ISSN: 1043-3546

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February • 1992

Vol • 12 • No. 2 • Pages 57-128

DAIRY, FOOD AND ENVIRONMENTAL

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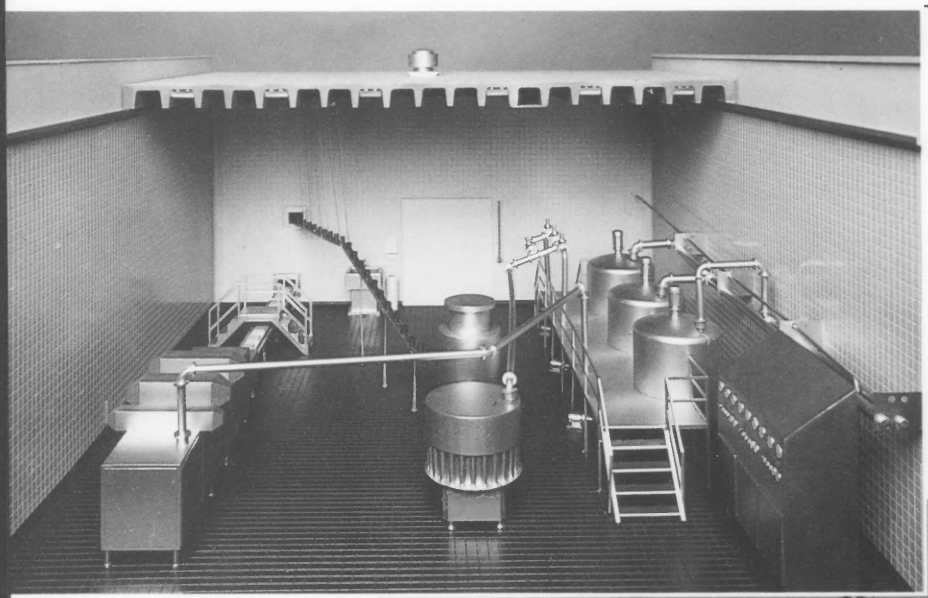
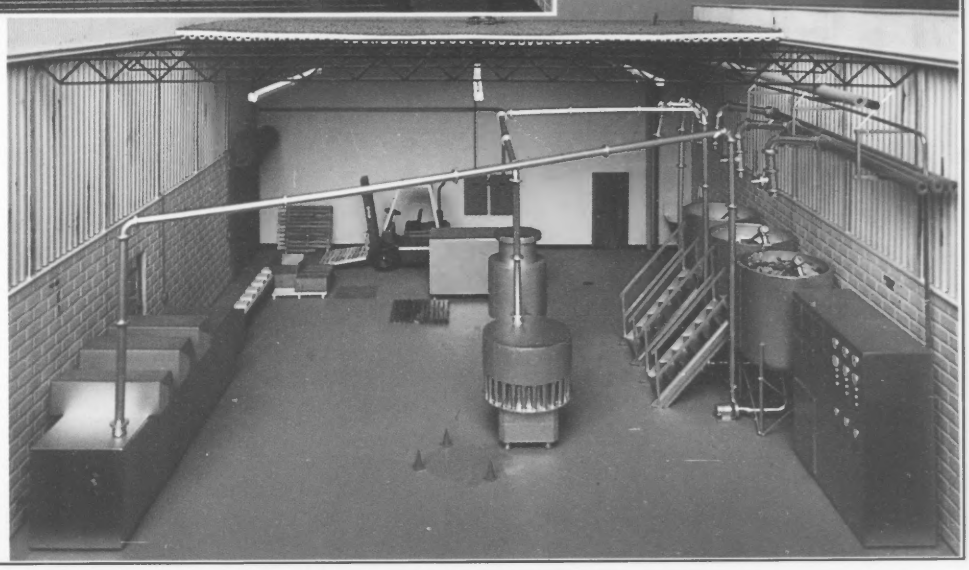


Food Plant Sanitation Model (Good Design)

See page 92 for Common Design Errors That Produce Unsanitary Conditions In A Food Plant

Food Plant Sanitation Model (Bad Design)



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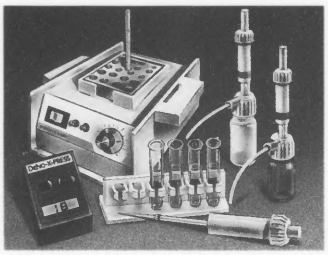

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On My Mind . . .

By
Steven K. Halstead, CAE
IAMFES
Executive Manager

. . . Facility Inspections

I have learned just enough about facility inspections and food sanitation to be dangerous. This knowledge has certainly taken the fun out of dining out.

Ignorance may be bliss, but I really don't remember looking for hair covering devices before. Or of watching the food servers' personal habits of touching their hair and/or face before serving my food. Or of being upset at finding no soap in the restroom being used by the employees. I even used to enjoy buffets where they make "omelets to order" with the uncased eggs stored right next to the grill. In fact, I used to enjoy dining out much more than I do now!

Those of you who attended the Annual Meeting in Louisville probably remember the riverboat dinner/dance on the Belle of Louisville.

Some of you will remember it because of the heat. The heat was so oppressive that only a few people went below deck to dance—the rest of us stayed outside, trying to catch a breeze. (We might ask how many of you even knew there was a band playing?)

Some of you will remember the event because of the beauty of the Ohio River—the beauty of the sun setting on the river—the beauty of the lights on shore after nightfall.

Nobody (as far as I know) remembers the boat ride because of food poisoning. Several of you expressed very real concerns about serving potato salad, ham, chicken and salad from unrefrigerated facilities. Others expressed concern that the serving line was below decks where the atmosphere's heat was supplemented by the heat from the boilers. Still others commented on the proximity of the engines and other mechanical devices to the serving of the food.

All these comments reminded me of what has to be the most embarrassing event in the history of IAMFES—a foodborne disease outbreak at an IAMFES Annual Meeting!

The scene was the 1951 meeting at Glenwood Springs, Colorado. On September 27, a noon meal of "chicken" (it was really turkey) fricassee was served to 145 members and guests. Ninety-three of them became ill in the next 8-18 hours with symptoms of severe abdominal cramps, explosive diarrhea, sharp stomach pains and gaseous distension of the abdomen.

An edited version of an article written by Dr. George W. Stiles, chief of the laboratory section of the Colorado Department of Health, which originally appeared in the July/August 1953 issue of the *Journal of Milk and Food Technology* the forerunner of the *Journal of Food Protection* is printed on page 64.

Thankfully no one became extremely ill and no one died. The laboratory findings showed that the turkey specimens from the meal harbored excessive numbers of the paracolon group.

Thankfully no one had to get sick for us to learn our lesson.

Following the outbreak, Dr. Stiles sent a questionnaire to all who attended the meeting. From an 80% response he tracked down the output and later reported his findings.

We all know that there is no way to absolutely prevent such an occurrence. But we will do what we can. To this end, the IAMFES Executive Board, at their October meeting, established a policy calling for a facility inspection of food preparation and serving areas no more than 30 days prior to the Annual Meeting. (It goes without saying that we expect an excellent score on the inspection.) Further, all future contracts with hotels and caterers will demand that "state of the art" sanitary procedures be used in the preparation and serving of food.

Failure to meet the sanitary standards can result in moving the meal functions to a better facility! Again, it won't assure us of preventing an outbreak, but it will certainly help and at the very least give us peace of mind.

I can really relate with those who were concerned about the buffet on the Belle. They were just doing what came naturally for them.

We learned by it and thankfully no one had to get sick for us to receive that education.

Thoughts From The President

By
Damien A. Gabis
IAMFES President

IAMFES exists to provide a forum for professionals in the areas of milk, food, and environmental safety and quality, and, in my opinion, the *Journal of Food Protection* is the flagship that exemplifies the ideals of our Association. Sometimes, I take the existence of the Journal as a perpetual given, but much effort has gone into, and continues to go into its publication. I recently read a survey where the members of the IFT Food Microbiology Division rated the *Journal of Food Protection* the most valuable among seven refereed journals published in the area of food microbiology. The respondents judged that the *Journal of Food Protection* publishes the highest percentage of applied, practical, mission-oriented papers.

The *Journal of Food Protection* is highly respected for publishing practical, reliable scientific research and timely review articles on food safety and quality. This reputation is largely a result of the careful referee work of the Editors and recognized experts of the Editorial Board who assure the scientific quality and integrity of the Journal. The Editorial Board consists of about 80 U.S. and Canadian scientists working in academic, industrial, or governmental laboratories. Scientists interested in serving on the Editorial Board should contact Dr. Bullerman.

The Journal Management Committee is responsible for guiding the Journal's operations and planning so that the high quality is maintained and it is published on time. Dr. Robert Marshall, Department of Food Science and Nutrition, University of Missouri-Columbia, is the Chairperson of the Journal Management Committee and he welcomes suggestions for betterment of the Journal.

Our circulation data indicate that there are nearly 1,500 non-member subscriptions to the *Journal of Food Protection* in 38 countries. The scope of the Journal is truly international. Approximately 25% of the papers come from countries other than the United States and Canada. Countries that are represented in the last complete volume of the Journal include Australia (5), Japan (5), Argentina (3), Nigeria (3), Finland (2), The Netherlands (2), Saudi Arabia (2), Scotland (2), South Africa (2), Spain (2), and the United Kingdom (2). Other countries represented by one contribution each included Austria, Belgium, Brazil, Egypt, France, Greece, India, Iraq, Ireland, Italy, Morocco, Northern Ireland, Poland, Sweden, Taiwan, Turkey, West Indies, and Yugoslavia.

Dr. Bullerman believes that the General Interest or Review Papers are an important section of the Journal. I would like to add my encouragement for our members and colleagues to develop and submit these review papers. They will be published promptly.

I urge you to send your research and review paper manuscripts for publication in the *Journal of Food Protection* to Dr. Lloyd Bullerman, Scientific Editor, at the Department of Food Science and Technology, University of Nebraska, Lincoln, Nebraska 68583-6668. I also want to take this early opportunity to encourage those of you who will be presenting papers at the Annual Meeting (July 26-29, 1992) in Toronto, Ontario to prepare and submit them to Dr. Bullerman for publication in the *Journal of Food Protection*.

The Instructions for Authors can be found in the January issue of the *Journal of Food Protection* or call the IAMFES office in Ames, Iowa (1-800-369-6337) for a copy. Also Dr. Bullerman's annual Report of the Editor appears in the November issue of the Journal.

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Dairy, Food and Environmental Sanitation (ISSN-1043-3546) is published monthly by the International Association of Milk, Food and Environmental Sanitarians, Inc., executive offices at 502 E. Lincoln Way, Ames, IA 50010. Printed by Heuss Printing, Inc., 911 N. Second St., Ames, IA 50010. Second-class Postage paid at Ames, IA. **POSTMASTER**: Send address changes to Dairy, Food and Environmental Sanitation C/O IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

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Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 62-63 (February, 1992)
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The Role of Employees in the Spread of Foodborne Disease— Food Industry Views of the Problem and Coping Strategies

Robert E. Harrington, National Restaurant Association, 1200 17th St., NW, Washington, D.C. 20036

Presented at the 78th Annual Meeting of IAMFES, July 21-24, 1991, Louisville, Kentucky

The role of food workers as a source of foodborne disease may be changing. Recent well-publicized outbreaks of *Shigella*, *Salmonella*, Hepatitis A, and even a Typhoid Fever incident a few years ago have re-focused public, regulatory, and industry concerns about our workers.

In the foodservice industry, there is acute awareness that employees can be important factors in prevention and control of illness, both as potential mishandlers of foods, and as direct sources. Moving away from the self-delusion of a mandatory medical "health card", the food industry today tends to focus on employee education and training. The industry has taken the lead in promoting and implementing this strategy of making sure that managers and workers are well-versed in the principles of food protection.

Because the costs to a restaurant implicated as the source of illness can be devastating, outbreaks are not accepted casually. Direst costs of an outbreak run to about $75,000 per establishment, including investigation cleanup, re-staffing and re-stocking, product loss, settlements, and increased regulatory sanctions. Some unfortunate operations *never* overcome the more insidious losses of goodwill, and they close permanently. For multi-unit chain operations, the negative effects of public opinion often spirals outward to uninvolved units, with indirect loss of business as high as $7 MILLION, in one recent outbreak in a metropolitan area.

In the face of such tremendous and fundamental risks to businesses, the foodservice industry has developed a long-standing positive record of implementing effective control strategies to protect customers and operational integrity. Industry has consistently been active in development of improved equipment designs and standards, safe operational procedures, and employee training.

Knowledge is power and the knowledge gained will enable restaurants to operate their businesses successfully and safely. The National Restaurant Association maintains a publication stock of more than three dozen separate titles to assist and advise operators in such diverse areas as Solid Waste Management; Efficient Facility Design; Energy Conservation; Customer and Employee Safety; and Food Protection.

Individual foodservice companies and the various state restaurant associations also maintain a wide variety of information and training programs. The National Restaurant Association is active in IAMFES and other professional organizations, as well as works with Federal, State, and local regulatory agencies to develop and implement equitable and effective standards and regulations to help assure customers' safety.

The "Applied Foodservice Sanitation" program, administered by the Educational Foundation of the National Restaurant Association, has trained and certified more than 250,000 managers in the principles of foodservice sanitation and safety. Foodservice employees are not ignored as agents of public health protection.

Yet, the publicity surrounding recent outbreaks suggest otherwise. This could be a by-product of our own success and visibility, coupled with shrinking regulatory resources. The media also play a large role in conditioning politicians and their constituents to seek and expect ominous and outrageous affronts to health and safety.

The current rush to achieve surgical asepsis in the restaurant kitchen bears striking parallels with the media's morbid fascination with the environmental disaster of the week. In a recent speech at Manhattan college, Sanitary Engineer John E. Kinney noted that these sorts of scaremongers rarely offer practical substitutes for the processes they want banned; claims of damage are almost never accurately assessed, and so that any questioning is immediately construed to mean that the objector is unconcerned about the problem. Peter Huber, writing in the Valparaiso University Law Review (1990) noted that, "... the easiest way to build a pseudocscientific case for a spurious cause is to point to something highly diffuse and hard to measure, for it is in measuring precisely this kind of stimulus that data can most easily be biased..."

There is hardly a more diffuse and difficult to measure set of data than the inherently inaccurate epidemiology of foodborne illness reporting. This sets the stage for scare stories to motivate politicians, leading to new legislation to "solve" the problem.

But has it been solved? Today's debate about food workers may be ignoring the controls that are available. There is talk of HACCP and risk assessment, but an attempt is made to achieve the impossible: ZERO outbreaks; ZERO exposure; ZERO risk. In the process, the industry becomes the target of another round of controls where the effectiveness is only assumed.

Why such a haste to abandon current controls in favor of new untried promises? If employees are working while they are ill, then grant employers the right and the duty to exclude those workers; if foodhandlers aren't washing their hands, then enforce the current rules which require them to do so.

We must realize that we are dealing with foodservice as one small piece of a much larger, more complex COMMUNITY public health situation.

Consider these excerpts from the 1985 CDC Surveillance reports on Hepatitis A: Among more than 7000 confirmed cases, the most common epidemiological factors were:

1.	*Personal* contact with a Hepatitis patient	27.7%
2.	Exposure in a daycare center	9.8%
3.	International Travel	6.3%
4.	Employment as a foodhandler	6.1%
5.	Recent Dental Work	4.5%
6.	Foodborne or Waterborne outbreak	4.0%

Thus, purely on the basis of these statistics, it would appear that dental work, daycare centers, international travel and personal contacts all carry a greater risk of Hepatitis A than does foodservice—But where is the hue and cry for control of THESE sources? Obviously, restaurants make an easier, and more media-satisfying target.

These sorts of records do point out one area that needs new emphasis—better follow-up and community investigation to determine the ultimate, rather than the proximate source of disease.

If people in public health are really serious about controlling disease, then there needs to be a better follow-up in the area of community investigation, so that they can locate and control the ULTIMATE sources. Similarly, there needs to be a better investigation and REPORTING of foodborne illness so the statistics used are more indicative of reality.

Still, the relatively low incidence of illness attributed to restaurants should bear somewhat eloquent witness to the success and effectiveness of our current industry programs. In 1987, CDC Summaries, Foodservice operations were implicated as the source of some 61 outbreaks, about 45% to that year's total. Contributing factors for confirmed outbreaks showed only 14% implicating poor personal hygiene.

Regardless of the specific cause, one outbreak, or even a single case, is one too many. But when compared to the BILLIONS of meals served in over 600,000 U.S. restaurant units, our more than 8 million employees tend to fade somewhat as a significant source of illness.

Still, the foodservice industry has no intention of resting on the industries' well-earned laurels. The industry will continue to take the high road, with multiple positive steps to secure that skilled and safe labor pool for our future.

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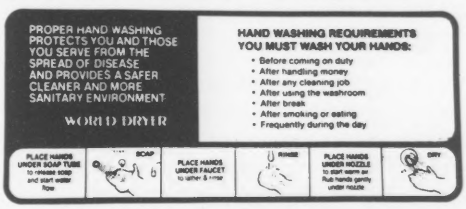

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The Gastroenteritis Outbreak Among Delegates and Guests, Thirty-Eighth Annual Convention

International Association of Milk and Food Sanitarians, Inc.
Glenwood Springs, Colorado, September 26-29, 1951

George W. Stiles, B.S., M.D., Ph.D., F.A.P.H.A.
Chief Laboratory Section, Colorado State Department of Public Health, Denver, Colorado

An Edited version from the Journal of Milk & Food Technology, July/August, 1953

The frequency of food poisoning cases at public or other gatherings constitutes a challenge to the sanitarian and public health official, not only to determine the cause of these unfortunate experiences, but to prevent occurrences of this character.

The convention of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS at Glenwood Springs, Colorado, was no exception. Here some 350 delegates and guests were gathered to discuss and promote the welfare of the various industries represented. Those present on this occasion comprised a notable list of persons from 35 states and territories. As commented by Homer Calver. "A precise demonstration of how food poisoning works" became an uninvited part of the program.

Epidemiology

Preliminary observations made by Dr. Harry A. Sauberli indicated that the possible cause of the gastroenteritis outbreak began at the noonday meal served at the Convention Hotel on Thursday, September 27, 1951. For brief designation, this will be called the *Inquiry Meal*. In order to establish the likely source of infection and persons involved, the following questionnaire accompanied by a letter of explanation was submitted to about 350 guests.

Results From The Questionnaire

Of the 350 questionnaires submitted, approximately 80 percent were answered. An analysis of these replies showed the following:

Ate the Inquiry Meal, which included a turkey dish called "chicken" by some, noonday, at the Convention Hotel, Thursday, September 27	155
Persons made ill	93
Persons not sick	52
Persons who ate the noonday meal, no turkey, not ill	10

Illness Among The Kitchen Help

One of the delegates made the following statement in reply to a written personal inquiry:

"The information came in a casual way while at breakfast when one of the persons at the table mentioned the fact that he was ill during the night. The waitress serving at this table overheard the conversation and remarked that nearly all the kitchen help were also ill during the night. She was then asked if the help had some of the buffalo meat served the previous evening and she replied that the leftover turkey or chicken from lunch (September 27th) was served to the employees for dinner."

Similar statements were obtained later through interviews with several persons who worked in the kitchen during the convention. One of the male cooks employed in the kitchen definitely affirmed that the diced turkey *was not* adequately cooked after it was prepared with sauce and noodles. He further testified the last tray of fricassee turkey returned to the kitchen after the noonday meal was "bubbling and fermenting." Consequently he and his wife refused to eat it and they were not ill. However, he said that other help who ate the turkey became sick.

These observations reported by the cook would account for the apparent absence of illness among those persons who ate the *Inquiry Meal* early, as against those who came late to it. The evidence tends to show that the stock turkey was contaminated when diced and that the noodle sauce added without subsequent cooking permitted rapid multiplication of gas-producing organisms in the fricasseed turkey when placed on the steam tables.

Symptoms

Many afflicted persons reported severe abdominal cramps, explosive diarrhea, sharp stomach pains, and gaseous distension of the abdomen. In exceptional instances there was slight nausea, headache, and dizziness during the diarrhea bouts. One man reported he went to the toilet 13 times during the 30 hours illness. His symptoms began at 3 A.M. on the 28th of September. Another person had two helpings of the turkey fricassee. He had "extreme diarrhea, chills, fever, and was sick 3 days—onset began at 3 A.M. on the 28th." Generally speaking there was no real vomiting aside from occasional nausea, such as might be expected in staphylococcus toxin poisoning.

The duration of illness varied from 2 to 12 hours or longer. Some cases lasted 2 days or more, but the majority less than 24 hours. Those who ate of the turkey dish "sparingly" report slight attacks in contrast to those who ate "heavily" and experienced reactions.

Laboratory Findings

Glenwood Springs Water Supply

Since several persons attending the Convention suspected an impure municipal water supply, the records in the Colorado State Department of Public Health Laboratories were checked for the bacteriological results during the year 1951. There were 33 samples of water submitted from the municipal supply of Glenwood Springs during 1951 for purity examinations. Of this number 6 were reported "unsafe," because of coliform organisms, according to standard methods of water examination. Fourteen of the 33 samples, however, showed slow lactose fermenters which did not ferment in brilliant green.

Glenwood Springs used unfiltered water from two natural streams, No Name Creek and Grizzly Creek. The installation of an adequate filtration plant has been repeatedly recommended by the Colorado State Department of Public Health.

Food Specimens

On the morning of Tuesday, October 2, 1951, five samples of food remnants were delivered to the author in person by the chief food sanitarian of the State Department of Public Health. This material was collected on the previous Friday, September 28th, from the refrigerator in the Convention Hotel. The samples were kept under refrigeration until delivery to the laboratory. The first 4 samples were collected in sterile glass containers but the

turkey specimen was wrapped in waxed paper. In the selection of material from the turkey both light and dark portions were removed aseptically from the inside.

Laboratory Technique and Bacteriological Results

The technique used by the author was as follows:

One gram portions of each sample were weighed into sterile mortars diluted with 9 cc sterile saline triturated, and diluted in multiples of ten, to one to ten-millionth of a gram. From each dilution 1 cc portions were seeded into lactose broth, also planted on nutrient agar. The cultures were incubated at 37° C for 48 hours, then at room temperature 2 days before final counting. The results were:

From 48-hour lactose broth tubes, seeded with 1-10,000,000 gram of ground raw buffalo meat and turkey specimens streaked on S. S. agar plates, several cultures were recovered and sent to the Enteric Bacteriological Laboratories of the Communicable Disease Center, Public Health Service, Chamblee, Georgia. Later it was realized that cultures on S. S. media should have been made direct from the various dilutions of the food specimens for the possible recovery of *Salmonella* organisms; since these species could have been overgrown in a mixed broth culture.

The organisms were identified by Edwards as intermediate paracolon from the buffalo meat, and as *E. coli* and aerogenes-like paracolon V. P.+ from the turkey specimen. Similar strains of these two turkey species of organisms were subsequently recovered from the Glenwood Springs municipal water supply from an unsafe sample submitted to the Colorado State Laboratory April 27, 1952, and also confirmed by Edwards.

Specimen Kind	Total Count per Gram
Ground raw buffalo meat	620,000,000
Cooked buffalo burgers and gravy	90 spore bearing colonies
Potato salad, freshly prepared	4,300,000
Home made salad dressing	No growth 1-10 gram
Large portions two cooked turkeys, breast and bony carcass	Est. 10,000,000,000

Comments on Food Specimens

Potato Salad: Since food poisoning cases have been previously reported from contaminated potato salad, suspicion was directed toward this item on the menu. The comparatively low bacterial content, including that of the gas producers, tended to eliminate this item as a major factor in causing the illness. Doubtless the bacterial count was much less at the time of serving 5 days prior to examination.

Further analysis of questionnaire reports showed that 36 of the 52 persons eating the *Inquiry Meal*, who did not become ill, also ate the potato salad served during the evening buffalo barbeque without ill effects.

Likewise 19 of the 28 persons attending the Aspen luncheon on September 27th ate potato salad during the evening barbeque meal and remained well.

Turkey: The writer has scarcely recovered from the shock received at the time of attempting to count the number of colonies (Quebec Colony Counter) after 4 days development of nutrient agar plates. The number of colonies on culture dishes seeded with 1-10,000,000 gram of turkey specimen were conservatively estimated at *ten billion* organisms per gram, of which two hundred million appeared to be of the gas producing varieties. This is the largest number of organisms ever observed by the author in a food product during a half century of laboratory procedures.

No evidence of a single staphylococcus type of colony was recognized.

Since the fricassee turkey appears to be the criminal involved in causing this gastrointestinal outbreak, a more elaborate story seems justified as follows:

Detailed History of the Incriminated Fricassee

Three frozen turkeys from the lot of eight were allowed to thaw over night, September 25th, at room temperature, and the whole turkeys were cooked in a large steam kettle under 15 lbs pressure for about 1 1/2 hours beginning at 2 P.M., on September 26th. After cooking, the hot turkeys were reported by the head chef as "properly cooled" in cold water for at least one hour, then placed under refrigeration at 38-40°F at 7 P.M. the same evening and left there until the following day.

We presume the turkeys were completely sterilized during the cooking process, but the matter of cooling these turkeys subsequently in cold water of doubtful purity is a mooted question.

The author believes a hot 24 lb turkey would absorb considerable water during its exposure in cold water, and if organisms of the colon-paracolon type were present in the water, this could account for at least some of the contamination found in the remnants of turkey submitted for bacteriological examination.

About 9 A.M. September 27th the flesh from two and one-half cold turkeys was diced in one inch cubes and placed in shallow steel pans at 10 A.M. The recipe for serving 200 guests the fricassee called for approximately 50 lbs of boned turkey, a gravy made of 5 gallons of broth from previous day's cooking of turkeys, and 5 lbs of egg noodles; seasoned with salt and white pepper, and thickened with flour.

