pounds of milk per cow per day) for all doses in primiparous cows and by an average of 9 percent (4.3 pounds per cow per day) in multiparous cows.

--BST treatment had no significant effect on milk composition, including fat, protein, lactose, and somatic cell count. All values reported were within expected ranges.

--In the same 255 cows, reproductive performance was affected by the level of milk production, but not BST. Higher producing cows typically had lower reproduction performance regardless of whether they were treated with BST. (Breeding was delayed until treatments were initiated.)

--General health of all cows throughout the study was typical of any random dairy herd.

6. BST administration was found to be effective in improving milk yield in dairy cows in southeast Brazil during summer months.

--In the 16-week trial, cows administered with supplemental BST produced 13.7 percent (5.1 pounds per cow per day) more milk.

--Milk fat and protein percentages were not significantly affected, and no differences in health and reproduction parameters were detected.

7. In a 49-day study with six cows, the overall digestibility of nutrients was found to be unaffected by supplemental BST administration.

8. Giving supplemental BST injections to cows was not found to affect the growth or blood chemistry of their calves.

--One-half of 72 cows was given intramuscular injections every 14 days.

--No abnormalities were discovered in calves from BST-supplemented cows.

--At nine weeks of age, there were no differences in weight, height, heart girth circumference, or blood constituents in the calves.

9. BST concentration did not elevate in mastitis-infected udders with the administration of supplemental BST.

10. For 135 cows, administering BST during their dry period resulted in no apparent increase in milk production in the following lactation.

11. More evidence was found to support the theory that BST increases milk production by coordinating nutrients from the cow's fat and bodily tissues toward the mammary glands.

Many of the Monsanto studies were done to meet FDA requirements for demonstrating the safety and effectiveness of BST. Another type of study sponsored by Monsanto involved a new computer model that mathematically mimics liver metabolism in cows. The model was developed at the University of California-Davis, and is capable of simulating input and output, as well as radiotracer data. The model will allow extended inter-

pretations of previous and current data on ruminant liver metabolism, and will help in designing future experiments.

For more information contact: Monsanto Agricultural Co., Public Relations Dept., 800 N. Lindberg Blvd., St. Louis, MO 63167.

Paulette A. Gardner Receives FSI "Member of the Year Award"

Paulette A. Gardner, President of SaniSafe & Associates, has been chosen "Food Sanitation Institute Member of the Year." FSI (The Food Sanitation Institute) is a subsidiary of the Environmental Management Association. Gardner was chosen for this honor because of her work in revitalizing the Tri-State Chapter (Illinois, Indiana, and Wisconsin) of FSI.

Gardner is a Certified Professional Food Sanitarian and a State of Illinois-certified instructor in foodservice sanitation. SaniSafe & Associates is a consulting group to the food industry in government regulation compliance, sanitation, and quality control.

Texas Automates Milk and Dairy Inspections Division

Until recently, the Milk and Dairy Products Division of Texas' Bureau of Consumer Health Protection has managed inspections data on PCs -- Handwritten inspections from across the state were mailed to a central office, typed into a PC by a data entry clerk and marginally organized for retrieval and review.

Now, as a result of a recent agreement with Oregon Digital Systems, Inc. (Corvallis, Oregon), the Milk and Dairy Products Division is taking a giant leap into inspection automation.

The division still manages data on PCs. But now field inspections are performed on a handheld computer; field reports are printed on location using a lightweight, battery-powered printer; and data is transmitted to the central PC network by modem.

Some fundamental changes have also occurred at the PC-based filing network. The division is using Oregon Digital's inspections-oriented database package -- Report WritR. Report WritR receives inspection data from the field units across the state and sends them new inspection text and schedules.

Report WritR's 25 standard and custom reports help improve consistency among inspectors as well as identify recurring weakness among facilities and operations.

Reports will track trends, operator performance and inspector productivity; they will schedule inspections, renew licences, mail notices, even describe inspections program effectiveness.

Kirmon C. Smith Director of the Milk and Dairy Products Division of the Bureau of Consumer Health Protection, Texas Department of Health, is the major force behind the division's new inspections advances.

Smith sought the services of Oregon Digital Systems, Inc. (ODS) to develop a customized system for his division.

Oregon Digital's strength lies in its knowledge of inspections-oriented software development and systems integration. ODS systems have been profitably used by regulatory personnel since 1981.

According to Smith, Texas has the first milk and dairy products consumer protection facility to adopt such a system. Smith anticipates his database-oriented, electronic inspections notebooks will soon be one of the division's most valuable assets.

Rising public consciousness and standards, an increase in institutions and inadequate regulatory funding have combined to make consumer health protection challenging. Inspector case loads have been growing while finances have been diminishing.

Smith says the automated inspections system will help provide Texans with better public health protection. The division's strategy is to facilitate inspectors with powerful automated inspections notebooks, thus freeing as much as 60 percent of their time for more relevant activities.

According to Gene Wright, Chief Sanitarian for the division, 32 inspectors are supported by the Oregon Digital system. These inspectors are responsible for 2100 dairy farms spread all over the state.

The division has adopted the Federal Pasteurized Milk Ordinance rules regulating how a dairy farm should be run. Detailed rule descriptions and necessary corrective measures for violations are all stored on the handheld computer. The handheld also contains establishment information on each sanitarian's scheduled establishments.

Inspectors simply cite the rule code and type a brief description of the location and specific circumstances of the violation. Reports automatically include the entire text of violations and corrective measures and any individualized comments by the inspector.

Wright explains that the Oregon Digital system "expands our previously aggressive automation system including automated sampling and managing sample data."

Perhaps the only thing more important to public health protection than inspection is the clear communication of the results. Previously handwritten field reports were not only tedious and time-consuming, but resulted in shortcuts which breached the communication process.

Not only will division automation save time, the resulting clearer communication will have many side benefits including:

1. More thorough unabbreviated and organized reports will result in better public health education to dairy farm operators. Corrective measures are easier to understand and implement.
2. No more miscalculated points or poorly cited rules.
3. Better program evaluation will result from reviews of uniform, organized data collected on inspection reports.
4. Reports generated from stock material will be more precise and controlled than handwritten reports. There will be less room for misinterpretation.
5. Automated reports will always be legible. Operators can focus on content rather than deciphering handwriting.
6. A more authoritative image is projected to the dairy farm community. Spelling, math, sentence structure and organization are all important, non-trivial aspects of a report's credibility, impact and overall education.

Editors Note: On September 1, 1989, Oregon Digital Systems, Inc. became Digital Inspections. The new address is 1325 NW 9th St., Corvallis, OR 97330. For more information, contact: John Lane at the above address or (503) 752-7233.

Tenth Annual Food Microbiology Symposium

The Tenth Annual Food Microbiology Symposium and Workshop is being held at the University of Wisconsin-River Falls on October 19th and 20th. The Symposium will focus on Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology.

The Workshop is scheduled for Friday afternoon. Tentative Workshop participants include:

Organon Teknika Corp., Gene-Trak Systems, Bio-Control Systems, Inc., Spiral Systems, Inc., Vitek Industrial Systems, Inc., Q.A. Laboratories, and 3-M Co.

For more information, contact: Dr. P. C. Vasavada, Dept. of Animal and Food Sciences, UW-River Falls, River Falls, WI 54022, (715) 425-3150.



Jack A. Laughery

Foundation Elects Chairman, Officers, 2 New Trustees

Jack A. Laughery, chairman and chief executive officer of Imasco USA, parent of Hardee's Food Systems, Inc., Rocky Mount, North Carolina, heads a roster of new officers and two new trustees elected to the Board of The Educational Foundation of the National Restaurant Association.

Elected chairman of The Educational Foundation at its annual meeting during the National Restaurant Convention in Chicago, Laughery has been in the foodservice industry since 1962 when he started as a management trainee for Sandy's Systems, Davenport, Iowa. Working his way up to president and chief operating officer at Sandy's before he negotiated a merger with Hardee's Food Systems in 1972, Laughery became executive vice president of Hardee's. He was named Hardee's president and chief operating officer in 1973, and in 1975, the Board of Directors elected him



George E. Fischer

president and chief executive officer. He was elected Hardee's chairman in 1980.

Other officers elected are: First Vice Chairman -- Ted J. Balestreri, president, Sardine Factory, Inc., Monterey, California; Second Vice Chairman -- Jim L. Peterson, president and chief executive officer, What-aburger, Inc., Corpus Christi, Texas; Secretary -- Jon C. Peterson, vice president-sales, HeinzUSA, Pittsburgh, Pennsylvania; and Treasurer -- Michael J. Grisanti, president, Grisanti, Inc., Louisville, Kentucky.

The two new members of The Educational Foundation's Board of Trustees are:

* George E. Fischer, president of SerVend International, Inc., Jeffersonville, Indiana, a manufacturing company producing ice dispensers for hotels/motels, convenience stores, bottlers, and hospitals. A former Kentucky state government official, Fischer served as Secretary of the Governor's Executive Cabinet, and prior to that, Secretary of Finance.

Following service as a jet pilot in the U.S. Air Force, he was in management and sales positions with IBM in New York, Illinois, and Kentucky. From 1969-1979, he was the founder and chief executive officer of MetriData Computing, Inc., Louisville.

He is a former chairman of the Board of Trustees of University of Louisville, and a member of the Boards of Directors of Louisville Medical Center, Campaign for Greater Louisville, and Project 21-Future of Kentucky.



John C. Metz

* John C. Metz, president of Metz Enterprises, Inc., Dallas, Pennsylvania. In 1967, Metz founded Custom Management Corporation, a foodservice management company. After merging with Morrison's, Inc., in 1987, Metz continued to serve as chairman and chief executive officer of Morrison's Custom Management, until April, 1989.

Metz is a member of the Board of Directors of the National Restaurant Association and was convention committee chairman for the 1988 and 1989 National Restaurant Association shows.

Daniel A. Gischeidle, Educational Foundation president, applauded Laughery, the other officers, and the newly-elected board members, stating, "The Educational Foundation is proud to have these experienced professionals guide the Foundation as it broadens its scope through expanding its programs and increasing its services to the hospitality/foodservice industry."

Heat Stress On Dry Dairy Cows Causes Varied Problems

Dairy producers should protect their dry cows from heat stress during hot weather. Heat stress on dry cows can cause a variety of problems, according to Jeff Reneau, extension dairy scientist at the University of Minnesota.

"Heat stressed dry cows have smaller calves and smaller placentas," says Reneau. "They also have more calving problems, retained placentas and metritis. In addition, they produce less milk in the next lactation and have poorer reproductive performance."

Reneau says Florida researchers have documented these problems, but the problems also occur on northern dairy farms in July and August.

"Dry cows should not be crowded into a stuffy barn or pole shed with little relief from the heat," says Reneau. "Provide pasture and a clean, dry, shaded rest area."

Reneau says dry cows will eat less during hot weather, so it's important to watch their dry matter intake. "Make sure that despite the drop in dry matter intake, the cows get the right amount of nutrients to maintain good health," he concludes.

Listeria Grows in S. Cremoris Cultures

Listeria monocytogenes can grow in pH-controlled cultures of *Streptococcus cremoris*. While *S. cremoris* appeared to inhibit the growth of the pathogen somewhat, preparing starter cultures using media with internal pH control does not guarantee *Listeria*-free results, a University of Wisconsin-Madison researcher told the annual meeting of the American Dairy Science Association.

Media with internal pH control (IPCM) are commonly used to prepare commercial starter cultures. As lactic acid-producing bacterial cultures grow, IPCM releases buffers that prevent acid damage to the cultured cells.

Listeria cells also find this medium fairly hospitable, according to food microbiologist Jane Wenzel. *Listeria*

monocytogenes is a widespread pathogen that has caused outbreaks of foodborne illness.

Working with UW-Madison microbiologist E. H. Marth, Wenzel inoculated media with 0.25 percent or 1.0 percent *S. cremoris* (a common starter for cheese, buttermilk, and other cultured dairy products) and one of three strains of *Listeria*. The cultures were incubated at 21 degrees C (70 F) or 30 degrees C (86 F). A 1,000-cell-per milliliter *Listeria* inoculum produced levels of 10,000 to 100,000 *Listeria* cells per ml after 30 hours of incubation. These levels depended on incubation temperature and concentration of *S. cremoris*.

Control cultures with no *S. cremoris* had 1 million to 10 million cells per ml after 30 hours.

"All three strains of *Listeria* grew, and all behaved similarly," Wenzel said. "We saw some inhibition in the presence of *S. cremoris* compared to the control cultures, but that inhibition was not complete. There were substantial numbers of *Listeria* in the inoculated medium when it was made ready for use according to the manufacturer's instructions, at a pH of 5.5 after 15 to 18 hours."

Inhibition began after 15 hours in all samples incubated at 30 degrees C, Wenzel reported. At 21 degrees C, inhibition began at 18 hours or 24 hours, depending on the level of *S. cremoris*.

Strict sanitation can help dairy manufacturers avoid accidentally duplicating this experiment, Wenzel noted. A speck of dirt can contain thousands of *Listeria* cells, and the bacterium's ability to grow at low temperatures can wreak havoc in dairy plants.

"*Listeria* can easily spread through poor sanitary practices," she said. "Plants must keep areas separate - keep intake people in intake areas and production people in production areas. We often don't realize how easily something can be carried from one area to another."

Wenzel has studied the behavior of *Listeria* in *Streptococcus lactis* cultures, and found that *S. lactis* also inhibited *Listeria* growth. She noted that some strains of *S. lactis* produce nisin, an antibiotic that may affect *Listeria* growth.

S. cremoris was almost twice as inhibitory as *S. lactis* after 30 hours of incubation. Wenzel thinks that *S. cremoris* might also produce an antibiotic during culture. "Whatever is going on here, either antibiotic production or competition between *S. cremoris* and *Listeria*, *S. cremoris* appears to be a better inhibitor of *Listeria* than *S. lactis*," she said.

Wenzel discussed these findings at the joint annual meeting of the American Dairy Science Association and the American Society of Animal Science, July 31 to Aug. 4 in Lexington, KY.

For more information, contact Jane Wenzel, (608) 262-0545.

Listeria Dies in Ripened Parmesan Cheese

Listeria monocytogenes did not survive long in properly aged Parmesan cheese, a study at the University of Wisconsin-Madison has shown. However, the researchers cautioned that lower curd-cooking temperatures than they used might make Parmesan cheese more hospitable to the bacterium.

Food microbiologists Ahmed Yousef and E.H. Marth inoculated a mixture of pasteurized whole and skim milk with one of two strains of *Listeria*, a widespread pathogen that has caused outbreaks of foodborne illness. Inocula levels of 10,000 or 100,000 *Listeria* cells per milliliter represented severe contamination.

The researchers could not detect *Listeria* after 3 to 16 weeks of ripening. Survival during ripening depended on the strain of *Listeria*, initial inoculum, and the batch of cheese. Yousef said that strain California seemed to die off more quickly than strain V7, which is considered a resistant strain.

"Ripening Parmesan cheese for the legal minimum of 10 months should produce *Listeria*-free cheese," Yousef told an audience Aug. 2 at the annual meeting of the American Dairy Science Association and the American Society of Animal Science in Lexington, Ky. "However, some manufacturers cook Parmesan cheese curd with less heat than we did, which may produce a cheese more favorable to *Listeria* survival. We think that milk used for cheesemaking should receive heat treatment equivalent to pasteurization."

The cheese curd in this study was cooked at 51 degrees C (124 F), drained and pressed. It was then salted, dried for 4 to 6 weeks at 13 degrees C (55 F), vacuum-packaged and held at 14 degrees C for the rest of the ripening period.

During the three hours of manufacture, *Listeria* numbers increased 0.6 to 1.0 order of magnitude due to retention in the curd. During cooking, the count did not decrease at the rate expected for a 51 degree C heat treatment. This was perhaps partially due to poor heat transfer into the cheese particles, but also because some unknown protective mechanism was at work, Yousef said.

Cell numbers dropped by one to two orders of magnitude during pressing, possibly because cells that were injured but not killed during cooking died faster than uninjured cells.

"When you cook cheese at 51 degrees C, which is not enough to kill *Listeria*, you produce injured cells that are hard to detect. Under certain conditions, they may revive and show up in the product," Yousef noted.

During ripening, numbers decreased more rapidly than is typical of other hard cheeses, according to Yousef. It took 20 to 30 days for *Listeria* populations to fall by 90 percent in Parmesan cheese. The same *Listeria* strains in Colby cheese took 60 days or more.

"When you combine more than one inhibitory factor, or 'hurdle,' each contributes a little bit to produce a strong overall effect," Yousef said. "The hurdles in our study were low pH, low moisture content, heat treatment, and ripening at 13 degrees C, which is higher than for most other cheeses."

"The overall effect we're seeing in Parmesan cheese is probably due to the sum of all these 'hurdle' effects. If all the hurdles are not present at these levels, however, you probably won't see these results," he said.

For more information, contact Ahmed Yousef, (608) 263-1715.

New Educational Video and Pamphlet on Trichomoniasis Now Available

A new, educational video and pamphlet on Trichomoniasis is now available from Franklin Laboratories.

The video, *Trichomoniasis, The Silent Calf Thief*, was written and produced by the University of California. The information presented in the video explains the clinical symptoms of Trichomoniasis including diagnosis and prevention of this devastating disease. The video also features producers who have successfully managed Trichomoniasis out of their herd.

In addition, the video discusses a new breakthrough in vaccine development with the introduction of Trichomonas Foetus Vaccine by Franklin Laboratories. The vaccine is the first and only vaccine available to combat Trichomoniasis; and, when combined with good management practices will help reduce infection and the staggering financial losses associated with Trichomoniasis in cattle.

Franklin Laboratories also offers an educational pamphlet on Trichomoniasis. The pamphlet, *Trichomoniasis, The Difference Between Profit and Disaster*, describes the economic implications and the severe impact the disease has in a typical encounter with Trichomoniasis.

For more information on how to reserve a copy of the video or to obtain copies of the pamphlet, contact Franklin Laboratories, P.O. Box 717, Fort Dodge, IA 50501.

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Mocha Mix_R Non-Dairy Creamer, the nation's number one best selling, fresh liquid non-dairy creamer, is proving its popularity in Houston and San Antonio, as it expands further into the Texas market.

Mocha Mix's move into Houston and San Antonio in April was the most recent step in Presto Food Products, Inc.'s aggressive national expansion strategy.

A major player in the West Coast non-dairy market for more than 25 years, Mocha Mix is the refrigerated liquid non-dairy equivalent to dairy half & half which can be used in coffee and tea, on cereal, fruit and desserts, and as a cooking ingredient.