The gravy and noodle mixture was heated and poured over the diced turkey about 10:30 A.M., then placed on a portable steam table until ready for serving. Each "Bain Marie" (water bath or double boiler) held two shallow trays of turkey, and there were four sets of trays served during the two-hour meal period. The heat applied to the steam tables was provided by "canned heat." As to this stage, a difference of opinion was expressed. The head chef says he instructed the second cook to boil the diced turkey before adding the fricassee sauce. In a personal statement to the author, however, the first cook declared the diced turkey mixture *was not* subsequently cooked; only the hot mixture was poured over the cold turkey before placing on the steam table.

The head chef further stated "unless new cans of sterno are lighted it is possible for heat to drop from extreme or steaming hot to slow incubating temperature. Cooks do not always watch this and sometimes guests coming in late complain of cold food or barely luke-warm."

One guest said, "The turkey was very hot when served." Another stated that "The turkey was warm—just right for incubation of anything in colon or other *Salmonella*."

When interviewed, a chef in one of Denver's leading hotels stated that a contaminated dish of creamed turkey or chicken can "sour in one hour" on the average steam table, and that he always recooks such articles of food about every thirty minutes to insure adequate safety.

Another possible source of contamination was indirect contact with the uncooked ground buffalo meat, probably handled by the same help whose hands might have carried paracolon organisms to the turkey meat during its preparation. A strain of intermediate paracolon from the raw buffalo meat was identified by Edwards.

The question of human carriers must always be considered in food infections of the character under consideration. However, because the Convention Hotel closed on October 5th, and the help scattered to widely separated areas, stool specimens could not be secured from any of the kitchen help. The same was true for the guests who were ill. Several days elapsed after the outbreak of illness occurred before the gravity and extent of the illnesses became apparent. The guests had returned home and it was too late to secure stool specimens from Denver delegates to be of any material value.

Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 66-68 (February 1992)
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Processing Procedures and Sanitation Practices to Extend the Keeping Quality of Fluid Milk

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Introduction

Four recent studies by the University of Minnesota, Penn State University and the Pennsylvania Association of Milk Dealers have shown that a significant number of fluid milk samples obtained from plants do not keep for up to 14 days at 45°F. Pennsylvania is one of few states with a mandatory open date which has been limited by the Pennsylvania Department of Agriculture to a maximum of 10 days following processing. Fluid milk processors in some states have chosen to use open dates of up to 16 days following processing. A list of processing procedures and sanitations practices was developed to help fluid milk processing plants achieve acceptable flavor after 12 or more days at 45°F. This list was used as part of an educational program by extension in the Food Science Department at Penn State University in cooperation with processing employees, Pennsylvania Department of Agriculture sanitarians, and allied industry representatives.

Development of Practices

The recommended procedures and practices were compiled by the authors from personal experience in trouble shooting keeping quality problems in plants in Pennsylvania. The initial list of recommended practices was presented at regional dairy processing employee meetings conducted in Pennsylvania in March 1990.

1. Use hot water from the HTST pasteurizer, through all pasteurized milk equipment, especially fillers. It is strongly urged even if keeping quality studies demonstrate that all products remain of acceptable flavor at 45°F for the length of the open date. A minimum of 170°F for at least five minutes must be present when checked by a thermometer, as the hot water overflows filler bowls and is drained from filler valves. Start with water at a temperature of up to 200°F; cover the surfaces of pasteurized surge tanks and all pumps, pipes and assembled filler parts which may be used to convey any pasteurized product to retail packages or dispenser bags.
2. Follow hot water with cool water chemical sanitizer solution of chlorine, iodine or acid sanitizer at a temperature of 70° to 90°F. Never use hot water or mix chemicals. Circulate the sanitizer solution for at least one minute. If necessary use a spray hose with metered sanitizer, so the solution flows down from the top of all milk contact surfaces. Allow surfaces to drain and never rinse sanitizer solution. Never rinse with plain water from your own water or that from a municipal supply.
3. Provide a separate area and facilities for milk haulers and receiving personnel to keep them out of pasteurizing and packaging rooms. This means restrooms, refrigerated cases for samples, ice, etc. which should be easily accessible, but away from processing areas.
4. Check the appearance, temperature and odor of milk in all truck tanks when received, and take an aseptic sample prior to unloading, for drug residue testing and performance of bacterial counts, microscopic examination, titratable acidity and taste.
5. Minimize spillage or leaking of raw milk. Flush it down the drain promptly, or collect in recovery system for separation, pasteurization and use in manufactured products.
6. Place footbaths and/or provide squirt bottles containing 800 to 1,000 parts per million of quaternary ammonium compound, at all outside entrances and between areas. Insist that all personnel and visitors use them.
7. Empty footbaths and manually brush or foam clean with a chlorinated alkaline cleaner, rinse and refill with quaternary ammonium sanitizer.
8. Eliminate the use of high pressure pumps to clean the outside of trucks, floors, walls and any dairy processing equipment. Aerosols are created in the air which can harbor bacteria and spread them widely.
9. Follow a preventive program to control all insects, rodents and birds. Carry out your own practices or engage a commercial exterminator. Check to see that prevention is accomplished.
10. You must manually clean the manhole cover, vent, gasket, pump, fittings, and in some cases the flexible plastic hose on farm truck tanks, if circulation cleaning does not properly clean it.

[2]*Account Manager, Klenzade Division of Ecolab., Inc.*
[3]*Regional Manager, Diversey Corp.*

11. Disassemble all raw milk and dairy product pumps at least weekly and manually wash, sanitize, then reassemble. Be sure hands are clean and sanitary when reassembling.
12. If you must repair equipment with raw or pasteurized milk contact surfaces, use rubber or plastic gloves to reassemble after chemically sanitizing them. Drain, rinse and sanitize milk contact surfaces and equipment, if it is not possible to follow a complete cleaning and sanitizing procedure.
13. Have a separate CIP system for cleaning and sanitizing truck tanks and raw milk storage tanks and lines. This prevents the possible spread of disease causing bacteria, which may be present from raw milk or products, and facilities and equipment which may contaminate pasteurized products, processing equipment and production areas.
14. Provide footwear and uniforms for all plant personnel. These should be left in a locker room with an outside entrance. Employees should leave street clothes and footwear in the locker room.
15. All employees should wear hair nets and hard hats, as well as nets to cover a beard or a mustache. This is most important for all persons working in or walking through processing and packaging areas.
16. Processing, product manufacturing, and packaging employees should wear no jewelry other than a wedding band while at work. Any jewelry wrist watch, etc. should be left at home or in the locker room.
17. Use a bactericide to wash your hands when returning from any area away from your work responsibilities. Dry them on single service paper towels, single use cloth toweling, or hot air driers.
18. Have flow diagrams for all raw and pasteurized milk piping and equipment; as well as other lines conveying water, steam, cleaning solution, or ingredients for dairy products. Update these diagrams whenever changes are made, and color code lines to indicate product and direction of flow.
19. Prohibit or remove any kind of piping from above any piece of open processing or packaging equipment to prevent condensation which could drip into milk or dairy products.
20. Seal any cracks in floors, walls, and ceilings.
21. Rinse and wash any product conveying systems whether in gutters in the floor or out in the open. Provide drip shields for overhead conveyors and use a lubricant containing a bactericide.
22. Provide separate rooms for returning containers and cases where they may be cleaned, apart from areas used for processing and packaging. Rinse, wash and dry all product cases when returned and before they enter the packaging area, and sanitize with quaternary ammonium compound.
23. Do not install any piece of dairy equipment over the top of floor drains.
24. Install drain covers with bell traps and grating which is easily removed for daily cleaning and sanitizing.
25. Clean all drain pipes every processing day with a black bristle brush designed and used only for that purpose, using an alkaline cleaner. Rinse, then pour quaternary ammonium sanitizer at full strength into the reassembled drain cover and down the pipe.
26. Pressurize the packaging room, so air movement is out.
27 Use separate color-coded brushes for milk contact surfaces-raw and pasteurized, floors and walls, and drains.
28. Minimum required pasteurization temperatures destroy disease causing and spoilage bacteria which may have contaminated raw milk. Temperatures above 170°F and holding times longer than 18 seconds for fluid white milk only provide a false sense of security that keeping quality will be extended.
29. Provide covers and shields for all processing and packaging equipment, and keep them in place to prevent entry of contaminants into products or containers.
30. Close and seal all packages of containers and covers which remain at the end of packaging to prevent entry of dust, dirt, air and other contaminants.
31. Any product resulting from changeover of products or container sizes should be repasteurized and used the same day.
32. Add all flavorings and sweeteners to milk prior to pasteurization. Vitamins should be added to separated milk prior to pasteurization in the correct amount and then thoroughly agitated.
33. Check samples of sweet water and glycol coolant on a frequent but irregular schedule for the presence of both disease causing and spoilage bacteria.
34. Minimize the use of water in processing and packaging areas to keep the floor as dry as possible.
35. Do not accept back into your cold room any product which has left a delivery truck and been delivered to a wholesale customer. If you must accept returns, put them in a separate area. The ideal means of disposal is to a farmer with pigs. Do not let any cases go to his farm and back to the plant.
36. Have a circulation cleaning and sanitizing system (CIP) dedicated to pasteurized milk equipment to prevent contamination from raw milk. A single use or solution recovery system is recommended. Discharge all rinse waters from CIP systems to drain. Empty and recharge CIP systems with fresh water and chemicals each processing day and more often if soil conditions of wash solution warrant.
37. Establish a written cleaning and sanitizing program which covers quantities, products, times and temperatures, usually prepared with a technical commercial representative.
38. Use cleaning and sanitizing compounds in the amount recommended, so that solutions are of the proper concentration. Check the strength of cleaning and sanitizing solutions daily and record them.
39. Circulation cleaning alkaline solutions should be at least 10°F above the temperature of raw or heated product. For cleaning cold milk contact surfaces temperature at the end of the wash cycle should be a minimum of 110°F to keep milkfat in a liquid state. Start with solution temperatures between 130°F and 150°F for raw milk equipment and lines. Temperatures for pasteurizers,

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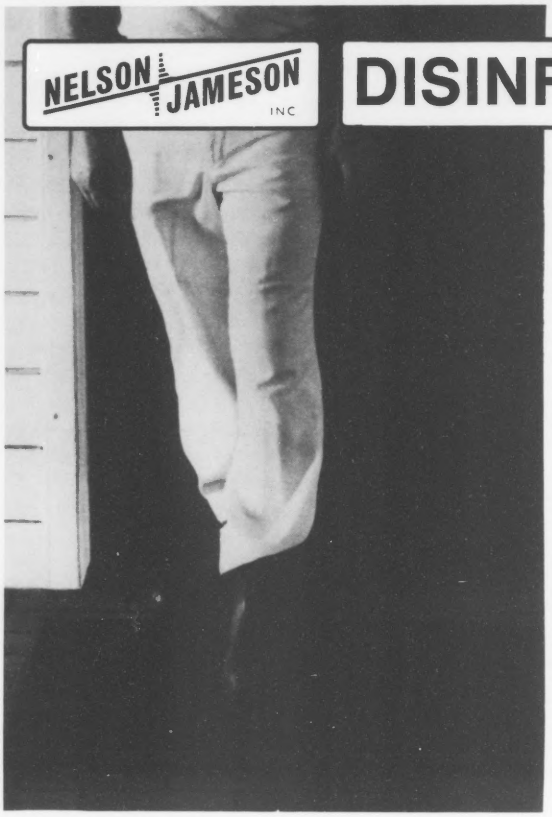

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fillers and pasteurized milk surfaces and lines should be 135°F to 175°F at the start for alkalize cleaning solutions.

40. For CIP cleaning velocity should be a minimum of five feet per second. To successfully clean a HTST press you need a velocity of about two and one-half times the product flow.
41. It is usually necessary to manually clean the following silo tank parts: agitator, door and gasket, sample cock, vent, sight glass, valves and any protrusions into the tank.
42. Other parts of a system which should be hand washed each processing day include plug valves, air operated valves which do not pulse, pump seals and pump gaskets.
43. There are even parts of your HTST system which need hand washing or frequent disassemble and visually checking. These include vacuum breaker, timing pump impellers, stand pipe, balance tank, divert line and leak detector lines.
44. Fillers present the greatest challenge to thoroughly clean and sanitize. With most machines many parts must be disassembled and manually cleaned. These parts include drive chains, splash guards, chain guards, heaters, mandrels, defoamer tubes and hoses, filler values and shields, and cups or pistons.
45. Check equipment surfaces after cleaning to be sure that all parts are free of deposits. Do this on an irregular, but frequent basis prior to assembly and sanitizing (which usually means the middle of the night).
46. Identify a few hard to clean areas on each machine or process. Disassemble and observe these as often as necessary to be sure they remain clean.
47. Develop a record book or log indicating when gaskets were changed, the date the HTST press was opened, filler gaskets, and air operated valves checked. Change gaskets and disassemble air operated valves at least quarterly and open the HTST press at least twice a year.

Conclusions

You may make this list of practices the Good Manufacturing Practices (GMP) for your plant. They may serve as a guide in identifying Hazard Analysis Critical Control Points (HACCP) in your operation, also. You will find it necessary to follow all forty-seven practices or something similar to regularly have packaged fluid milk which will be of acceptable flavor after 12 or more days at 45°F (7.2°C), and still have bacterial counts of less than one coliform and less than 20,000 Standard Plate Count per ml. More than 40% of the samples from Pennsylvania milk dealers in late 1991 have proven that it works. The challenge is to continue this high level of commitment and regular monitoring when results are good.

Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 69-70 (February 1992)
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A Case Study of the Influence of Microbial Quality of Air on Product Shelf Life in a Meat Processing Plant

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Abstract

The microbial quality of air in a meat processing plant was monitored for three months (May, June, and Aug, 1990; 2 sampling times each month) because of concern for the shelf life of cooked products (wieners). With the exception of the hallway and the area surrounding the showering tubes, the microbial count in air was < 300 CFU/m^3 in the first month. Subsequent samples generally gave higher counts. Suggested changes included eliminating stacked boxes in the hallway where the product was showered, decreasing the cross traffic among workers, and more frequent cleaning. Other suggested changes in processing practices, after further evaluation of the microbial quality of air, included showering of the product inside the smoke house and reducing the time from cooking until packaging. All changes were associated with improving the shelf life of the cooked product.

Introduction

Air contains different types of microorganisms at high or low numbers, depending on the type and intensity of an activity. Air can transmit these microorganisms with the help of airborne dust particles, water spray, insects, animals, and human beings. However, the air is not a normal medium for living organisms, including microorganisms, because of the lack of nutrients. Because, microorganisms can be harmful to humans, plants, and animals, microbial quality of air is becoming more important (Al-Dagal and Fung, 1990; York, 1973).

In food processing plants, the presence of microbes in air means one of two things: 1) the microorganisms are coming from the product (indication of spoilage) or 2) they are coming from other sources and may invade the product and affect the ultimate quality of the food.

This material is based upon work supported by the Cooperative State Research Service, U.S.D.A., under agreement No. 89-34187-4511.

Contribution 92-131-J, Kansas Experiment Station, Manhattan, KS 66506.

The type of microbes found in the atmosphere of food processing plants is normally associated with specific activities. For example, coliform bacteria were present in slaughtering house in two studies conducted by Al-Dagal (1989) and Kotula and Emswiler-Rose (1988). This finding could be attributed to the dirt and fecal materials associated with the live animals.

In an aerobiological study of the meat processing plant at Kansas State University, three different ranges were established as guidelines of microbial quality. The ranges are 1) Range A, 100 CFU/m^3 or less, which is considered excellent; 2) Range B > 100 < 300 CFU/m^3 as an intermediate range; and 3) Range C, > 300 CFU/m^3 indicating poor microbial quality in the environment surrounding the product. Those ranges do not apply to freezers and coolers, where low counts are normally expected (Al-Dagal, 1989).

The microbial count in the atmosphere of a food processing plant may be important in pinpointing the source of contamination. Airborne microbes may affect the ultimate quality of the product, if it is exposed to the environment too long.

This study was initiated at the request of a meat plant manager, who was concerned with the shelf life of wieners because some vacuum packaged links had slimy purge about 30 days after processing and packaging.

Materials and Methods

The airborne microbes in the meat processing plant were monitored twice a month for 3 months. The plant had some cross traffic, and the processing rooms were not well separated from each other (Figure 1). The floor of the hallway connecting the processing room, smokehouse and other rooms has some cracks. The cooked product was showered outside the smokehouse at an open site (26-29) in the hallway.

The surface Air Sampler (SAS, Pool Bioanalysis Itliana, Milano, Italy) was used to sample microbes in the air (Ligugnana and Fung, 1990). The one-stage sampler draws 3 liters/sec. through a cover with small holes that direct the air flow onto a plate containing a suitable agar medium. The

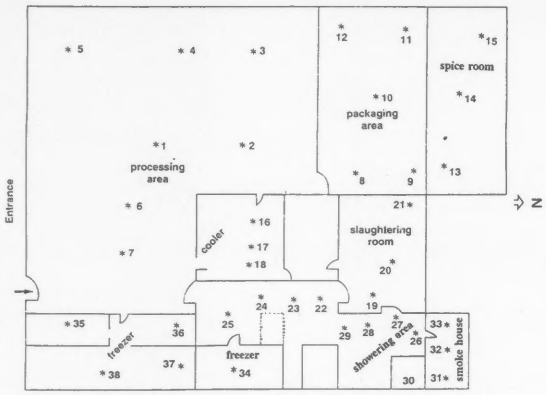

Figure 1. The Floor Plan of a Meat Processing Plant.

desired volume (up to 900 liters/5 min.) at one operation can be chosen by a 15-unit adjustable knob. In this study, the system was adjusted to draw 60 liters/20 sec. from each sampling position, and the samples were taken at 1.4 to 1.5m above the floor. The cover of the system was sanitized between individual samples using ethyl alcohol.

Plate Count Agar (PCA, Difco) was the medium used in recovering air microbes. After sampling, the plates were incubated at 32°C for 48 hrs. for mold and aerobic plate counts.

Results and Discussion

Table 1 shows that the aerobic plate counts in the first 2 weeks were 100 to 300 CFU/m^3 in all processing areas, except the hallway (sites 22 to 25) and the showering area (sites 26 to 29, where the number exceeded 300 CFU/m^3.

The water used for showering the cooked products was first suspected as a source of contamination, but two water samples showed negative bacterial counts. Another possible source of contamination was through water droplets and vapors deposited onto the surface of the cooked product during the showering and holding operation. We suggested that the plant move the stacked boxes from the hallway (22-24); clean the plant more frequently, especially the hallway; decrease the cross traffic among the workers; and seal the cracks in the hallway floor.

At our suggestions, two other major changes took place after the second microbial sampling: 1) showering the cooked links inside the smoke house instead of in the hallway (sites 26-29) and 2) reducing the time from more than 24 hrs. to 6 hrs. (3 hrs. for chilling and 3 hrs. for packaging) between cooking and vaccum packaging. These two suggestions, which reduced the exposure time of the cooked product to the air and areas of highest contamination, were associated with resolving the shelf life problem.

At the third sampling time, construction to open a door into the slaughtering room was underway. The construction was done to reduce cross traffic contamination between the finished product and the raw materials. Workers were separated into two groups; one group handled the product before cooking and the other handled the product after cooking.

Table 1: Mold and total plate counts per cubic meter of air in a meat processing plant.

Sampling Site		1	2	3		4		5		6	
		5/14/90 CFU/m^3	5/17	6/19		6/20		8/6		8/11	
		APC	APC	APC	MC	APC	MC	APC	MC	APC	MC
Processing Area	1	ND	ND	1500	70	1600	250	370	180	TMTC	
	2	130	<100	1100	80	1800	100	270	200	TMTC	
	3	100	<100	1900	120	1100	70	230	100	TMTC	
	4	<100	<100	1400	170	1600	130	270	80	TMTC	
	5	<100	<100	980	120	1600	120	100	50	TMTC	
	6	<100	<100	1050	70	1500	70	200	70	TMTC	
	7	<100	ND	1500	200	1050	120	200	70	TMTC	
Packing Area	8	<100	<100	200	170	630	270	300	80	350	70
	9	<100	<100	330	200	430	220	400	120	250	120
	10	<100	NC	180	130	580	220	280	80	200	30
	11	<100	<100	130	70	730	380	120	20	180	70
	12	<100	<100	230	230	670	220	230	180	220	100
Spice Room	13	---	---	70	70	100	100	600	230	400	130
	14	---	---	170	120	100	20	600	400	480	150
	15	---	---	350	180	120	100	480	200	570	230
Small Cooler	16	ND	<100	1000	920	270	30	70	70	130	ND
	17	<100	<100	1200	1000	670	130	50	20	130	ND
	18	100	<100	900	830	470	130	170	80	130	20
Slaughter Room	19	170	<100	870	270	530	270	350	170	830	30
	20	230	150	1130	430	1000	430	370	230	830	100
	21	130	<100	1050	630	1500	630	400	170	830	50
Hallway	22	150	380	1350	670	630	220	620	280	420	130
	23	350	320	1200	330	520	230	670	180	600	120
	24	280	250	900	400	520	250	620	220	650	100
	25	420	---	1300	480	720	200	470	130	620	130
Cooling Shower	26	---	400	880	400	880	250	1550	380	400	80
	27	---	850	870	270	1020	250	1780	500	480	120
	28	---	420	1000	400	950	120	spreader		spreader	
	29	---	380	880	480	730	230	1100	420	270	30
Cooler	30	---	120	870	50	530	270	230	120	230	30
Smoke House	31	---	300	870	300	450	300	870	450	780	250
	32	---	180	630	180	450	320	600	200	EE	
	33	---	120	520	250	450	270	670	350	530	120
Freezer A	34	---	<100	350	250	84	67	67	17	17	ND
Freezer B	35	<100	ND	300	150	134	17	ND	ND	67	17
Freezer C	36	117	EE	117	117	200	ND	50	ND	17	ND
Freezer D	37	<100	ND	66	33	167	17	17	ND	150	ND
	38	<100	<100	ND	ND	100	17	17	17	67	ND

ND: Not Detectable; EE: Experimental Error; TMTC: Too Many to Count. APC: Aerobic Plate Count; MC: Mold Count; --: Not Done.

The number of airborne microbes in the last 4 weeks was very high in all areas of the plant. These high numbers may be attributed to: 1) the summer season (high airborne counts might be expected in the summer), 2) dust particles possibly introduced by the construction operation, and 3) inadequate ventilation system to exhaust airborne particles.

Conclusions

Air sampling provides a useful tool to determine the presence of microbes in a food processing plant. With the microbial profiles obtained using this system, corrective measures can be made. In this study, reducing the exposure time of the product to microbes in the air was the logical solution to the problem, until the source of air contamination was eliminated.

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Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 71-76 (February 1992)
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Food Labeling Reform: A Progress Report

The Food and Drug Administration, with the support of the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture, has embarked on a major effort to improve the format and content of food labels. The changes would sweep away what Department of Health and Human Services Secretary Louis Sullivan, M.D., has called a "Tower of Babel" of sometimes misleading and often confusing statements on food packages that have frustrated consumers for years.

FDA Commissioner David A. Kessler, M.D., has stated that "the goal is simple: a label the public can understand and count on—that would bring them up-to-date with today's health concerns. It is a goal with three objectives: First, to clear up confusion; second, to help us make healthy choices; and third, to encourage product innovation, so that companies are more interested in tinkering with the food in the package, not the words on the label."

Except for the addition of sodium content in the late 1980s, FDA's food labeling regulations have remained basically unchanged since the early 1970s. The new changes will address today's public health priorities, in which conditions linked at least in part to diet, such as heart disease and cancer, have replaced beriberi, pellagra, scurvy, and other diseases caused by dietary deficiencies that afflicted past generations.

The label reform effort began in 1989 when FDA published an advance notice of proposed rule-making and, with FSIS, held nationwide hearings to find out what consumers and industry wanted to see on food labels. Early in 1990, the agency began publishing proposals for new regulations. The proposals called for extensive changes in the information that would be allowed or required on food labels. Labels would have to give reliable information by which shoppers could judge a food's nutritional value and on which health professionals could depend to help their patients choose healthy diets.

Nutrition Labeling and Education Act

At about the same time the proposals were being published, the Nutrition Labeling and Education Act of 1990 (NLEA) became law. The legislation gives FDA's labeling initiative a solid legal base and an accelerated timetable.

The timetable is important because the NLEA specifies that if the agency's regulations on nutrition labeling and health claims are not finalized by Nov. 8, 1992, the pending FDA proposals would become the final regulations, with an effective date of May 8, 1993.

FDA continued its rule-making by publishing during the summer of 1991 proposals on:

- the listing of certified color additives.
- the listing of ingredients in "standardized" foods such as ketchup and peanut butter.
- the labeling of fruit and vegetable juices.
- the display in grocery stores of nutrition information on the 20 most popular raw fruits, vegetables, and types of fish.

Then, in November 1991, FDA announced 20 more proposed rules, one final rule, and two notices. These:

- stated that nutrition information would be required for virtually all packaged foods and spelled out the conditions for its use.
- defined serving sizes.
- defined descriptors such as "light" and "low-fat".
- approved certain health claims.
- covered the technical provisions that tie the program together.

These November proposals dealt with the *content of* the label. Early in 1992, FDA will propose a regulation to revise the *format* of the nutrition label to help consumers better understand and use the nutrition information. USDA also has proposed changes in the labeling of meat and poultry, which it regulates.