Because it's made exclusively with a select grade of soybean oil, Mocha Mix is an excellent dairy alternative for people concerned about cholesterol and saturated fat intake. Mocha Mix contains no cholesterol, no "tropical"

oils, no animal or milk products, and is low in saturated fats and sodium. It's ideal for the more than 30 million Americans who are milk allergic or lactose intolerant. In addition, Mocha Mix is certified Kosher pareve.

Mocha Mix outsells all half & half brands combined in Southern California, according to Bruce Coffey, Presto Food Products president. "We're pleased that Houston and San Antonio consumers are also enjoying the great taste, fresh quality, and health benefits of Mocha Mix."

Since its Houston debut, Mocha Mix sales have been tremendous with a 50 percent increase in product demand over original market projections, according to Johnny Williams of Williams-Lyons Inc., the food broker appointed by Presto Foods to represent Mocha Mix in the Houston area.

Mocha Mix is also doing "extremely well" in San Antonio, according to Russ Polzin, vice president-grocery sales for the Tom Cristal Company, food brokers for Mocha Mix in the San Antonio area. "Brand awareness is high and we are right on target with market sales projections," he said.

"We are confident that Mocha Mix_R Non-Dairy Creamer will continue to have tremendous sales potential in Texas, given the large percentage of the population who is keenly interested in a healthy, low cholesterol and low saturated fat diet," Coffey said.

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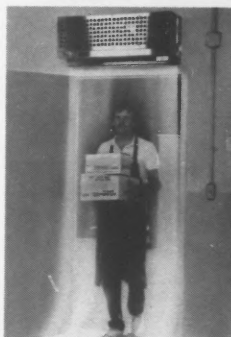
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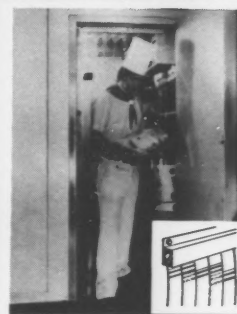
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The Mocha Mix introduction was supported with an aggressive marketing outreach strategy which included television and newspaper advertising; direct mail programs to physicians and dieticians; and free-standing insert couponing.

Since April, Mocha Mix[®] Non-Dairy Creamer has been available in the dairy case of most major supermarket chains in Houston including Fiesta mart, Gerland's Food Fair, Kroger, Randall's, Rice Food Markets, Apple

Tree Stores, Food-A-Rama, Food King, Market Basket, SWF, Minimax, and Holiday Foods.

In the San Antonio area Mocha Mix is available at supermarket chains including H.E.B. Food Stores, Albertson's, I.G.A. Stores, Handy Andy, and Kroger.

Presto Food Products is headquartered at 18275 Arenth Avenue, City of Industry, California 91748-1225. For further information, contact Berkhemer Kline Golin/Harris, Barbara Beckley or Lisa German, (213) 620-5711.

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New Programmable Drain Treating System Developed By Hydro Systems Company

Hydro Systems Company, Cincinnati, will debut its Programmable Drain Treatment Dispenser at two upcoming trade shows: NAFEM/89 in Dallas and ISSA in Chicago.

The company believes this all new product is the only battery powered dispenser that offers up to eight doses per day. The dispense rate is 2-1/2 ounces per minute. Pumping time settings are made in one minute intervals, and events can vary each day of the week for precise dosing control. Settings can be verified on the dispenser's LCD display without changing or resetting the program.

Two common 6-volt lantern batteries power the Hydro Systems Programmable Drain Treatment Dispenser, so it 1) can be conveniently located without regard to outlets, 2) operates safely, even in wet environments, and 3) continues to operate during power outages. Batteries install quickly with a holder assembly. Batteries will last approximately 6 to 9 months depending on degree of use. An optional low battery alarm is available. Separate AA batteries operate the programmer. These hold the program when the motor power batteries are low, or are being changed.

For further information, contact Hydro Systems Company, 3798 Round Bottom Road, Cincinnati, OH 45244 USA -- Phone 513/271-8800 (fax 513/271-0160).

Cool Night Air Reduces Heat Stress On Dairy Cows

Letting dairy cows take advantage of cool night air during periods of hot weather is a good way to reduce heat stress on them.

"Providing a well-drained, well-managed outside lot or pasture for cows at night is a good procedure when it's hot," says Jeff Reneau, extension dairy specialist at the University of Minnesota. "Just make sure the cows don't have access to ponds or stagnant water."

The effects of heat stress on dairy cows are well documented, Reneau points out. Reduced milk production and reduced reproductive performance top the list.

"When the temperature exceeds the 75-to-80 degree range and humidity is high, heat stress on cows is likely," says Reneau. "The first signs are reduced feed intake and milk production. Then comes an increasing respiration rate. If a cow is panting, she's definitely suffering from heat stress."

Many Minnesota dairy producers use stall barns and keep their cows inside much of the time. While tem-

peratures drop at night, cows in hot barns can't take advantage of the cool air, notes Reneau.

Other hot weather strategies Reneau recommends for dairy producers are:

--Make sure cows have access to plenty of clean, fresh water at all times.

--Increase ventilation rates when cows are in the barn.

--Observe cows for estrus early in the morning or late in the evening. More cows fail to express the normal signs of estrus during hot weather.

--Change bedding more frequently. Heat and humidity increase the number of bacteria that are likely to cause environmental mastitis. Scrape the back half of stalls and replace bedding daily during hot weather.

For more information contact the source Jeff Reneau, 612/624-4995, or the writer Joseph Kurtz, 612/625-3168.

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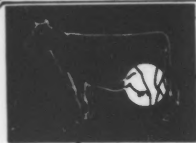
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Coagulase-negative Staphylococci Infections

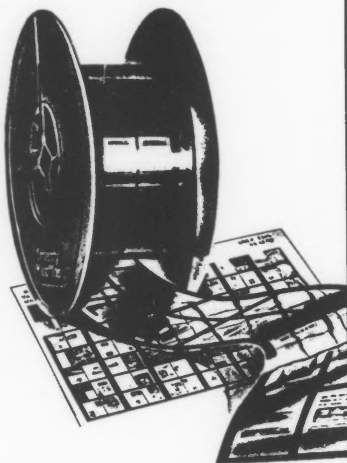
The coagulase-negative staphylococci are minor pathogens which include a variety of species other than *Staphylococcus aureus*. The predominant species isolated in most herds seem to be *S. chromogenes*, but *S. hyicus*, *S. simulans*, *S. epidermidis*, *S. hominis*, and *S. xylosus* may also be found. It is common in well-managed herds (using teat dipping and dry cow therapy) to find 10-20% of quarters infected with coagulase-negative staphylococci. Somatic cell counts in these infected quarters may be two to three times that of uninfected quarters. Prevalence tends to be higher in first lactation cows than older cows. Most coagulase-negative staphylococci are neither contagious nor environmental but are more likely to enter the mammary gland from teat skin where they commonly reside. Certain *Staphylococci* species such as *S. xylosus* and *S. sciuri* appear to be free-living in the environment, though these species do not seem to be a frequent cause of infection in most herds.

Coagulase-negative staphylococci infections can be controlled by routine postmilking teat dipping using a germicidal dip and antibiotic treatment of all quarters in all cows at drying off. Dry cow therapy eliminates over 80% of coagulase-negative staphylococci infections; however, new coagulase-negative staphylococci infections can occur during the dry period since these organisms are part of the resident teat skin flora. It is not clear if coagulase-negative staphylococci infections decrease milk production enough to justify treatment during lactation. Therefore only treatment of clinical cases, which occur infrequently, is currently recommended.

This article is one in a continuing series made available by the National Mastitis Council. For additional information, contact the NMC, 1840 Wilson Blvd., Arlington, VA 22201; (703) 243-8268.

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Procedure

1. Use the printed Abstract form that appears on the other side of this page. Complete the form using a typewriter equipped with a reasonably dark ribbon.
2. Type in the title, capitalize the first letter of the first word and of any proper nouns.
3. List authors and institution(s). Capitalize first letters and initials. Indicate with an asterisk the author who will present the paper. Give complete mailing address of the author who will present the paper.
4. Check the proper box to indicate if the paper will be presented by a graduate student and is to be entered in The Developing Scientist Award Competition.
5. Type the abstract *double-spaced*, in the space provided on the abstract form.
6. **Mail two copies of the abstract before January 1, 1990 to:**

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Executive Manager, IAMFES
P.O. Box 701
Ames, Iowa 50010

7. Enclose *two* self-addressed standard post cards. One will be used to acknowledge receipt of the abstract and the other to notify the speaker about the scheduling of the paper. Two cards must be included with *each* abstract that is submitted.

Content of the Abstract

The abstract should describe briefly: (a) the problem that was studied, (b) methods used in the study, (c) essential results obtained, and (d) conclusions. Statements such as "results will be discussed" should not appear in an abstract.

Oral Presentations

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Subject Matter for Papers

Papers should report results of applied research in such areas as: food, dairy, and environmental sanitation and hygiene; foodborne disease hazards; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives; food and dairy technology; food service and food administration; food and dairy fermentations; quality control; mastitis; environmental health; waste disposal, pollution, and water quality.

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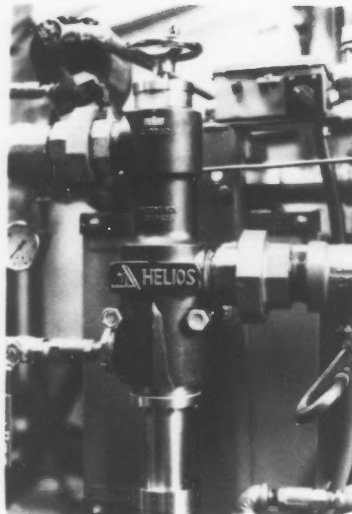
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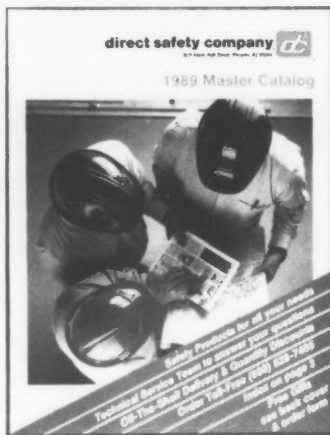
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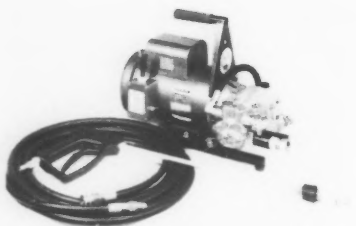
Supercritical Processing, Inc. (SCP) Extraction Process

SCP is developing an all-natural extraction process that removes cholesterol and saturated fats from butterfat. The process may be used to produce low cholesterol butter, milk, cheese, and ice cream. SCP seeks the participation of industrial sponsors in further development and commercialization.

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SCP is also conducting research in cholesterol removal from eggs, pharmaceutical separations, coffee decaffeination, oils and fats processing, and flavor extractions.

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MetaByte's MBC-MI MacINSTRUMENTS

An exciting, low cost, yet versatile software package for data acquisition and control appliances. Designed for use with Macintosh-based computer systems, it offers an alternative to traditional laboratory instrumentation and is fully compatible with many other MetaByte Macintosh products.

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PlasmaVision

Applied Research Laboratories has introduced a new IBM PS/2-based software called PlasmaVision for its 3500 series of inductively coupled plasma (ICP) spectrometers.

The powerful new analytical software, designed for use with ARL's Models 3520, 3560, and 3580, is ideally suited for the novice or occasional user and features pull-down menus, color graphics, and on-line help prompts.

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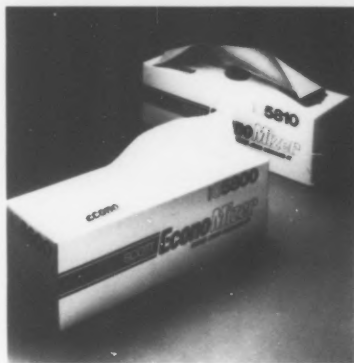
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Food and Environmental Hazards To Health

Science Doesn't Support European Beef Ban

The European Economic Community began 1989 by banning \$130 million worth of American beef imports. The reason: hormone implants. Although most experts agree that the U.S. technique for implanting small amounts of growth hormones in cattle is safe, the European Community vehemently objects to the practice.

Europe's concerns surfaced after a scandal in Italy, in which a baby food manufacturer illegally injected hormones directly into the muscle of cattle. The baby food produced from this meat contained a concentrated dose of the drugs.

In the United States, however, hormones are implanted under the skin of the animal's ear, to make the animal larger and perhaps leaner. The implant provides a steady but very small amount of the hormone, most of which the animal metabolizes and excretes before it is slaughtered. Very little of the drug remains in the meat. For example, a man's body naturally produces 15,000 times the amount of estradiol (one of the hormones used to treat cattle) in a day than he would get from a pound of meat, and a pregnant woman produces several million times that amount.

In 1987, at the request of the international Codex Committee on Residues of Veterinary Drugs in Foods, 11 experts met in Rome to review safety data. They concluded that proper use of the five approved hormones -- three natural and two synthetic -- should not present safety concerns. A scientific working group convened by the European Economic Community itself also recently agreed.

FDA Consumer 4/89

Guarding Against *Listeria* at Home

Listeria bacteria don't signal their presence through taste or smell. To reduce risks from *Listeria* at home, practice the basic food safety principles for avoiding any food-borne illness. For example:

* Avoid contaminating one food with microorganisms that might be present on another.

* Don't carry raw meat, poultry and seafood -- which might contain microorganisms -- on the same plate you intend to use for cooked products or other foods, and don't let juices from the raw products drip on other foods.

* Remember that vegetables can carry *Listeria* and -- once cut -- support its growth. Scrub fresh produce thoroughly to remove visible dirt.

* Cook meat, poultry and seafood sufficiently to kill harmful microorganisms. The U.S. Department of Agriculture recommends cooking meat to an internal temperature of 160 degrees Fahrenheit at the thickest part and poultry to 185 F. FDA currently has studies under way to ensure the adequacy of cooking instructions for seafood.

* Although *Listeria* can grow at low temperatures, it's still important to keep foods refrigerated so that microorganisms can't multiply as fast as they would unrefrigerated.

FDA Consumer Special Report, "Safety First: Protecting America's Food Supply"

Human Listeriosis Surveillance in Canada - 1987

Introduction

Listeriosis is a bacterial disease with a wide variety of clinical manifestations including meningoencephalitis, septicemia, and influenza-like illness. Congenital infection can result in stillbirth, abortion or neonatal death. Groups at high risk for infection include neonates, pregnant women, older adults and those who are immunosuppressed. *Listeria monocytogenes* (LM), generally an ubiquitous organism, has been implicated in several foodborne outbreaks over the last several years, often with severe consequences.

The incidence of listeriosis is not tabulated nationally.

However, it is notifiable in the following provinces:

Ontario, Alberta (laboratory isolations only), Prince Edward Island, and British Columbia (congenital cases only).

Consequently, any national incidence estimates have been based on laboratory isolations of the organism and hospital morbidity and mortality data. Between 1981 and 1986 there were 15 to 30 hospitalizations (0.6 to 1.2 per million population) and 1 to 7 deaths per year. These data do not reflect the true national incidence of listeriosis and provide no epidemiologic information.

Listeriosis in Canada has been reviewed in 2 different articles. Since the first Canadian case was described in 1951, occurrence has been sporadic with no clustering in time or place, with the exception of the food-implicated outbreak in the Atlantic provinces in 1981. Recently, during routine screening, the Field Operations Directorate, Health Protection Branch (HPB), detected LM contamination of domestic and imported semi-soft cheese, hard cheese and ice cream. Because the public health significance of such findings is unknown, the Food and Field Operations Directorates requested the Bureau of Communicable Disease Epidemiology, Laboratory Centre for Disease Control (LCDC) to investigate the magnitude of human listeriosis in Canada and the role of food in its transmission.

Methods

A. Identification of Cases: In 1987, a laboratory surveillance program was instituted across Canada with all Provincial Epidemiologists assuring that laboratories in their jurisdictions would notify public health authorities as soon as a human LM isolate was identified. Provinces joined the program at various times throughout the latter part of 1987

and early 1988 and several searched retrospectively for all 1987 cases.

B. Data Collection: A case is defined as any individual in whom LM is isolated from a site which is normally sterile. A mother-infant pair is considered one case. A standardized questionnaire was developed to characterize host, agent and environmental factors. This questionnaire, consisting of the following sections, is administered to cases and/or relatives:

1. **General:** This section deals with host and predisposing factors such as medication, health status, and recent exposure to *Listeria* organisms.

2. **Food:** This section solicits information on the food history/habits/frequency of selected foods consumed by the case during the month prior to the onset of illness or event. The interviewer has a detailed standardized list of fresh and processed foods available in Canada which are not generally cooked prior to consumption.

3. **Hospital Chart:** This section - to be completed by the attending physician - requests information on the following: a) clinical characteristics; b) laboratory profile; c) treatment; and d) outcome.

4. **Peripartum Supplement:** This section is reserved for collection of additional epidemiologic information involving pregnancy/peripartum cases including the number of previous pregnancies, outcome of present pregnancy, and clinical presentation.

When completion of the questionnaire is not possible, information is collected by telephoning health-care personnel involved in the case.

C. Food Sample Collection: Every effort is made to obtain samples of any food identified in the food history and consumed in the 4 weeks prior to onset of illness. These samples are chilled and transported as quickly as possible to the Bureau of Microbial Hazards, HPB, where LM isolation is attempted.

Results

A total of 44 cases conformed to the case definition in 1987. Since surveillance was instituted in the latter part of the year, much of the data collection was done retrospectively. The response rates for the 4 sections of the questionnaire were as follows: general, 18 cases (40.9%); food, 7 cases (15.9%); hospital chart, 5 cases (11.4%); and pregnancy/peripartum, 4 cases (40.0% of the 10 eligible cases). Although no questionnaires were completed for an additional 24 cases (55%), some information was gathered by telephone contact.

Seasonal Distribution: In 1987 the number of cases occurring monthly ranged from 1 (2.3%) in January to 8 (18.6%) in December, reflecting an average of 3.7 cases per month. During the late fall, when most provinces were initiating surveillance, the average number of cases per month in-

creased to 7. Since no comparable surveillance data for previous years are available, it is difficult to interpret the significance of this incidence pattern.

Geographic Distribution: In 1987 listeriosis was reported in 7 provinces. Newfoundland, Manitoba, Saskatchewan, and the Territories did not report any cases. Over half (59%) of the reported cases were from Ontario. The incidence shows wide regional variation and ranges from 0.06 per 100,000 population in Quebec to 0.35 in Prince Edward Island. The overall rate for Canada was 0.17 per 100,000 or 1 per 581,000 population. There was no clustering of cases in time or place.

Age and Sex Distribution: Age was known for 42 (95%) of the 44 cases. Ten cases (24%) were peripartum/neonatal, ranging in age from 0-22 days, with a mean of 16 days. One of these was a stillbirth (gestational age 23 weeks). Maternal age was indicated in only 4 cases, and it ranged from 18 to 34 years, with a mean of 28. The remaining 32 non-perinatal cases (76% of the total) ranged in age from 26 to 96 years; 22 of these were 60 and over. Both the median and mean ages were 65 years. Except for mothers of peripartum cases, no cases were between the ages of 23 days and 25 years.

Age-specific incidence was bimodal. The highest rate was among neonates (29 per 100,000), followed by the elderly, especially those over 90 years (3.85 per 100,000). There was a preponderance of males. Of the 42 cases where sex was known, excluding mothers of perinatal cases, 29 (69%) were males.

Predisposing Health Conditions: Information on possible predisposing health conditions or treatments was available for 39 cases (89%), and at least one was recognized in 33 of these cases (85%). For each case, the number of cited conditions ranged from 1 to 4, with an average of 2 per case. These included the following: pregnancy; cancer; cardiovascular, pulmonary and hepatomeal disease; diabetes; ascites; colitis; arthritis; stroke; hemorrhoids; pernicious anemia; systemic lupus erythematosus; immunosuppressive treatment; radiotherapy; chemotherapy; antacid treatment; iron treatment or overload; and blood transfusions.

Occupation: Of the 23 cases where occupational status was known (including mothers of neonatal cases), approximately half (52.2%) were retirees. The remaining cases represented many diverse occupational groups. The only case where occupation was associated with animal contact was a farmer.

Sources of Listeria: *Listeria* was detected in blood and/or cerebrospinal fluid (CSF) in 91% of the cases. The remaining sites from which the organism was isolated included placenta, rectum (newborn), and peritoneal and pericardial fluids. Isolates from 16 of the 44 cases have been received by the Bureau of Microbiology at LCDC and 13 have been

serotyped. Nine (69%) of these were identified as type 1 and 4 (31%) as 4b.

Clinical Manifestations: Septicemia was the most frequent complication (51.2%), followed by combined septicemia and meningitis (34.9%), with meningitis alone occurring in 11.6% of cases and stillbirth in 2.3%. Mild influenza-like symptoms in the 2 to 7 days prior to delivery were reported by 3 of 8 mothers associated with perinatal/neonatal cases. The remaining 5 mothers were asymptomatic.

Mortality: Outcome was known for 37 of the 44 cases. Eighteen of the 37 died (including the stillborn infant), giving an overall case-fatality rate (CFR) of 49%, while that for neonates was 33%. Among adult cases (excluding mothers associated with perinatal cases), the CFR increased with increasing age. The lowest CFR occurred among those 26 to 59 years of age (27%), followed by those 60 to 69 (36%). Individuals 70 years and over had the highest CFR (73%).

Food History/Habits: No leftover food samples were obtained for testing. The following practical problems were encountered in obtaining food histories and samples:

1. The time between onset/diagnosis of listeriosis and reporting was often very long. This should decrease as the retrospective phase of this surveillance program ends.
2. Occurrence in the very elderly and in those with life-threatening conditions made it difficult to obtain food histories and food samples. Diagnosis was often made near death or after death and sometimes no knowledgeable friends or relatives could be found.
3. Some cases had no history of consuming any suspected food.

Interpretation of the food histories obtained is hampered by lack of an appropriate control group. However, in general, there were no unusual patterns, types or frequencies of food consumption noted.

Conclusions

Forty-four cases of listeriosis were identified in Canada in 1987. The successful identification of such a large number of cases in one year is attributable to the institution of a surveillance program. However, the true incidence of listeriosis infection in this country is probably higher. Mandatory notification, if adopted across Canada, might provide a better picture of the magnitude of disease attributable to LM. If the incidence for all Canada was the same as that for Ontario, a province with mandatory reporting, the number of cases reported nationally would exceed 72 per annum.

Appropriate case-control studies may be the best method of determining whether certain factors, particularly foods, are associated with human listeriosis. In the meantime, physicians, especially obstetricians, should be encouraged to collect appropriate specimens for bacteriological investigation from possible cases, and consider listeriosis in the differential diagnosis of febrile illness in pregnant females.

Since the epidemiology of LM is poorly defined, the development of appropriate fingerprinting techniques, now underway, will undoubtedly contribute to future understanding of sources and modes of spread of the organism.

Can. Dis. Weekly Report 8/27/88

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FDA Food Service Code Interpretations

by

Homer Emery

IAMFES FDA Food Service Interpretations Committee

From the numerous notes taken during the August IAMFES Conference, the following items are on our priority list.

Item one; Reorganization of Food Related Committees: IAMFES now has four food related committees (Food Service, chaired by Bennett Armstrong; Retail Foods, chaired by Thomas Schwarz; Food Equipment Sanitary Standards, chaired by Duain Shaw; and FDA Interpretations). During the August conference all four committees recommended reorganizing into a single food safety committee. In the next six months committee chairs will review alternatives and make a recommendation to the executive board for reorganization. A major goal will be to increase participation by sanitarians in the field. Sanitarians interested in becoming involved in food safety related matters, let us know.

Item two; Code Interpretation on Egg Safety: Since last January, FDA has been drafting a code interpretation on the safe handling of eggs. As of August, a draft interpretation has not been issued. Committee members recommended that IAMFES write a letter to FDA requesting this code interpretation be released as soon as possible. In the meantime, at least one state (Illinois) has already issued a code revision on the subject. If other states have issued code revisions/interpretation on the egg safety issue, send us a copy.

Item three; Sanitarians Knowledge and Expertise in Microbiology: During the conference one of our microbiology colleagues challenged us with the statement that; "Sanitarians didn't have enough knowledge and expertise in microbiology." Unfortunately, our colleague didn't say just how much knowledge and expertise sanitarians needed. I started to counter challenge that "Microbiologists didn't have enough knowledge and expertise in cross connection control, waste disposal, air pollution, radon, asbestos, and all the other program areas in which sanitarians become involved." As a result of this challenge a Field Inspection Quiz will be included with this column starting next month. Items will be included on microbiology and other program areas of current interest.

Since last February when this column first appeared, more than 100 copies of FDA code interpretations and related information have been sent to IAMFES members. To help set priorities for next year, take a few minutes to complete the reader survey in table one. Let us know what interpretations you want discussed.

OFF THE CLIPBOARD: - If you received the Journal too late to participate in the National Fourth Tuesday Temperature Check (see last month's column), you can do it

this month. Send your results in and help determine if product temperatures can be lowered to 40 F with current equipment.

- Dispensing freezers with heat sanitizing capabilities are now on the market. Heat sanitizing allows the unit to be used up to 14 days without being dismantled. NSF Standard #6 provides construction criteria for these units. FDA has issued a memorandum describing how units should be evaluated in the field.

- Turkey time is almost here. Consumers in your community can get help on questions concerning the handling and preparation of turkey and other poultry items from the Meat and Poultry Hotline at 1 (800) 535-4555. During November the USDA hotline will extend hours of operation with calls taken from 9:00 a.m. to 5:00 p.m. (EST). The hotline will also take calls on Saturday, the 18th and Sunday, the 19th from 9:00 a.m. to 5:00 p.m. The hotline will be in operation from 8:00 a.m. to 2:00 p.m. on Thanksgiving Day. Let your community know about this unique service and help eliminate foodborne illness from this year's Thanksgiving Day menu.

Don't forget to send your temperature check results in and take a few minutes to complete the reader survey. For a copy of FDA comments on evaluating dispensing freezers, send a self addressed, stamped envelope to: Homer Emery, FDA Interpretation Committee, Box 1832, Frederick, Maryland 21701.

Table One
Reader Survey

Check only five of the following interpretation subjects you would like to have discussed or have copies of:

- Use of Sulfiting Agents in Retail Establishments
- Moldy Cheese
- Coins and Currency as Potential Fomites
- Bar Soap as Fomites
- Electrocuting Devices for Insect Control
- Temperature Requirements for Microwave Cooking
- Interruption of Potable Water Supply
- Refilling Take-Home Beverage Containers
- Customer Self-Service of Bulk Food
- Reuse of Plastic Food Containers
- Other: Describe:

Check only five and send to FDA Interpretations, Box 1832, Frederick, Maryland 21701.

International Association of Milk, Food and Environmental Sanitarians Committees

Committee and Chairperson

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Affiliate News

Tennessee Meeting

The Tennessee Association of Milk, Water and Food Protection held its annual meeting at the Ramada Inn, Nashville on June 14, 1989. Reports were given on Residues, Pathogens and Packaging, Consumer Complaints, Interstate Milk Shippers, Ground Water Quality, and the Extension of Shelf Life.

A scholarship program has been started whereby a graduate student at The University of Tennessee is awarded \$100 to help pay his expenses to the National Meeting of IAMFES. This year's awardee, Randall Phebus, gave a report to the Tennessee group on his research work having to do with *Campylobacter jejuni*.

Special Awards were presented to: Ruth Fuqua for outstanding service to the Association for the year 1988; to Herbert Holt for outstanding service to the Association for 1980; to Dan Alexander for outstanding service to the Dairy Industry; and to David Moss as out-going president. Newly elected officers are:

President Gil Murrey
 President Elect Hugh Wilson
 Vice President Ed Miller
 Secretary-Treasurer Dennis Lampley
 Archivist Ruth Fuqua
 Board Member at Large Ann Draughon
 Immediate Past President David Moss



Immediate Past President David Moss, left and President Gil Murrey.



In recognition for special service to the Association, Ruth Fuqua, left, receives a plaque from Dennis Lampley, Secretary-Treasurer.

Upcoming IAMFES Affiliate Meetings

1989

NOVEMBER

7-9, North Dakota Environmental Health Association will hold its Annual Meeting at the Sheraton Galleria Hotel in Bismark, ND. For details contact: Allen Saylor, 701-224-4762.

8-9, The Alabama Association of Milk, Food and Environmental Sanitarians will hold the annual Alabama Dairy and Food Conference in Birmingham, AL. Program topics (tentative) Community-Right-To-Know Act; Underground storage tanks and environmental quality; Food plant employee safety; Air quality in food plants; CIP automation; What's new in truck refrigeration?; Microbial contamination of food equipment lubricants. Conference registration fee will include a luncheon, breakfast, and hospitality. For more information contact: Tom McCaskey 205/844-1518.

1990

FEBRUARY

26-27, Kentucky Association of Milk, Food and Environmental Sanitarians' Annual Conference will be held at the Holiday Inn Convention Center, Louisville, Kentucky. For more information, contact: Debbie Pierce, Secretary, KAMFES, PO Box 1464, Frankfort, KY 40602 (502) 564-3340.

MARCH

28-30, Michigan Environmental Health Association's 1990 Annual Education Conference at Holiday Inn, Holland, Michigan. For more information contact K. Durwood Zank, R.S., P.O. Box 277, DeWitt, MI 48820-0277.



For many years of service to the Dairy Industry, Dan Alexander, left, receives a recognition award from Dennis Lampley, Affiliate Secretary-Treasurer.



Ernest Yates, left, receives a Tennessee Country ham as a door prize, being presented by Hugh Wilson, President Elect.



Jimmy Hopper, Director of Quality and Standards, Tennessee Department of Agriculture.



Immediate Past President David Moss, left and President-Elect Hugh Wilson.

**ATTENTION
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MEMBERS!
WIN \$250**

The IAMFES Foundation Fund is sponsoring a contest for the best articles in *Dairy, Food and Environmental Sanitation*. Three, \$250 prizes will be given. One for the best Dairy article, one for Food and one for Environmental.

**For more information contact :
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Randall Phebus, graduate student, left, receives a check for \$100 to help pay his expenses to attend the Annual Meeting of IAMFES.



President Gil Murrey.

Abstract of Papers Presented at the Seventy-Sixth Annual Meeting of the IAMFES

Kansas City, Mo. August 13 - 17, 1989

Abstracts of most papers submitted for presentation at the 76th Annual Meeting of the IAMFES appear on this and the following pages. The complete text of some of the papers will appear in future issues of the *Journal of Food Protection or Dairy, Food and Environmental Sanitation*.

MODERNIZING THE DAIRY PLANT

DESIGNING FOR EFFICIENCY AND SANITATION

Dale A. Seiberling, Seiberling Associates, Inc., 11415 Main Street, Roscoe, IL 61073

The design of a dairy processing facility for the '90's should give special attention to (1) reducing labor requirements for accomplishing all production operations, (2) reducing product loss and (3) substantially improving product quality through (4) application of greater control of the design, maintenance, and daily operating procedures. These objectives can be achieved to an equal degree both by building new facilities and by renovation of existing operations to a well defined long-range plan. The facility and process design must also address regulatory requirements, giving special attention to assurance of proper pasteurization, elimination of post-pasteurization contamination, avoidance of all cross-connections between Grade-A and non-Grade-A products or any product and cleaning/sanitizing solutions, control of plant traffic, and reduction of air-borne contamination. Special attention should be given to meeting the requirement for maintaining all product temperature at or below the required limit. New and/or differing technology including double-tube headers, continuous blending and standardizing systems, U-bend transfer panels, new CIP systems, and programmable logic controllers or computers for all product flow/CIP control has been applied for more than a decade and is well proven.

OPERATIONAL ASPECTS: P.A.S.S.

Robert L. Garfield, Director of Technical Services, Milk Industry Foundation & International Ice Cream Association, 888 16th Street, N.W., Washington, D.C. 20006

The Milk Industry Foundation & International Ice Cream Associations' Product Assurance Safety System (P.A.S.S.) incorporates hazards analysis, manufacturing practices and basic sanitation into a computer accessible format. P.A.S.S. provides a framework for each milk processing and ice cream manufacturing plant to tailor a program to its individual needs.

Implementation of a product safety program takes a concentrated effort to achieve positive results. P.A.S.S. is a program which can help achieve that goal. The system includes a training manual, video tapes, and computer software which includes a user's guide. These materials help to educate employees, heighten accountability, maintain accurate records and broaden management control.

P.A.S.S. is designed to be used in conjunction with a product safety committee. The job of the committee is to organize all the activities which will be part of the program. These include what tasks are to be performed, how often they are to be done, and who is accountable for their completion. The committee also oversees the program-making additions and changes in the program as they become necessary.

NEW AND INNOVATIVE CLEANING AND SANITIZING PROCEDURES

Jentry L. Nix, Diversey Wyandotte Corp., 4606 Onys, Lamath Falls, OR 97603

The present day CIP recording and monitoring equipment will be compared with the innovative methods. These records can be used to diagnose and possibly prevent problems in the future. Information for action and how to use it more proactively will also be presented.

TRAINING THE MODERN OPERATOR

Terry Ryan, Borden, Inc., Dairy Div., 35 N. Fourth St., Columbus, OH 43215

Despite technological advances, the importance of an effectively trained dairy plant operator has not diminished. Events of the past few years have demonstrated the need for properly trained operators. Management must balance the need for employee training with added awareness of increased public health safety; to the ever increasing demand for more products and product volume. This balance must be met to achieve an efficient plant operation that produces wholesome dairy products.

Various methods of training employees are available. Use of various types of media, such as video tape and personalized instruction manuals with self-administered review tests have proliferated training procedures. The instruction can encompass both general employer policy and specific job related duties before actual "hands-on" experience. Follow up review is necessary to ensure the employee has mastered the basic skills and understands the responsibilities. Proper presentation of training materials can help effectively motivate the employee.

MAINTAINING A MODERN DAIRY PLANT

Richard K. Smith, Kraft, Inc., 2211 Sanders Road - Northbrook, IL 60062

Maintaining a modern dairy plant starts with good design. Reducing ongoing maintenance begins with facilities that have properly designed floors, walls and ceilings--as well as services such as broilers, refrigeration and heating, ventilating and air conditioning (HVAC). Capturing all product and water by good design of the process will provide for a "dry floor" operation and reduce maintenance as well as waste treatment costs.

Training is becoming the key element in good maintenance. Today's maintenance person often carries a volt/ammeter instead of wrenches and screwdrivers. Most new equipment is computer or PLC controlled. Even the mechanical aspects of machinery is more complex. To be more productive there is a trend towards the operators maintaining their own equipment.

Better maintenance yields: more uptime, lower inventories, energy savings, better safety, and cost savings.

MODERN DAIRY LABORATORY AND QUALITY CONTROL

Ruth G. Fuqua, Director, Quality Assurance, Flav-O-Rich, Inc., 10140 Linn Station Road, Louisville, KY 40223

With the modernization of dairy plants comes the redesign of the quality control programs used. Testing and sampling plans must be designed to detect the new problems which emerge with automation, and inspection programs must be implemented which will monitor the adequacy of processing and handling.

The modernization of the processing plant usually brings new equipment, new processing procedures, and new sanitation procedures. The quality control program must be flexible and adaptive to the changes.

The modern quality control programs must also recognize changes which have occurred in microbiology and should adapt testing programs to monitor the plant accordingly.

To accomplish the challenges of modernizing a quality control program, it is helpful to use a HACCP program to identify the new areas of monitoring and controlling quality and product safety.

INDUSTRY EXPERIENCES IN ADAPTATION TO CHANGES IN DAIRY PLANTS

Dave Welde, Mid-America Dairymen, Inc., 800 W. Tampa, Springfield, MO 65801-1837

The dairy industry has changed greatly during the decade of the 80's and any dairy's success in the marketplace can be directly traced to the continual updating of processes and products along with the modernization of our processing plants.

Mid-Am has reacted to these changes in a number of ways: First, we realize that our employees are our most valuable resource; therefore, we need to continuously develop and present adequate training to ensure that these employees know how to do their jobs.

Second, we have to have the supervisors support in analyzing all of the jobs within their department and their help and support in presenting the training programs.

Third, management faces the constant challenge of keeping up with changes in the marketplace and at the same time keeping up with changes in regulations and technology in order to produce products to meet or exceed all governmental regulations with a high level of consumer confidence.

Fourth, industry and regulatory agencies should work together to protect the public health, and that can be accomplished by advising the appropriate agency of proposed changes in plants and by submitting drawings for approval before construction is started.

Finally, continuing education of middle and upper management is very important as we try to keep current with the world around us, not only for today, but for tomorrow and the day after.