Industry and consumers who wish to comment on the proposals have 90 days after their publication in the *Federal Register* to do so. In accord with the NLEA timetable, FDA expects that by Nov. 8, 1992, all of the proposals (revised as necessary based on public comments) will be published as final rules. The new labels will be required on all packaged foods that are produced beginning May 8, 1993, and the newly labeled products will begin to appear on store shelves later that year.

Here are brief summaries of the FDA proposals published so far:

Mandatory Nutrition Labeling

Among the proposals announced in November 1991 is one covering the labeling of a food's nutrient content. (It had originally been published July 19, 1990, but was reissued to bring it in line with the provisions of the NLEA.) Manufacturers have been voluntarily providing information on nutrient content on some food labels for many years. FDA has required this information only on fortified foods and those for which nutrition claims are made, but such information has never been required across the board. As

a result, only about 60 percent of processed foods have provided such information.

The November proposal would make nutrition information mandatory on processed foods that are meaningful sources of nutrients; that is, on virtually all packaged foods. Excluded would be most spices, small packages (generally those no larger than a package of Life Savers), restaurant food, and food produced by small businesses (those with food sales of less than $50,000 a year and total sales of less than $500,000 a year).

The emphasis would be on nutrients that have a significant impact on the health of today's consumers. Currently, if nutrition information is provided, it must include: serving size; servings per container; and per serving levels of calories, protein, carbohydrates, fat, sodium, thiamine, riboflavin, niacin, vitamins A and C, calcium, and iron. Other nutrients, including cholesterol, are allowed to appear voluntarily.

List of Nutrients

Under the November 1991 proposal, the nutrients that must be listed would change to keep pace with the nation's changing health concerns. The amount per serving of these nutrients would have to be shown: total calories, calories derived from fat, total fat, saturated fat, cholesterol, total carbohydrates, complex carbohydrates, sugars, dietary fiber, protein, sodium, vitamins A and C, calcium, and iron. Thiamine, riboflavin and niacin would become optional listings because the U.S. population generally does not suffer from diseases related to deficiencies of these commonly available B vitamins.

Nutrition information would be presented in quantitative amounts—for example, 4 grams of fat—or as percentages of certain dietary reference values. There would be two types of these reference values that consumers could use as up-to-date yardsticks for a healthy diet: Reference Daily Intakes (RDIs) and Daily Reference Values (DRVs). RDIs would replace the U.S. Recommended Daily Allowances (USRDAs) for protein, vitamins and minerals that have been used for many years. RDIs would provide consumers a basis to compare the protein, vitamin and mineral content of foods, based on the National Academy of Sciences' Recommended Dietary Allowances. DRVs would provide a similar basis to compare certain other food components—total fat, saturated and unsaturated fat, cholesterol, carbohydrates, dietary fiber, sodium, and potassium—that are especially important in affecting health, but which have not been addressed by the National Academy. To present these numbers as simply as possible, labels will just refer to the percentage content of all these components as "Percent of Daily Value."

The terms for some nutrients would be simplified. For example, "saturated fat" would be used rather than "saturated fatty acids."

The proposal allows for a more simplified nutrition labeling format when more than half of the required nutrients are present in insignificant amounts.

Vitamin and Mineral Supplements

Another November proposal would require a modified form of nutrition labeling for vitamin and mineral supplements. The label would have to show the quantitative amount and percent of RDI of all vitamins and minerals, and the quantitative amount of calories and food components—fat, carbohydrates, or dietary fiber, for example—present in more than insignificant amounts. The amounts would be those in one unit of the supplement (one pill or tablet, for example). Where label directions say to take more than one unit per day, the information also would have to be given for the total number of units to be taken in one day.

Serving Sizes

In order to help consumers fully understand and compare nutrition listings, serving sizes need to be uniform, consistent across product lines, and closer to the amounts people actually eat.

Currently, food companies are free to determine the size of a serving and the units of measure. In November 1991, FDA reproposed a regulation on serving sizes that it has originally issued on July 19, 1990. The reproposal is based on comments received on the earlier proposal, a public meeting, and a 1990 nutrition report by the National Academy of Science's Institute of Medicine.

The reproposal would require the nutrition content on labels to be based on the serving or portion size customarily consumed by an average person over the age of 4, and it must appear in common household and metric measures, such as 1 cup (240 milliliters). Special portion sizes for infants and children from 1 to 3 years of age would have to be shown when products are formulated specifically for those groups.

The proposal includes standard reference amounts for 131 categories of food. From these, manufacturers will calculate serving sizes in common household measures. Any package that contains less than two servings would be considered a single-service container. For example, the proposed standard serving size for a soft drink is 8 ounces. So a 12-ounce can would be considered a single serving, and its nutrient content would have to be declared on the basis of the contents of the entire can. Any description such as "low sodium" also would have to be based on the entire contents of the can.

Defining Descriptive Terms

Currently, marketers may use the FDA-defined terms "low," "reduced" and "diet" to describe levels of calories in a food and "free," "low," "very low," and "reduced" to describe the level of sodium. Descriptive claims are not defined for other nutrients.

Now, in its November 1991 proposals, FDA has developed a "dictionary" for food producers, marketers and consumers to consult for consistent and uniform definitions on an expanded list of terms. For example, under the new rules, "low fat" would be defined and would mean only one thing. Consumers could have confidence that a product labeled "low fat" is truly low in fat.

FDA has proposed definitions for nine core terms, called descriptors or nutrient content claims, that could be used to describe a food if the food meets that definition. These nine are: free, low, high, source of, reduced, light (or lite), less, more, and fresh. These nine terms have also been given specific definitions when used with certain nutrients.

The proposals would also permit the use of certain synonyms for these nine core terms.

The list of nutrients for which descriptors can be used is expanded to include all nutrients required to be listed on the label.

Also, if a food is labeled with a descriptor for a certain nutrient but that food contains other nutrients at levels known to be less healthy, the label would have to bring that to consumers' attention. For example, if a food making a low-sodium claim is also high in fat, the label must state "see back panel for information about fat and other nutrients."

Here are the proposed definitions.

Free and Low

- ***Free***: an amount that is "nutritionally trivial" and unlikely to have a physiological consequence.
- ***Calorie Free***: fewer than 5 calories a serving.
- ***Sugar Free***: less than 0.5 grams per serving.
- ***Sodium Free and Salt Free***: less than 5 milligrams of sodium a serving.
- ***Low***: would allow frequent consumption of a food "low" in a nutrient without exceeding the dietary guidelines. Per serving and per 100 grams (a little less than half a cup) of food, these amounts would be defined as:
  - ***Low Sodium***: less than 140 milligrams per serving and per 100 grams of food.
  - ***Very Low Sodium***: less than 35 milligrams per serving and per 100 grams of food.
  - ***Low Calorie***: less than 40 per serving and per 100 grams of food.

A food that is *normally* free of or low in a nutrient may make such a claim, but the claim must indicate that the condition exists for all similar foods—for example, "Fresh spinach, a low-sodium food."

High and Source of

- ***High and Source of***: are intended to emphasize the beneficial presence of certain nutrients, not to characterize levels of nutrients that increase the risk for chronic diseases. "High" is 20 percent or more of the RDI or DRV. "Source of" is 10 to 19 percent of the RDI or DRV. Any high-fiber claim for a food containing more than 3 grams of fat per serving and per 100 grams of the food must be accompanied by a declaration of total fat.

Relative Terms

- ***Reduced, Light, Less***, and ***More***: Use of these terms must be accompanied by information about the food that is the basis of comparison—the identity of the comparable food, the percentage (or fraction) by which the referenced food has been modified, and the amount of the nutrient that is the subject of the claim.
- ***Reduced***: may be used for sodium only if the food contains no more than half the sodium of the comparison food. ***Reduced*** may be used for calories, however, if the referenced food has been reduced by one third.
- ***Less***: may be used to describe nutrients if the reduction is at least 25 percent.
- ***Light***: may be used on foods that contain one-third fewer calories than a comparable product. Any other use of the term ***light*** must specify if it refers to the look, taste or smell; for example, "Light in color."
- ***More***: could be used to show that a food contains more of a desirable nutrient, such as fiber or potassium, than does a comparable food. To use the term more, a food must contain at least 10 percent more of the given nutrient than the comparable food.

Definitions Related to Fat and Cholesterol

- ***Fat Free***: less than 0.5 grams of fat per serving, providing that it has no added ingredient that is fat or oil.
- ***Low Fat***: 3 grams or less of fat per serving and per 100 grams of the food.
- ***(Percent) Fat Free***: may only describe foods that meet FDA's definition of "low fat."
- ***Reduced Fat***: no more than half the fat of an identified comparison— for example: "Reduced fat, 50 percent less fat than our regular brownie. Fat content has been reduced from 8 grams to 4 grams." To avoid trivial claims, the reduction must exceed 3 grams of fat per serving.
- ***Low in Saturated Fat***: may be used to describe a food that contains 1 gram or less of saturated fat per serving, and not more than 15 percent of calories from saturated fat.
- ***Reduced Saturated Fat***: no more than 50 percent of the saturated fat than the food with which it's compared. Foods with a reduction of 25 percent or greater may have a comparative claim using the term "less." If "reduced saturated fat" or a comparative claim is used, it must indicate the percent reduction and the amount of saturated fat in the food with which it's compared. The reduction of saturated fat must exceed 1 gram.
- ***Cholesterol Free***: less than 2 milligrams of cholesterol per serving and 2 grams or less saturated fat per serving.
- ***Low in Cholesterol***: 20 milligrams or less per serving and per 100 grams of food, and 2 grams or less of saturated fat per serving.
- ***Reduced Cholesterol***: 50 percent or less of cholesterol per serving than its comparison food. Foods with reductions in cholesterol of 25 percent or more may bear comparative claims using the term "less," but both "reduced cholesterol" and comparitive claims must be fully explained and the reduction in cholesterol must exceed 20 milligrams per serving.

All claims of cholesterol content are prohibited when a food contains more than 2 grams of saturated fat per serving. The label of a food containing more than 11.5 grams of total fat per serving or per 100 grams of the food must disclose those levels immediately after any cholesterol claim.

Fresh

- ***Fresh***: can only be linked to raw food, food that has not been frozen, processed or preserved.
- ***Freshly***: with a verb such as "prepared," "baked" or "roasted" may be used if the food is recently made and has not been frozen or heat processed or preserved.

Adding approved waxes or coatings, using approved pesticides after harvest, or applying a mild chlorine wash or mild acid to raw produce would not prohibit the use of the term "fresh."

Terms such as "fresh frozen" and "quickly frozen" are also defined.

Other Issues About Definitions

A percent of the RDI or quantitative amount of a vitamin or mineral may be specified on the label without further definition (for example, "Orange juice—60 milligrams of vitamin C in every glass").

Products that are prepared meals (TV dinners or entrées, for example) may not use the term "reduced." Such products can be called "low calorie" only if they contain no more than 105 calories per 100 grams.

Implied claims (for example, "contains no tropical oils") can lead a consumer to assume that a nutrient is absent or present in a certain amount. FDA is not proposing definitions for such claims at this time, but is asking for comments on how to draw a line between implied nutrient content claims and ingredient claims, the criteria for evaluating whether implied claims are appropriate and not misleading, and information on specific implied claims.

FDA held a public hearing on its proposed definitions of descriptive terms in December 1991. Also, to reflect alternative views on this issue, FDA intends to publish by January 1992 a supplemental proposal on descriptors.

Nutrient Claims for 'Substitute' Foods

Many consumers, heeding to advice of current nutrition experts, would like to buy foods that contain less fat than what is in certain "standardized" foods such as butter, cheese, and sour cream. The current law has sometimes discouraged the food industry from developing healthier alternatives because it often prevented a manufacturer from calling its product by a name the public most readily understands. For example, if a company wanted to make a low-fat sour cream, regulations governing standards of identity would not allow using the term "sour cream" on the label if the product is low fat. The product would have to be called "imitation sour cream" or "low-fat sour cream substitute," names that clearly have negative connotations.

To correct this, FDA, in its November proposals, gives general requirements for substitutes for standardized foods—foods similar to the standardized products but with different amounts of certain nutrients. Food producers would be able to lower the fat in sour cream, for example, and not not have to call it "imitation" or "substitute," but simply "low fat."

According to the proposal, a substitute food must be nutritionally equivalent to its standardized counterpart. It must contain the ingredients used in the standardized food; calories or fat may be lowered, but the food must contain the same amount of fat-soluble vitamins as the standardized food.

A separate proposal concerns butter. Butter, by standard, cannot contain less than 80 percent milk fat by weight. This proposal would allow the use of terms such as "light" for butter if the product has less fat and fewer calories but is otherwise nutritionally equivalent to regular butter. It must contain cream or milk, or both.

Health Claims

The NLEA provided, for the first time, the specific statutory authority to allow food labels to carry claims about the relationship between the food and specific diseases or health conditions. This represents a major shift in labeling philosophy. Until 1984, a food product making such a claim on its label was treated as a drug and considered misbranded unless the claim was backed up by an approved new drug application. The last few years have been a period of transition. FDA is now squarely in the "pro-information" mode. Eleven of the documents issued in November 1991 dealt with how, and on what grounds, health claims would be appropriate.

As directed by the NLEA, FDA examined the scientific evidence on 10 relationships between nutrients and the risks of certain diseases. Of the relationships considered, these four are currently supported and would be allowed on labels:

- calcium and osteoporosis
- sodium and hypertension
- fat and cardiovascular disease
- fat and cancer

Two other claims—fiber and heart disease, and fiber and cancer—require additional comment. FDA is reserving judgment on these claims until it gets enough information on which to base a final decision.

The proposal would not allow claims linking folic acid with neural tube defects, antioxidant vitamins with cancer, zinc with immune function in the elderly, or omega-3 fatty acids with heart disease.

Proposals for the general requirements for health claims set forth a number of definitions to clarify their meanings. One of the most significant defines the nutrient levels that would disqualify a health claim. Disqualified are those foods that contain more than 11.5 grams of fat, 4 grams of saturated fat, 45 milligrams of cholesterol, or 360 milligrams of sodium per amount commonly consumed, per labeled serving size and per 100 grams of the food.

Ingredient Labeling

FDA has always required the ingredients of packaged foods to be listed on the labels. But certain common foods such as mayonnaise, macaroni and bread, made according to "standard" recipes set by FDA, have been exempt from the requirement to list all their ingredients. FDA now considers listing of all ingredients necessary even for standardized foods, mainly because many of today's consumers, unlike their parents or grandparents, don't know what these

foods are made of. Therefore, a proposal published June 21, 1991, would require the listing of all ingredients in standardized foods. The proposal also would require:

- the listing of all FDA-certified color additives by name.
- an explanation on the label that the list of ingredients is in descending order of predominance by weight.
- the listing of all sweeteners together in the ingredient list, under the collective term "sweeteners," when more than one sweetener is used in a product. Following the collective term, each sweetener would be listed in parentheses in descending order of predominance by weight.
- identification of caseinate as a milk derivative when used in foods that claim to be nondairy, such as coffee whiteners, because some people with milk allergies use nondairy products.
- use of a uniform format if a processor chooses to declare ingredients by percent of content. Under the proposed format, the percentages would be presented by weight rather than volume to avoid inconsistent calculations. Firms could use percentage declarations for as many or as few ingredients as they choose, as long as the information would not be misleading.
- declaration of sulfites used in standardized foods because some people are allergic to these preservatives.
- declaration of protein hydrolysates, used in many foods as flavors and flavor enhancers. Most importantly, for consumers with religious or cultural dietary requirements, the food source of the additives would have to be identified. For example, if hydrolyzed milk protein is added to canned tuna, the ingredient statement would have to declare it in that manner and not simply as "hydrolyzed protein."

FDA also plans to require that the flavor enhancer monosodium glutamate (MSG) be declared on the label whether it is added as a separate ingredient or as a component of protein hydrolysates. For more information on the MSG requirements, see FDA Backgrounder 91-7.1, Monosodium Glutamate (MSG), October 1991.

The proposal also calls for comments from all interested parties to improve the readability of ingredient information on the labels, particularly concerning such questions as type size and placement of major and minor ingredients.

Final rule on the ingredient listing proposal are expected in mid-1992.

Juice Labeling

The percentage of actual fruit or vegetable juice would be required to appear on the label of all juice beverages, whether full strength or diluted, according to another proposal published July 2, 1991. Beverages made from several juices that identify individual juices on the labels would have to declare the percentage of each of the identified juices.

Final rules on juice labeling are expected in mid-1992.

Raw Produce and Fish Labeling

In a proposal published July 2, 1991, and made final in November 1991, FDA identified the 20 most frequently consumed raw fruits, raw vegetables, and types of raw fish and provided guidelines for grocery stores to make available nutrition information on these 60 foods close to where they are displayed for sale. Initially, this information would be displayed voluntarily. By May 1993, if at least 60 percent of stores were displaying the information, the guidelines would continue to be voluntary. If not, regulations would be written to make this display mandatory. (USDA is also developing similar arrangements for raw meat and poultry).

Format for Nutrition Labeling

For a nutrition label to be truly useful to consumers and simplify comparisons among products, the format must be easy to read and understand.

FDA anticipates publishing a proposal for a standardized nutrition labeling format by mid-1992. To do this, the agency conducted a study using 1,460 food shoppers in eight large and small urban areas. The shoppers were shown five different types of nutrition information labels and were asked to use the labels to identify specific information about the contents of the food packages. The label formats ranged from the currently used type to others that contained substantially more information, including one label that was a bar graph, designed to give information at a glance. The current, almost 18-year-old label format scored the best in enabling consumers to see nutrition differences among various products.

Based on the results of that study and on public comments on its findings, FDA is now conducting another study using additional formats. Also, in response to FDA's request for a cooperative effort by industry and consumer groups, members of the Grocery Manufacturers of America and the National Food Processors Association will conduct their own consumer study on the same formats. FDA's research is scheduled to be completed by December 1991, and the industry study early in 1992.

Deadline Exemptions

The NLEA deadline of November 8, 1992 (to avoid having FDA's proposals become final rules as proposed), applies to all the agency's food labeling regulations except percent juice labeling, ingredient labeling for standardized foods, and the declaration of certified colors. An August 1991 amendment to NLEA (Public Law 102-108) allows delays on certain effective dates for those three requirements. Nevertheless, the final rules for all three will still go into effect by May 8, 1993, the deadline for the effective date for all food labeling regulations.

State Preemption

The NLEA preempts states from regulating nutrition labeling. States may, however, request exemption from federal preemption if the state's requirements would not unduly burden interstate commerce, are consistent with federal food laws, and serve a specific need for information not met by the federal requirements.

Economic Impact

FDA has evaluated the costs and benefits of its food label reform. The costs of the changes will fall on packaged food producers, supermarkets and restaurants (and will ultimately be passed along to consumers). It is estimated that 17,000 food processors and 257,000 labels will be affected. Total costs of the proposals are approximately $1.6 billion over 20 years, or about $1.50 per household per year.

The benefits include decreased rates of cancer, coronary heart disease, osteoporosis, obesity, hypertension, and allergic reactions to food. FDA has concluded that as consumers are given more information, uncertainty over the ingredient and nutrient content of the foods they now eat will decrease, and some consumers will select more nutritious, healthier foods.

The benefits to the public health—measured in monetary terms—are estimated to well exceed the costs. The estimate of these benefits focused on the two largest public health problems in America, cancer and coronary heart disease. It was based on a study of how consumer purchases would change in response to new nutrition information and how the changes would affect the risk of disease. The changes in risks are estimated as benefits to consumers both in years of additional life and money saved. Over a 20-year period, the provisions of the NLEA are estimated to prevent about 39,200 cases of cancer and heart disease. About 12,900 of those cases would have resulted in death, yielding 80,900 years of life gained. The monetary value of the years saved is estimated to be between $3.6 billion and $21 billion, and reduced health-care costs would exceed $100 billion.

Public Education

As FDA moves forward with its food labeling initiative, it is also developing a major public education campaign to inform consumers how to get the most from the new food label. FDA Commissioner David A. Kessler, M.D., said "FDA will do everything possible to promote the use of the food label to improve the collective diet—and with it the health—of the entire nation." This campaign would fulfill the provisions of NLEA that directs the Secretary of Health and Human Services to educate the public about the new labeling requirements.

Commissioner Kessler has stated that the new food label "can—and will— do more than provide accurate and useful information about food. It will increase consumer awareness of nutrition, of what actually makes up the food we eat every day, of how much of the various components make up a healthy diet."

"It is not our business to tell people what to eat. But it is very much our business to ensure that people who wish to make sound dietary choices have the best and most accurate information available—and available to them in the most accessible form."

Reprinted from the FDA Backgrounder, November 1991.

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Announcing the Pre-Meeting Workshops for the 79th IAMFES Annual Meeting

Hazard Analysis at Critical Control Points (HACCP)

Conducted by
Frank L. Bryan, Ph.D., M.P.H.

July 24-25, 1992
The Sheraton Centre Hotel
Toronto, Ontario

The HACCP system is designed to ensure food safety by reducing the likelihood of foodborne illness through identifying the hazards and assessing the risks of contamination associated with food products as they pass through the phases from production to consumption.

This day and a half workshop will provide step-by-step instructions to develop, implement and refine the HACCP system in the food processing and foodservice sectors.

The procedures and practices to be discussed will include:

- Assignment of Responsibilities
- Selection and Training of Staff
- Evaluation of Operations for Hazards and Risks
- Measurement of Time-Temperature Exposures
- Measurement of pH Level of Foods
- Collection of Samples
- Testing of Samples for Pathogens
- Measurement of Water Activity (a_w)
- Analyses of Measurements
- Flow Diagrams of Food Production Processes
- Determination of Critical Control Points
- Establishment of Control Criteria
- Monitoring Data at Critical Control Points
- Recording Data at Critical Control Points
- Verification of HACCP Systems Effectiveness
- Modification of HACCP System

Workshop Hours will be:
Friday, July 24th - 1:00pm to 5:00pm
Saturday, July 25th - 8:00am to 5:00pm

Included in each registrant's course materials will be the Procedures to Implement the Hazard Analysis at Critical Control Point System manual, developed by the IAMFES Committee on Communicable Diseases Affecting Man.

Monitoring/Measuring Environmental Sanitation in Food & Dairy Plants

Conducted by
J. Russell Bishop, Ph.D.

July 25, 1992
The Sheraton Centre Hotel
Toronto, Ontario

Environmental Sanitation within and around food and dairy processing plants plays a vital role in the production of safe and wholesome food products.

This one day workshop is designed to provide participants with a working knowledge of proper monitoring of environmental sanitation. The workshop will present the hows and whys, as well as the interpretation and consequences, of proper monitoring.

Issues will be addressed from four perspectives:
Chemical (Sanitation) Industry
Testing Methods Manufacturers
Food Processing Industry
Environmental Services Laboratory

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

Specific topic areas to be covered will include:

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

Workshop Hours will be:
Saturday, July 25th - 9:00am to 5:00pm

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

News

New Technical Review from IDF Addresses Residue Prevention and Reduction

The International Dairy Federation has released an updated overview of residues and contaminants of interest to the dairy industry. Written for a technical audience, this nearly 200-page monograph provides comprehensive summaries of potential sources of chemical residues, their significance and recommendations for preventing or reducing their presence in milk products.

Residues and Contaminants in Milk and Milk Products reviews principles for the toxicological evaluation of residues, noting new microanalytical techniques sensitive enough to detect trace elements in minute quantities. It also includes detailed summaries of specific sources of residues, including veterinary drugs, pesticides, PCBs, detergents and disinfectants. Each section includes information on basic chemistry, toxicology, residue levels and significance to the industry.

To order a copy of *Residues and Contaminants in Milk and Milk Products* ($75) from the IDF U.S. National Committee, contact: Harold Wainess, secretary, USNAC/IDF, 464 Central Avenue, Room 24, Northfield, IL 60093; phone (708)446-2402 or fax (708)446-2456.

Heatseal Covers for Food Packaging

A heat-seal cover system from Britain, used with nonmetallic food containers, can be applied automatically in one operation; it employs biodegradable materials and can be used on containers used for heating in an oven. ADVANCED PETAL from *Print Design and Graphics* incorporates a polyethylene terephthalate-lined cover which is secure and also easy to open, even when hot. It comes with a printed sleeve which has high-impact shelf appeal, and can be printed with all-round graphics in color.

The system can be used with various PET and "ovenable" coated-board trays. No carton-erect machinery is required; the packaging is tamper-resistant and, because no additional sealed packaging is needed, the combination of the cover and the shelf-impact sleeve can reduce significantly the amount of packaging material which is required for oven-ready, frozen-food and microwave containers. The company says that cost savings can represent 30% of the cost of other packaging methods. The company also produces other packaging systems for the food-manufacturing industry.

Inquiries from prospective agents are welcomed by the company or may be sent to the press contact for forwarding. For more information contact Sandra Paul, Ext. 446, British Trade and Investment Office, 845 Third Avenue, New York, NY 10022-6691.

Mizzou Tastes Best in Ice Cream Contest

Three students representing the University of Missouri-Columbia won the intercollegiate ice cream evaluation contest in Chicago last week.

Melissa Suttles, New Bloomfield, was first and Susan Brunjes, Villa Ridge, was third among the 51 contestants. Sharon Brown, Foristell, placed eighth.

The team matched tasting skills with students from 16 other universities from the United States and Canada.

The team judged five other dairy foods, placing second in the cottage cheese category with Brunjes the second place individual.

Missouri tied for first place in the evaluation of all six products, but the tie-breaker rule dropped them to third place behind South Dakota State University and the University of Minnesota.

Suttles placed second in the evaluation of cheddar cheese.

The team placed fourth in the judging of both cheddar cheese and yogurt and finished third in evaluation of milk.

The contest was sponsored by the U.S. Dairy and Food Industry Supply Association and several other dairy organizations. The Missouri team was sponsored by firms and individuals of the state.