DAIRY QUALITY

THE ISOLATION AND IDENTIFICATION OF *LISTERIA* SPECIES FROM RAW MILK

R.L. Patterson¹, D.J. Pusch, and E.A. Zottola, University of Minnesota; Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108

Raw milk was received from 12 Minnesota dairy farms and examined for *Listeria* species using several listeria enrichment broths and isolation media. Enrichment procedures included 100 ml of milk in Listeria Enrichment Broth (LEB) used in the FDA procedure, UVM Broth used in the USDA procedure followed by enrichment in Fraser Broth (FB), Cold Enrichment of the milk and milk in Nutrient Broth. After incubation all enrichments were streaked onto Phenyl Ethanol Moxalactam Agar (LPM), Modified McBride Agar (MMA), RAPAMY Agar, Oxford Agar (OXA), and Gum Base Nalixidic Agar (GBNA). The plates were incubated at 25°C for 24 hr. Typical or suspect colonies were purified and identified using physical, biochemical and serological tests. Of the 84 samples tested 7.1% contained *L. innocua* and 1.2% contained *L. welshimeri*. *L. monocytogenes* has not been isolated. The most effective method for isolating listeria was UVM broth with secondary enrichment in FB. The selective

plating media ranked in order of efficiency are : LPM, MMA, OXA, GBNA, and RAPAMY.

ENVIRONMENTAL SOURCES OF *LISTERIA* AND *YERSINIA* IN VERMONT DAIRY PLANTS

R.B. Klausner¹, C.W. Donnelly¹ and D.F. George², ¹The University of Vermont, Department of Animal Sciences, Room 212 Carrigan Hall, Burlington VT 05405 ²Vermont Department of Agriculture, Montpelier VT 05602

Environmental samples were collected from fluid and manufacturing dairy plants in Vermont. Sampling focused on environmental and non-product contact surfaces. Samples were collected during production hours via the sponge method which employed use of neutralizing buffer to minimize the effects of sanitizing compounds on recovery of bacteria. Sponges were stomached in 99 ml of diluent, and 25 ml aliquots of diluent were enriched in media selective for *Listeria* and *Yersinia*. For *Listeria* testing, *Listeria*-Tek was used to screen positive samples. *Yersinia* isolation proceeded according to FDA methods. The predominant microbial species recovered included *L. monocytogenes*, *L. innocua*, and *Y. enterocolitica*. Of confirmed positive samples, most were from wet traffic areas. Environmental sources of *Listeria* and *Yersinia* spp. included: floors in coolers, freezers, processing rooms particularly entrances, sites associated with cases and case-washer, floor mats, foot baths and the beds of paper fillers. Approximately 11% of environmental samples collected were positive for both *Yersinia* and *Listeria* spp., indicating general deficiencies in sanitation in these specific areas.

GROWTH AND SURVIVAL OF *SALMONELLA TYPHIMURIUM*, *STAPHYLOCOCCUS AUREUS* AND *PSEUDOMONAS FRAGI* DURING THE MANUFACTURE AND STORAGE OF COLBY CHEESE MADE FROM PASTEURIZED UF CONCENTRATED MILK

K.F. Eckner¹, and E.A. Zottola, University of Minnesota, Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108

Colby cheese was made from pasteurized ultrafiltered milk (2x by vol) and whole milk. The growth and survival characteristics of *Staphylococcus aureus* 196E, *Salmonella typhimurium* var. Hillfarm, and *Pseudomonas fragi* 4973 were compared during cheesemaking and storage. Initial numbers in the cheese milk were approximately 10⁷/ml of each. The starters were grown in reconstituted skim milk or in 2x UF retentate and consisted of *Lactococcus lactis* subsp. *lactis* C8 and *L. lactis* subsp. *EB1*. Samples of milk, curd, whey and cheese were taken during manufacture and analyzed for pH, TA, % solids, and microbial numbers. Storage samples were taken at 1 day, 2 weeks, 1.5, 3, 4, 5, and 6 months and analyzed in the same way. The *salmonella* increased slightly during manufacture but none were detected at 6 months. The staphylococcus increased during manufacture and declined but persisted through 6 months. The numbers of pseudomonas showed an increase in populations and a slight decline during storage. These results suggest that UF concentration of the milk has no effect on growth of these microbes during cheesemaking and storage.

THE USE OF CHLORINE AND IODINE SANITIZERS TO CONTROL MICROORGANISMS IN SWEET WATER USED IN HTST IN FLUID MILK PROCESSING PLANTS

B.J. Overdahl¹, and E.A. Zottola, University of Minnesota, Department of Food science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108

Potential spoilage and pathogenic organisms were isolated from sweet water used in the cooling sections of high temperature short time (HTST) pasteurizers. The purpose of this study was to determine an appropriate sanitizing method to control the organisms in the sweet water at 4°C. *Pseudomonas fluorescens* and *Staphylococcus haemolyticus* and *Bacillus* sp. isolated from sweet water samples from grade A fluid milk HTST pasteurizers were used in this study. Organisms were grown in Tryptic Soy Broth, centrifuged, washed with sterile phosphate buffer and resuspended in sterile phosphate buffer solution at 25°C or 4°C. Organisms

were exposed to different concentrations of 2 to 50 ppm available chlorine or 2.5 to 25 ppm iodine at 25°C and 4°C for 30 seconds. The suspension was neutralized with .1% sodium thiosulfate and the number of surviving organisms was determined by spread plating on Plate Count Agar. Results suggest that a greater concentration of available chlorine and iodine is needed at 4°C than at 25°C to control these organisms.

EVALUATION OF AIR SAMPLERS FOR RECOVERY OF ARTIFICIALLY GENERATED AEROSOLS OF PURE CULTURES IN A CONTROLLED ENVIRONMENT.

Young-jae Kang and Joseph F. Frank*, Department of Food Science and Technology, University of Georgia, Athens, GA 30602

An AGI-30, Andersen 6-stage Sieve Sampler, RCS Sampler and Millipore membrane filter sampler were evaluated for recovery of artificially-generated aerosols of pure cultures of *Pseudomonas fluorescens*, *Escherichia coli*, *Streptococcus faecalis* and endospores of *Bacillus subtilis*. Size distribution of the aerosol was analyzed to determine its relationship to sampler efficiency. The Andersen sieve sampler recovered significantly greater numbers of non-sporeforming bacteria, with least variability and the RCS sampler recovered significantly smaller numbers and exhibited greatest variability of the 4 samplers tested. AGI-30 and Filter sampler performance varied depending on the species tested. For recovery of bacterial endospore, the Filter and Andersen samplers both recovered greater numbers than the AGI-30 and RCS sampler. The RCS sampler recovered a significantly lower number of spores with the most variable results of the 4 samplers. Our data indicate that the Andersen sieve sampler is the sampler of choice for recovering microbial aerosols of interest to the food processing industry.

EVALUATION OF AIR SAMPLERS FOR RECOVERY OF BIOLOGICAL AEROSOLS IN DAIRY PROCESSING PLANTS

Young-jae Kang* and Joseph F. Frank, Department of Food Science and Technology, University of Georgia, Athens, GA 30602

An AGI-30, Anderson 6-stage Sieve Sampler, RCS sampler and Millipore membrane filter sampler were evaluated for measuring microbial air quality in three dairy processing plant environments: during milk processing, during ice cream processing and in the idle ice cream room. Sampler performances were evaluated based on the viable particle recovery, particle size distribution information and types of microorganisms recovered. Mean viable particle recovery decreased in the order of AGI-30 Anderson sieve sampler, RCS sampler and Filter sampler for each of the three sampling environments. But AGI-30 produced results with a high coefficient of variance, a result of several outliers. A comparison of the percent of non-mold cfu recovered by the RCS sampler vs. Andersen sieve sampler indicates that the RCS sampler had a bias toward the detection of non-mold containing particles at all three of the locations tested. The Andersen sieve sampler proved to be the most reliable sampler for recovering biological aerosols from dairy processing plant air.

THE EFFECT OF DAIRY PLANT HYGIENE ON MICROBIAL LEVELS OF SURFACES AND AIR

Katalin Rossmore and Cherie Drenzek, Diversey Wyandotte Corporation, 1532 Biddle Avenue, Wyandotte, MI 48192

The relationship between environmental surface contamination levels and airborne contamination levels were studied in different dairy processing areas (fluid milk, ice cream). Environmental surface contamination (equipment, walls, floors, etc.) levels were determined by Rodac Contact Plate Method and air contamination levels were assessed with S.A.S. (Surface Air System) sampling device at 90L/min. air intake using non selective and selective media for the recovery of microorganisms. The baseline and acceptability levels of both air and surfaces were determined and expressed as colony forming unit per contact plate surface of cubic meter of air. Surface contaminants were represented by *Bacillus. Micrococcus*, *Staphylococcus*, *Serratia*, *Klebsiella*, *Pseudomonas*, *Alkaligenes* and *Aeromonas* species. The dominant microorganisms encountered in the air belonged to the same species. Aerial contamination levels were reduced after environmental surface cleaning and sanitization practices.

The acceptable sanitary limits varied according to the different dairy processing environments.

RESTRICTION ENZYME ANALYSIS OF EPIDEMIC STRAINS OF *LISTERIA MONOCYTOGENES*

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Listeria monocytogenes, serotype 4B has been associated with food-borne outbreaks in North America. Mexican-style soft cheese was the vehicle of transmission in the 1985 epidemic in Los Angeles County. The purpose of this study was to employ restriction enzyme analysis in characterizing 17 human and 20 cheese isolates associated with the Los Angeles outbreak. Genomic DNA was harvested and cleaved with Hha I which we have previously shown best differentiates strains of *Listeria*. Each of the 37 isolates exhibited the same restriction enzyme pattern, which indicates a common source of *Listeria* contamination. The DNA fingerprint could be easily differentiated from the patterns observed in other 4B strains which were not associated with that outbreak. Therefore, restriction enzyme analysis is a sensitive epidemiologic tool in characterizing strains of *L. monocytogenes* associated with common-source food outbreaks.

INVESTIGATION OF AN OUTBREAK OF SALMONELLOSIS ATTRIBUTED TO THE INGESTION OF CHEESE PREPARED FROM PASTEURIZED MILK--RESOLUTION OF PROBLEM

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In 1984, the cause of an epidemic of salmonellosis was attributed to the ingestion of cheese produced by one plant in Eastern Canada. The cheese was prepared from pasteurized milk--a process which should have eliminated *Salmonella* spp. from the raw material. Investigation revealed that the milk was, for a brief period during the cheese production cycle, not pasteurized. This communication will present the data available at the time of the outbreak, the sequence of events and tests performed to identify the problem, and the corrective measures taken.

BACTERIAL QUALITY OF SHAKES PURCHASED AT FAST FOOD OPERATIONS

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The dairy industry has received complaints about milk shake quality for years. Samples of shakes were purchased throughout Pennsylvania in 1988. Bacterial testing was done within 24 hours of purchase in consumer containers. Over one-third of the nearly 200 samples had coliform counts of less than one per ml. However, 51% of the samples contained more than 10 coliforms per ml. Thirty-five percent of the Standard Plate Counts were less than 1,000 per ml. SPC's of 46% of the samples were more than 10,000 per ml., while 30% of the total samples had SPC's above 50,000 per ml. More regulations, sampling, testing and enforcement seem to be necessary to improve shake bacterial quality. Training of persons handling mix, and cleaning and sanitizing freezers is necessary. Dairy processors, associations and regulatory agencies are interested in developing training visuals and conducting programs.

COMPOSITION OF SHAKES PURCHASED AT FAST FOOD OPERATIONS

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Many consumers believe a shake or milk shake contains more milkfat than milk. Most regulatory agencies require a listing other than milk shake, when milkfat is not at least 3.25%. Milkfat and total solids composition of nearly 200 retail purchased samples were determined in duplicate by Mojonnier procedures. Thirty-seven percent of the samples contained less than 3.25% milkfat. Most of the samples (47%) contained between 3.25% and 3.99% milkfat. Eight percent of the samples contained between 4.0% and 5.0%, and the same percentage of samples had more than 5.0%. Total solids content of shakes varied from less than 25% to more than 30%. Twenty-eight percent of the samples contained between

25% and 27.49% total solids, while 22% had between this upper limit and 29.99%. Only 9% of the samples contained more than 30% total solids. It would seem that regulatory agencies would require a name not similar to milk shake for those shakes not containing 3.25% milkfat.

A SIMPLE PLATING METHOD FOR ESTIMATION OF POTENTIAL SHELF-LIFE OF PASTEURIZED FLUID MILK

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Research has led us to a method for potential shelf-life estimation which is simple, familiar, sensitive, accurate, relatively rapid, and inexpensive. It involves preliminary incubation of 5 ml milk with 5 ml nutrient broth at 21C for 18h, followed by enumeration of psychrotrophic bacteria by the modified Psychrotrophic Bacteria Count (21C for 25 or 48h, agar or petrifilm - PI/mPBC). The resultant correlation to potential shelf-life is -0.89. If the PI is conducted with milk only (no broth), the difference between correlation values is insignificant ($r=-0.88$). Not only is this method strongly related to its ultimate determinant (shelf-life/quality), it can be used in day-to-day operations with great ease. The shelf-life range can be predicted by the following chart.

PI/(P)mPBC	Shelflife
$\leq 1,000$ cfu/ml	≥ 14 days
1,000-200,000 cfu/ml	10-14 days
$\geq 200,000$ cfu/ml	≤ 10 days

This method can easily be incorporated into a quality assurance program which includes Standard Plate Count, Coliform Count, shelf-life testing within 2-3 days, and sensory evaluation (initially and at the code or "target" date).

IMPROVEMENT OF QUALITY OF DAIRY PRODUCTS IN TENNESSEE

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Since 1967, 625 samples of cottage cheese, 506 samples of homogenized milk and 472 samples of chocolate milk were collected from retail outlets in Tennessee and examined for flavor, standard plate count (SPC) and psychrophilic plate count (PPC). Approximately 10 samples of each product were collected at each sampling period. The median SPC for each sampling period on cottage cheese, homogenized milk and chocolate milk ranged from 500 to over 2,000,000, 100 to 283,000 and 20 to 2,460,000, respectively. The median PPC for each sampling period on these same products ranged from <100 to 64,000, <100 to 326,000 and <30 to 5,070,000, respectively. The "lacks freshness" criticism was noted frequently in cottage cheese and whole milk. The data show a gradual improvement in quality of these products since 1967.

DEVELOPMENT OF A RIPENING COEFFICIENT FOR PICKLED WHITE CHEESE

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Four batches of milk were used for pickled white cheese manufacturing. Titratable acidity of milk samples were 0.16% as lactic, fat content of 3.2%, casein/fat ratio of 0.70 and pasteurization at 70C for 3 minutes to meet the requirement of a standard raw material. A mixed culture of *Streptococcus lactis* and *Lactobacillus casei* in 2:1 ratio was used as starter culture. The cheese samples were stored at 4C for three months. Samples were analyzed for total nitrogen by micro-Kjeldahl procedure, and soluble nitrogen by formol titration method at 1, 30, 60, and 90 days of ripening. The ripening coefficient was calculated with the following formula:

$$\text{Ripening coefficient} = \frac{\% \text{ soluble nitrogen}}{\% \text{ total nitrogen}} \times 100$$

and found to range between 5 to 36.

The correlation coefficients between ripening coefficients and overall quality scores were calculated which were ranged between 0.88-0.96.

RESIDUAL CHEMICALS IN MILK AND DAIRY FOODS

CURRENT FINDINGS ON ANTIBIOTIC RESIDUALS IN MILK AND DAIRY FOODS — STATE PERSPECTIVE

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The current trend towards larger and fewer milk and dairy products processing facilities, increased consumer awareness and subsequent demand for Food Safety, and the increased use of a broad spectrum of antibiotics/chemicals by today's larger dairy farm to control the increased risk or incidence of infectious dairy animal diseases has created anxiety in the Dairy Industry.

Consumers are questioning the rationale of the permissive antibiotic standards that exist for milk and dairy foods given the developing technology for the detection of these residues.

Antibiotic supplements in feeds, sulfamethazine residues or any other potential carcinogens and antibiotic resistant pathogenic bacteria are some of the issues that must be successfully addressed to protect the integrity of dairy foods.

The public health milk regulatory authority must respond quickly and effectively with 'state of the art' residue testing programs to fulfill this mandate.

"AFLATOXINS - THE 1988 OUTBREAK"

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The drought of 1988 produced conditions which caused the largest incidence of aflatoxin in survey samples in 20 years. The samples were obtained from university research plots and elevator samples, which were voluntarily submitted. The samples were analyzed by the official AOAC procedure.

Thirty percent of the samples were above 20ppb. Illinois had similar levels in their survey samples. Other states surrounding Iowa analyzed fewer samples and found lower levels.

The farms with the aflatoxin levels were in the areas of the state which received less than 2 inches of rain in the months of June and July in 1988.

Traces of aflatoxin were found in milk samples in early fall 1988. The State Department of Agriculture continues to monitor milk samples. No samples above 0.5ppb have been found in commercial milk. On-farm process plant testing for aflatoxin has assured no milk for human consumption contained detectable aflatoxin.

RESIDUE CHEMICALS IN MILK AND DAIRY FOODS--THE SOLUTIONS AND ACTIONS--A PANEL-UNIVERSITY ACTIVITIES

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When the determination was made that we may have an aflatoxin problem with the 1988 corn crop in Iowa due to drought conditions, an Iowa State Extension aflatoxin information team was organized in late September to deal with the press, farmers, grain elevators, food processors, and county extension staff. After corn harvest, samples from grain elevators in each of Iowa's 99 counties were obtained to survey for aflatoxin. These samples were analyzed by the ISU Vet Diagnostic Lab. After the extent of the aflatoxin problem was determined, the Iowa Department of Agriculture Food lab became equipped and people trained for testing. In early October, I sent to each Iowa dairy food processor three documents: May 1986 IFT Scientific Status Summary--Mycotoxins and Food Safety, Elmer Marth's Aflatoxin: Toxicity to Dairy Cattle and Occurrence in Milk and Milk Products-- A Review published in June 1982 J. Food Protection, and Lloyd Bullerman's Significance of Mycotoxins to Food Safety and Human Health published January 1979 J. Food Protection. From October 1988 through the Spring of 1989 concerns continued from food processors, farmers and the public about aflatoxin.

toxin residues in food. Through newsletters, annual meetings, workshops, radio, TV and newspaper interviews, and telephone calls, information on aflatoxin residue testing, food tolerances and safety concerns were addressed.

NEW LABORATORY METHODS

THE USE OF AN ELISA, LISTERIA-TEK™, FOR THE RAPID DETECTION OF *LISTERIA* IN FOOD AND ENVIRONMENTAL SAMPLES

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Detection of *Listeria* contamination in food and environmental samples remains a major concern for the food industry and regulatory agencies. Conventional microbiological methods for the detection of food borne pathogens are often laborious, time-consuming, and inconvenient. We have developed a rapid assay, enzyme-linked immunosorbent assay (ELISA), to detect *Listeria*. The test uses highly sensitive and specific monoclonal antibodies to directly assay a heat-inactivated broth sample from a 44-48 hour enrichment culture. This assay, which can test multiple samples in less than two (2) hours, has the requisite sensitivity to meet zero tolerance providing objective data for product certification.

CHROMOGEN-LABELLED DNA PROBE FOR THE *LISTERIA MONOCYTOGENES* HEMOLYSIN GENE USED IN THE DETECTION OF *FOODBORNE LISTERIA*

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The *Listeria monocytogenes* hemolysin gene was cloned and expressed in *Escherichia coli*. Chromogen-labelled DNA probes prepared from the plasmid inserts permitted detection of *L. monocytogenes* by a colony hybridization method based on hydrophobic grid-membrane filters (HGMFs). Pure cultures of all *L. monocytogenes* serovars gave positive reactions (purple dots) which could be detected automatically (HGMF Interpreter®). Other *Listeria* spp., and 21 other potentially cross-reactive organisms yielded negative results.

RAPID SIMPLE AFLATOXIN ANALYSIS IN MILK AND MILK PRODUCTS USING THE AFLATEST(TM) METHOD

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Aflatoxin M1 is a carcinogen secreted in the milk of cows which ingest aflatoxin contaminated feed. Surveillance of aflatoxin residues requires a simple, rapid, sensitive, and quantitative test.

A test has been developed which uses an antibody affinity column to isolate aflatoxin M1 from milk and milk products. Fluid samples are passed directly through the column. Solid samples can be analyzed after reconstitution or extraction. The column is then washed and the aflatoxin eluted into a test tube. The affinity column provides sufficient sample cleanup that the aflatoxin level can be measured directly using a fluorometer.

Using raw milk samples spiked with known amounts of aflatoxin M1, the method provides greater than 95% recovery over the range 0.05ppb to 0.5ppb. Values obtained on the fluorometer agree with those obtained by HPLC. Detection limit is 0.05ppb. The time required to quantitate a prepared sample is about 8 minutes. The test can be easily done outside a lab setting.

Using this method, aflatoxin levels can be monitored easily, rapidly, and accurately.

MEASUREMENT OF RESIDUAL ALKALINE PHOSPHATASE IN DAIRY PRODUCTS USING THE ADVANCED FLUOROPHOS(TM) QUANTITATIVE ASSAY

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A new quantitative assay has been developed for measuring residual alkaline phosphatase (ALP). The assay is applicable to a wide variety of dairy products including whole milk, low fat and skim milk, chocolate milk, egg nog and cheeses. ALP in the test sample hydrolyzes a non-fluorescent substrate, Fluorophos(TM), to a highly fluorescent product. The rate of product formation is monitored continuously during a short incubation period in a dedicated bench-top fluorometer and enzyme activity is calculated from the rate of product formation. Total test time is 3 minutes. Test procedure consists of adding 0.1 ml sample to 3.0 ml working substrate, mixing and placing the cuvette in the fluorometer, regulated at 38°C. Cheese samples are assayed using the same procedure after a standard extraction of 1 g of sample into neutralized 7.5% butanol. Optimum enzyme activity was obtained with a single working reagent containing diethanolamine buffer at pH 10.0 and substrate at 2 mM. Milk ALP gives a V_{max} of 1.47×10^2 and a K_m of 3.06×10^{-2} . Reaction rates are read for 3 minutes but are linear up to 30 minutes and 2.0% raw milk (equivalent to Scherer 20 µg phenol/ml). The detection limit for the assay is 0.006% raw milk (approx 0.06 µg phenol/ml). Interference controls were negative for a wide variety of products including flavored milks. Correlation with the Scherer quantitative colorimetric procedure was good with a r of 0.995 and a least square regression of Y (Scherer) = $0.003X + 0.299$ (N=20). Within and between run precision of the Fluorophos I method were assessed by repeated analysis of a 0.1% raw milk pool. The within run (N=10) mean was 190.4 mU/L, sd 3.2, and a cv of 1.7%. Between run results for the same pool (N=20) were mean 188.8 mU/L, sd 4.8, and a cv of 2.6%. This procedure provides a rapid, sensitive, precise and easy-to-use ALP assay, applicable to a wide variety of dairy products.

A NEW DISC ASSAY FOR DETECTING SULFAMETHAZINE AND OTHER SULFA DRUGS AT LESS THAN 10 PPB

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The current *B. steurothermophilus* disc assay is insensitive to sulfonamides. This permitted sulfamethazine to contaminate milk widely without detection by regulatory. Although much attention has been focused on sulfamethazine, a number of other sulfa drugs commonly used are equally illegal.

We have adjusted the medium of the disc assay to accommodate the required sensitivity to sulfa drugs, i.e. less than 10 ppb. The sensitivity to beta-lactam and other antibiotics is about the same or improved over the old disc assay. Sulfa drugs may be identified with paba neutralizing zones. A survey of milk with this method will be presented. It is also possible to test urine for assessing the condition of animals.

BETA-LACTAM ANTIBIOTIC ADMINISTRATION STUDY COMPARING A BETA-LACTAM ASSAY IN MICROTITRATION FORMAT WITH THE *B. STEUROTHERMOPHILUS* DISK METHOD

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Beta-Lactams are among the most widely used anti-bacterial agents in veterinary medicine. Appropriate administration and recommended withdrawal times for these drugs must be followed in order to prevent residues from remaining in the milk. We have developed an assay in microtitration format to detect the presence of beta-lactam antibiotics. Twice daily, milk samples were collected from five Holstein cows starting two days prior to administration of beta-lactam and antibiotic. Treatments included I.M. penicillin G or intramammary infusion of cloxacillin or amoxicillin for three days. Sampling continued through the recommended milk-out period and for two days thereafter. Samples were assayed by the beta-lactam assay and *B. steurothermophilus* disk methods. Of a total of 102 samples, fifty-one (51) were positive by both beta-lactam and disk

methods, while forty-nine (49) samples were negative by both methods. Only two samples near the cut-off value were in disagreement. This beta-lactam assay offers equal sensitivity to the disk method at a considerable savings in time.

AN ENZYME IMMUNOASSAY SCREENING TEST FOR ANTIBIOTIC RESIDUES IN MILK

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Use of antibiotics has led to the prevalence of undesirable drug residues in milk of lactating animals. Simple and rapid assays for sulfamethazine, β -lactams, chloramphenicol and other drugs in milk (raw, pasteurized, low fat, extra rich), that can be performed by untrained personnel for on-site analysis of antibiotic residues, are being developed. The tests are conducted in easy-to-handle, antibody coated polystyrene tubes, and take approximately 15 minutes to screen 5 samples. Results are interpreted by visual color comparison of the sample tubes to the known standards. The lower detection limit of the tests are less than 10 ppb. Inter- and intra-assay coefficients of variations are less than 10%.

THE USE OF CONDUCTANCE MICROBIOLOGY TO MONITOR ENTEROBACTERIACEAE LEVELS

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Monitoring levels of Enterobacteriaceae in finished products and on environmental surfaces is an effective method for ensuring the quality of a food or beverage process. The method for Enterobacteriaceae enumeration recommended by the ICMSF (Micro-organisms in Foods 1, second edition 1988) utilizes serial dilution followed by selective agar plating. An automated method using conductance monitoring of a selective Enterobacteriaceae media was investigated as a rapid alternative method.

Various dairy products, naturally and artificially contaminated with Enterobacteriaceae, were inoculated into test tubes containing the Enterobacteriaceae selective broth. The test tubes were then placed into a Malthus 2000 Microbiological Analyzer. Conductance monitoring of the samples began immediately upon insertion into the Malthus and continued until the test was completed. The samples were simultaneously subjected to the ICMSF recommended method for enumerating Enterobacteriaceae.

Levels of Enterobacteriaceae, as determined by conductance and agar plate methods, were compared and a strong statistical correlation observed between the two methods. Variation between replicates were less for the conductance method. Results of this study prove that Enterobacteriaceae levels can be accurately monitored using the conductivity method described with results automatically available within hours.

PRESUMPTIVE AND CONFIRMED TOTAL COLIFORM MPN ESTIMATIONS IN A SINGLE DISPOSABLE DEVICE.

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A disposable plastic device with nine separate chambers permits both presumptive and confirmed total coliform MPN estimations. The device is designed to replace the conventional nine test tubes with lauryl sulfate tryptose broth (LST) that are specified by the BAM/AOAC procedure for presumptive determinations and the additional test tubes with brilliant green bile broth (BGB) that are used for confirmation of positive presumptive tubes. Each chamber of the disposable device contains 10 ml of LTB and allows for the addition of a 1 ml inoculum. Gas that accumulates during incubation by the fermentation of lactose by the coliform bacteria is captured in a cylindrical area of each chamber to indicate a presumptive positive result. A concentrated preparation of BGB is then added into each positive chamber after the device has incubated for 24 and 48 hours at 35°C. The unit is re-incubated at 35°C for 24 hours and read again for the appearance of gas. The presence of gas indicates a confirmed culture. The device was compared to the BAM/AOAC method for the confirmed estimation of total coliform bacteria in raw and processed

products. For 304 samples representing 24 different food types, a confirmed mean log MPN for the AOAC/BAM method was found to be 1.51 whereas the confirmed mean log MPN within the single device was found to be 1.35. The advantages of the single device for confirmed MPN results are ease of use, minimization of biohazard associated with subculturing and handling of tubes, and time savings of 24 hours for a confirmed MPN result.

VALIDATION OF EF-18 AGAR WITH THE ISO-GRID HGMF SYSTEM FOR RAPID DETECTION OF SALMONELLA IN FOODS

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In 1984, a rapid hydrophobic grid membrane filter (HGMF) method for detecting *Salmonella* in foods was accorded Official First Action by the AOAC. This method, which used Selective Lysine Agar (SLA), was equivalent in sensitivity to the conventional AOAC reference method; however, many non-salmonellae resembled *Salmonella* on SLA, resulting in a relatively high frequency of presumptive false positive samples. To overcome this deficiency, SLA was replaced by EF-18 Agar which incorporates an additional selective agent, novobiocin, and a second biochemical test. The revised ISO-GRID HGMF *Salmonella* method provides a negative screen result in as little as 42 hours with sensitivity equivalent to the conventional AOAC reference method. With the HGMF method, the confirmation rate of presumptive positive samples is approximately 99%, as compared to less than 90% confirmation of presumptive positive reference method results on the same samples. A collaborative study of the improved HGMF *Salmonella* method using EG-18 Agar is scheduled for 1989.

SEAFOOD TOXIN

AMNESIC SHELLFISH POISON (DOMOIC ACID)

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At least 103 persons developed gastroenteritis and neurological symptoms after eating cultivated mussels harvested from eastern Prince Edward Island in November and December 1987. In the most severely affected cases, memory loss was permanent and three deaths were reported. The toxic agent was identified as domoic acid which originated in a marine diatom *Nitzschia pungens*. Once the problem was associated with shellfish, sales were banned until stocks were tested by the mouse bioassay and then found to be negative. An HPLC method has since been developed for identification of domoic acid in shellfish. The reason for the bloom of *Nitzschia* in a limited coastal area has not been determined but it reappeared in the winter of 1988. Since control measures were in place, however, no illnesses were reported.

FOOD MICROBIOLOGY

FOODBORNE PATHOGENS IN PERSPECTIVE: THE ONTARIO EXPERIENCE

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Between 1983 and 1988, the Laboratory Services Branch of the Ontario Ministry of Health examined approximately 10,000 food samples related to about 6,500 reported incidents of suspected foodborne illness. Single cases accounted for almost half of these incidents. The data to be presented will include the isolation frequency of contemporarily recognized bacterial etiological agents by outbreak location and food type. The isolation frequencies of these agents from clinical specimens will also be presented and the relative significance and application of food and fecal analyses to foodborne disease investigations will be discussed and challenged.

MICROBIAL AIR QUALITY OF A NEW MEAT LABORATORY COMPLEX BEFORE AND AFTER OCCUPANCY

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The numbers and kinds of air-borne microbes in the foodprocess environment have a direct impact on the final microbial quality of the product. Air-borne microbes in a new meat research laboratory complex were monitored by use of an efficient air sampler--"SAS" system--for 14 weeks prior to occupancy (ca. 24C) and another 13 weeks after occupancy (ca. 3 to 16C). The average weekly total counts before and after occupancy of 5 sites were 220 CFU/m³ and 53 CFU/m³, 296 CFU/m³ and 162 CFU/m³, 296 CFU/m³ and 55 CFU/m³, 296 CFU/m³ and 81 CFU/m³, and 313 CFU/m³ and 104 CFU/m³, respectively. Of more than 700 bacterial isolates studied 60% were Gram positive rods (mostly *Bacillus*) and 40% were Gram positive cocci (mostly *Micrococcus*).

Air quality of the meat laboratory complex was poor before occupancy. The microbial air quality improved greatly (reduction of counts at all sites) due to cleaning and cooling of the sites. However, the air quality of various sites was influenced by human activities and hygienic conditions after occupancy.

SURVIVAL OF *CAMPYLOBACTER JEJUNI* IN TURKEY ROLL STORED AT 4 AND 21 C UNDER VARYING LEVELS OF CARBON DIOXIDE, NITROGEN AND OXYGEN

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The objectives of this study were to determine the effects of seven gas atmospheres composed of carbon dioxide, nitrogen and oxygen on the survival of *Campylobacter jejuni* in turkey roll. Turkey roll slices inoculated with *C. jejuni* and uninoculated control slices were stored in anaerobe jars flushed with a desired gas mixture. Slices were stored under each atmosphere at 4 and 21 C for 0, 1, 3, 6, 12 and 18 days and 0, 6, 12, 24 and 48 hr, respectively.

Increasing carbon dioxide concentration yielded a corresponding increase in *C. jejuni* survival, simultaneously, at both temperatures provided greater inhibition of aerobic and psychrotrophic bacterial growth. Atmospheres containing 100% air and 5% oxygen/10% carbon dioxide/85% nitrogen were most lethal to *C. jejuni*. The effect of carbon dioxide was more pronounced at 4 C with *C. jejuni* survival being substantially higher than at 21 C. *Campylobacters* were isolated by enrichment from turkey roll held under all atmospheres on day 18 and 48 hr at 4 and 21 C, respectively.

Consumption of processed turkey roll packaged under elevated carbon dioxide levels seems to pose a potential health risk concerning *C. jejuni*. This is due to an increased survival rate of *C. jejuni* accompanied by minimal evidence of spoilage by aerobic and psychrotrophic bacteria.

THE EFFECT OF PRIOR HEAT SHOCK ON THE HEAT RESISTANCE OF *LISTERIA MONOCYTOGENES* IN MEAT

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Although the heat resistance of *L. monocytogenes* in dairy products has been intensively studied, little data is available on the thermal resistance of the organism in meat products. Irradiated meat was inoculated with *L. monocytogenes* to give a final concentration of 1.0-2.0 x 10⁷ CFU/g. In initial experiments meat was heat-shocked at 48°C, prior to being heated at test temperatures of 62° or 64°C. Increases in recovery of *L. monocytogenes* of slightly over one log were observed in those meats which had been pre-heated at 48°C. Experiments done to compare the heat resistance of cells which had been heat-shocked for 30 min, 1h or 2h showed that the latter time, provided for the greatest increase as compared to control (non heat-shocked) cells, i.e., an increase in recovery of *L. monocytogenes* of approximately 1.25, 2.2, and 2.7 logs was observed for cells heat-shocked for 0.5, 1.0 and 2h, respectively. Cells heat-shocked at 48°C for 1h and left 24h at 4°C before being heated at a test temperature of

64°C, still maintained their increased heat resistance properties as compared to control cells.

BACTERIAL SURVIVAL AND THERMAL RESPONSES OF BENTONITE-GLYCEROL-BHI BROTH DISPERSIONS, A SIMULATION MODEL FOR BEEF AND/OR TURKEY LOAVES IN A MICROWAVE FIELD

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Purpose of this study was to determine if Bentonite-Glycerol-BHI broth dispersions (20%, 10%, 70% by wt.; BGB) could serve as a simulation model for beef and/or turkey loaves (10% fat) that had been processed in a microwave oven (2450 MHz). Experimental products were inoculated with *Escherichia coli* (0157:H7) and *Staphylococcus aureus* (ATCC 6538) and packed into 150, 600, 1200g load sizes (n=72). Each load size was exposed to four identical levels of microwave energy (3.57, 4.76, 5.94, and 7.13 Watts x min.) per gram of loaf. The surviving aerobic flora, *E. coli* and *S. aureus* were enumerated at the point (n=16) of lowest temperature. Statistically, survival of bacteria was similar (P<0.05) in thermal responses except time of post processing temperature rise (mean diff.= 194 sec.) between turkey and BGB loaves and time of post processing temperature rise (mean diff.= 242 sec.) and sum of temperature rise (mean diff.= 3.1°C) between beef and BGB loaves. In conclusion, BGB dispersions have the potential to be a simulation model for bacterial survival and thermal responses of beef and/or turkey loaves (10% fat) after microwave processing.

INHIBITION OF *LISTERIA MONOCYTOGENES* BY BACTERIOCIDIN-PRODUCING *PEDIOCOCCUS* DURING THE MANUFACTURE OF FERMENTED SAUSAGE

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A bacteriocin-producing *Pediococcus* species that showed inhibitory activity against *Listeria monocytogenes* was used to manufacture typical fermented summer sausage. Separate 14 kg batches of a commercial summer sausage formulation were inoculated to contain an initial level of 10⁸ cells/g of *Listeria monocytogenes* Scott A. In each of two independent trials, a greater than 2 log reduction of cells occurred over the fermentation period, as compared to a less than 1 log reduction of *L. monocytogenes* in sausage fermented with a non-bacteriocin-producing *Pediococcus* strain. Inactivation of *Listeria* was also observed in sausage trials where adequate acid production did not occur (pH>5.5), indicating that bacteriocin production occurred independently of carbohydrate fermentation. Following cooking to an internal temperature of 64°C and storage up to 2 weeks, 9 of 85 samples were positive for *Listeria*.

CLOSTRIDIUM BOTULINUM GROWTH IN FRESH FISH STORED UNDER MODIFIED ATMOSPHERES. USE OF PREDICTIVE MODELING IN QUANTIFYING THE RISK OF TOXICITY IN THIS AND OTHER NEW GENERATION REFRIGERATED FOODS.