Two weeks earlier the team had placed second in an 11-team regional contest held at the Kraftco National Foods headquarters in Glenview, IL. In that contest Brown was the top evaluator of cheese and Brunjes placed fourth overall. The third member of that team was Rebecca Robbins, Charleston.

Coaches of the team are professors Dean Shelley and Robert Marshall of the MU Department of Food Science and Human Nutrition.

For more information contact Dean Shelley (314)882-4114 or Robert Marshall (314)882-7355.

Six Country Pavilions Provide International Dimension to Pack Expo 92

A new, growing international dimension is taking shape for PACK EXPO 92 with the confirmation of six country pavilions.

Participating countries in the show, to be held November 8-12 in Chicago, are Canada, Germany, Italy, Japan, Netherlands, and the United Kingdom.

"For Germany and Japan, their exhibits are firsts in a PACK EXPO," said Charles Yuska, Executive Director of Packaging Machinery Manufacturers Institute, "emphasiz-

ing the new, world-class character of the event, and our theme — The World of Packaging Technology."

These are comments by the directors of several of the pavilions:

"The Chicago-based show is widely known among German packaging machinery manufacturers and there is a keen appreciation for its importance to their business in the American market." — Christian H. Winslow, Dusseldorf Trade Shows, Inc.

"Japanese packaging manufacturers regard PACK EXPO as one of the most important international exhibitions. They consider PACK EXPO to be a kind of 'status symbol.'"— Mitsuo Amano, Japan Packaging Machinery Manufacturers Association.

"Canadian companies are very competitive in today's economy — and they feel that PACK EXPO represents the best opportunity to showcase their products and increase their sales." — David Koelliker, Canadian Consulate General, Chicago.

"PACK EXPO 92 is the premier opportunity for Italian packaging machinery, component and packaging manufacturers to showcase their products on the North American continent." — Dr. Sergio Laverghetta, Italian Trade Commissioner, Chicago.

"In the seven months since the initial announcement, more than 700,000 square feet of exhibit space has been confirmed," said Bonnie Kilduff, Exposition Manager. "Considering that 800,000 feet is the maximum available to us in the two buildings at McCormick Place, we are confident that PACK EXPO 92 will be a sell-out — setting new records not only in exhibit space, but, in attendance as well. There is no question that PACK EXPO 92 truly will be a global marketplace."

For more information please contact Bonnie Kilduff, Exposition Manager, Packaging Machinery Manufacturers Institute, 1343 L Street, NW, Washington, DC 20005; (202)347-3838.

Seafood Trade Association Announces Communications Program

The National Fisheries Institute (NFI) announced its 1992 trade and consumer communications program at the NFI Annual Convention in New Orleans, LA, October 30-November 2, 1991. Since 60 percent of all seafood is sold through foodservice, the NFI will market seafood to foodservice operators and distributors at the Center-of-the-Plate Foodservice Conference scheduled for December 7-9, 1992 at the New Orleans Hilton. The Conference is co-sponsored by the American Meat Institute and the National Broiler Council. The National Restaurant Association will also participate.

In addition, the association has teamed up with *Restaurant Business* to produce an innovative marketing supplement entitled, *Seafoodservice*. The comprehensive supplement is targeted to distributors and food service operators at medium price range restaurants and is scheduled for distribution in August. It will focus on seafood's profitability.

In an effort to increase per capita consumption from the current 15.5 pounds per person to 20 pounds by the year 2000, NFI's new communications and education program will also continue to target the consumer. According to Lee Weddig, executive vice president of NFI, "the new program includes projects which seek to educate the American consumer about what it takes to bring fish to the dinner table and the importance of protecting our marine environment." "Since many consumers lack confidence in their ability to cook fish at home, the new program also includes projects aimed at teaching consumers about the basics of purchasing, storing and preparing seafood," he continued.

Specific elements of the campaign include:

- Continuation of *Seafood Source*, a quarterly newsletter which provides information on the seafood industry to 5,000 health professionals, consumer advisors, and newspaper/magazine food opinion leaders.
- Monthly news features on the commercial seafood industry which describe how seafood is harvested.
- Quarterly recipe and educational kits for the nation's newspaper/magazine food editors. The association will also support the National Frozen Food Association's "March is National Frozen Food Month" campaign.
- Sponsorship of the Society of Nutrition Education (SNE) Annual Conference and the International Association of Culinary Professionals Annual Meeting.
- Continued sponsorship of SERVSAFE, the National Restaurant Association Educational Foundation's comprehensive foodservice training program.

The Association will pick up the fulfillment of trade requests for information previously handled by the National Fish and Seafood Promotional Council. The Council, a governmental entity responsible for the promotion of seafood products closed its doors on December 31, 1991.

The NFI is a non-profit trade association of 1,000 companies involved in all aspects of the U.S. fish and seafood industry — producers, processors, wholesalers, distributors, brokers, importers, exporters, and members of allied supportive industries. The Institute provides government relations, technical, promotional and public relations services in support of industry objectives and goals.

For more information contact the NFI Communications Department, 1525 Wilson Blvd., Ste. 500, Arlington, VA 22209, or call (703)524-8881.

MIF/IICA Distribution Conference Will Provide Valuable Insight

Throughout the food industry, aggressive management of the distribution function is being employed as a tool to reduce marketing costs, protect product quality, and boost profits. Be sure your company stays on top of the latest information by attending the Dairy Distribution Conference in March.

The 1992 Dairy Distribution Conference, sponsored annually by the Milk Industry Foundation (MIF) and International Ice Cream Association (IICA), headquartered in Washington, DC, will focus on these and many other issues. The conference will take place March 12-14 in San Diego,

California, at the San Diego Princess Hotel, and distribution and transportation executives from more than 100 dairy food companies are expected to attend.

Maximizing Distribution Efficiencies

The workshop will cover a wide range of topics designed to help managers maximize distribution efficiencies. A steering committee of industry distribution managers has identified the key issues for dairy foods distribution executives.

Issues that will be covered at the three-day conference include:

- Cost-saving Techniques and Trends in Food Distribution;
- Distribution Concerns of Retail/Foodservice Customers;
- Worker Motivation and Management Training;
- Substance Abuse Policies and Procedures;
- DOT Record-Keeping and Regulatory Requirements - Recent Revisions;
- Private Fleet Training & Certification;
- Successful Company Safety Programs;
- Environmental Issues;
- Foodservice Distributors; and
- Customer Service.

Expert speakers and panelists will be addressing these topics, including: Keith Klingenbert, Total Logistics Control Group; Dan Smith, Thrifty Corp.; John Crown, Burris Retail Food Systems; Jeff Barber, Ruan Leasing; Ben Joyce, Center for Applied Excellence; Denis Zegar, DRZ Management Associates; Bill Cogswell, Colombo, Inc.; and Guy Hollis, Dean Foods. Also, the commissioner of the California Highway Patrol will present a luncheon address on Thursday, March 12.

Delegates to the conference will also have the option of touring a Kraft foodservice warehouse facility in San Diego or participating in a roundtable discussion on the principles of total quality management.

Register Today

Be sure your company has the tools to put today's state-of-the-art distribution management techniques to work for you. Distribution managers can get the information they need at the 1992 Dairy Distribution Conference. For information about registering, contact Lisa Heying at (202)296-4250 today.

Food Safety Research Center Offers Taste of the Future

At the new National Center for Food Safety and Technology (NCFST) in Bedford Park, IL, food scientists from the Food and Drug Administration are getting a taste of things to come.

Replete with renovated laboratories, some new laboratory equipment and supplies, and lots of work space, 33 FDA scientists and other staff members are studying how up-and-coming food processing and packaging technologies may affect food safety.

Since the establishment of the collaborative research program in late 1990, the scientists have been studying emerging food issues that include recycled plastic food containers, computerization of food processing systems, shelf-life extension of food, and use of biotechnology-derived tools for detecting contaminants in food.

Their ultimate goal: to enhance the safety and quality of food products.

The research at the center is made possible through the center's unique consortium of government, industry and academia devoted to cooperative food safety research on food biotechnology and food processing and packaging technologies.

In addition to FDA, the center is supported by the Illinois Institute of Technology, the IIT Research Institute, the University of Illinois, and 38 food-related companies. FDA's Center for Food Safety and Applied Nutrition oversees the agency's role in NCFST.

According to FDA Commissioner David Kessler, M.D., the center helps FDA carry out two of its food-related missions: to serve as a leader in food safety and to foster innovation.

Getting to Work

Currently, the science is being done by the center's 37 employees, four of whom are employed by IIT. Among the latter is director Lechowich, a food scientists with more than 30 years of academic and industrial experience.

Their work site is CPC International Inc.'s former corporate research and development facility on the Illinois Institute of Technology's Moffett Campus in a southwest suburb of Chicago. CPC donated the $7 million facility in 1988.

It includes more than 40 laboratories, many of which have been been renovated and stocked with new lab equipment and glassware. There also are three pilot plants, two of which will house scaled-down versions of industrial food processing and packaging equipment to be used for research on all stages of food processing and packaging. The third is an industrial-sized plant that will include a biotechnology mini-pilot plant.

Educating Future Researchers

In addition to the research, NCFST is providing a training and educational ground for IIT's master's degree program in food safety and technology—the first graduate program of its kind in the United States. It began in September 1991.

Also in the works are short courses and symposia, and various publications to update food science professionals about emerging food safety issues.

Ultimately, the consortium hopes to make NCFST the world's source of food safety expertise and knowledge. Said Commissioner Kessler during a speech at the center's dedication, "I am hopeful that in 10 or 15 years, the world will know the National Center for Food Safety and Technology for what, today, it has only the potential to be: an internationally recognized and truly collaborative facility that provides the best know-how about food science and technology."

Paula Kurtzweil is editor of FDA Today, *the agency's employee publication. Reprinted from the* FDA Consumer, *December 1991.*

Food and Environmental Hazards to Health

Foodborne Outbreak of Gastroenteritis Caused by *Escherichia coli* O157:H7—North Dakota, 1990

In late July and early August 1990, an outbreak of gastroenteritis occurred among persons who had eaten a meal while attending an agricultural threshing show in North Dakota on July 28-29. At least 70 (3.5%) of the more than 2000 attendees were affected; of these, 16 persons were hospitalized, and two children, aged 2 and 8 years, were diagnosed with hemolytic uremic syndrome. An epidemiologic investigation was conducted by the North Dakota State Department of Health and Consolidated Laboratories.

A case was defined as gastrointestinal illness in a person 2-5 days after eating at the threshing show. Of the 70 case-patients, 65 (93%) had diarrhea; 55 (79%), abdominal cramping; 27 (39%), bloody diarrhea; and 21 (30%), nausea. The mean age of case-patients was 38 years (range: 2-82 years); 36 (51%) were women. Onset of cases occurred from July 30 through August 2, with a peak (22 [31%] cases) on July 31. For those who reported having bloody diarrhea, the mean incubation period from the time the implicated meal was eaten on July 28 to onset of symptoms was 74.6 hours (range: 32.3-132.0 hours).

Stool samples obtained from 20 ill persons were analyzed by the Division of Microbiology of the North Dakota State Department of Health and Consolidated Laboratories. *Escherichia coli*, serotype O157:H7, was isolated from eight of the samples. The positive samples were collected during August 2-4, from 1 to 4 days after onset of symptoms; negative samples were obtained 4-20 days after onset of symptoms. Analysis by CDC confirmed the isolate results and detected both Shiga-like toxins I and II (verocytotoxin 1 and 2).

Analysis of food histories obtained from 157 persons implicated a buffet-style dinner on July 28. Although food samples were not available at the time of the investigation, food history analysis indicated that roast beef served at the dinner was the most likely source of infection: ill persons were more likely to report having eaten rare roast beef (chi-square test for linear trend 5.4, p = 0.02) and/or cool roast beef (chi-square test for linear trend 7.6, p=0.006).

Sixteen inside round roasts had been special-ordered from a local grocer for the dinner; none had been sold to local customers. Fourteen of the roasts were skewered on a noncommercial grade metal spit and rotated in a closed drum above a charcoal fire for approximately 10 hours; the temperature of some of the roasts reportedly registered 140F 60 C). Two other roasts were prepared in enamel-lined electric roasting pans set to cook at 300 F (149 C) according to the temperature dials on the pans; no temperatures were recorded for these roasts.

All roasts were sliced and served from the electric roasting pans. During the serving period (approximately 5-8 p.m.), the pans were not cleaned but were refilled with slices from other roasts.

Editorial Note: Since *E. coli* O157:H7 was first reported as a cause of bloody diarrhea in 1982, infection with this pathogen has emerged as an important cause of both bloody and nonbloody diarrhea in the United States; in some cases, infection with this organism results in hemolytic uremic syndrome and thrombotic thrombocytopenic purpura. Young children and the elderly are at increased risk for these more severe complications.

Transmission of this organism has been documented through food; person-to-person contact; and, rarely, contaminated water. Foodborne outbreaks have been most commonly associated with undercooked ground beef; some sporadic cases have been associated with drinking unpasteurized milk. A reservoir in healthy dairy cattle has been documented.

The outbreak in North Dakota is the second instance in which roast beef has been implicated as the vehicle of transmission. Because thorough cooking kills *E. coli* O157:H7, cooking beef until a meat thermometer reads ≥140F (≥60C) will reduce the risk for this infection. If cooked beef is to be kept hot, the holding temperature should be at least 140 F (60 C). Although the precise source of the outbreak in North Dakota is unknown, inadequate cooking and possible cross-contamination of cooked, sliced roast beef as a result of the food-preparation and serving techniques may have contributed to the outbreak.

In many clinical laboratories, testing for *E. coli* is not routinely done. The yield of cultures is likely to be highest when specimens are obtained within 6 days of onset of illness in patients with grossly bloody diarrhea and abdominal cramps. A request for culture should specify sorbitol MacConkey agar; *E. coli* O157:H7 ferments sorbitol slowly and appears sorbitol-negative at 24 hours. Suspected sorbitol-negative colonies can be confirmed using commercial antiserum. Most state and territorial public health laboratories are able to confirm isolates.

The North Dakota State Department of Health and Consolidated Laboratories has made laboratory isolation of *E. coli* reportable and is conducting surveillance for this pathogen.

MMWR 4/26/91

Sanitary Design

A Mind Set (Part VII)

Donald J. Graham
Senior Food Technologist
Sverdrup Corp.
St. Louis, MO

More rats, mice and insects sneak into a processing facility through poorly designed doorways, including truck dock doors, than through any other opening to the food plant. Hollow doors and frames become homes for cockroaches, ants and spiders. It does not take very long for insects to find their way into one of these units through latch and doorknob penetrations. Already installed hollow door frames can be filled with mortar or cement. For newly constructed facilities, the specified frames should either be solid or filled with mortar or cement immediately upon installation. Penetrations for latch plates, knobs, kickpanels and any other attachments should be fitted and then caulked without delay.

Door and window frames should be installed flush with the walls to avoid creating flat ledges. While the flat ledges on incorrectly installed frames are small, they become dust collection areas and sources of airborne contaminants. Installing the frames flush, and caulking the cracks between the frame and the wall eliminates areas that otherwise must undergo periodic cleaning, insect control and sanitization.

Doors must be tight fitting with clearances less than 1/4 inch (6.4mm) to prevent mice from squeezing through and into the plant. Dock doors in the receiving and shipping warehouses are often difficult to seal adequately on closing, especially if they have to close onto rail tracks. An effective seal is obtained by creating a split track gap directly in the fall line of the overhead door. When the door is closed, it fits into the rail gap providing a rodent-proof seal along the bottom. The roll-up feature is not recommended since the roll-up housing serves as a collection point for dirt, can house insects and requires dismantling for proper cleaning. If there is room, track doors should be installed.

Reducing the clearance between the vertical leg of the door track and the door is usually necessary to reduce the 1/4 inch or greater gaps that occur along the sides of the doors.

Retrofitting existing overhead doors to make them rodent-proof can range from complete replacement to adding rubber crossover pads and weather stripping. The exact solution is highly dependent upon the type, age and condition of the overhead doors. Existing doors can and have been made rodent-proof through engineering creativity and a sanitation mindset.

Dock levelers are another access point for pests. The leveler pit is near enough to the ground so it is readily reached by most rodents. These levelers provide mice and rats entrance into the warehouse and subsequently, the rest of the facility. To prevent access from the dock leveler pit, some companies are using brush seals instead of rubber seals in the pit. They claim that rodents do not like the brushes and refuse to pass through them. I have not found any documentation of this claim but will be tracking a new installation where brush seals are used.

There are several dock seals and shelters available that will prevent the entry of wind, snow, ice or rain and insects when the trailer is securely positioned against them. Truck door openings are a prime area for pest entrance and are often forgotten in the sanitary design plan.

Interior doors in food processing areas are often exposed to high moisture, food acids and other corrosive elements. Both the USDA and FDA look with favor upon solid fiberglass-reinforced-plastic (FRP) doors in food processing areas. These doors can be obtained with the color molded in and will not peel or corrode. They have eliminated microbe-hiding cracks and crevices by having the mortises for the locks and strikes molded in at the factory and door mated to the opening. Air curtains over outside doors were discussed in a previous article, but it bears repeating here, that all personnel doors, product doors and any other access door should be equipped with a correctly designed air curtain. In addition, personnel doors require automatic closing mechanisms for pest control purposes.

Plumbing

Both USDA-FSIS and FDA-GMPs address plumbing in food processing plants. Part 110.37 (b) of 21 Code of Federal Regulations (21 CFR) states "Plumbing shall be of adequate size and design and adequately installed and maintained to:

1. Carry sufficient quantities of water to required locations throughout the plant.
2. Properly convey sewage and liquid disposable waste from the plant.
3. Avoid constituting a source of contamination to food, water supplies, equipment, or utensils or creating an unsanitary condition.
4. Provide adequate floor drainage in all areas where floors are subject to flooding-type cleaning or where normal operations release or discharge water or other liquid waste on the floor.
5. Provide that there is not back-flow from or cross-connection between piping systems that discharge waste water or sewage and piping systems to carry water for food or food manufacturing."

Even though FDA regulations do not spell out the details of the design, nor does the design require approval by FDA before installing, it must conform to the definition of "adequate" set out in the Food and Drug Act. In essence it defines adequate as doing whatever is necessary to prevent the food product from being processed, manufactured or held under conditions whereby it *MAY* become contaminated. It is up to the processor to make sure the plant's plumbing, as is true with all other sections of Part 110, meets the mandatory "shall" used in the regulations.

Part 110.37 continues on to set out practices for sewage disposal, toilet facilities, hand washing facilities, and rubbish and offal disposal as well as the water supply. These GMPs must be reviewed when new construction is undertaken or an existing facility renovated.

USDAs Agricultural Handbook 570 "U.S. INSPECTED MEAT AND POULTRY PACKING PLANTS - A Guide to Construction and Layout" is more definitive in its requirements for plumbing in the plants under its jurisdiction. The handbook states that the plumbing plan of the floor drainage system and the toilet soil lines must show that the two systems are separate to a point outside the building and must be complete for the official premises. Toilet soil lines may not discharge into grease catch basins.

Water supplies must be distributed throughout the plant under adequate pressure and in quantities sufficient for all operating needs. The handbook goes on to define potable water supply, nonpotable water supply, vacuum breakers, plant waste disposal, and plant drainage. Specific conditions are spelled out in these regulations.

USDA regulations require that plumbing plans and designs, as well as all other plans and designs concerning the inspected establishment, must be reviewed and approved by USDA prior to being implemented. Time must be included in the project planning stage to provide for the extra time needed for USDA approval and to incorporate any changes and resubmittals they require.

The recent cost saving trend of installing plastic or PVC piping for process water or product should be reviewed carefully before incorporating into the plumbing design. A recent study by the Centers for Disease Control-Atlanta, published in the January 1990 issue of the American Public Health Journal reported that some infectious microbes can establish thriving colonies in the plastic pipes commonly used to carry water, thwarting all attempts to flush them out. The microbes in question belong to the genus *Pseudomonas* and commonly live in soil and water. Although these bacteria rarely cause disease in healthy people, some can cause serious and even fatal infections in people with compromised immune systems, open wounds or medical implants.

Plastic pipes were filled with water contaminated with two strains of *Pseudomonas*. After allowing the bacteria to incubate for eight weeks, the scientists emptied the infected water and doused the pipes with germ-killing chemicals, including chlorine and an iodine disinfectant, for seven days. They then refilled the pipes with sterile water and periodically samples the "clean" water. Both strains of the bacteria survived in the chemically treated pipes and re-established colonies there. The data shows the best way to prevent these bacteria from establishing colonies in plastic pipe is to sanitize the pipes with 180 degree water. The only problem with that remedy is regular PVC will not withstand temperatures above about 140 degrees F.

Research is continuing to find new types of plastic that prevent bacteria and their slime from adhering to the surface. Such an advance would reduce the threat of contamination in pipes used to carry water in food processing facilities, hospitals, homes and whirlpool facilities. Until these new plastics are found, the recommendations are to use galvanized pipe for potable water distribution and stainless steel for process water and liquid product distribution within the processing plant.

The plumbing system design must eliminate any possibility of cross contamination of the plant's potable water supply with sewage wastes of any kind or with the food products being processed or stored.

Pipelines will someday leak, therefore overhead sewage lines must be located so they do not pass over process areas, stored packaging, ingredients or finished product or over product in progress.

Not only do federal regulations have to be met when plumbing a food or beverage processing facility, but there must be strict compliance with local, state and national plumbing codes. There are far too many incidents involving food products being contaminated by poorly designed plumbing systems.

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

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The History of the HACCP Concept

HACCP is not a new concept. One of the first applications of HACCP occurred with the Jewish exclusion of pork due to Trichina. The pig, a carnivorous animal, eats rats, which are infected with many diseases, and which could cause foodborne illness in people if the pork were not cooked well done. The rabbi was the "sanitarian" in the early days. The hazard control entailed forbidding the Jewish population to eat pork.

HACCP Application as a Concept

The following examples illustrate the application of HACCP to various foods.

Food	Hazard	CCP
Jewish exclusion of pork (BC)	Trichina	Forbidden
Yogurt fermentation (BC)	Various pathogens	Acid fermentation
Korean kimchee (BC)	Various pathogens	Acid fermentation
Wine in lead pots (BC)	Acid	No heavy metal container
Cheese (BC)	Various pathogens	Acid fermentation
Slaughtering live animals immediately before eating (BC)	Various pathogens	Heat > 165°F
Hollandaise and Bernaise sauces (1850's)	*Salmonella* spp.	Acid (≤4.1 pH) + heat
Canned food (1920's)	*C. botulinum* A, B	250°F, 3 min.
Pasteurized milk (1930's)	Various pathogens	145°F, 30 min., store <45°F
Pasteurized crab (1950's)	*C. botulinum* E	185°F, 3 min., store <35°F
Mayonnaise and salad dressing (1970's)	*Salmonella* spp.	Acid (≤4.1 pH)
Raw vegetables in anerobic plastic bags at 70°F (1970's)	*C. botulinum* A, B	Air (2 each 1/8" holes)

Goat's milk was made safe through acid fermentation, by which various pathogens in the goat's milk were destroyed by lactic acid bacteria growth. Kimchee (i.e., fermented cabbage, a food of Korea), and cheese achieved safety through acid fermentation as well.

During the time of the Roman Empire, wine was kept in lead pots. The wine acid leached the lead from the pots, which resulted in lead poisoning. The control for this problem is storing the wine in containers that are made of non-toxic materials.

Animals have always been contaminated with illness. However, the general rule stemming from ancient times has been to cook the meat well done in order to make it safe.

Eggs have always been potentially hazardous. Even whole, uncracked, unchecked eggs have many pathogens on the shell. The French learned to make safe Hollandaise and Bernaise sauces from eggs by adding acid to get the pH below 4.1, and by preparing the sauces with heat as one of the recipe steps.

Canning

There were many cases of *Clostridium botulinum* illness from canned foods until the 1920s, with Estes, Meyer, and Ball developed the mathematical process which stated that in order to control *Clostridium botulinum* types A and B, food needed to be heated to the equivalent of 250°F for 3 minutes. (Ball, 1923) (Ball, 1928). Note that there was still a minor problem with canning until the early 1970s, when HACCP and mandatory education were enforced in the canning industry.

Pasteurized Milk

Pasteurized milk was first produced at a milk plant in New York City in the early 1900s. The standards developed in that pasteurization plant are still used today. Note that because some people incorrectly believe that raw milk is better for one's health than pasteurized milk, raw milk can be purchased directly from farms in many states. The result is a small but constant number of people made ill from raw milk.

Pasteurized Crab

The pasteurized crab industry began over thirty years ago. After the crab is cooked and picked from the shell, it is canned and heated to 185°F for 30 minutes. Because the spores are not destroyed, the crab is stored at less than 30°F in order to keep it safe for consumption. Some crab has been stored for years in a refrigerator and has been shown to be totally safe, although its quality had deteriorated.

Salad Dressing

In the 1970s, research was completed which declared that mayonnaise and salad dressings, if they had a pH of less than 4.1, would be safe from both *Salmonella* spp. and *Clostridium botulinum*. Today, commercial dressings are acidified to less than 4.1 pH for safety.

Vaccuum-Packed Vegetables

During the same time, it was discovered that *Clostridium botulinum* types A and B from the soil could outgrow in anaerobically packaged raw vegetables to produce toxin. This problem was eliminated by making sure that two 1/8-inch holes were present in the plastic overwrap on raw vegetable packages.