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A five year study evaluated the toxigenesis of *C. botulinum* in modified atmosphere (MA) packaged fresh fish stored between 4 and 30°C for up to 60 days. The earliest observations of toxicity, at 30, 20, 16, 12, 8 and 4°C, were 0.5, 1, 2, 3, 3, and 15 days, respectively. The lag time (LT), i.e. sampling period prior to toxicity, across all experiments was significantly affected by temperature, spore inoculum level, fish type, spore pool, and MA. Temperature explained 74.6% of experimental variation in a predictive model (r²=0.883) for LT. A general formula containing factors yielding the most conservative model, i.e. shortest LT, predicted LT's in individual experiments which were usually shorter than the observed data. The utility of the general model is demonstrated by its ability to quantitatively predict the time before toxigenesis, in the greatest majority of cases reported in the literature dealing with qualitative observations of *C. botulinum* toxicity in inoculated fish studies. The significance of experi-

mental design and use of predictive modeling approaches in evaluating the *C. botulinum* toxigenesis risk in "new generation" refrigerated foods will be discussed.

DETECTING *LISTERIA* SPP. IN NATURALLY CONTAMINATED SEAFOODS, COMPARING FOUR ENRICHMENT PROCEDURES TO A MODIFIED STANDARD FDA METHOD

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Four enrichment procedures were used in analyzing 211 raw and processed seafood composites for *Listeria* spp. Detection was made using a commercial ELISA kit. Enrichment methods included buffered and unbuffered *Listeria* enrichment broth (LEB) incubated for 48 h, buffered LEB with a 24 h transfer step, and a commercial UVM-1 media with a 24 h transfer to UVM-2 media. The composites were also examined by a modified standard FDA cultural method. Unbuffered LEB was the most efficient of the four enrichments for raw seafoods with a false negative of 13.8%. Buffered LEB incubated for 48 h was most efficient with a false negative rate of 51.6% for processed seafoods. The FDA method had false negative rates of 10% for both raw and processed seafoods. In raw seafoods, unbuffered LEB compared closely to the FDA method; however, in processed seafoods no enrichments were satisfactory.

THE SURVIVAL OF *LISTERIA MONOCYTOGENES* IN AEROSOLS

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Aerosols of *Listeria Monocytogenes* Scott A were generated in 0.1% peptone (PW) and 0.1% reconstituted skim milk (RSM) and rate of fall determined. *L. monocytogenes* Scott A was propagated in Tryptic Soy Broth with 0.6% yeast extract (TSBYE) at 30°C for 18 hr. Cells were harvested by centrifugation at 10,000 rpm for 10 min, washed with 0.85% saline, centrifuged and resuspended in either 0.1% PE or 0.1% RSM. Cell population in the suspension was 1×10^8 . The aerosol was generated into an enclosed hood by pressurized freon. TSAYE plates were spread out on the bottom of the hood and used to collect fallout. For the first 25 min after aerosolization, every 5 min the lids of 3 randomly selected plates were removed for 2 min and then replaced. For the remaining time of the study, lids were removed at 10 min intervals and replaced after 5 min of exposure. Exposed plates were incubated at 30°C for 24 hr and numbers determined per cm² per min. Results showed that *L. monocytogenes* under these conditions survived in aerosols of either PW or RSM for 3 hr and 25 min.

MODIFIED AGAR MEDIUM TO ISOLATE STARTER CULTURE FROM RAW MILK

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A modified MRS (De Man, Rogosa, Sharpe) agar, Difco, containing 0.1% sorbic acid (MRS-S) and pH adjusted to 6.4 was used as a primary medium for plating goat's milk in the process of isolation of lactic acid bacteria of importance to the dairy industry. An inhibition of 86.30 ± 2.4 percentile (CV=3%) towards undesirable flora was observed after comparing samples inoculated in the two media. From 156 isolates originated from the modified medium (five trials) 95.5% were cocci which exhibited positive Gram reaction following bacilli (2.60%), yeast (1.30%) and Gram negative cocci (0.60%). Behavior of the species of interest were comparable (pH, acid and diacetyl production), to that of the type-species when cultivated in NDFM (10% reconstituted), sterilized at 121°C/15 minutes incubation at 21°C/24 h.

FOOD MICROBIOLOGY AND TOXICOLOGY

INDICATORS OF FOOD SAFETY: CONCEPTIONS AND MISCONCEPTIONS

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The reliability of indicator organisms to predict significant or detectable levels of foodborne disease causing bacteria in ready-to-eat processed foods was evaluated. The data was compiled from results of analyses conducted by the Laboratory Services Branch of the Ontario Ministry of Health between 1985-1988. Approximately 10,000 food samples associated with suspected foodborne outbreaks and about 21,000 "routine" samples were quantitatively examined for significant levels of indicator organisms with the following isolation frequencies: Aerobic Plate Count (24.2%); Coliforms (17.8%); *Escherichia coli* (11.5%); Total Gram Negative Count (13.3%). Where appropriate, protocols for detectable or significant levels of foodborne pathogens were included with the following frequencies of detection: *Salmonella* sp. (90.5%); *Campylobacter jejuni* (0.0%); *Yersinia enterocolitica* (0.0%); *Staphylococcus aureus* (1.2%); *Clostridium perfringens* (0.2%); *Bacillus cereus* (0.6%). These data suggest that food microbiologists need to reconsider the traditional concepts of indicator organisms and the significance placed on their role as predictors of foodborne hazards.

HEMORRHAGIC *ESCHERICHIA COLI*

Donald J. Pusch, University of Minnesota, Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108

A relatively rare serotype of *Escherichia coli* O157:H7 has within the past decade been recognized as a foodborne pathogen. This microorganism produces a Shiga-like toxin producing a gastro-intestinal disease characterized as a hemorrhagic colitis with hemolytic uremic syndrome (HUS) and thrombotic thrombocytopenic purpura (TTP) as potentially serious side effects.

Methods of isolation and identification require an enrichment step subsequent biochemical and serological confirmation and testing for the Verocytotoxin produced by the isolates.

Because several outbreaks of hemorrhagic colitis have been related to consumption of ground meat and raw milk, it is believed that cattle may be the primary reservoir for this pathogen.

TIME-TEMPERATURE PATHOGENIC BACTERIA GROWTH STANDARDS FOR RETAIL FOOD OPERATIONS

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Current retail food operations food safety regulations state that the hazard temperatures for holding food are 45F-140F. Today we know this is incorrect. *Yersinia enterocolitica* begins to multiply at 32F and in a carryover condition *Clostridium perfringens* can multiply up to 130F. A database of pathogenic bacteria growth data in food has been compiled and an equation developed that can be used by a food safety inspector to numerically evaluate the safety of food process in terms of time and temperature. Based on conventional operating conditions, when pathogen multiplication is limited to four generations, the food will normally spoil first. With extended shelf life pasteurized chilled food processes, the optimum controls are store at <30F, keep the pH<4.6, use conventional preservatives, or add spoilage bacteria for self-control.

INTRACELLULAR pH EFFECTS IN LACTIC ACID BACTERIA

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The effect of the lactic acid fermentation on the intracellular pH in strains of *Streptococcus thermophilus*, *Streptococcus lactis*, and *Streptococcus cremoris* grown in various media was studied. The intracellular pH was determined by measuring the distribution ratio (in/out) of the radioactive weak acid probe, C-14 benzoate. Accumulation of the probe was determined by a silicon oil centrifugation technique, and radioactivity was measured by liquid scintillation counting. In each of the three species of lactic acid bacteria studied, a pH gradient of 0.8 to 1.0 pH unit, between the intracellular compartment (cytoplasm) and extracellular medium was achieved in log phase cells. A reduction of the pH gradient began to occur in late log phase (extracellular pH less than 5.0). In late stationary phase the pH gradient was reduced to 0.1 unit or less. Cells grown in the presence of excess lactose and proton-uncoupling agents provided evidence that rapid growth of lactic streptococcus does not occur when the intracellular pH is below 6.1 - 6.4.

THE COMPARATIVE ANALYSIS OF TRYPAN BLUE AGAR AND CONGO RED AGAR FOR THE ENUMERATION OF YEAST AND MOLD USING HGMF SYSTEM

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Hydrophobic grid-membrane filter (HGMF) system has been introduced as a rapid alternative method for viable count of bacteria, yeast and mold. After filtration of liquidized sample through the HGMF, the filter was placed on an appropriate agar for colony development. On regular agar, the colonies were pale and hard to enumerate. We have previously developed a trypan blue (1:10⁶) agar such that yeast and mold colonies showed distinct blue colonies. Recently a Congo red (25:10⁶) agar was proposed due to the ability of yeast and mold to fluoresce under UV. We compared both agars for viable counts of yeast and mold from foods.

Large numbers of milk, spice, dry products, vegetables, fruit juice and meat samples were tested. Data indicated that both agars were suitable for enumeration of yeast and mold, however the trypan blue agar was more direct since no UV was needed. This became crucial when a mechanical counter was utilized for rapid counting of colonies as it was not practical to operate a counter under UV for counting fluorescing yeast and mold colonies on Congo red agar.

THE EVALUATION OF VARIOUS GROWTH MEDIA USED TO DETERMINE PERCENT MOLD INFECTION OF GRAINS

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Fifty-three samples of dried stored corn (maize) displaying various amounts of mold and insect damage were evaluated for percent mold infection by direct plating technique. Four different media employing two levels of water activity (A_w) were used. These media included potato dextrose agar plus tetracycline (PDAT), dichloran rose bengal chloramphenicol agar (DRBC), PDAT plus 7.5% NaCl and DRBC plus 7.5% NaCl. Results indicate that DRBC and DRBC + salt was more effective than PDAT and PDAT + salt in inhibition of "spreader" molds, resulting in more accurate detection of kernels infected with molds. The lower A_w media (PDAT + salt and DRBC + salt) also gave higher percent mold infection levels than PDAT and DRBC indicating a better assessment of the degree of mold contamination by storage fungi such as *Aspergillus sp.* and *Penicillium sp.* by these media.

RAPID PRESUMPTIVE IDENTIFICATION OF YEASTS IN MEAT PRODUCTS

C. Liang* and D.Y.C. Fung, Department of Animal Sciences and Industry, Kansas State University, Manhattan, KS 66506

Yeasts play an important role in food microbiology. Identification of food yeasts is time consuming and cumbersome using conventional methods. Commercial diagnostic kits are available for clinically important yeasts but not for food yeasts.

We have tested a simplified identification key (SIK) for yeasts from meat products. The MYID23 (Su/Li) computer program utilizes 23 physiological tests and the MYID14 (Su/Li) utilizes 14 tests. Database for both programs was from 84 species of yeasts. Fung's Mini system was used for physiological tests.

In testing SIK we found that MYID14 was more practical than MYID23. Eighteen out of 21 named yeasts were correctly identified by MYID14. The presumptive identification of 41 fresh yeasts isolated from meat products by MYID14 and phase contrast microscopy showed that various meat products have different yeast flora. Yeast identified were *Candida famata*, *C. valida*, *C. versatilis*, *Saccharomyces cerevisiae*, and *Torulopsis delbrueckii*.

INHIBITION OF GROWTH AND AFLATOXIN PRODUCTION BY LACTIC ACID BACTERIA

Hassan Gourama*, A. Karunaratne, and L.B. Bullerman, Department of Food Science and Technology, University of Nebraska-Lincoln, Lincoln, NE 68583-0919

Three *Lactobacillus* species (*L. plantarum*, *L. bulgaricus*, *L. acidophilus*) and a commercial mixture of strains of the same species inhibited growth and aflatoxin production by *Aspergillus flavus* subspecies *parasiticus* NRRL 2999 when grown competitively in MRS-Corn meal broth. Actively growing bacterial cells totally inhibited germination of *A. flavus* spores. Culture supernatant broth from the commercial mixture of strains inhibited mold growth but did not destroy mold spore viability. Some mold spores were observed microscopically to have germinated and produced short non-branching germ tubes, however the germinated spores did not continue to grow. The pH of the culture broth and supernatant were found to be about 4.0. Acidification of non-fermented MRS broth to pH 4.0 with HCl or lactic acid did not cause a similar inhibition of spore germination. Inhibition may be due to an antifungal/antibiotic substance or a combination of factors.

PRODUCT TAMPERING UPDATE

PRODUCT TAMPERING - FBI

R. Novotny, FBI, Kansas City, MO.

FBI's point of view of recent trends in product tampering. Discussion will include investigations of alleged tampering problems and development of evidence for prosecution under the Federal Anti-Tampering Act. Who is responsible for the various aspects of the investigation? Dealing with the news media in the best interest of the public.

PRODUCT TAMPERING - FDA

R. Swanson, FDA, Rockville, MD

Tampering has been a problem historically but has been at the forefront of public attention most of this decade. The Federal Anti-Tampering Act was enacted in 1983 defining responsibilities for FDA. With the heightened awareness of tampering, consumers are scrutinizing products and packaging much more closely. There is a need to distinguish manufacturing defects from tampering incidents.

Everyone has a significant role to play in coping with this problem from the producer to the consumer.

SALMONELLA ENTERITIDIS AND EGGS

EGG PRODUCTION AND PROCESSING

A. Vaughn, United Egg Producers, Decatur, GA

There are about 240 million commercial egg producing hens in the United States and they produce about 68 billion eggs each year. The average person consumes 242 eggs each year. About 18-20% of the eggs produced are used in pasteurized egg products, 17-18% are used in restaurants and other food service establishments, and 62-65% are used as shell eggs in the home. Modern egg production involves large farms frequently housing as many as 80,000 hens per house and 1,000,000 hens per farm. Fifty-eight percent of the eggs are produced in 10 states, mostly in the mid-West, Southeast, and California. Eggs are washed, sanitized, graded, sized, and packed in plants connected on-line with production facilities or in plants receiving eggs from nearby farms. Eggs are refrigerated while in storage at the processing plant and during transport. Several types of pasteurized egg products are available. These products as well as recently developed new products will be discussed.

INCREASE IN THE NUMBERS OF CASES OF SALMONELLA ENTERITIDIS IN THE UNITED STATES DUE TO WHOLE CHICKEN EGGS AND THE IMPLICATIONS TO FOOD HANDLERS

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For many years, *Salmonella enteritidis* was a rarely found species accounting for about 6% of the *Salmonella* isolates reported to the Centers for Disease Control. Beginning in 1976, this percentage began to rise. *Salmonella enteritidis* now accounts for more than 51% of all *Salmonella* isolates. From January, 1985 to May, 1987, there were 65 salmonellosis outbreaks caused by *Salmonella enteritidis* involving 2,119 people. Eleven elderly people died in these outbreaks. An August 19, 1988 MMWR update attributed 6,390 illnesses to *Salmonella enteritidis* in 1987. Illnesses and isolations have spread down the Atlantic coast and are sporadically occurring across the country. Great Britain, Spain, Scandinavia, and Eastern European countries are reporting similar or more serious problems. Like other *Salmonella* species, *Salmonella enteritidis* infections usually result in self-limiting gastroenteritis of variable severity with classical symptoms including diarrhea, abdominal pain, chills, fever, vomiting and headache. The very young, the elderly, pregnant women (because of the fetus), and people already weakened by serious illness, malnutrition, or with weakened immune systems are at high risk. Food handlers must be made aware of the problem and avoid precracking eggs prior to cooking, must thoroughly cook eggs and egg products, and ensure that all utensils that come into contact with raw eggs and their products be thoroughly cleaned after use. The use of pasteurized eggs is recommended in suitable circumstances.

THE VETERINARY CONTROL PROGRAM

Everett Bryant, Poultry Diagnostic Laboratory, University of Connecticut, Storrs, CT 06268

A protocol for veterinary control of systemic *Salmonella enteritidis* infections in laying hens has been developed by the Northeast Conference on Avian Diseases, and the protocol has since been adopted by the USDA as a Voluntary State Program of *Salmonella enteritidis* Quality Assurance. The program involves serological and microbiological testing of breeder flocks and those flocks suspected of causing outbreaks of *Salmonella enteritidis* infections. The program will be discussed.

SURVIVAL OF SALMONELLA ENTERITIDIS ON AND IN SHELLED EGGS, LIQUID EGGS AND COOKED EGG PRODUCT

R.C. Baker, Cornell University, Ithaca, NY 14853

Several studies have been carried out on the survival of *Salmonella enteritidis* on the shells of eggs, in the egg albumen and in the yolk. Studies also include egg shell penetration and migration of the organism in the albumen of shell eggs. Work was also done on the effect of proper egg washing on the survival of *Salmonella enteritidis*. In addition, Thermal Death Time experiments using liquid whole egg have been studied. The survival of *Salmonella enteritidis* in several cooked egg dishes has also been studied. All of this research will be discussed.

CURRENT ARS RESEARCH ON SALMONELLA ENTERITIDIS IN CHICKENS: EXPERIMENTAL INFECTIONS IN LAYING HENS

Richard K. Gast, Southeast Poultry Research Laboratory, ARS, USDA, Athens, GA 30604

Experimental *Salmonella enteritidis* (SE) infections were established in laying hens by oral inoculation. The consequences of this treatment were then examined, including changes in the number of eggs produced, the fraction of these eggs that were contaminated with SE, the duration of fecal shedding of SE, and the frequency of isolation of SE from internal organs of the hens. A variety of serological tests were performed with antigens derived from several *Salmonella* strains to evaluate the humoral antibody response of infected hens. This information will be valuable in assessing the significance of SE infections in laying hens and in developing accurate techniques for identifying infected flocks.

RISK ASSESSMENT

George K. Morris, Egg Nutrition Center, 4016 Dover Avenue, Alpharetta, GA 30201

The recent disease problems associated with eggs have involved eggs containing *Salmonella enteritidis* on the interior of the egg rather than egg shell contamination. The frequency of contamination of the internal portions of the eggs is extremely rare, about one in 14,000 in an area where the problem is prevalent. It has been estimated that 0.9% of eggs are eaten raw. Therefore, it is expected that the likelihood of eating an egg that has been produced and consumed in a way that an infection could occur is extremely rare. Disease problems usually occur when large numbers of eggs are broke, pooled, and left unrefrigerated for a period of time before use; and then are not cooked sufficiently to kill the *Salmonella*. The risk increases proportionately to the number of eggs pooled and the time left unrefrigerated. The people at highest risk are the very young, the elderly, the debilitated, and the immunocompromised. Eggs prepared for people in these groups should always be cooked well-done. Food service establishments for high risk groups such as nursing homes and hospitals should consider use of pasteurized eggs.