HACCP Principles for Food Production

The modern concept of HACCP was developed during the Apollo and other space missions by the U.S. Army Natick Laboratories and NASA in order to prevent the astronauts from getting ill from the food they consumed in space. Pillsbury, which was the manufacturer of the food, applied HACCP to its food operations. Pillsbury then presented HACCP principles to the FDA in 1972, and the FDA applied it to low-acid canned foods. Today, anyone who wishes to operate a retort for a low-acid canned food process must attend and receive certification from the Better Processing Control schools, which are held two or three times a year throughout the U.S. by departments of food science and nutrition in conjunction with the FDA. This mandatory education/certification has virtually eliminated any incidents of *Clostridium botulinum* in canned foods. In 1985, the National Research Council noted the many flaws in FDA and USDA food safety regulations and stated that HACCP should be used as the basis for process control and food safety in the United States.

USDA HACCP

The USDA in 1988 stated that there were seven principles of HACCP which should be applied to food systems. A major problem with the USDA's set of principles is that management is not included. In addition, many other control variables are left out. The following are the USDA principles:

1. Assess hazards associates with growing, harvesting, raw materials and ingredients, processing manufacturing, distribution, marketing, preparation and consumption of the food
2. Determine CCP required to control the identified hazards
3. Establish the critical limits which must be met at each identified CCP
4. Establish procedures to monitor CCP
5. Establish corrective action to be taken when there is a deviation identified by monitoring of a CCP
6. Establish effective record-keeping systems that document the HACCP plan
7. Establish procedures for verification that the HACCP system is working correctly.

Most food processing companies have quality assurance departments. However, all too often these departments are considered to be "watch dogs" to catch operations making mistakes.

Zero Defects Requires 100 Percent Process Control

To achieve zero defects, a process must be "in control" 100 percent of the time. This means that **line workers must be responsible for zero-defect process control.** The quality assurance department and all levels of management function to make it possible for employees to perform with zero defects. **HACCP must begin with the president of the company.** If that person does not show leadership and set the example in terms of hazard control and enabling employees to work with zero defects, the company does not have an effective program. If there is every any question of shipping a product when the process was not in control, then everyone must agree that the product must not be shipped, because the company's commitment to customers is zero defects.

HITM's HACCP Principles

The following is a list of HITM's HACCP principles. They begin with the description of the system and identification of the person responsible for the program. These principles generally follow those of the USDA, but are enriched to include items which must be a part of the control process in order to make it possible for the line employee to work with zero defects.

1. Describe the food system. Specify the person responsible for the program. The president of the company must be the leader of the HACCP program.
2. Describe the food and its intended use/product description/ specifications. Prepare specifications that ensure safety when the food is consumed. Identify all regulations that must be met.
3. Ensure adequate environment, facilities, and equipment.
4. Make a list of raw materials and all supplies to be used. When possible, use suppliers who have HACCP programs.
5. Do a flow diagram from growing/harvesting to consumption for the materials.
6. Do a hazard assessment at each step in the flow diagram, to include calibration of equipment.
7. Establish the critical limits for each hazard variable.
   - Management
   - Customers
   - Environment
   - Facility
   - Equipment
   - Employees
   - Materials and supplies
   - Food production methods: handling from source to consumption.
8. Establish monitoring requirements: temperature, sanitation, barriers, package integrity, shelf life, finished product specifications, distribution (microbiological, chemical, hard foreign object hazards).
9. Establish corrective action to be taken when there is a deviation at a CCP.
10. Establish an effective record-keeping system that documents the performance of the HACCP program, to be used for quality control (QC), quality assurance (QA) and quality improvement (QI).
11. Establish a verification program to ensure that the HACCP program is working.

HACCP, as normally applied by the government, stops when a particular point has been identified as the point at which contamination or multiplication could occur. This is insufficient. A threat or hazard is not controlled until a control procedure, shown by research to be effective, is defined; all employees have been taught and are certified to correctly use the procedure; and the leader makes sure that employees apply this knowledge correctly as they prepare/handle food.

Hand Washing HACCP

A classical example of the lack of control is demonstrated in hand washing. The government can identify feces on hands as a hazard. It can identify the hand sink as a critical control point. However, no one in the government has a research-supported method for reducing the probable fecal contamination at approximately 10^7 microorganisms on the fingertips to a safe level. The government can only provide personal opinion. Since the government currently cannot provide technically correct control information, the high number of foodborne illnesses is to be expected.

Sick Employees

Another example is that the government states that when employees are sick, they should stay home. This is unreliable advice. Employees will not stay home because they need the income or they feel that their presence is essential at work.

In addition, in the case of many illnesses, a person sheds illness-causing microorganisms before he or she shows any symptoms of illness. What must be added to the government's HACCP principles is that the operator must specify **Controlled Operating Policies, Procedures, and Standards** (COPPS) that will ensure zero defects in terms of foodborne illness 100 percent of the time.

The System for HACCP-Based Food Safety Assurance

In order to initiate a hazard control program, one must **define the system** used for purchasing, processing, and serving food. The diagram, **The System for HACCP-Based Food Safety Assurance**, is a flow diagram of the system.

Output

First, the output must be defined; **who will consume the food**, and what **type of abuse** the food will receive. For instance, manufacturers who sell food in supermarkets may find that their refrigerated products are displayed at 50°F, a moderately dangerous temperature. They may find that supermarket employees ignore sell-by dates, and that customers open packages to taste items and replace the packages on the shelves. All of these possibilities for abuse must be built into their hazard control programs.

In the foodservice environment, one must be aware of what customers might do to the leftover food that they take home from the restaurant, or to carry-out food.

It is not uncommon for customers to let their take-home food sit out on the counter before they actually eat it. This allows for much pathogen multiplication in the food. In health care facilities, food is sometimes allowed to sit for one to two hours before it is actually consumed because a patient has not returned from treatment.

INPUT	RETAIL PROCESS: FOODSERVICE, MARKETS, VENDING, HOME	SAFETY-ASSURED OUTPUT
Environmental contamination Soil, water, air Vegetation, plants, grains Wild animals, birds, fish, insects, pests Supplier contamination Pesticides, insecticides Mold growth in grains Filth contamination of food Microorganisms, toxins, poisons, hard foreign objects Poor nutritional food profiles due to feed supplies, condition of soil where food is grown Hazardous feed additives Container contamination of food Time, temperature abuse Inadequate facilities, equipment, and management Distribution contamination Increase in pathogens, toxins, and poisons through mishandling Nutrient loss in shipping Food spoilage Time, temperature abuse Inadequate facilities, equipment, and management Wholesale processor contamination Fecal contamination during slaughter Pathogenic environmental organism contamination Spoilage waste Hard foreign objects Unsafe chemcial addition Food mislabeling Underprocessing Overprocessing waste and nutrient loss Packaging; container poisons Time, temperature abuse Inadequate facilities, equipment, and management	Facilities that control environmental hazards Equipment that controls hazards or warns when it is not functioning correctly; construction from safe materials Refrigeration that keeps food at less than 32°F and cools to less than 40°F in less than 4 hours Ovens that cook food from 40°F to greater than 130°F in less than 6 hours Hot holding devices that keep food at greater than 130°F Safe air Safe water Hand washing control of transient organisms Thawing Recipe food time and temperature control Proper food temperature measurement Food contact surface cleaning and sanitizing Hard foreign objects control Unsafe chemicals control; additives Control of carcinogens in cooking, as in broiling and grilling Nutrient loss minimization Equipment maintenance Personal hygiene Food thermal pasteurization Food acid pasteurization	Striving towards zero defects Safe levels of hazards for consumer, based on immune threshold Nutrition profile and contamination control (i.e., food components) for a long physically excellent quality of life Proper balance between pleasurable and safe food Consumer abuse control Environmental control, smoking, air conditioning systems

Input

Once the output problems have been properly determined, then **food ingredients**, or input, must be considered. The cleanest available ingredients must be purchased, to be put into food products. If poor-quality (high spoilage microbial count) fresh or dried vegetables are purchased, it will take more thermal input (cooking) to reduce these organisms so that they will not spoil the food rapidly during storage.

Food Freshness

The objective in foodservice is to please customers with fresh food. Freshness means that cooked food is subjected to only a minimum amount of cooking. To be optimally digestible, most meat, poultry, and fish must be cooked to about 140°F, and vegetables to about 180°F. Above this temperature, protein shrinks, nutrients are rapidly lost, and the product loses quality. **A HACCP objective is to specify minimum process values to ensure safety. Quality is the responsibility of the owner, cook, and the "customers."**

Supplier Certification

It is important to remember that the environment is contaminated and always will be. Poor suppliers and distributors will further contaminate the product. The wholesale system in general provides many opportunities for hazards to develop in food products. Another key to hazard control and customer satisfaction is supplier HACCP TQM process certification. Hazards and quality will be controlled when suppliers have hazard control TQM programs, and can demonstrate to their customers that they are effective. Note that all proposed government HACCP program today are voluntary. Hence, it is up to the buyers to mandate supplier hazard control programs.

Process

The process, then, **converts the food and beverages**, contaminated in the supply system at some level, **into safe food and beverages** for normally healthy people and/or immunecompromised people to eat. The following are the process variables that must be reviewed at each step-location in the process, from growing to consumption, to ensure that each step is within the control limits demonstrated to produce safe, quality products:

1. Management
2. Customer
3. Environment
4. Facilities
5. Equipment
6. Personnel
7. Supplies and materials
8. Work methods at each step.

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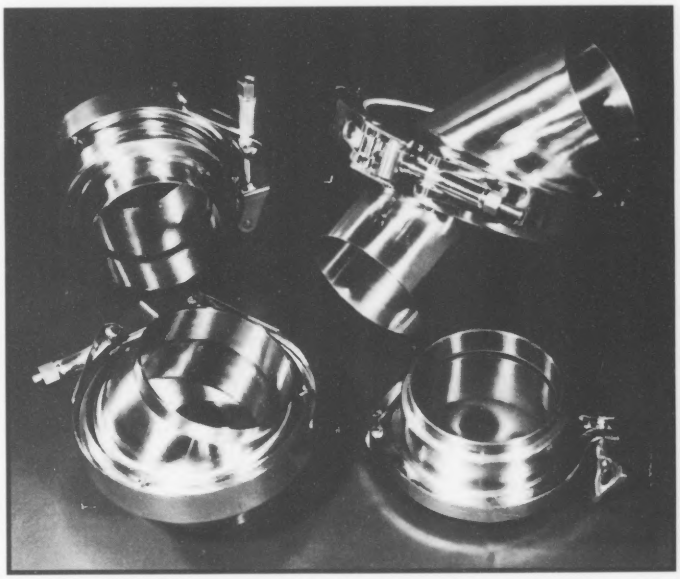

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Federal Register

Food Safety and Inspection Service

Net Weight Labeling of Meat and Poultry Products

Agency: Food Safety and Inspection Service, USDA.

Action: Final rule; delay of effective date.

Summary: On November 30, 1990, the Food Safety and Inspection Service (FSIS) published a final rule, effective January 2, 1992, that amended the Federal meat and poultry products inspection regulations to provide uniform net weight labeling requirements for meat and poultry products. The Agency has determined that the provisions in the rule which require scales to be tested and inspected prior to use in accordance with National Institute of Science and Technology (NIST) Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices," will not become effective until March 2, 1992. Additionally, the provisions requiring scales to be installed, maintained and operated to ensure accurate weights in accordance with applicable requirements contained in Handbook 44, and requiring such scales to be tested for accuracy, in accordance with NIST Handbook 44, once a year thereafter, will not become effective until March 2, 1992. All other provisions of the final rule will become effective January 2, 1992.

Effective Date: Sections 317.20(a) and (c), 317.21, 381.121c (a) and (c), and 381.121d will not be effective until March 2, 1992.

For further information contact: Mr. William C. Smith, Director, Processed Products Inspection Division, Science and Technology, Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, DC 20250. (202)720-3840.

Supplementary Information: FSIS's net weight labeling of meat and poultry products final rule (FR 49826) is effective January 2, 1992. The rule establishes objective, numerical variations from labeled net weight which are to be determined by prescribed procedures adopted by way of incorporation by reference of the Third Edition of the National Bureau of Standards (NBS) Handbook 133. This will permit Federal, State, and local agencies to enhance the industry-wide use of strict net weight standards at the packing, warehouse and retail level, and will establish greater uniformity with regulations of net weight compliance used by the Food and Drug Administration for other types of foods.

Sections 317.20(c) and 381.121c(c) of the meat and poultry products inspection regulations prohibit the use of any scale at federally inspected establishments unless the scale has been found upon test and inspection, as specified in NIST Handbook 44, to provide accurate weight. Additionally, before a scale may be used to weigh meat and poultry products, §§ 317.20(a) and 381.121c(a) require that scales be installed, maintained and operated to ensure accurate weights, and that such scales meet the applicable requirements contained in NIST Handbook 44.

Sections 317.21 and 381.121d require that official establishments have the scales tested and certified for accuracy, in accordance with NIST Handbook 44, once a year, by a State or local government weights and measures authority, or by a State registered or licensed scale repair firm or person, or have an FSIS approved net weight program under a quality control program.

FSIS has determined that more time is needed to coordinate the actions that must be undertaken by State or local government authorities, official establishments, and FSIS to assure compliance with §§317.20 (a) and (c), 317.21 or 381.121c(a) and (c), and 317.21 or 381.121d. Consequently, the Agency has decided to delay the effective date for the above listed provisions from January 2, 1992, to March 2, 1992. Therefore, §§ 317.20 (a) and (c), 317.21, 381.121c (a) and (c), and 381.121d of the meat and poultry products inspection regulations will not be effective until March 2, 1992. All other provisions of the final rule will be effective January 2, 1992.

Done at Washington, DC, on December 26, 1991.

Marvin A. Norcross, *Acting Administrator, Food Safety & Inspection Service.*

Federal Register/Vol. 56, No. 251/Tuesday, December 31, 1991/Rules and Regulations.

IAMFES Secretary Candidates

Ann Draughon

Dr. Ann Draughon is a Professor of Food Microbiology for the Department of Food Technology & Science at the University of Tennessee in Knoxville. She directs 8 graduate students, several undergraduates and a technician in research concerning *Salmonella*, *Listeria* and Aflatoxins in food and dairy products. Ann teaches courses in Food Microbiology, Advanced Food Micro and Food Toxicology at the University of Tennessee. She has been active in the area of Food Safety for almost 20 years. Ann received her B.S. in Microbiology from the University of Tennessee in 1973 and worked as a clinical microbiologist until beginning her Master's degree. She received her M.S. in Food Tech. & Science from UT in 1976. Ann received her Ph.D. from the University of Georgia in Athens in Food Science/Food Microbiology in 1979.

Ann has been active in IAMFES for many years. She has served on the Editorial Review Board of the *Journal of Food Protection*. She is currently chair of the Applied Lab Methods committee. She has chaired the Developing Scientist Awards committee twice and currently serves on the IAMFES Program Advisory Committee. Ann will chair the IAMFES Program Advisory Committee in 1992-93. She is also the vice-chair of the Tennessee affiliate of IAMFES.

Ann has been involved in many other professional organizations serving as chair of the Food Science Division of the Southern Association of Agricultural Scientists (SAAS) in 1989. She currently serves on the Executive Board of SAAS. She has served on numerous committees for the Institute of Food Technologists and has chaired the Vice-President's Agricultural Advisory Board twice at the University of Tennessee.

Ann has presented numerous papers at IAMFES meetings and is the author of over 50 research articles. She is a frequently requested speaker and has presented over 125 technical and invited papers. Ann has been elected or selected to participate in numerous national and regional committees in the food safety area. She is currently involved in a regional effort to increase interaction of research and extension in food safety and to begin education at the K through 12 level on food safety.

Ann is 40 years old and is a widow with two sons. They live in Knoxville, Tennessee.

Susan S. Sumner

Susan S. Sumner is an Assistant Professor/Extension Food Microbiologist at the University of Nebraska-Lincoln. She is an active researcher in the area of foodborne bacterial pathogens and works closely with the food industry on issues related to the microbiological safety of foods. Her current projects include investigations to prevent and eliminate *Salmonella* on poultry and *Escherichia coli* O157:H7 on meat. Prior to her academic appointment, she was a Project Microbiologist II and Assistant Manager in the Eastern Microbiology Laboratory at the National Food Processors Association in Washington, DC.

Susan received her B.S. degree in Food Science from North Carolina State University and her M.S. and Ph.D. in Food Science/Food Safety & Toxicology from the University of Wisconsin-Madison at the Food Research Institute.

Her professional memberships and honors include: Institute of Food Technologists, Regional Communicator for IFT, Food Microbiology Division IFT, Extension Division IFT, Washington DC Section IFT (member-at-large), Ak-Sar-Ben Section IFT (member-at-large, executive committee, alternate councilor, board of directors), International Association of Milk, Food and Environmental Sanitarians (member of the *Journal of Food Protection* Editorial Board), Nebraska Association of Milk and Food Sanitarians (executive committee, served as secretary, vice-president and president), American Society for Microbiology (membership chairman of Washington DC section), Sigma Xi (Scientific Honor Society), Phi Tau Sigma (Food Science Honor Society), Phi Kappa Phi (Scientific Honor Society), General Foods Graduate Fellowship 1984-87.

Susan is the author or co-author of 27 research publications including: 12 refereed journal articles, 5 book chapters, 5 other technical and scientific articles and reports, and 5 abstracts. She have given presentations at local and national scientific meetings.

Susan is married and has one son.

Affiliate News

Lydia Strayer, President of the Mississippi Association of Sanitarians, Inc.

Mississippi Association of Sanitarians Meet

The Mississippi Association of Sanitarians, Inc. met in Tupelo, MS on September 11-12, 1991. This meeting was held in conjunction with the Mississippi Public Health Association.

Lydia Strayer, Director of the Division of Sanitation, MS State Department of Health and long time (1982) member of IAMFES and supporter of the aims of both the International and the Mississippi Affiliate, was elected to the office of President of the Mississippi Public Health Association.

Congratulations from all of us, Lydia!

Upcoming IAMFES Affiliate Meetings

1992

MARCH

•**10-12, Idaho Environmental Health Association's Annual Educational Conference** will be held in Boise, ID. For more information contact Shireene Hale, 2195 Ironwood Court, Coeur d'Alene, ID 83814; (208)667-3481.

•**18-20, Michigan Environmental Health Association's Annual Educational Conference "Racing Into The Future"** will be held at the Holiday Inn Executive Conference Centre, Flint (Grand Blanc), MI. For more information contact John Kowalczyk, 401 Manor Drive, Ann Arbor, MI 48105; (313)761-1294.

APRIL

•**1, Ohio Association of Milk, Food & Environmental Sanitarians Annual Meeting** will be held at the Monte Carlo Restaurant, Columbus, OH, located at I-270 and Cleveland Avenue. Registration 8:30 a.m. Featured speaker will be Doug Young, OH Department of Health. For more information contact Don Barrett, Health Department, 181 S. Washington Boulevard, Columbus, OH 43215; (614)645-6195.

•**7-10, Missouri Milk, Food and Environmental Health Association's Annual Educational Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Richard Janulewicz, Clay County Health Department, 1940 W 152 Highway, Liberty, MO 64068; (816)781-1600.

Georgia Association of Food and Environmental Sanitarians to Host 80th IAMFES Annual Meeting

Atlanta Site of National Meeting. Especially exciting for our organization is the selection of GAFES as the host organization for the 1993 IAMFES annual meeting. The meeting will be held in Atlanta during the month of August. Having this meeting locally will provide our membership with an exceptional opportunity for advanced education and professional development. The IAMFES meeting brings together the world's top food microbiologists and sanitarians for symposia and research reports. The various symposia of invited papers will be of special interest to affiliate members, as these offer discussions of important issues in food sanitation by the leading experts in the field.

In addition to your attending the IAMFES meeting in 1993, we hope that you will volunteer to help GAFES serve as a gracious host. We will be organizing several committees over the next year. We will need help for organizing spouse activities, obtaining industry support and contributions, registration activities, and special events. Helping your affiliate to host the annual meeting will provide you with professional visibility and personal satisfaction. The GAFES Executive Committee has selected Bob Brackett and Joe Frank to be co-chairmen of the organizing committee. Already, Bob Brackett has worked with Steve Halstead on hotel selection. It you want to get involved, please contact either Bob or Joe.

Dr. Mike Doyle Moves to Georgia. One of the top food microbiologists in the country, Dr. Mike Doyle, has been appointed Head of the Department of Food Science and Technology, University of Georgia, Griffin. Dr. Doyle was previously with the Food Research Institute, University of Wisconsin-Madison. I wish to welcome Dr. Doyle to Georgia on behalf of GAFES. We all can look forward to his participation in GAFES activities in future years. Dr. Doyle is currently President-Elect of IAMFES and will serve as President in 1993.

Reprinted from The GAFES Report, Vol. 5, No. 1, January, 1991.

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Call **(800) 932-7707** for more information.

Manufactured by:
MERITECH, INC.
Englewood, Colorado

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Procedures to Implement the Hazard Analysis Critical Control Point System (72 pp.)

This manual was developed for use by food safety/regulatory officials and food industry personnel charged with assuring food safety. The HACCP system is designed to ensure food safety by reducing the likelihood of foodborne illness. It accomplishes this goal by identifying the hazards and assessing the risks of contamination associated with food products as they pass through the phases from production to consumption.

The manual provides step-by-step instructions to develop, implement and refine the HACCP system in the food processing and foodservice sectors. These procedures include:

- Assignment of Responsibilities
- Evaluation of Operations for Hazards and Risks
- Measurement of pH Level of Foods
- Collection of Samples
- Analyses of Measurements
- Determination of Critical Control Points
- Monitoring and Recording of Data at Critical Control Points
- Selection and Training of Staff
- Measurement of Time-Temperature Exposures
- Testing of Samples for Pathogens
- Measurement of Water Activity (a_w)
- Flow Diagrams of Food Production Process
- Establishment of Control Criteria
- Verification of HACCP System's Effectiveness

The Procedures to Implement the Hazard Analysis Critical Control Point System manual is available exclusively from the International Association of Milk, Food and Environmental Sanitarians. To order, Contact IAMFES at 800-369-6337 (U.S.) or 800-284-6336 (Canada).

PRICING: **$5.00/COPY TO IAMFES MEMBERS** **$7.50 /COPY TO NON-MEMBERS**
(SHIPPING CHARGES: $1.50 FOR FIRST COPY ORDERED, $0.75 FOR EACH ADDITIONAL COPY)

Twenty-Two Common Design Errors That Produce Unsanitary Conditions In A Food Plant

...and how to fix them

1 The flat ledges on the open truss ceiling in **Plant A** are a perfect place for dust to collect. Only the slightest vibration is needed to send dust into the product below. The one piece, double-T poured concrete ceiling in **Plant B** eliminates nooks and crannies where debris could collect.

2 Unscreened windows with flat ledges like the ones in **Plant A** are ideal places where soda cans, dirt, and other debris can collect. To minimize this source of contamination, ledges should slant at a 60 degree angle. Better yet, windows should be altogether eliminated from processing facilities, as they are in **Plant B**.

3 Pipe racks made of dust-collecting flat angle iron run over the process area in **Plant A**. Preferred are the stainless steel supports or vertical pipes with sanitary pipe supports in **Plant B**.

4 The concrete floor in **Plant A** is susceptible to cracks, another nesting spot for dangerous microbes. **Plant B** uses impervious tile floor that is easier to clean and maintain.

5 The restroom in **Plant A** opens directly into the processing area, providing another source of potential contamination. In **Plant B**, the restroom is located away from the processing area in another part of the building.

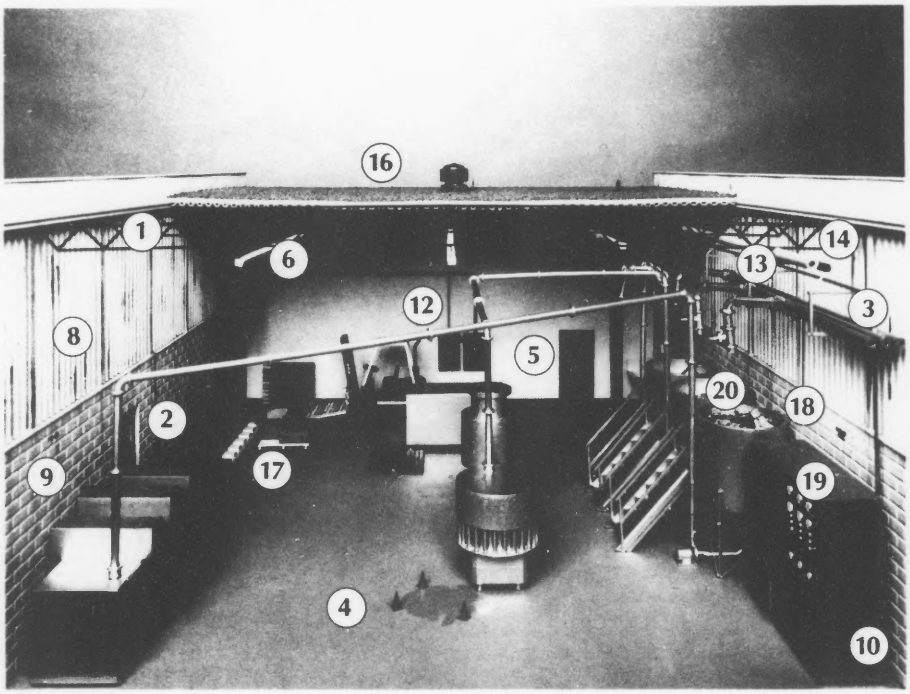
6 The problem with fluorescent fixtures is that they break. In **Plant A**, a shattered fixture would send glass flying into the product below. Preferred is the covered and recessed fixture in **Plant B**.