NATIONAL VIEW OF FOOD SAFETY

THE FOOD INDUSTRY RESPONSE TO PRODUCT SAFETY — A PANEL DISCUSSION

Dr. Heldman, Nat'l. Food Processors Assoc., Washington, D.C.
Abstract not available at time of printing.

Robert E. Harrington, Assistant Director, Technical Services, Public Health & Safety, National Restaurant Association, 1200 Seventeenth Street, NW, Washington, D.C. 20036

Recent controversy about chemical residues in foods underscores long-standing consumer concerns about food safety. The foodservice industry is very sensitive and responsive to such concerns, owing to intense competition. Many major multi-unit operations maintain in-house quality control functions, including purchase and operational specifications which often exceed minimum regulatory requirements. The National Restaurant Association has adopted a position urging foodservice operators to document training of personnel in food safety and sanitation.

SOLID WASTE CHALLENGE

PUBLIC HEALTH ATTITUDES TOWARD SINGLE SERVICE AND SOLID WASTE

Charles W. Felix, Charles Felix Associates, PO Box 1581, Leesburg, VA 22075

Concern over the problem of solid waste disposal has led a number of communities in the U.S. to ban or restrict the use of single service articles for food service. A survey was conducted of the 50 States and 50 local health departments soliciting the opinions of the directors of the food programs in these jurisdictions regarding the impact such restrictions might have, if any, on public health protection in food service. The results indicate a concern over the solid waste and litter generated by disposables, along with an appreciation for their sanitation and disease prevention functions. In weighing the tradeoffs against one another the majority of the survey respondents estimate the benefits of disposables to be greater than their disadvantage. However, comparing the results of this survey with two earlier surveys conducted in 1976 and 1983 reveals a diminution of the appreciation health professionals have for the contribution single service makes to food service sanitation. This paper discusses the survey and various aspects of the solid waste problem which may account for the survey findings.

RECYCLING IN METROPOLITAN KANSAS CITY: CURRENT PRACTICES AND FUTURE POTENTIAL

Marlene Nagel, Community Development Director and Lynn Kenton, Recycling Coordinator, Mid-America Regional Council, 600 Broadway, Suite 300, Kansas City, MO 64105

Since the early 1980s, the Mid-America Regional Council (MARC) has operated a Regional Recycling Information Program for the 8-county bi-state metropolitan Kansas City area. With federal, state and local funding support, MARC has assisted the community by raising awareness and support for recycling; has helped set up local recycling efforts; and has organized curbside recycling demonstration projects.

The Kansas City metropolitan area, unlike areas on the east and west coasts, does not face an immediate landfill crisis. Recycling has been somewhat limited to those persons and organizations who saw recycling as a way to address their environmental concerns or for additional economic resources. However, recent experiences in several local communities to site landfills have raised interest in recycling among local government officials and area residents.

The presentation will focus on the local recycling programs in the metropolitan area that have been implemented including curbside recycling; those programs in the discussion or planning stages; and prospects for the future.

CONCERNS IN SEAFOOD

KNOWLEDGE TO HAZARDS RELATING TO RAW OYSTER CONSUMPTION AMONG SELECTED PATIENT RISK GROUPS: REPORT OF A SURVEY

C.R. Anderson, AR Johnson, GE Rodrick, University of Florida, Department of Food Science and Human Nutrition, Gainesville, FL.

Retrospective, epidemiological studies have identified groups at risk for contracting *Vibrio vulnificus* infection. Raw oyster ingestion and/or seawater exposure are primary methods for infection with *V. vulnificus*. In order to determine the baseline knowledge regarding *V. vulnificus* infectious disease risks, a survey of high risk groups was conducted. Fifty-six patients currently under treatment for cancers, gastrointestinal diseases, or liver diseases, were surveyed regarding their attitudes and behaviors on diet, recreation, and health status. Although all respondents were at-risk for *V. vulnificus* infections, only 8 reported any previous counseling to avoid raw oyster consumption. 28 persons indicated they consumed raw oysters, and 21 reported ingesting raw oysters within the past six months. This limited survey indicates the need for strengthening patient education.

PROBLEMS RELATED TO THE MARKETING OF HIGH QUALITY FRESH FISH

George J. Flick, Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, VA.

This project was a culmination of prior programs funded by the Mid-Atlantic Fisheries Development Foundation, Inc. and Virginia Tech on seafood quality and quality maintenance. The purpose of the first part of the program was to conduct a survey of fresh fish marketing practices from harvesting through consumption. Included in the study were three processing and distribution firms employing different levels of sanitary practices. Part I also included specific activities to: (1) determine the shelf-life of fish handled under various conditions; (2) determine what effects, customary and alternative handling procedures on fishing vessels, in processing plants, and during transportation, had on shelf-life; (3) identify the appropriate technology for achieving a 12-day minimum shelf-life; (4) establish objective criteria for determining product quality. The second part of the program was initiated to define and solve selected quality problems identified during Part I. Specific program activities included in the fishing vessel section were: (1) effect of day of catch on shelf-life; (2) use of sodium bicarbonate in absorbent pads for controlling odors of tray-packed seafood; (3) effect of a high-pressure wash on reducing the surface microflora and extending the shelf-life of fish. The last part of the program expanded to include the retailer with the primary goal of developing an economically attractive permanent market for quality mid-Atlantic fish. The corroborating retailer chosen for this project was the Kroger Company of Cincinnati, Ohio.

SALMONELLA TAVIANA - AN EPIDEMIOLOGICAL CASE STUDY

M. T. Osterholm, Minnesota Dept. of Health, Minneapolis, MN

Recognition of the outbreak; first epidemiological questionnaire; analysis of data; results of first study; second epidemiological questionnaire; results of second study; involvement of CDC; and further analysis of data.

Patricia A. Jensen, Minnesota Dept. of Agric., St. Paul, MN

Cooperation of Minnesota Dept. of Agriculture with Minnesota Department of Health; collection of samples, testing and results; investigation of cheese factories; involvement and cooperation of industry, other states and FDA.

E. A. Zottola, University of Minnesota, St. Paul, MN

Information on organism background; thermo death studies; cheese making practices with respect to heat and GMP's; differences among types of cheeses such as cheddar, mozzarella, processed and imitation and how they relate to survival of *Salmonella javiana*.

ENVIRONMENTAL CONCERNS

RADON UPDATE

H. L. Spiker, KS Dept. of Health and Environment, Bureau of Air Quality and Radiation Control, Forbes Field Bldg. 740, Topeka, KS.

Radon (Rn-222) is naturally occurring colorless, odorless, radioactive noble gas which has a half-life of 3.8 days and decays by emitting alpha particles. The source of radon is Radium-226, which is present in minute quantities in almost all geological formations, soil, water and building materials. Radium-226 is a daughter of naturally occurring Uranium-238. However, it is the daughters, or decay products, of radon that are the radionuclides of real concern in human exposure, since they are charged particles which readily attach to dust and other particles in the air. The main organ of concern is the lungs, where these particles are inhaled and deposited. The resulting damage caused by the emitted alpha particles can cause cancer.

The U.S. EPA and Centers For Disease Control have estimated that total U.S. deaths due to lung cancer caused by exposure to indoor radon decay products are in the range of 5,000 to 20,000 per year.

Since the discovery of extremely high radon concentrations in homes in the Reading/Prong area of Pennsylvania in 1985. The U.S. EPA and many states have initiated programs to learn more about indoor radon, how to measure it, and how to mitigate homes with elevated levels.

This is an overview of what we now know about radon, as well as recent and current efforts to address the problem.

BIODEGRADABLE PLASTIC FILMS

P. Campbell, St. Lawrence Starch Company Limited, 141 Lakeshore Road East, PO Box 1050, Port Credit Postal Station, Mississauga, Ontario, Canada 15G 1E8

Plastics have become an increasingly visible part of our everyday lives. Lightweight and versatile, plastics are, in many cases, the packaging medium of choice for many consumer products. Many of these applications are short lived by definition while the material used is extremely long lived by nature. Although increased efforts in recycling and alternative waste disposal are underway, the pressure on our landfill sites has caused a great deal of concern regarding the entombment of our non-degradable waste.

This presentation will deal with one method of rendering common polymers degradable through the use of a starch-based additive system. This relatively inexpensive material has the additional advantage of being a renewable resource produced in abundance in North America.

APPLICATION OF SBR (SEQUENCING BATCH REACTOR) TECHNOLOGY TO FOOD PROCESSING WASTE

Kenneth A. Milkkelson, Ph.D., Senior Process Engineer, Aqua-Aerobic Systems, Inc, PO Box 2026, Rockford, IL 61130-0026

This paper discusses the features and benefits of SBR wastewater treatment systems. System design in terms of reactor requirements, equipment details, operational strategy based on effluent requirements and operating costs will also be discussed. Specifically detailed will be the application of SBR technology to the food processing industry, including pre-treatment and complete treatment applications.

Information will be presented which outlines the design basis for three food processing plants (dairy, citrus, and meat) which employ the SBR process to treat their wastewater. Data collected over a period of several months will document the performance of the SBR process in the removal of BOD₅ and suspended solids.

EDUCATION & TRAINING

IMPLEMENTATION OF HAZARD ANALYSIS BASED INSPECTION PROGRAMS IN LOCAL HEALTH DEPARTMENTS

Homer C. Emery, Ph.D, RS and Jodena Henneke, M.S. RS (City of Fort Worth Health Department), PO Box 1832, Frederick, MD 21701

Foodservice sanitation inspections conducted by local and state health authorities have long been a standard practice aimed at reducing the public's risk of foodborne disease. Recently, several approaches [(HACCP), (SAFE)] for monitoring the foodservice environment have been developed. These approaches are based on the systematic application of food microbiology techniques (pH, water activity, temperature) to control the growth of pathogens in food. Most health authorities agree that these methods represent a significant improvement over traditional inspection methods. However, few local health departments have implemented HACCP or SAFE based inspection programs.

This presentation provides strategies for implementing HACCP/SAFE based inspection programs in local health departments. In addition an approach [Hazard Analysis Physical Plant Inspection (HAPPI)] that combines the analysis of food microbiology factors and an in depth inspection of the foodservice physical plant is described.

ATTITUDES, BEHAVIOR AND GOALS--KEYS TO DEFECT-FREE FOOD AND MILK SUPPLIES

N.E. Schmitt, Quality Transformation Associates, Inc., 10000 Highway 55 West, Suite 430, Minneapolis, MN 55441

The safety of our food and milk supplies depends on their freedom from contamination and pathogenic micro-organisms. Conventional wisdom has concentrated on the technology of detection and reaction to the findings, or as stated in a recent article in Dairy and Food Sanitation, "the age old question of sampling and testing...face the industry as it attempts to control environmental sanitation."

There is little emphasis on the contributions of the human beings involved in the handling and processing of our food and dairy supplies or the possibility that these human beings could be accountable for and capable of producing defect free (contamination free) products.

The industry must shift to a "defect prevention" mode of operations and away from an inspection-reaction mode. This can only be accomplished through the development of the people.

Defect free food and milk depend on the behavior of the people involved in the handling and production of these supplies and on the behavior of their managers. The behaviors depend on the skills and attitudes of all people involved. Skill training and knowledge sources abound. However, there is little power in skill or knowledge--the power is in the application of skills and knowledge!

Attitudes of people must and can be changed all the way up and down the existing producer to consumer structure. Attitudes are effectively changed by developing a network of solution oriented goals for the individuals and for the organizations involved, and integrating the individual organizational goals. There must be open confrontation with "What's in it for me?" at all levels, and there are positive motivating answers to that question. The technology of goal setting and properly structured communications provide the key to the attitude changes required.

PRACTICAL PROPOSALS FOR TRAINING OF FOOD AND DAIRY STAFF FOR MICROBIOLOGICAL AIR AND SURFACE HYGIENE

R. Ligugnana and D.Y.C. Fung*, Department of Animal Sciences and Industry, Kansas State University, Manhattan, KS 66506 and PBI International, Milano, Italy

Most workers in food and dairy plants seldom realize the direct impact of their activities on the microbial air quality and surfaces of their work environments. By use of agar contact plate method and an efficient air sampler--"SAS" system--one can develop a training program to illustrate the impact of food processing and hygiene on the microbial air and surface quality of the work environment.

Some suggested demonstrations include: effect of cleaning of hands and utensils on microbial loads on work surfaces, effect of aerosol disinfectants on air-borne microbes in enclosed environments, effect of fumigation on the reduction of fungi, air hygiene level of critical environments such as sterile filling and packaging of yogurt, detection of air-borne phage, detection of specific microbes by selective media, effect of dry sweeping versus wet sweeping on microbial air quality, etc.

This proposed training program is applicable to many food industries.

GERMBUSTERS--A SANITATION EDUCATION PROGRAM FOR ELEMENTARY SCHOOLS

Homer C. Emery, Ph.D. RS*, Florence P. Emery, U.S. Army, PO Box 1832, Frederick, MD 21701

The 1988 Conference for Food Protection identified food safety education as a major issue facing food service regulatory and industry organizations. The Conference stated that "gaps in food safety education have allowed the widespread development of poor food safety habits..." The Conference concluded that deficiencies in food safety education extend across the entire population.

Correcting these deficiencies will require a national food safety education effort starting in the elementary school population. Local health agencies and professional public health organizations, such as IAMFES, are in a unique position to contribute valuable expert resources to local school programs. This paper describes a program (GERMBUSTERS) that can be used to introduce food safety education to elementary school students.

UNIQUE DISEASE VECTORS

GIARDIA FROM FOOD AND DRINK: AS A PARASITE OF MAN AND AS A HOST FOR BACTERIAL AND VIRAL SYMBIONTS

George J. Jackson, Division of Microbiology, Center for Food Safety and Applied Nutrition, Food and Drug Administration, Washington, DC 20204

Reports of protozoa as agents of food- and drink-borne disease issued primarily from undeveloped tropical and arctic locales in the years between World War I and the 1970s. Since then, an increasing number of outbreaks and individual cases of gastrointestinal illness in developed communities have implicated one of several genera of these single-celled animals as a causative agent, and food or drink as the vehicle of infection. The protozoa *Giardia* is an organism of major concern. Once described as a secondary pathogen, this flagellate became the object of much research, beginning with waterborne outbreaks in the USSR, USA and Canada. Food transmission was long suspected but proven only within the past decade. Infected food handlers were incriminated in two well-documented outbreaks. Current work on *Giardia* focuses on strain differences of the organism, the immune status of the host, improved methods for diagnosis and contamination testing, and on the bacterial and viral symbionts that occur in freshly isolated strains as well as this parasite's ability to serve as host for mammalian viruses.

PEST CONTROL

RISK MANAGEMENT--WHAT IS THIS PEST AND CAN IT BE CONTROLLED

H. Lee McConnell, Director, Risk Management, Hershey Foods Corporation, Hershey, PA

Risk Management is the protection of assets, earnings and employees from the pure risk to which they are exposed. Pure risk being those risks to which an organization is exposed where you have no chance of profit, only loss. This can be compared with speculated risk where you have a possibility to make a profit or loss. The Risk Management process is:

- * Identification of Risk
- * Measurement of Risk
 - Probability of Loss
 - Financial Impact of Loss
 - Ability to Predict Losses
- * Alternative Solutions
 - Avoid Risk
 - Reduce Risk (pest control/safety)
 - Retain Risk
 - Transfer Risk
- * Implementation of Solution
- * Monitor and Evaluate

Risk Management may be described as both an art and a science. However, sound judgement should always play an important role.

PEST CONTROL: A REGULATORY VIEWPOINT

James A. Rahto, Supervisory Investigator, Food and Drug Administration, 1009 Cherry, Kansas City, MO 64106

The production and distribution of a clean wholesome product to the consuming public is a common goal shared by both regulated industry and the FDA. A sound pest control program is essential to the achievement of this goal. During an inspection a FDA investigator will routinely review a firm's pest control program. This will include such aspects as use of pesticides and various types of traps and the structural condition of the facility. The principle objective of the review is to assure that conditions do not exist whereby adulterated products may reach the consuming public.

The presentation will give a general overview of FDA's inspectional activities covering such topics as how firms are selected for coverage, what the investigator looks for and possible consequences of their findings. The attendee will gain an insight into the working of the FDA and what he/she can do to assure that their firm or client will be in compliance with various laws and regulations enforced by the FDA.

CONTROLLING ROACHES: PRESENT AND FUTURE

Jonathon Berger, Manager, Technical Services, Whitmire Research Laboratories, Inc., 3568 Tree Court Ind. Blvd., St. Louis, MO 63122

The techniques used in pest control have not radically changed for the last 20 years. Before the year 2000, regulatory constraints, new pesticides and the news media may totally change how pest control is performed. This presentation will discuss what the environmental manager or quality control director will have to prepare for during the next few years. How will you be doing pest control in the 1990's?

RODENTS - THEIR BEHAVIOR AND CONTROL (RODENT COMBAT TACTICS)

William E. Pursley, V.P. of Sanitation Education, American Institute of Baking, Manhattan, KS

In considering pest control procedures and strategies for rodents in and around the food plant environment, it must first be determined which rodent. Establishing controls for either mice or rats is as different as comparing apples and oranges. For these reasons it's important to first understand their behavior and their responses to various control strategies before developing a program for an individual facility.

The modern day pest control operator must understand the problem, consider each control (including building and design modifications, operational and procedural revisions, trapping, etc.) and design a complete IPM system and monitoring program to fit each situation.

"IS SAFE EFFICACIOUS PEST CONTROL POSSIBLE UNDER TODAYS REGULATIONS AND RESTRICTIONS?"

Donald A. Wilbur, Jr., President, The Industrial Fumigant Company, 601 E. 159th St., PO Box 1200, Olathe, KS 66061

It is not only important to have an effective, efficient pest control program, but the program must also comply with all of the new rules and regulations compiled by USDA, EPA, FDA, OSHA, consumers and others.

The only truly effective pest management programs must revolve around IPM (integrated pest management). Many think that this is a brand new concept, which means elimination of the use of pesticides. However, effective pest management directors have used this concept for years. It simply entails the use of the knowledge of pest behavior modification, changing favorable conditions for pest feeding, living and reproduction, in conjunction with the judicious selection and use of pesticides that are specifically suited to the control of a specific pest in a specific situation.

The program must guarantee safe pesticide storage, safety for the user, safety for those workers who may be inadvertently exposed to the pesticide, as well as, safety for the ultimate consumer of products that have been prepared, packaged, or held, under conditions where pesticides may have been used.

Compliance requires careful monitoring, training and logging of a comprehensive pest management program.