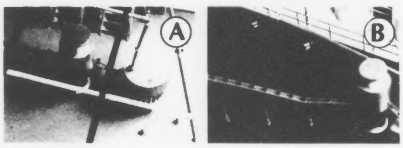
8 The ridges in the corrugated metal wall resting on top of the concrete block wall in **Plant A** make convenient runways for rodents and other creatures. What's more, debris can easily collect on the top of the difficult-to-clean concrete wall. **Plant B** eliminates these problems with its tile wall.

9 When laying brick or concrete blocks, a soldiered bond is preferred over the running bond used in **Plant A**. The soldiered bond gives moisture a straight path down the wall, rather than a place to collect.

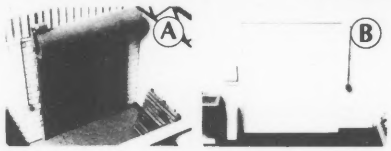
10 Dirt is bound to collect in the sharp 90 degree angle where the floor meets the wall in **Plant A**. **Plant B** incorporates coved flooring to facilitate easy cleaning and eliminate seams and cracks.

A





7 The puddle of water in **Plant A** is the result of an unlevel floor and poor drain placement—and could be home to billions of dangerous microbes. In **Plant B**, the tile floor slopes down to the stainless steel drain at 1/4-inch per foot.



11 **Plant A's** dock door will not close completely, providing easy access for rodents, insects, and other creatures that prefer the confines of a processing facility. What's more, the dock door leads from the outside right into the processing area—the space most susceptible to contamination. In **Plant B**, a well-maintained door opens from the processing into the warehousing area of the building.

Sverdrup

Since its founding in 1928, Sverdrup has become one of the world's largest and most diversified professional services firms. We provide services internationally to industrial, commercial, institutional and government clients in six markets: Industrial, Architecture, Advanced Technology, Environmental, Public Works and Transportation. We employ over 5,000 people, including engineers, architects, programmers, planners, economists, scientists, program managers and construction managers at over 25 offices nationwide.

12 The electrical boxes and conduit are too close to the wall in **Plant A** to be easily cleaned. **Plant B** locates these items at least one inch away from the wall to allow access for cleaning.

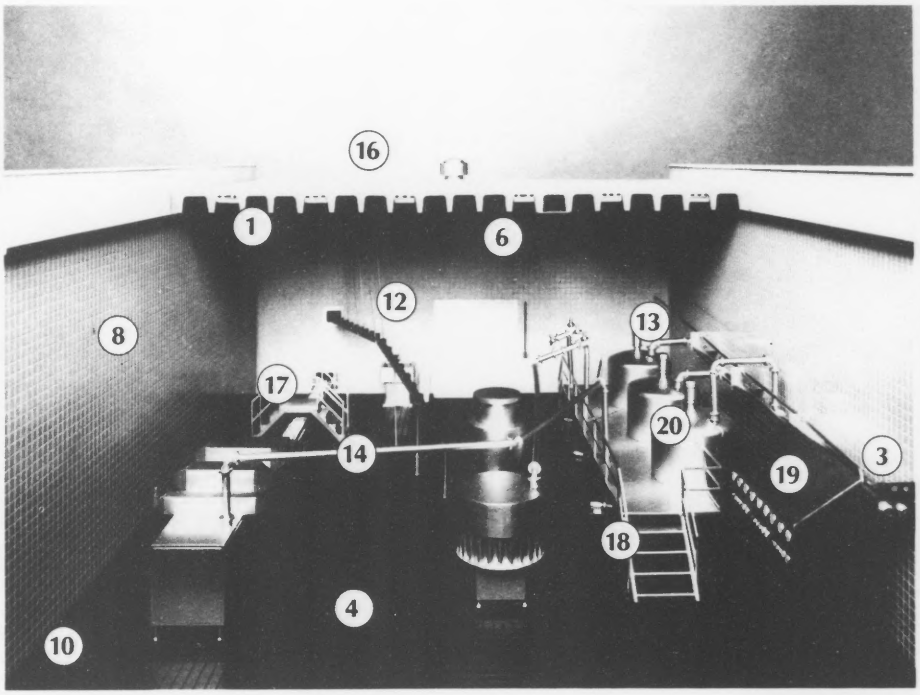
13 The pipelines in **Plant A** pass over the open product. Any condensate—a prime breeding ground for listeria—could contaminate the exposed product below. In **Plant B** the lines do not cross over exposed product.

14 The waste lines in **Plant A** run directly over the process. **Plant B** avoids waste lines over process areas, raw material, ingredient, and finished goods areas.

16 The difficult-to-clean gravel roof in **Plant A** provides a perfect environment for vegetation, mold, and insects to thrive. The roof in **Plant B** presents a smooth surface which prevents build-up of the dirt and debris that is emitted from the plant's ventilation system.

17 Packages coming off the line in **Plant A** are loaded into cardboard boxes, stacked on broken pallets, and transported by forklift to the loading dock. Exhaust fumes, broken wooden slats, and cardboard-loving insects all threaten product safety. In **Plant B**, products are conveyed from the processing to the warehouse area to eliminate hazards to the ongoing process.

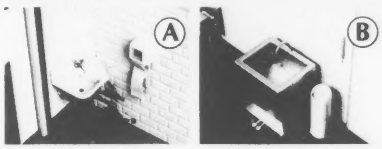
B



18 The processing equipment crowded into **Plant A** is too close to the wall and the floor to facilitate easy cleaning. **Plant B** features a layout that considers the space needed to maintain and clean both behind and beneath equipment.

19 The process control panel in **Plant A** is too close to the floor and wall and has a flat top. It will be difficult to clean around this piece of equipment. The same panel in **Plant B** has clearance under and behind to facilitate cleaning. The top is slanted to prevent collection of debris.

20 The open mixing vats in **Plant A** are susceptible to debris falling from above. **Plant B** uses closed vats with ingredients pumped in from the raw material preparation area.



15 The standing water in the clogged sink in **Plant A** is another breeding ground for bacterial contamination. The sink in **Plant B** is operated by foot pedal, so clean hands do not have to risk contamination by touching sink hardware. **Plant B** also replaces the old-fashioned cloth towel dispenser with paper towels.

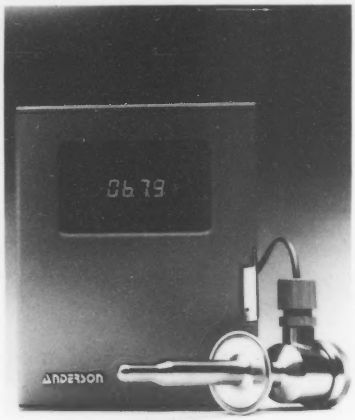
21 What better place for birds to roost than outside a food plant? **Plant A** provides a ready-made home in the exposed bracing of the roof overhang over the dock door. **Plant B** eliminates the overhang altogether—and locates the dock door so that it does not open into the processing area of the plant.

22 The shrubbery outside **Plant A** might look nice to passers-by. But it is also an excellent nesting spot for rodents, birds, and other undesirable creatures. **Plant B** features a simple grass lawn with crushed stone next to the wall.

For over 40 years, Sverdrup has been designing complex facilities for food clients such as Kraft General Foods, Nabisco, Hershey, Tropicana, and Ralston Purina. Our knowledge in the food business combined with our experience in industrial process systems, enables Sverdrup to provide experts in this arena.

Sverdrup continues to be ranked high among its engineering, architecture and construction peers. Sverdrup is ranked No. 2 in Building Design and Construction's Engineers/Architects 1990 rankings and No. 15 on ENR's 1990 Top 500 Design Firms list.

Industry Products



The Anderson "Dart" ... The Only Digital Thermometer That Complies with PMO Pasteurization Provisions

The Anderson "DART" Digital Reference Thermometer is the only digital thermometer available today that complies with the applicable provisions of the Pasteurized Milk Ordinance. With accuracy at least twice that of conventional pasteurization thermometers, the "DART" assures consistent processing. Unlike existing technology thermometers which must be viewed at the process location, the "DART" display may be located up to 1500 feet from the sensor.

The "DART's" dual-element sensor and proprietary comparator circuitry assure fail-safe performance. Self-diagnostics guarantee continued reliable service. An internal test feature allows easy verification of accuracy and performance by regulators. The "DART" not only meets or exceeds the requirements of the PMO, it stands up to the demands of the pasteurization loop.

Dual element "DART" sensors are built to meet or exceed 3A standards. "DART" sensors are interchangeable; requiring no field calibration. As with all critical temperature instruments, "DARTS" are calibrated to Anderson's exacting performance requirements and are traceable to the National Institute of Standards and Technology (N.I.S.T.).

Anderson Instrument Company, Inc. - Fultonville, NY

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Clean Front Iodine Blocks New from West Agro

Block Type Anti-Clog and Water Deodorizer Unit for Drains formulated from a patented blend of iodine, nonionic surfactants and blocking agents, these iodine blocks are suitable for use in food and dairy plants as anti-clogging and anti-soil buildup devices. They can also be used to deodorize condensate water and any other standing water in plants and other facilities. They will help control most odors that occur from condensate and standing water. West Agro's Clean Front Iodine Blocks are simple to use. Prior to placing the Iodine Block, clean and sanitize the drains, troughs, condensate trays and drip pans as outlined by the plant environmental cleaning program. Place the block to allow maximum contact with water flow or pooling water. The slow releasing Clean Front Iodine Block, with moisture sensitivity, releases approximately 1 ppm iodine until equilibrium is reached. The blocks are active only when adequate water is present for dissolution. Remove the blocks for periodic cleaning and place new blocks as needed. The new Clean Front Iodine Blocks are effective, easy to use and economical.

West Agro, Inc. - Kansas City, MO

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Sanitary Hose & Coupler Assemblies

For receiving bay product intake, CIP tank wash systems, pump pulsation absorption, or anywhere a sanitary flexible connector is required, new Sani-Seal Hose & Couplers are ideal. This unique system creates a sanitary hose assembly with permanently installed end fittings. Sani-Seal assemblies have no crevices to harbor bacteria or ledges to restrict flow. Permanently installed couplings can be CIP cleaned, saving costly down-time required to disassemble and clean ordinary fittings. Four different lightweight, flexible food-grade hose styles are available, including a new crush resistant version that actually springs back to its original shape after being kinked, twisted, or run over by a vehicile. Assemblies in 1 1/2" thru 4" sizes up to 100 feet long are offered with a variety of fittings available—including clamp, bevel, or plain tube ends. USDA & FDA accepted.

Although each hose assembly is cutom built, with the Sani-Seal system Nelson-Jameson can generally ship in one or two working days. A six ton hydraulic press is utilized to internally expand a special two-piece stainless steel coupling onto the hose end. This creates the full-flow, smooth bore hose assembly, which has no obstructions to trap or retain food soils and bacteria. Sani-Seal hose assemblies are widely recommended for both their sanitary and labor saving aspects.

Nelson-Jameson is a wide line supplier of packaging, equipment, safety, personnel, laboratory, cleaning chemical, and ingredient products to food and pharmaceutical processors. In addition to the Sani-Seal Hose and Coupling System, Nelson-Jameson provides other unique products such as the Disinfectant Mat™ Sanitizing Footbath, Corning Chloride Titrators, and the Sam Gray Gold Electrode.

Nelson-Jameson, Inc. - Marshfield, WI

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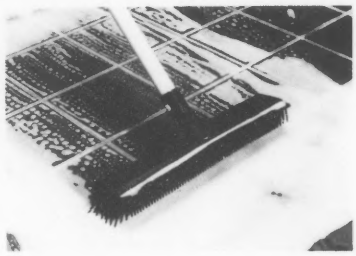

Sparta Introduces the Squeeper®

Jim Dunn, Vice President of Marketing and Sales for Sparta Brush, has announced that the company is now distributing the British made Squeeper hygenic brush line to the U.S. Food Processing and Food Service Industries.

The Squeeper is a unique molded synthetic rubber broom, brush and squeegee -- all in one piece. It works equally well on wet or dry floors, indoor or out; tile, concrete, terrazzo, marble, wood, even carpet and windows.

The Squeeper is available in three Sparta Tri-zone colors, black, red and yellow, allowing users to segregate brush usage and avoid moving bacteria from one area of a restaurant or food plant to another. The polyisoprene synthetic rubber head withstands tough use, harsh cleaning chemicals, heat to +225°F, and cold to -65°F and very tough cleaning jobs. Food debris is easily rinsed from the Squeeper. The Squeeper comes with a two year warranty.

Sparta Brush Company is a leading manufacturer of high quality specialized brushes for the food service and food processing industries.

Sparta Brush Company - Sparta, WI

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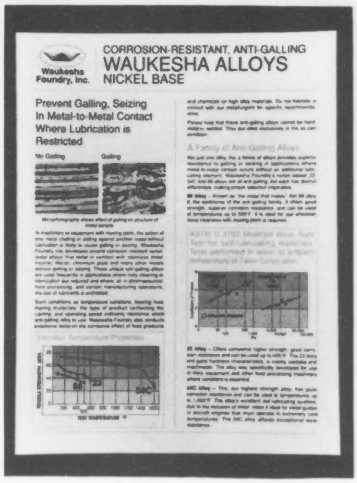

Technical Bulletin on Anti-Galling Alloys Released by Waukesha Foundry

Waukesha Foundry has developed several corrosion-resistant nickel base alloys that work in contact with stainless steel, Inconel, Monel, chromium plate and other metals without galling or seizing. The anti-galling alloys are frequently used for applications where daily cleaning or sterilization are required and where the use of lubricants is prohibited. Technical data on these anti-galling alloys, which are known as Waukesha 88, 23, and 54C, are presented in a new, four-page bulletin just released by the manufacturer.

A chart tracing elevated temperature properties for the three anti-galling alloys is provided. Also included are the results of an ASTM D 3702 Modified Wear Rate Test for self lubricating materials. Typical chemical composition, as well as mechanical and physical properties of the three alloys, are detailed. The bulletin also gives machining recommendations for Waukesha's 88 alloy.

To receive a copy of the anti-galling bulletin,

Waukesha Foundry, Inc. - Waukesha, WI

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Sanitary Systems Plant Design Software Now Available on the PC Cadpipe® Develops Software using Tri-Clover® Components

The company that develops and markets the CADPIPE® line of plant design software products has now made available SANITARY versions of their software for the food, dairy and pharmaceutical industries. This is the first available PC Computer-Aided-Design (CAD) application devoted solely to the plant design needs of sanitary systems.

The product born of the CADPIPE/Tri-Clover strategic alliance, CADPIPE SANITARY, consists of FLOW/P&ID, ISOMETRIC, and ORTHOGRAPHIC piping design products.

The new version of CADPIPE has incorporated several time-saving features such as the automatic placement of piping components with AUTO-ELBOW, AUTO-PIPE and AUTO-CLAMP. With a single pick, the system will automatically place flow arrows in both the primary and back wash directions.

The program's unique automatic Bill of Materials function includes Tri-Clover part numbers as well as total weights to assist in determining shipping costs, and because the CADPIPE programs run on affordable PCs, plant design for sanitary systems is now within the reach of every design department.

The CADPIPE SANITARY line of products, FLOW/P&ID, ISOMETRIC and ORTHOGRAPHIC, when used with CADPIPE STRUCTURAL AND ELECTRICAL, provide a total solution to plant design.

CADPIPE software is currently installed at over 1300 sites worldwide, in 50 countries. CADPIPE uses AutoCAD®, the leading PC CAD program in the world, as its graphics driver.

International Software Systems develops and markets software products, collectively known as CADPIPE, for industries involved in plant design. ISS, headquartered in Calgary, Alberta, Canada, is an authorized third-party developer for AutoCAD.

INTERNATIONAL SOFTWARE SYSTEMS, INC. - Calgary, Alberta

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Weber Scientific's Hydrophobic Slide

Weber Scientific introduces a major breakthrough in the direct microscopic method for milk smears.

This slide has a unique blue hydrophobic coating, delineating the circles, which permits rapid smearing of 0.01 ml of milk over an exact 1 cm area. The slide can actually be turned upside down, and the milk will remain in place.

In-house testing has proven that the slide's hydrophobic coating is durable, chemically resistant, and autoclavable. In addition, it can be written on with just about anything: pencil, pen or marker.

Weber Scientific - East Windsor, NJ

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COX Temperature Recorder Redesigned

COX Recorders has just released a totally redesigned version of its popular, easy to use, and affordable COX temperature recorder. The new product, the COX2 Recorder, is the result of an industry survey of the needs of temperature recorder users.

The COX2 Recorder is built to be used in all types of temperature sensitive shipments, and serves to protect the load by monitoring the performance of the carrier in maintaining temperature. Temperature recorders ride with the load as a necessary "third party" source of unbiased evidence.

Packaged in a protective corrugated sleeve, the COX2 is a self-contained, battery powered instrument which tracks temperature vs. time, and plots the data on a strip chart. The COX2 produces a wide and easy to read chart of a special material never before used in temperature charting. High accuracy of temperature sensing (± 1°F) results from the use of this material, which produces a very bold trace on the chart which will photocopy and FAX with ease.

When the shipment reaches destination, the COX2 Recorder immediately delivers its charted information after the tamperproof security seal on the instrument is removed. A pop-open door on the instrument presents the chart for easy removal. Retum address and prepaid postage information printed on the corrugated sleeve makes recorder retum as simple as dropping it in the mail.

COX Recorders provides the COX2 with calibration information already inscribed on the chart, since each unit is test-run before leaving the factory. The results of the test run appear on the actual chart in the unit, and serve to verify timing and temperature accuracy. Technical experts at COX Recorders are on call for assistance in interpreting the temperature record or to re-verify recorder performance.

COX RECORDERS - Long Beach, CA

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"Smart Meter" Digital Monitors

The Lamson Corporation, a leading manufacturer of Multistage Centrifugal Blowers and Exhausters, introduces a family of a microprocessor controlled digital monitors under the brand name "SMART METERS." These modules, specifically designed to monitor centrifugal blower/exhausters, were conceived, engineered, and manufactured at Lamson's headquarters in Syracuse, New York.

Offered as a reliable, more accurate alternative to traditional analog gauges, the modules provide a host of features and benefits:

- **Large easy-to-read digital display**. Eliminates guesswork, maximizes performance.
- **Early warning signal**: Should the blower/exhauster equipment approach pre-set limits, the module's digital display or LED's flash to alert the operator of potential problems.
- **Failsafe circuitry**: in the event input signals cannot be processed, the meter places the system in a "safe" operating mode and the display "freezes" to alert the operator.
- **Reduces installation time and expense**: eliminates the use of cumbersome "Murphy" gauges.
- **Tamper resistant**: 4 button push pad and simple security code allow access to set points while preventing accidents and tampering.
- **2 year warranty**.
- **Remote Monitoring**: By March 1, 1992 - Remote monitoring and data collection through a P.C.

Modules are available for Surge, Vibration, Bearing Temperature, Filter Differential, Inlet/Outlet temperature, and outlet pressure. Each unit comes complete with field device(s) and a wire harness in a NEMA 12 enclosure.

Lamson Corp. - Syracuse, NY

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New Product Bulletin Available from Walker

A New product line Bulletin GB-191 is now available on Stainless Steel Biological Safety Cabinets/Glove Box work stations. This literature describes fixed modular stations and portable units for safe handling of product or process in a contained environment. Chamber controls, station modules and construction specifications are introduced in this bulletin along with a variety of options.

Walker Stainless Equipment Company is a stainless steel fabricator which has served the processing industry for almost 50 years.

WALKER STAINLESS EQUIPMENT CO., INC. - New Lisbon, WI

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New Micro-Processor Based Tank Monitor

A new programmable, micro-processor based tank monitoring unit complete with internal computer and capable of receiving and sending inventory data, alarm conditions, information on leak detection from a variety of sensors, (ie.) ultrasonic, load cells, and pressure transducers, is the latest in a new line of equipment available from Electronic Sensors, Inc. The 9032-xA reporter system originally developed for the 9025A ultrasonic sensor can now be integrated with other sensing technology to provide a single unit capable of displaying and remotely monitoring chemicals previously incompatible with ultrasonics. Gasoline, diesel, benzes, and other highly volatile chemicals that exhibit hysteresis can now be handled by one manufacturer.

Electronic Sensors, Inc. - Wichita, KS

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GENE-TRAK Systems' New and Improved Salmonella *Assay is Granted Official First Action Status from the AOAC*

GENE-TRAK Systems Corporation announced that Official First Action status has been granted for a new and improved colorimetric DNA hybridization method for detection of *Salmonella* by the Association of Official Analytical Chemists (AOAC). The new GENE-TRAK® *Salmonella* Assay is one of six colorimetric DNA hybridization assays offered by the company for the detection of foodborne pathogens, including tests for *Listeria, E. coli, Staphylococcus aureus, Yersinia enterocolitica,* and *Campylobacter* species. The new GENE-TRAK® *Salmonella* Assay is the third generation of DNA hybridization assays to receive this recognition from the AOAC.

The new GENE-TRAK® *Salmonella* Assay will provide processors with the means to test foods easily and quickly for the presence of *Salmonella* prior to shipment. The assay will provide detection of all common serotypes of *Salmonella* in food products in less than 48 hours, as compared to 4 to 7 days for conventional microbiological methods. This significant time saving offers food processors the opportunity for substantial savings in the cost of raw materials and finished product inventories.

GENE-TRAK Systems Corp. - Framingham, MA

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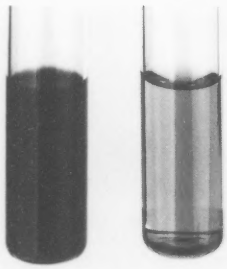

New Enrichment Medium and Supplement Provide Earlier Detection of Listeria

The presumptive detection of *Listeria* from enrichment cultures of food and environmental samples is now possible with the use Fraser Broth prepared by combining Bacto® Fraser Broth Base and Bacto® Fraser Broth Supplement. This selective medium differentiates *Listeria* from other related pathogens which cause food associated illnesses.

Differentiation and selectivity are increased by the addition of Fraser Broth Supplement to Fraser Broth Base. The esculin indicator system in the medium causes the broth to turn black when *Listeria* is present, since all *Listeria sp.* hydrolyze esculin. In addition, Lithium and acriflavin prevent most of the other esculin positive microflora from growing.

Fraser Broth is a secondary enrichment broth required for the U.S.D.A. procedure for *Listeria monocytogenes* isolation. The ready-to-use supplement is conveniently packaged and easy to dispense into the final medium preparation.

Difco extends their *Listeria* testing product line by addition of Bacto® Fraser Broth Base, Fraser Broth Supplement, Modified Oxford Supplement, and Moxalactam Antimicrobic Supplement. All Difco *Listeria* testing products are available from leading laboratory distributors.

Difco Laboratories - Detroit, MI

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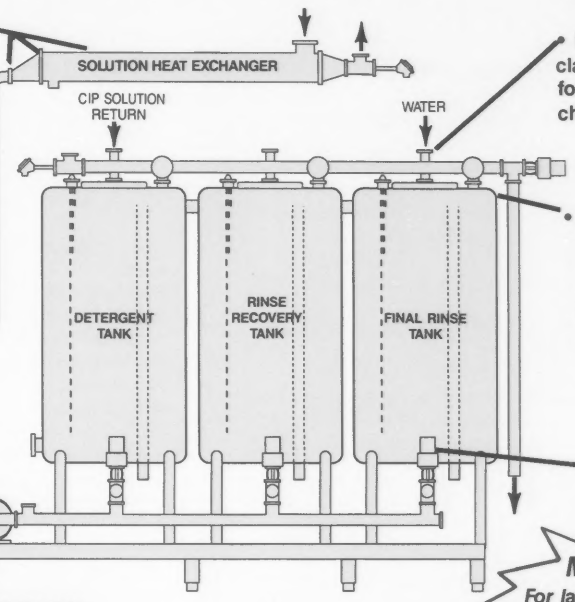
See 3-A Holders List, #02-08, 13-08

NEW **SANI-MATIC CIP SYSTEM** *per latest*

For All Milk Related Processing Plants (Fluid Milk, Ice Cream, Cheese, Cultured Products, Butter) **3-A Guidelines**

- Heat Exchanger
  - Stainless Steel solution-contact surface.
  - CIP style gasket and clamps (no threads).
- Angle-line strainer on pump discharge to keep spray devices clean.
- CIP Pump — smooth as ACI - SIS-1
- Pre-packaged, skid-mounted unit with clearance for easy cleaning.
- Removable quick clamp connection ports for water, steam, and chemicals.
- CIP tanks have dished all-welded tops with sanitary radiused corners (no bolts, threads).
  - Continuous welds, bottom pitched to drain (no NPT ports).
- Open yoke valves — free draining.



DEC INTERNATIONAL

SANI-MATIC SYSTEMS

A Division of DEC International, Inc.

1915 S. Stoughton Rd. • P.O. Box 8662 • Madison, WI 53708 • Ph: 800-356-3300 • Fax: 608-222-5348

Mr. Processor:
For latest 3A CIP Guidelines and CIP evaluation,

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ASI Food Safety Consultants

1992 Seminars

Sanitation by Design
March 30-31, 1992 — St. Louis, MO

Food Safety for Zero Defects
May 4-5, 1992 — St. Louis, MO

Reclamation and Environmental Concerns in the Food Industry
May 6, 1992 — St. Louis, MO

Employee Health, Hygiene and Practices in the Food Industry
May 7, 1992 — St. Louis, MO

Food Safety for Zero Defects
September 14-15, 1992 — St. Louis, MO

Reclamation and Environmental Concerns in the Food Industry
September 16, 1992 — St. Louis, MO

Employee Health, Hygiene and Practices in the Food Industry
September 17, 1992 — St. Louis, MO

GMPs for the Food Industry
October 26, 1992 — Chicago, IL

For more information call Christine VerPlank
ASI Food Safety Consultants • 7625 Page Boulevard • St. Louis, MO 63133
314/725-2555 • 800/477-0778 • Fax: 314/727-5563

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Analytical and Microbiological Testing

Primary Nutrient Analysis
Nutritional Labeling Verification

Sanitation Audits
HACCP Programs Start Up
Sampling Protocols - Environmental and Product

Research Projects
Challenge Studies
Shelf Life and Raw Material Testing

USDA · FDA · AOAC · USP · AOCS Methodologies

Northland Food Laboratory, Inc.

Putting safety and quality into your food products.

Call us today at 414-336-7465 in Green Bay or 414-682-7998 in Manitowoc.

1044 Parkview Road
Green Bay, WI 54304

P.O. Box 160
2415 Western Ave.
Manitowoc, WI 54220

Preview of the 79th IAMFES Annual Meeting

Monday Morning, July 27

Technical Session - Foodborne Pathogens

- Isolation of *Salmonella enteritidis* from pooled egg samples as a screening method for detecting infected laying hens
- Survival of *Listeria monocytogenes* on the surface of egg shells and during frying of whole and scrambled eggs
- Heat stability of *Listeria monocytogenes* in Liquid Egg
- Health risk assessment of undrawn (New York Dressed) poultry in Ontario
- A comparison of antilisterial activity of two lactic starter cultures in chicken summer sausages
- Control of *Escherichia coli* O157:H7 by Fermentation
- Thermal Destruction of *Listeria monocytogenes* in Reduced Salt Uncured-Restructured Meat Product
- Bacterial growth and survival in vacuum packaged beef during extended refrigerated storage
- Effect of growth nutrients on attachment of *Listeria monocytogenes* to stainless steel
- Simultaneous growth of *Listeria monocytogenes* and *Listeria innocua* in pure culture and food systems
- Accelerated growth of *Listeria monocytogenes* by moulds
- The 1991 Cholera Epidemic in Latin America and the FDA Actions in Response

Technical Session - Dairy Microbiology

- Detection of latent coliforms in pasteurized milk
- Identification of milk enzymes for monitoring heat-treatments applied to milk
- Adaption to Acid Promotes Survival of *Salmonella* in Cheese
- Microbiological Safety of Blue and Cheddar Cheeses Containing Naturally Modified Milk Fat
- Behavior of *Listeria monocytogenes* in Cold-pack Cheese Containing Nisin During Storage
- Extension of shelf-life of cottage cheese using monolaurin
- The use of epifluorescent and phase microscopy in evaluating mixed biofilms
- Elimination of Surface-Attached Bacteria by Detergent Washing and Chemical Sanitation in a Dynamic Flow System
- A Novel System of Sanitation, Disinfection and Sterilization Effective Against Biofilms
- Effect of cold temperature on germicidal efficacy of quaternary ammonium compound, iodophor and chlorine on *Listeria*
- Assessment of handling conditions and quality of milk in Oregon public schools
- A comparison of commercially processed fluid milks held at 7.2°C (45°F) for 10, 12 and 14 days

Milk Quality Symposium

- Making Decisions for Therapy of Clinical Mastitis: Impact on Potential Residues
- Factors Associated with Inhibitor Violations on Ontario Dairy Farms
- Cowside Antibiotic Residue Tests: Current Status on Availability, Use and Interpretation
- Verotoxigenic *E. coli* Contamination of Milk and Associated Risk Factors
- Milk Quality Improvement Initiatives for the Ontario Dairy Industry
- Dynamics and Trend Analysis of Bulk Milk SCC Data
- Relationship of Milking Machine Design and Function to Milk Quality

Scientific Poster Session

- The growth and survival of *Vibrio* sp. as determined by pH, acidulant, time and temperature
- Rapid assay for *Bacillus* proteinases in raw milk as detected by a simple casein denaturation method
- Application of a recording thermometer to monitor cleaning and sanitizing procedures for farm raw milk transport lines
- Microbial and Chemical Analysis of Mexican White Soft Cheese and its Relationship with the Content of Histamine and Tyramine
- Survival of *Salmonella typhimurium, Escherichia oli* O157:H7 and *Listeria monocytogenes* Scott A During Storage on Beef Sanitized with Organic Acids
- Use of phenols and liquid smoke to control *Listeria monocytogenes*
- Fate of *Listeria monocytogenes* in modified-atmosphere packaged turkey roll
- Fate of *Escherichia coli* O157:H7 in Fermented, Dry Sausage and in Modified Atmosphere Packaged Beef
- Frequency of false presumptive positive results obtained using a commercial ELISA kit to screen retail ground beef for *Escherichia coli* O157:H7
- Incidence of low levels of enterotoxin-producing *Bacillus cereus* in routine surveillance food samples
- Dimorphism in shigella sonnei as it related to Retention of Biochemical and Serological Characteristics
- Accessibility to chlorine of bacteria attached to or entrapped in poultry skin
- Low Dose UV and Gamma Radiation on Shelf-life of Peaches
- Incidence of bacteria on smear-ripened cheeses able to inhibit *Listeria monocytogenes*
- Effectiveness of a Modified Salmonella-Tek™ Enzyme Immunoassay for the Recovery of *Salmonella* from Selected Low-Moisture Foods
- Microbial growth rate of two minimally processed vegetables packaged in modified atmosphere package
- Ultrasonic killing of *Listeria monocytogenes* and *Salmonella typhimurium* in milk
- Evaluation of PC Based Software in the Dairy O.C. Laboratory
- Improvement of Lactic Cultures Through Organic Solvent Treatment
- Virulence of an *Escherichia coli* O157:H7 sorbitol positive mutant
- Quantitative effects of pH and lactic acid concentration on the kinetics of *Listeria monocytogenes* inactivation
- Survey of spoilage bacteria in raw milk at Egyptian markets and farms
- Fate of enterotoxigenic Staphylococci in fish subjected to curing
- Actual and Perceived Incidences of Perforation in Surgical and Examination Gloves
- The Effect of Ultraviolet Light-C on Storage Rots and Ripening of Tomatoes

Video Theatre

All day Monday, Tuesday morning and all day Wednesday

Monday Afternoon, July 27

Update of Foodborne Pathogens Symposium

- Overview of Foodborne Illnesses
- *Listeria monocytogenes*: methods, perspective on tolerance limits in foods
- Verotoxigenic *E. coli* (VTECS) including O157:H7 (significance, advances in methods, trends)
- Foodborne toxoplasmosis

Technical Session - Laboratory Methods

- Effective Method for Dry Inoculation of *Salmonella* Cultures
- Evaluation of Enrichment and Plating Media for Isolation of Virulent *Yersinia enterocolitica* from Ground Meat
- Comparison of 25g and 375g composite samples for detection of *Listeria*
- Development of Culture Media for the Rapid Detection of *Lactobacillus* Species in High Acid Foods Using Impedance Microbiology
- Effective Recovery of Campylobacter in the Presence of Mixed Culture
- Recovery of Campylobacter spp. from poultry through enrichment in 10 ml or 100 ml volumes
- Rapid Method for Assessing Microbiological Quality of Egg Washwater Using Resazurin
- Rapid Fluorometric Analysis of Acid Phosphatase Activity in Cooked Poultry Meat
- Fluorometric Analysis of Alkaline Phosphatase Inactivation Correlated to *Salmonella* and *Listeria* Inactivation
- Food Safety and Sanitation in the Nineties
- Shelf life prediction of pasteurized fluid milk using the Charm II System

Sanitation and Disaster Control Symposium

- General Mills Restaurants Program for Preparedness
- Ready? or Sorry!! The Need to Exercise Emergency Plans
- Hurricane Hugo and its Aftermath
- Disaster Control/Prep. Canada

Tuesday Morning, July 28

Technical Session - Foodborne Microbiology

- Predictive modeling of psychrotrophic *Bacillus cereus*
- Microbiology of "Mexican-Style" Salsas
- Microbial Ecology of Modified Atmosphere Packaged Pork
- Food Store Delicatessen Practices: Report of Two Chain Survey
- Method for classifying foods with a similar microbiological risk
- Processing and Fermentation of Soy Yogurt Made from Rapid Hydration Hydrothermal Cooked Soy Milk
- Microbiology HACCP determination at a Poultry Processing Plant
- Combined Effects of Monolaurin, Ethanol, and Lactic Acid Against *Listeria monocytogenes*
- Lethal effect of dimethyl dicarbonate on *Listeria* and *Salmonella*, and its potential for use in the treatment of fresh produce
- Simultaneous production of Yeast Polygalacturonase and Lactate Dehydrogenase from Sauerkraut Brine

NAC on Microbiological Criteria for Foods Symposium

- *Listeria* Overview
- Raw poultry/meat, model HACCP
- *Campylobacter*
- Revised NACMCF HACCP document

Automation in Dairy Process Control Symposium

- Process Design and Extended Shelf Life of Dairy Products
- Documentation of Automated Processes
- Automation in Cleaning and Sanitizing
- Aseptic Dairy Processing
- Regulatory Aspects/Inspections

Tuesday Afternoon, July 28

General Session - International Food Standards

- Development of IDF Standards and Bulletins
- Food Standards and Food Safety in Japan
- International Labeling and Advertising Requirements: The Effect on Trade
- Food Safety Issues in Europe - An Update

Wednesday Morning, July 29

Seafood Regulatory Symposium

- The United States Food and Drug Administration's Office of Seafood; Update on Activities
- Canadian Seafood Inspection
- Seafood Issues Within CODEX
- Seafood Issues Within ICMFS
- National Advisory Committee on Food Safety, Seafood Issues

Dairy Symposium

- *Bacillus cereus* in Dairy Products
- Bioluminescence and Detection of Pathogens in Milk
- Biofilms from a cleaning and sanitizing perspective
- The *Bifidobacterium* and dairy products

Consumer's and Scientist's Views on Irradiation and Food Safety Symposium

- The Consumer's View of Food Safety
- The Epidemiologist Perception
- Limitations of Our Current Approach for Assessing Microbiological Food Safety
- Safety Ramifications of Food Irradiation
- The Public Perceptions Toward Irradiation of Foods - Media Presentation
- Round Table Discussion - Closing the Gap Between Perception and Reality or, How do we get there from here?

Wednesday Afternoon, July 29

Seafood Safety Symposium

- Enteric Viruses and Seafood Safety
- Bacterial Pathogens and Seafood Safety
- Natural Toxins - Update
- Chemicals and Seafood Safety
- Seafood HACCP Programs

Food Irradiation Symposium

- Food Irradiation: Introductory Overview
- Safety and Wholesomeness of Irradiated Food
- Microbial Aspects of Food Irradiation
- International Regulatory Status and Harmonization of Food Irradiation
- Marketing Irradiated Food
- Radiation Processing of Food for Quarantine Control

IAMFES

79th Annual Meeting
Spouse/Companion Tours

A Get-Acquainted Tour of Toronto and CN Tower
Monday, July 27, 1992
9:00 a.m. - 12:00 noon
Cost: $19 (US)
$20 (CDN)

Historic Tour of Downtown and Restored Theatres
Monday July 27, 1992
2:00 p.m. to 5:00 p.m.
Cost: $12 (US)
$14 (CDN)

Niagara Falls and Niagara-on-the-Lake
Tuesday, July 28, 1992
8:00 a.m. to 5:00 p.m.
Cost: $45 $32 (Youth) US
$49 $35 (Youth) CDN

Blue Jay Baseball and dinner at Windows
Tuesday, July 28, 1992
7:30 p.m. to 11:00 p.m.
Cost: $43 (US)
$47 (CDN)

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

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

FOR OFFICE USE
Date Rec'd._____ First initial _____ Last name _____
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- ___ Non-Member
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		Amount	# of tickets	Total Amount
Registration				
	IAMFES Member (Banquet included)	$100 ($135 on-site)		
	Non-Member (Banquet included)	$150 ($185 on-site)		
	IAMFES Student Member	$ 25 ($ 25 on-site)		
	IAMFES Member One Day (Circle: Mon/Tues/Wed)	$ 50 ($ 70 on-site)		
	Non-Member One Day (Circle: Mon/Tues/Wed)	$ 75 ($ 95 on-site)		
	Spouse/Companion (Name):_____	$ 20 ($ 20 on-site)		
	Children (16 & Under), Name: _____	$ 20 ($ 20 on-site)		
***New Membership Fees:**	Membership (*Dairy, Food & Environmental Sanitation*)	$ 50		
	Membership *Plus* (*Dairy, Food & Env. Sanitation & Journal of Food Protection*)	$ 80		
	Student Membership ❒ *Dairy, Food & Env. San.* or ❒ *Journal of Food Protection*	$ 25		
	Student Membership *Plus* (*Dairy, Food & Environmental Sanitation & Journal of Food Protection*)	$ 40		
	POSTAGE CHARGES: OUTSIDE THE U.S. - SURFACE RATE	$ 15 per journal		
	AIRMAIL	$ 95 per journal		
Other Fees: (Per Person)	Cheese & Wine Reception (Sun., 7/26)	FREE		
	CASA Loma Dinner (Mon., 7/27)	$ 40 ($ 45 on-site)		
	IAMFES Awards Banquet (Wed., 7/29)	$ 25 ($ 30 on-site)		
Spouse/Companion Events:	A Get-Acquainted Tour of Toronto and CN Tower (Mon., 7/27)	$ 19 ($ 24 on-site)		
	Historic Tour of Downtown and Restored Theatres (Mon., 7/27)	$ 13 ($ 18 on-site)		
	Niagara Falls and Niagara-on-the-Lake (Tues., 7/28)	$ 45 ($ 50 on-site)		
	Children (16 & under)	$ 32 ($ 37 on-site)		
	Blue Jay Baseball and dinner at Windows (Tues. P.M., 7/28)	$ 43 ($ 48 on-site)		

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Registration Information

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

Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $15.00 processing fee, will be refunded for written cancellations post-marked at least two (2) weeks prior to the start of the meeting. No refunds will be made for cancellations made less than two (2) weeks prior to the start of the meeting, however, the registration may be transferred to colleague with written notification to IAMFES.

Exhibitor Information

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

Guest Room Committment
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IAMFES

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

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❑ King (2 persons 1 bed)
❑ Triple ❑ Quad

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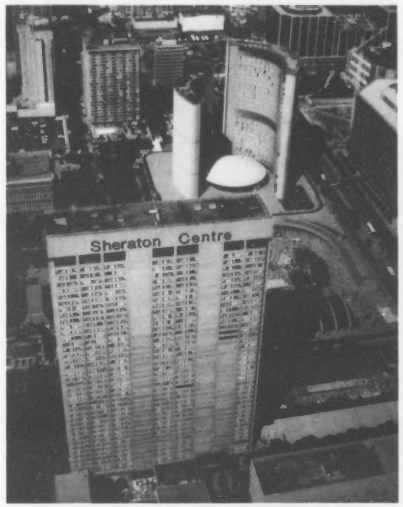

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Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 103-107 (February 1992)
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Amendments To 3-A Accepted Practices For Permanently Installed Product And Solution Pipelines And Cleaning Systems Used In Milk and Milk Product Processing Plants, Number 605-03

Number 605-04

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Practices for permanently installed product and solution pipelines and cleaning systems specifications heretofore or hereafter developed which so differ in design, materials, and construction, or otherwise, as not to conform to the following practices but which in the manufacturer's or fabricator's opinion, are equivalent or better may be submitted for joint consideration of the IAMFES, USPHS and DIC at any time.

A

SCOPE

A.1

These 3-A Accepted Practices provide for the installation and mechanical cleaning and sanitizing of rigid pipelines used for milk and milk processing systems in which the connections are welded or are provided with permanently installed CIP fittings. These 3-A Accepted Practices also specify materials, fabrication and other requirements for the rigid cleaning solution lines and for the mechanical cleaning (CIP) unit which circulates the pre-rinse, rinse, cleaning solutions and post-rinse liquids used for cleaning and sanitizing the product pipelines and process equipment. The mechanical cleaning and sanitizing of individual items of equipment may be found in the 3-A Sanitary Standards covering the specific equipment. This practice does not pertain to cleaning systems used on dairy farms, nor to large diameter piping used for conveying dry product in milk drying or instantizing systems. (See Appendix, Section P for an example of a mechanical (CIP) cleaning unit.)

B

DEFINITIONS

B.1

CIP (Cleaned-In-Place)/Mechanical Cleaning: Shall denote cleaning solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.2

Pipelines

B.2.1

Permanently Installed Product Pipelines: Shall mean rigid pipelines which have welded joints or permanently installed CIP fittings and are designed for CIP cleaning and which are used for milk and milk products.

B.2.2

Permanently Installed Solution Pipelines: Shall mean rigid pipelines which have welded joints or have permanently installed CIP type fittings and are used exclusively for the supply and recirculation of cleaning and/or sanitizing solutions, except those used to supply concentrated cleaning and/or sanitizing materials to the point of use.

B.3

Permanently Installed CIP Fittings: Shall mean welded or gasketed fittings designed for CIP cleaning which form substantially smooth, flush interior surfaces.

B.4

Product: Shall mean milk and milk products.

B.5

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

B.6

Solutions: Shall mean those solutions used for flushing, cleaning, rinsing, and sanitizing.

B.7

Solution Contact Surfaces: Shall mean the interior surfaces of the system which are used exclusively for supply and recirculation of cleaning and/or sanitizing solutions, except those used to supply concentrated cleaning and/or sanitizing materials to the point of use.

B.8

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.9

Mechanical Cleaning (CIP) Unit

B.9.1

Mechanical Cleaning (CIP) Unit: Shall mean equipment assembled as a unit dedicated to and used exclusively for supply and recirculation of cleaning and/or sanitizing solutions. This equipment may include but is not limited to the following:

B.9.1.1

Solution Pump(s);

B.9.1.2
Solution Tank(s);

B.9.1.3
Solution Supply and Return Valve(s) and Valve Manifold(s);

B.9.1.4
Fittings;

B.9.1.5
Solution Contact Heat Exchanger(s) or Steam Injector(s);

B.9.1.6
Instrument Fitting(s) and;

B.9.1.7
Strainers.

B.9.2
The mechanical cleaning (CIP) unit does not include utility piping.

B.10
Tungsten Inert Gas (TIG) Method: Shall mean electric welding with a tungsten electrode shielded by an inert gas, to produce a butt fusion weld.

B.11
Non CIP Appurtenances: Shall mean those appurtenances such as plug valves, sample cocks, instrument fittings, pumps and parts having the same functional purposes and not designed for mechanical cleaning.

B.12
Utility Piping: Shall mean other system service piping such as the steam supply line up to and including the steam supply valve; chemical injection lines up to and including the chemical shut-off device; water supply lines up to and including the water shut-off valve.

C
MATERIALS

C.1
The materials of equipment included in the product and solution pipelines and mechanical cleaning units for which there are applicable 3-A Sanitary Standards or Accepted Practices shall comply with the material criteria of the applicable Standards or Practices.

C.2
All other product and solution contact surfaces shall be of stainless steel of the AISI 300 Series[*1] or corresponding ACI[*2] types (See Appendix, Section I.), or metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types and is non-toxic and non-absorbent, or heat resistant glass piping, except that:

C.2.1
Rubber and rubber-like materials may be used for gaskets, seals and short take-down jumpers.

C.2.2
Rubber and rubber-like materials shall comply with the applicable provisions of the 3-A Standards for Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00.

C.2.3
Plastic materials may be used for gaskets, seals, sight ports and short take-down jumpers.

C.2.4
Plastic materials shall comply with the applicable provisions of the 3-A Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-14 as amended.

C.3
Utility piping need not be stainless steel.

C.4
Paper gaskets shall not be used.

D
FABRICATION

D.1
The fabrication criteria of equipment included in the permanently installed product and solution pipelines for which there are applicable 3-A Sanitary Standards or Accepted Practices shall be those of the applicable 3-A Sanitary Standard or Accepted Practice.

D.2
All other product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets, and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section J.)

D.3
All solution contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets, except for those of castings for solution heat exchanger(s)/steam injector(s) and pumps. This does not preclude the use of a No. 2B finish for solution contact surfaces.

D.3.1
The solution contact surfaces of castings for heat exchangers(s)/steam injector(s) and for pumps shall be at least as smooth as ACI Surface Indicator Scale SIS-1. (See Appendix, Section M.)

D.4
Product lines shall comply with the provisions of 3-A Standards for Polished Metal Tubing for Dairy Products, Number 33-00.

D.5
Product and solution lines and equipment shall have permanently installed CIP fittings or welded joints. Gasketed CIP fittings shall be readily demountable for inspection.

D.6
Welded joints shall be smooth and free from pits, folds, crevices, cracks, inclusions, or other defects. (See Section G.)

D.7
Removable fittings may be used with or without gaskets and shall be of such design as to form substantially flush interior joints.

D.7.1
Gaskets, when used, shall be self positioning and form a substantially flush interior joint.

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*[*1] The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-20. Available from the Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412-776-9460).*

*[*2] Alloy Casting Institute Division, Steel Founders Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016 (708-299-9160).*

D.8

Power operated solution valves shall have an open space of at least 1 in. (25 mm), clear for inspection, between the actuator and the valve.

D.9

Non CIP appurtenances, such as plug valves, instrument fittings, sample cocks, pumps and parts having the same functional purposes which have product or solution contact surfaces shall be readily demountable and easily disassembled for manual cleaning and sanitizing.

D.10

Radii

D.10.1

All internal angles of 135 degrees or less on product contact and solution contact surfaces shall have minimum radii of 1/4 in. (6 mm) except that:

D.10.1.1

The radii in gasket retaining grooves except for those for standard 1/4 in (6 mm) and smaller O-Rings, shall be not less than 1/8 in. (3 mm).

D.10.1.2

Smaller radii may be used when they are required for essential functional reasons, such as those in pump impellers. In no case shall radii be less than 1/32 in. (1 mm). The angle must be readily accessible for cleaning and inspection.

D.10.1.3

The radii in grooves for standard 1/4 in. (6 mm) O-Rings shall be not less than 3/32 in. (2 mm) and for standard 1/8 in. (3 mm) O-Rings shall be not less than 1/32 in. (1 mm).

D.11

All product contact and solution contact surfaces shall be cleanable, either when in an assembled position or when removed. System appurtenances shall be accessible for inspection.

D.12

Lines and fittings for the application of air under pressure shall comply with the applicable provisions of 3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Product Contact Surfaces, Number 604-03.

D.13

Non-Product contact surfaces shall be smooth, free of pockets and crevices and be readily cleanable.

D.14

There shall be no threads on product contact surfaces or on solution contact surfaces of solution heat exchangers or steam injection heaters.

D.15

Information Plate

Cleaning solution pumps designed and used solely for CIP recirculation shall be provided with an information plate permanently affixed to the pump, next to the name plate stating: "This pump shall be used solely for pumping cleaning and/or sanitizing solutions."

E

INSTALLATION

E.1

Pipelines shall be supported so that they remain in alignment and position. The support system shall be designed so as to preclude electrolytic action between support(s) and pipeline(s).

E.2

Each separate cleaning circuit, including product and solution lines, shall be provided with a sufficient number of access points, such as valves, fittings, or removable sections to make possible adequate inspection and examination of representative interior surfaces.

E.3

Pipelines shall be drainable or self-draining and pitched to drain points.

E.4

Upon completion of welded pipeline installations and prior to use, all interior line and weld areas shall be subjected to circulation of cleaning solution of 0.5 to 1% alkalinity at a minimum of 160 degrees F (71.1 degrees C) for 30 minutes, followed by an adequate post rinse, followed by circulation of 0.5% minimum and 1% maximum phosphoric or nitric acid solution at 150 F (65.6 degrees C) to 180 degrees F (82.2 degrees C) for 10 minutes to clean all interior surfaces of ferric impurities. (This is not intended for passivation.) This treatment shall be followed by an adequate rinse.

F

LAYOUT AND ENGINEERING REQUIREMENTS

F.1

Prior to installation, a drawing or equivalent plan shall be made available to the regulatory agency by the processor for each installation, or subsequent addition or modification, showing each permanent circuit to be cleaned.

F.2

The mechanical cleaning unit shall be designed so that the suction intake of the primary circulating pump shall be flooded at all times during the cleaning cycle.

F.3

Solution temperature shall be automatically controlled by the use of temperature control system with a response range of $\pm$ 5 degrees F ($\pm$ 3 degrees C).

F.4

The mechanical cleaning unit shall be provided with a recording thermometer or similar device complying with these specifications or a recording device which has been reviewed by the FDA and found to provide sufficient information to adequately evaluate the cleaning and sanitizing regimen and which is approved by the local regulatory agency shall be installed in the return solution line or other appropriate areas to record the temperature and time during which the line or equipment is exposed to cleaning and sanitizing solutions. The Scale range shall be: 60 degrees F to 180 degrees F (16 to 83 degrees C) with extensions of scale on either side permissible; graduated in time-scale divisions of not more than 15 minutes. Above 110 degrees F (44 degrees C), the chart is to be graduated in temperature divisions of not more than 2 degrees F (1 degree C) spaced not less than 0.0625 in. (0.159 mm) apart. Provided that the temperature-scale divisions of 2 de-

grees F (1 degree C) spaced not less than 0.040 in. (1 mm) apart are permitted when the ink line is thin enough to be easily distinguished from the printed line. Temperatures shall be accurate within 2 degrees F (1 degree C) plus or minus, when above 110 F (44 degrees C). The pen-arm setting device shall be easily accessible and simple to adjust. The pen and chart paper shall be designed to make a line not over 0.025 in. (0.635 mm) wide and be easy to maintain. The stem fitting shall have a pressure-tight seat against the inside wall of pipe and no threads shall be exposed to solution. The sensor shall be protected against damage at 212 degrees F (100 degrees C). Circular charts shall make one revolution in not more than 24 h. Strip charts shall not move less than 1 in. (25 mm) per h. More than one record of the cleaning operation shall not overlap the same section of the chart for either circular or strip-type charts.