RODENT BAIT STATIONS

Dale Kaukeinen, ICI Americas Inc., Eastern Research Center, PO Box 208, Goldsboro, NC 27533-0208

Increased needs to reduce pesticide hazards have affected the area of rodent control through the development of rodenticide applicators, which reduce toxicant exposure to people and non-target animals such as pets and wildlife. As developers of industry standard products containing the anticoagulant compound brodifacoum, ICI Americas was interested in

evaluating new bait applicators for their effect upon product efficacy. Eight commercial designs offered by various manufacturers were evaluated, and significant differences in rodent utilization were determined for commensal rats, but not for mice. Therefore, in choosing bait stations, rodenticide users should not only consider robustness and hazard-reducing features, but also the possible effects of more complex station designs upon rodent utilization of such bait containers. A new development involving a toxicant-impregnated wick for rodent control in a secure enclosure, is described. This approach requires contact but not feeding, and may overcome difficulties arising from bait placements in some situations and may reduce potential associated non-target hazard still further. Possible future trends and regulations governing allowable methods of rodenticide applications are given, and ways that industry and pest control specialists may meet these challenges discussed.

EMERGING CHILD CARE ISSUES 1989 AND THE CHILD CARE INDUSTRY

DEVELOPMENT OF NATIONAL HEALTH AND SAFETY PERFORMANCE STANDARDS FOR OUT-OF-HOME CHILD CARE PROGRAMS

George Kupfer, MS¹ and Patricia Schloesser, MD². ¹Director, Bureau of Consumer Protection & Environ. Health, Milwaukee Health Department, 841 N. Broadway, Room 105, Milwaukee, WI 53202 ²Director of Health, Kansas Dept. of Health & Environ., Landou State Office Building, 900 SW Jackson - 9th Floor, Forbes Field, Topeka, KS 66620-0001

Currently, there are no national standards or guidelines for the development or evaluation of child health and safety programs in family day care homes and child care centers. The American Public Health Association (APHA), in collaboration with the American Academy of Pediatrics (AAP), is developing a comprehensive set of national performance standards in health, nutrition, safety and sanitation for out-of-home child care programs. This conference session will highlight the standards development to-date and more specifically, on Environmental Quality, Food Safety, Infectious Disease Control, and General Health. These standards will address the needs of infants, toddlers, preschoolers and school-age children through twelve years of age in child care centers, family day care homes, and group day care homes. While these standards are not regulations, they will delineate professional criteria between minimum requirements and the ideal. These long-awaited performance standards will help promote improved quality of child care and enhance the health and safety status of children in out-of-home child care.

FAMILY STYLE MEAL SERVICE FROM AN ENVIRONMENTALIST POINT OF VIEW

Karen J. Tiggs, B.S., City of Albuquerque, Environmental Health Department, PO Box 1293, Albuquerque, NM 87103

The use of day-care centers from the mid 1970's to the present has changed dramatically and how day-care centers operate has also changed during this period of time. A new concept implemented in the late 1980's that dramatically affects all agencies who regulate child-care facilities is family style meal service. This concept in meal service allows the child to prepare his/her plate during meal time. Studies by nutritionists indicate that children consume more food when they are able to prepare their own plate instead of having a plate prepared for them.

The success or failure of family style meal service in centers across the U.S. weighs heavily on proper training of the center staff and children from the regulatory health official. A study to determine how successful hand-washing vs. growth of pathogens in a university lab school was done along with a follow-up study on handwashing after the children had proper hand-washing training. A definite decrease in pathogens could be observed on blood agar petri dishes. Hand-washing games were also implemented so that the children would wash their hands successfully every time.

There are many perceptions on how a program like this can or cannot work. Environmentalists and other health practitioners can use this data to better reduce the intentional and non-intentional illness epidemic that

can occur from this type of meal service if staff and children are not properly trained.

Upon discussing this data, health practitioners can prepare guidelines for successful and approved methods to implement a family style meal service program in the day-care centers in their jurisdiction. While these elements cannot guarantee program success, they do appear to make significant contributions to the overall effectiveness of compliance efforts.

FOOD PRODUCT LIABILITY IN CHILD CARE

Glenda Overfelt, Food Program Coordinator, Child Inc., 5555 N. Lamar, Suite K103, Austin, TX 78751

Every day millions of meals are served to infants, children, and staff in family day homes and child care centers nationwide. The children, parents, and staff assume that the meals they are served are healthy, nutritious and free from infection or contamination. Yet in 1986, thousands of cases and foodborne illnesses were reported involving children under 5 years of age.

Food product liability was not a term readily associated with child care food service until recently. The current liability crisis has made consumers more aware of many health hazards and foodborne illnesses associated with food. This attitude is carrying over into the child care industry as well. The time has come for child care providers to be more concerned about product liability and about the issues of food safety and reliability.

HUMAN SERVICES LIABILITY LOSS CONTROL: WHAT IT IS/ WHAT IT ISN'T

S. Reynolds, Ph.D., President, Human Services Risk Management Exchange, 555 N. Lamar Blvd., Suite K103, Austin, TX 78751

There is obviously some correlation between environmental safety and quality standards and loss control. But safety, quality, and loss control are not synonymous, and the failure to draw a distinction results in insurers and insureds operating with a false sense of security. Often the liability-producing incident relates much more to the "actions" of the personnel than to any environmental safety precaution. For the last three years, we have tracked cases against human service providers. Very few of the causes of action focused solely on any environmental safety issue. In many cases, the cause of action occurred in spite of good environmental safety procedures and often because of the actions of untrained or improperly oriented or unsupervised personnel. Because of the high turnover of personnel, orientation, training, and close supervision are particularly essential to controlling liability risks. Quality standards are needed, but none of these standards set maximum acceptable staff turnover rates. The potential for liability claims increases along with staff turnover.

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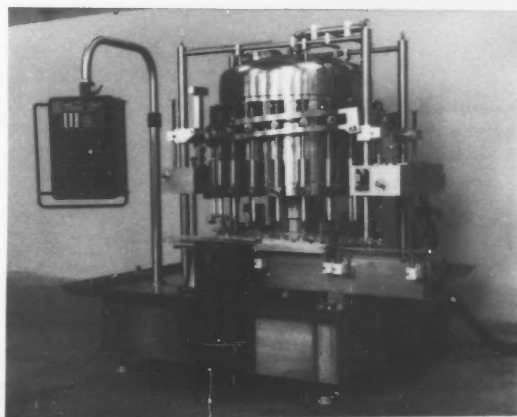


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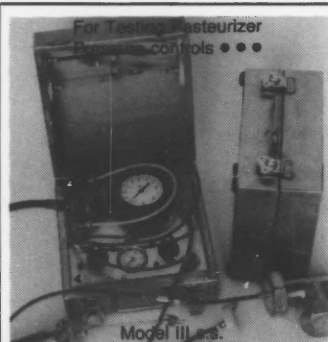
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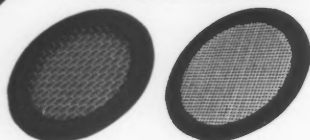
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Coming Events

1989

NOVEMBER

- **1-2, "Establishing Hazard Analysis Critical Control Point (HACCP) Programs"** will be held at the Syracuse Marriott Hotel, East Syracuse, NY in cooperation with Cooperative Extension and Institute of Food Science, Cornell University. For more information call 202/393-0890, or write to The Food Processors Institute, 1401 New York Ave., N.W., Suite 400, Washington, DC 20005.
- **2-5, Second International Symposium on Horticulture & Human Health.** Alexandria, VA, Radisson Mark Plaza, (703) 836-4606.
- **4-9, EMA 1989 National Educational Conference and Trade Show** to be held in Clearwater Beach, Florida at the Holiday Inn Surfside. For more information, contact EMA headquarters at 1019 Highland Ave., Largo, FL 34640 (813) 586-5710.
- **6-8, 1989 Food Processing Waste Conference**, will be held at the Omni International Hotel, Atlanta, GA. For more information, contact: Ed Valentine or Chuck Ross, Georgia Tech Research Institute, Economics Development Laboratory, Environment, Health and Safety Division, O'Keefe Bldg, Atlanta, GA 30332 (404) 894-3412.
- **6-10, Advanced Bakery Production.** American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4650.
- **7-9, North Dakota Environmental Health Association Annual Meeting** to be held at the Sheraton Galleria Hotel, Bismarck, ND. For more information, contact Allen Saylor, 701-224-4762.
- **9-10, Water Activity**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.
- **11-15, Dairy and Food Industries Supply Assoc., Inc.** McCormick Place, Chicago, Illinois.
- **13-14, Tailoring Dairy Packaging & Distribution - Tomorrow's Needs** sponsored by the International Dairy Federation and the U.S. National Committee of the International Dairy Federation. This Seminar will be held in conjunction with the DFISA Expo in Chicago. For more information, contact: Harold Wainess, Secretary, U.S. National Committee of the IDF, 464 Central Ave., Northfield, IL 60093 (312) 446-2402.
- **13-14, Sanitation Through Design.** American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.
- **13-17, Cookie and Cracker for Allied Personnel.** American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

- **15-17, Gum Chemistry and Technology**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd., St. Paul, MN 55121 (612) 454-7250.
- **16, Sanitation Workshop for the Food Industry.** Presented by the University of California Cooperative Extension with assistance from industry trade associations and food industry personnel. Held at Inn at the Park, Anaheim, California. For more information, contact Kathryn Boor, Food Science and Technology, UCD, Davis, CA 95616; (916) 752-1478.
- **23, Ontario Food Protection Association Annual Meeting and Scientific Symposium, Foodborne Listeriosis: Science or Politics.** Airport Hilton Hotel, 5875 Airport Road, Mississauga, Ontario. For more information, call Patrick Kwan at (416) 672-6633.
- **28-30, Experimental Baking.** American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

DECEMBER

- **4, Pesticide Applicator Certification Seminar**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.
- **4-6, Microbiology and Engineering of Sterilization Processes.** A three day course given at the University of Minnesota, St. Paul Minnesota Campus. For further information contact Dr. William Schafer, Course Coordinator, Department of Food Science and Nutrition, 1334 Eckles Avenue, St. Paul, MN 55108, 612-624-4793.
- **4-6, Bagels! Bagels! Bagels!** American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.
- **5-6, Pests Associated with Food Industry and Environmental Sanitation Seminar.** Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.
- **5-6, "Establishing Hazard Analysis Critical Control Point (HACCP) Programs"** will be held at the Hotel El Rancho, Davis, CA in conjunction with University and Cooperative Extensions of the University of California at Davis. For more information call 202/393-0890, or write to The Food Processors Institute, 1401 New York Ave., N.W., Suite 400, Washington, DC 20005.
- **5-7, International symposium** to be held at Battelle in Columbus, Ohio. Registration material available from Phillip Wells, The Conference Group, 1989 West Fifth Avenue, Suite 5, Columbus, Ohio 43212, 614-424-5461, FAX 614-488-5747.

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

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103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
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105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
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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	358
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	258	269	282	295	308	321	334	347	360

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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	358
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112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
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•6-7, **Starch: Structure, Properties, and Food Uses**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact: AACC, 3340 Pilot Knob Rd, St. Paul, MN 55121 (612) 454-7250.

•7-8, **Advanced Course on Pest Recognition and Food Industry Problems**, Okumura Biological Institute, Clarion Hotel, Sacramento, CA. Contact: George Okumura, 6669 14th St., Sacramento, CA 95831 916/421-8963.

•18-20, **In-Store and Retail Bakery Management**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

1990

JANUARY

•8-12, **Technology of Bakery Production**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•8-12, **Electrical Troubleshooting**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•15-26, **Baking for Allied & Non-Production Personnel**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•17-19, **5TH Annual Biotechnology Process Engineering Symposium** at the Massachusetts Institute of Technology. For more information contact: Biotechnology Process Engineering Center, Conference Coordinator, M.I.T., Room 20A-207, Cambridge, MA 02139.

•29-31, **Baking Production Technology**. American Institute of Baking, Honolulu, HI. Contact: Melinda Enns at (913) 537-4750.

•29-Feb. 1, **Basic Food Processing Sanitation**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

FEBRUARY

•5-June 15, **Baking Science and Technology #136**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•5-9, **Specialized Cookie**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•24-28, **The Texas Public Health Association's 65th Annual Meeting** in Austin, Texas at the Hyatt Regency Hotel on Town Lake. Contact either Ms. Terri Pali, TPHA Executive Secretary, (512) 451-1846, or Jim Allen, Chairman Exhibit Procurement Committee, (512) 458-7500.

•12-16, **Bakery Management**. American Institute of Baking, Manhattan, KS. Contact: Melinda Enns at (913) 537-4750.

•19-21, **ABC Research 16th Annual Technical Seminar**, University Centre Hotel, Gainesville, FL 32608. For additional information contact Sara Jo Atwell, 904-372-0436.

•26-27, **Kentucky Association of Milk, Food and Environmental Sanitarians' Annual Conference** to be held at the Holiday Inn Convention Center, Louisville, KY. For more information, contact Debbie Pierce, Secretary, KAMFES, PO Box 1464, Frankfort, KY 40602 (502) 564-3340.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, PO Box 701, Ames, IA 50010.

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From the Ames Office . . .

By
Steven K. Halstead
IAMFES
Executive Manager



Affiliates - The Backbone of IAMFES

Five semi-small words that not only convey a big thought, but also a big undertaking (a word I have a hard time using ever since working for the Funeral Directors Association!). **BUT, THE AMES OFFICE IS COMMITTED TO THIS CONCEPT!**

The first item of staff reorganization was to assign Dee Buske as our affiliate liaison. Right now she is working on a status report for our 31 affiliates.

According to our constitution, each affiliate is to provide us with a copy of their constitution and bylaws, a list of their officers, a list of their members, and minutes of their meetings. Dee now has a file for each affiliate and is determining what of the required information we have.

Where we are lacking, she will contact the affiliate, seeking those materials.

While it may seem that she is bugging you - it is my hope that you will see that we really do care. It is our firm conviction that if we are to grow and progress, it will be because of the growth and progress of our affiliates.

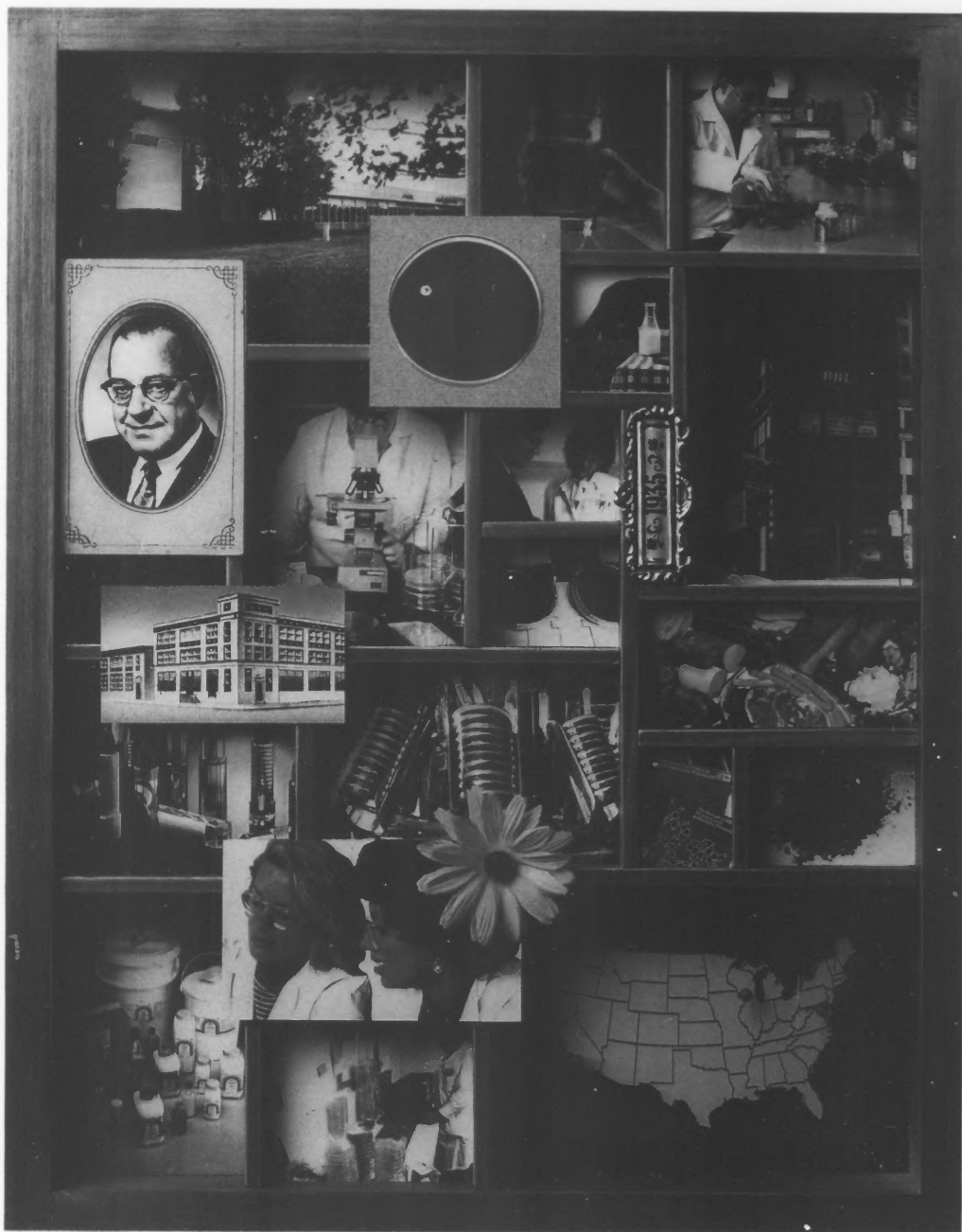
Dee is also providing me with a list of affiliate meetings. We will try our best to have an IAMFES representative at as many meetings as possible.

Dee is the person to contact if you are interested in starting an affiliate. She has loads of information and will happily walk with you through every step of the process.

And last, but not least, very shortly we will be sending out a needs assessment survey to the affiliates. With the information we receive, we will begin to establish programs to meet those identified needs.

Affiliates - the backbone of IAMFES. More than just a cute phrase.

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 - ◆ ■ Ticarcillin
 - ◆ ■ Penicillin V.
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 - (hydrabamine)
 - (potassium)
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 - (benzathine)
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 - Erythromycin Lactobionate
 - Erythromycin Phosphate
- ◆ ■ Spiramycin
 - Erythromycin Thiocyanate
- ◆ ■ Oleandomycin
- ◆ ■ Tylosin
- ◆ ■ Lincomycin
- ◆ ■ Clindamycin

MYCOTOXINS (MY)

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- Aflatoxin B₁, B₂, G₁, G₂

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- ◆ ■ Sulfapyridine
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