F.5

All connections between any solution circuit and any product circuit shall be effectively separated to positively prevent the commingling of the product and solution during processing. (See Appendix, Section N.)

F.6

There shall be no cross-connection(s) between the safe water supply and any unsafe or questionable water supply, or any source of pollution through which the safe water supply might become contaminated. For example, a connection between the water supply piping and make-up tank, unless protected by an air gap or effective back-flow preventer constitutes a violation of this practice.

G

INSTALLATION WELDING REQUIREMENTS

G.1

All welding of sanitary product pipelines and solution lines shall be made by the TIG method or an equally satisfactory method. The following precautions shall be taken:

G.1.1

Inert back-up gas shall be used to protect and control the interior of the weld.

G.1.2

The welding surface (interior, face and exterior) shall be cleaned and freed of all foreign matter and surface oxide before welding. Iron-free abrasive shall be used when cleaning surfaces.

G.1.3

All tube and fitting ends shall be square cut and deburred.

G.1.4

Welding procedures shall assure uniform and complete penetration of the weld at all times.

G.1.5

All welds having pits, craters, ridges, or imbedded foreign materials shall be removed and the joints shall be properly re-welded.

G.1.6

Internal and external grinding and/or polishing of pipeline welds is not required. If grinding and/or polishing of external weld surfaces is desired by either the installer or the user, such finishing shall be delayed until after inspection and acceptance of the welding by the applicable regulatory agencies unless internal weld surfaces are easily accessible for inspection.

G.1.7

An acceptable sample weld piece shall be provided when required.

G.1.8

A boroscope or other acceptable inspection device shall be available to use to inspect representative welds.

H

CLEANING AND SANITIZING PROCEDURES

H.1

A mechanical flushing, cleaning, rinsing and sanitizing regimen which has been demonstrated to be effective shall be employed. Because of the possibilities of corrosion, the recommendations of the cleaning compound manufacturer shall be followed with respect to the time, temperature and the concentration of specific acid or alkaline solutions and sanitizers. To insure proper strength of solution and to avoid corrosion, the cleaning compound shall be completely dissolved or dispersed prior to circulation. (See Appendix, Section O for one regimen found to be satisfactory.)

H.2

Pulsing of all product outing valves shall be done during each phase of cleaning cycle, ie. rinse, wash, rinse, sanitize.

H.3

A description of the cleaning regimen which has been demonstrated to be effective for each circuit shall be made available by the processor.

H.4

Reverse osmosis permeate or cow water (condensed vapors removed from liquid dairy products by vacuum evaporation) produced in compliance with Appendix D-V of the Pasteurized Milk Ordinance where applicable may only be used as a pre-rinse to drain and to make up cleaning solutions, but cannot be used as the final rinse or to make up sanitizing solutions.

APPENDIX

J

PRODUCT CONTACT SURFACE FINISH Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of Sections D.2.

TABLE-1. Recommended flow rates to achieve 5 FPS or 1.5 MPS

Sanitary Tube Size				Flow Rate	
OD	ID	OD	ID		
in.		cm		GPM	LPM
1.0	0.875	2.5	2.22	9.4	35.6
1.5	1.375	3.8	3.50	24.0	90.8
2.0	1.875	5.1	4.75	43.0	163.0
2.5	2.375	6.4	6.033	69.0	261.0
3.0	2.875	7.6	7.303	102.0	386.0
4.0	3.850	10.0	9.779	182.0	689.0

[3] Available from ASTM, 1916 Race St., Philadelphia, PA 19103-1187 (215-299-5400).

N.1

During processing, pipelines and equipment used to contain or conduct milk and milk products shall be effectively separated from tanks or circuits containing cleaning and/or sanitizing solutions (See Section F.5). This can be accomplished by:

O.1.5.3

Exposure to steam for at least 15 minutes after the temperature of the drainage at the outlet has reached 170 degrees F (76.7 degrees C) or for 5 minutes after the temperature of the drainage at the outlet has reached 200 degrees F (93.3 degrees C).

NOTE: Approved sanitization procedures and related recommendations are provided in detail in the Grade "A" Pasteurized Milk Ordinance — 1989 Recommendations of the U.S. Public Health Service/Food and Drug Administration.

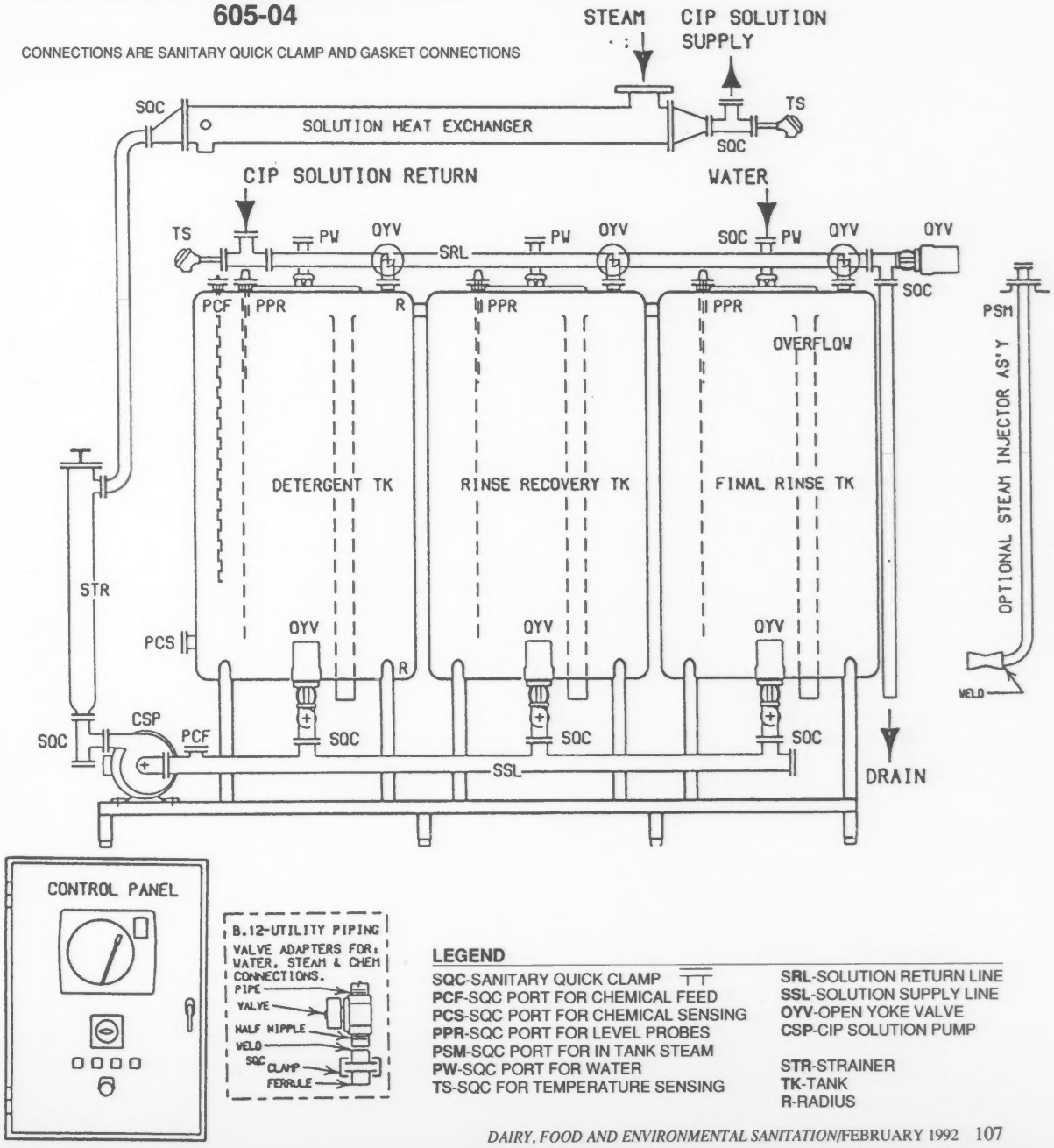
P

SCHEMATIC EXAMPLES OF MECHANICAL CLEANING (CIP) UNIT

These amended accepted practices shall become effective September 28, 1992, at which time the 3-A Accepted Practices for Permanently Installed Sanitary Product-Pipelines and Cleaning Systems, with Amendment, Number 605-03 are rescinded and become null and void.

MECHANICAL CLEANING CIP UNIT 605-04

CONNECTIONS ARE SANITARY QUICK CLAMP AND GASKET CONNECTIONS



LEGEND

SQC-SANITARY QUICK CLAMP
PCF-SQC PORT FOR CHEMICAL FEED
PCS-SQC PORT FOR CHEMICAL SENSING
PPR-SQC PORT FOR LEVEL PROBES
PSM-SQC PORT FOR IN TANK STEAM
PW-SQC PORT FOR WATER
TS-SQC FOR TEMPERATURE SENSING
SRL-SOLUTION RETURN LINE
SSL-SOLUTION SUPPLY LINE
QYV-OPEN YOKE VALVE
CSP-CIP SOLUTION PUMP
STR-STRAINER
TK-TANK
R-RADIUS

Dairy, Food and Environmental Sanitation, Vol. 12, No. 2, Pages 108-119 (February 1992)
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Holders of 3-A Symbol Council Authorization on February 15, 1992

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Walter F. Laun, Administrative Officer 3-A Symbol Council, 4403 First Avenue, Suite 404, Cedar Rapids, IA 52402 (319) 395-9151.

01-06 Storage Tanks for Milk and Milk Products

2 APV Crepaco, Inc. (5/1/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

28 Cherry-Burrell Corporation (10/3/56)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

117 DCI, Inc. (10/28/59)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

76 Damrow Company (10/31/57)
(A Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

172 Paul Mueller Co. (6/29/60)
P.O. Box 828
Springfield, Missouri 65801

440 Scherping Systems (3/1/85)
801 Kingsley St.
Winsted, Minnesota 55395

571 Viatec Process/Storage Systems (8/21/89)
500 Reed St.
Belding, Michigan, 48809

31 Walker Stainless Equipment Co., Inc. (10/4/56)
Elroy, Wisconsin 53929

02-08 Pumps for Milk and Milk Products

63R AVP Crepaco, Inc. (4/29/57)
100 South CP Ave.
Lake Mills, Wisconsin 53551

636 Abel Pumps Corporation (7/10/91)
79 North Industrial Park
503 North Drive
Sewickley, Pennsylvania 15143-2394
(Mfr: Abel Pumps, Buchen, Germany)

214R Ben H. Anderson Manufactures (5/20/70)
Box A
Morrisonville, Wisconsin 53571

212R Babson Brothers Company (2/20/70)
Dairy Systems Division
1400 West Gale
Galesville, Wisconsin 54630

205R Dairy Equipment Co. (5/22/69)
1919 S. Stoughton Rd., P. O. Box 8050
Madison, Wisconsin 53716

462 Enprotech Corporation (12/5/85)
335 Madison Avenue
New York, New York 10017

466 Fluid Metering Inc. (1/10/86)
29 Orchard St.
Oyster Bay, New York 11771

306 Fristam Pumps, Inc. (5/2/78)
2410 Parview Road
Middleton, Wisconsin 53562

65R G & H Products Corp. (5/22/57)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53141

492 A. Gusmer Inc. (1/15/87)
Mfg. by Philip Hilge GmbH
27 North Avenue East
Cranford, New Jersey 07016

145R ITT Jabsco Products (11/20/63)
(Mfg. by ITT Jabsco, England)
1485 Dale Way
Costa Mesa, California 92626

502 INOXPA, S.A. (4/27/87)
(not available in USA)
c/. Telers, 54
17820 Banyoles (Verona) Spain

314 Len E. Ivarson, Inc. (12/22/78)
3100 W. Green Tree Rd.
Milwaukee, Wisconsin 53209

603 Johnson Pumps (UK) Ltd (8/16/90)

325 Highfield Industrial Estate (8/16/90)
Edison Road, Eastbourne
East Sussex, England BN23 6PT
U. S. REP: Johnson Pump of America, Inc.
4825 Scott Street, Suit 306
Schiller Park, Illinois 60176

604 Johnson Pumps (UK) Ltd. (8/16/90)
(Not Available in the U.S.A.)
Highfield Industrial Estate
Edison Road, Eastbourne
East Sussex, England BN23 6PT

373 Luwa Corporation (12/27/82)
(Mfg. by MAAG Gear, Switzerland)
P.O. Box 16348
Charlotte, North Carolina 28297-6348

654 Mono Pumps Ltd., Dresser Pump Division (10/22/91)
Martin Street
Audenshaw, Manchester
England M34 5DQ
U.S. REP: MonoFlo, Dresser Pump Division
Dresser Industries
821 Live Oak Drive
Chesapeake, Virginia 23320-2601

400 Netzsch Incorporated (8/15/83)
119 Pickering Way
Exton, Pennsylvania 19341-139

595 Seepex US, Inc. (3/16/90)
(Formerly Pumpen - und Maschinenbau)
1834 Valley Street
Dayton, Ohio 45405

241 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

148R Robbins & Myers, Inc. (4/22/64)
1895 Jefferson St.
Springfield, Ohio 45506

364 Roper Pump Company (7/28/82)
P.O. Box 269
Commerce, Georgia 30529

568 Shanley Pump & Equipment, Inc. (5/15/89)
(Mfg. by Allweiler, West Germany)
2255-1 Lois Dr.
Rolling Meadows, Illinois 60008

507 Sine Pump (7/21/87)
Division of The Kontro Co., Inc.
500 West River Street
Orange, Massachusetts 01364

567 Stainless Products, Inc. (4/4/89)
1649-72nd Ave.
P.O. Box 169
Somers, Wisconsin 53171

72R L.C. Thomsen Inc. (9/14/57)
1303-43rd St.
Kenosha, Wisconsin 53140

26R Tri-Clover, Inc. (9/29/56)
9201 Wilmot Road
Kenosha, Wisconsin 53141

609 Tuthill Corp. (12/12/90)
Tuthill Pump Division
12500 S. Pulaski Road
Alsip, Illinois 60658

175R Universal Dairy (10/25/56)
11100 N. Congress Ave.
Kansas City, Missouri 64153

52R Viking Pump, Inc. (12/31/56)
A Unit of IDEX Corporation
406 State Street
Cedar Falls, Iowa 50613

29R Waukesha Fluid Handling (10/3/76)
(Formerly Cherry-Burrell
Fluid Handling Division)
611 Sugar Creek Road
Delavan, Wisconsin 53115

408 Westfalia Systemat (10/18/83)
(Mfg. by Westfalia, West Germany)
1862 Brummel Drive
Elk Grove Village, Illinois 60007

04-03 Homogenizers and High Pressure Pumps of the Plunger Type

37 AVP Crepaco, INC. (10/19/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

75 APV Gaulin, Inc. (6/26/57)
500 Research Dr.
Wilmington, Massachusetts 01887

309 APV Rannie, Inc. (7/19/78)
(Formerly Niro Atomizer Food & Dairy, Inc.)
445 Etna Street
Suite 57
St. Paul, Minnesota 55106

247 Alfa-Laval (4/14/73)
8400 Lake View Parkway
Suite 500
Pleasant Prairie, Wisconsin 53158

390 American Lewa, Inc. (6/9/83)
(Mfg. by Lewa, Germany)
132 Hopping Brook Road
Holliston, Massachusetts 01760

247 Bran & Luebbe, Inc. (4/14/73)
1025 Busch Parkway
Buffalo Grove, Illinois 60015

87 Cherry-Burrell Corp. (12/29/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, Wisconsin 53115

486 Fowler Products Company (11/18/86)
150 Collins Industrial Blvd.
P.O. Box 1706
Athens, Georgia 30613-1706

558 Niro Soavi S.p.A. (1/389)
43100 Parma (Italy)
VIA M. Da Erba Edoari, 29/A
Distributed in the U. S. by
Niro Hudson, Inc.
1600 Country Road F
Hudson, Wisconsin 54016

05-14 Stainless Steel Automotive Milk Transportation Tanks for Bulk Delivery and/or Farm Pick-up Service

379 Bar-Bel Fabricating Co., Inc. (3/15/83)
N 3760 Hwy 12 & 16
Mauston, Wisconsin 53948

70R Brenner Tank, Inc. (8/5/57)
450 Arlington Ave., P.O. Box 670
Fond du Lac, Wisconsin 54936

45 The Heil Company (10/26/56)
1125 Congress Pkwy.
P.O. Box 160
Athens, Tennessee 37303-0160

40 Hills Stainless Steel & Equipment Co., Inc. (10/20/56)
505 W. Koehn Street
Luverne, Minnesota 56156

66 Kari-Kool Transports, Inc. (5/29/57)
P.O. Box 538
Beaver Dam, Wisconsin 53916

201 Paul Krohnert Mfg. Ltd. (4/1/68)
(not available in USA)
811 Steeles Ave., P.O. Box 126
Milton, Ontario, Canada L9T 2Y3

513 Nova Fabricating Inc. (8/24/87)
404 City Rd.
P.O. Box 231
Avon, Minnesota 56310

85 Polar Tank Trailer, Inc. (12/20/57)
Holdingford, Minnesota 56340

653 Tremar (10/10/91)
(Not available in the U.S.A.)
1, Tougas Street
Iberville, Quebec, Canada J2X 2P7

25 Walker Stainless Equip. Co., Inc. (9/28/68)
618 State St.
New Lisbon, Wisconsin 53950

623 Walker Stainless Eq. Co., Inc. (3/28/91)
560 E. Burleigh Blvd.
P.O. Box 358
Tavares, Florida 32778

437 West-Mark (11/30/84)
2704 Railroad Ave., P.O. Box 418
Ceres, California 95307

08-17 Rev. Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products

349 APN, Inc. (12/15/81)
400 W. Lincoln
Caledonia, Minnesota 55921

260 APV Crepaco, Inc. (08-17 A&B) (5/21/75)
100 South CP Avenue
Lake Mills, Wisconsin 53551

470 Advance Stainless Mfg. Corp. (3/30/86)
218 West Centralia Street
Elkhorn, Wisconsin 53121

380 Allegheny Bradford Corp. (3/21/83)
P.O. Box 200 Route 219 South
Bradford, Pennsylvania 16701

79R Alloy Products Corp. (11/23/57)
1045 Perkins Ave., P.O. Box 529
Waukesha, Wisconsin 53187

621 Bradford Castmetals (2/25/91)
P. O. Box 33
Elm Grove, Wisconsin 53122

82R Cherry-Burrell Corp. (12/18/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, Wisconsin 53115

645 Cipriani, Inc. - Tassalini S.P.A. (8/27/91)
23195 LaCadena Drive
Suite #103
Laguna Hills, California 92653

528 Dayco Products Inc. (3/16/88)
333 West First Street
Dayton, Ohio 45402-3042

455 Flowtech Inc. (9/17/85)
1900 Lake Park Dr. Suite 345
Smyrna, Georgia 30080

271 The Foxboro Company (3/8/76)
33 Commercial Street
Foxboro, Massachusetts 02035

67R G & H Products Corp. (6/10/57)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53141

369 IMEX, Inc. (11/3/82)
(Mfg. by Lube Corp., Japan)
4040 Del Ray Ave. Unit 9
Marina del Rey, California 90292

454 Jensen Fittings Corp. (9/11/85)
107-111 Goundry St.
North Tonawanda, New York 14120-5998

389 Lee Industries, Inc. (5/31/83)
P.O. Box 688
Philipsburg, Pennsylvania 16866

239 Lumaco, Inc. (6/30/72)
P.O. Box 688
Teaneck, New Jersey 07666

601 Nave Gmbh (6/15/90)
Am Rotboell 5
6108 Weiterstadt 2
Germany

200R Paul Mueller Co. (3/5/68)
1600 W. Phelps St., Box 828
Springfield, Missouri 65801

242 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

424 Robert-James Sales, Inc. (8/31/84)
250 Ramsdell Ave.
Buffalo, New York 14216

334 Stainless Products, Inc. (12/18/80)
1649-72nd Ave., Box 169
Somers, Wisconsin 53171

391 Stork Food Machinery, Inc. (6/9/83)
(Mfg. by Stork Amsterdam, Netherlands)
P.O. Box 1258/Airport Parkway
Gainesville, Georgia 30503

357 Tanaco Products (4/16/82)
3860 Loomis Trail Rd.
Blaine, Washington 98230

449 Tech Controls Enterprise Co., Ltd. (8/2/85)
(Mfg. in Taiwan)
2940 SE 200th Avenue
Issaquah, Washington 98027

73R L.C. Thomsen, Inc. (8/31/57)
1303-43rd. St.
Kenosha, Wisconsin 53140

589 Titan Industries (12/27/89)
11121 Garfield Ave.
South Gate, California 90280

34R Tri-Clover, Inc. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

304 VNE Corporation (3/16/78)
1415 Johnson St.
Janesville, Wisconsin 53545

08-17A Compression Type Valves

533 APV Crepaco, Inc. (5/21/75)
100 S. CP Ave.
Lake Mills, Wisconsin 53551

484 APV, Inc. (10/22/86)
1325 Samuelson Rd.
Rockford, Illinois 61109

552 Alloy Products Corp. (11/23/57)
1045 Perkins Ave.
P.O. Box 529
Waukesha, Wisconsin 53187

245 Babson Brothers Company (2/12/73)
Dairy System Division
1400 West Gale Ave.
Galesville, Wisconsin 54630

443 Badger Meter, Inc. (4/30/85)
6116 East 15th Street
P. O. Box 581390
Tulsa, Oklahoma 74158-1390

555 Cherry-Burrell Corp. (12/11/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, Wisconsin 53115

538 Cipriani, Inc. (7/31/86)
(Mfg. by Fratelli Tassalini, Italy)
23195 La Cadena Drive, Suite 103
Laguna Hills, California 92653

376 Defontaine, Inc. (1/25/83)
(Mfg. by Defontaine, France)
563 A.J. Allen Circle
Wales, Wisconsin 53183

530 G & H Products Corp. (6/10/57)
7600-57th Ave.
P.O. Box 1199
Kenosha, Wisconsin 53141

480 GEA Food and Process Systems Inc. (8/8/86)

8940 Route 108
Columbia, Maryland 21045

607 Kammer Valve, Inc. (9/25/90)
510 Parkway View Drive
Pittsburgh, Pennsylvania 15205

570 LUMACO (8/9/89)
9-11 East Broadway
Hackensack, New Jersey 07601

594 Oden Corp. (3/6/90)
255 Great Arrow Ave.
Buffalo, New York 14207

483 On-Line Instrumentation, Inc. (10/15/86)
Rt. 376, P.O. Box 541
Hopewell Junction, New York 12533

652 Pierre Guerin SA (10/4/91)
BP.12 - 79210
Mauze-Sur-Le-Mignon
France
U.S. Rep: Alfa Technical Group, Inc.
601 Thompson Road N.
Syracuse, New York 13211

551 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Fracc. Ind. Puente de Vigas
Tlalnepantla, Mexico

149R Q-Controls (5/18/64)
Subsidiary of Cesco Magnetics
93 Utility Court
Rohnert Park, California 94928

542 L.C. Thomsen Inc. ((8/31/57)
1303-43rd. St.
Kenosha, Wisconsin 53140

34A Tri-Clover, Inc. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

467 Tuchenhagen North America Inc. (1/13/86)
(Mfg. by Otto Tuchenhagen, West Germany)
4119 W. Greentree Road
Milwaukee, Wisconsin 53209

561 VACU-PURG, Inc. (1/26/89)
214 West Main St.
P.O. Box 272
Fredericksburg, Iowa 50630

584 Valvinox Inc. (11/27/89)
654 1ere Rue.
Iberville-QUE-Canada J2X 3B8

86R Waukesha Specialty Co., Inc. (12/20/57)
P.O. Box 160, Hwy 14
Darien, Wisconsin 53144

08-17B Diaphragm-Type Valves

565 APV Rosista, Inc. (10/22/86)
(Mfg. by APV Rosista, Inc. W. Germany & Denmark)
1325 Samuelson Rd.
Rockford, Illinois 61109

615 AsepCo (1/4/91)
170 State Street, Suit 200
Los Altos, California 94022

617 Defontaine, Inc. (2/1/91)
563 A. J. Allen Circle
Wales, Wisconsin 53183

637 Gemu Valves, Inc. (7/10/91)
3800 Camp Creek Parkway
Bldg. 2400, Suite 102
Atlanta, Georgia 30331

514 H. D. Bauman Assoc., Ltd. (8/24/87)
35 Mirona Road
Portsmouth, New Hampshire 03801

203R ITT Grinnell Valve Co., Inc. (11/27/68)
Dia-Flo Division
33 Centerville Rd.
Lancaster, Pennsylvania 17603

494 Saunders Valve, Inc. (2/10/87)
15760 W. Hardy, #440
Houston, Texas 77060

08-17D Automatic Positive Displacement Sampler

291 Accurate Metering Systems Inc. (6/22/77)
(Mfg. by Diessel, Germany)
1650 Wilkening Ct.
Schaumburg, Illinois 60173

284 Bristol Engineering Co. (11/18/76)
210 Beaver St.
P.O. Box 696
Yorkville, Illinois 60560

08-17E Inlet and Outlet Leak-Protector Plug Valve

553 Alloy Products Corp. (11/23/57)
1045 Perkins Ave.
P.O. Box 529
Waukesha, Wisconsin 53187

556 Cherry-Burrell Corp. (12/12/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, WI 53115

34E Tri-Clover, Inc. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

08-17F Tank Outlet Valve

531 G & H Products Corp. (6/10/57)
7600-57th Ave.
P.O. Box 1199
Kenosha, Wisconsin 53141

534 Lumaco (6/30/72)
9-11 East Broadway
Hackensack, New Jersey 07601

643 Paul Mueller Company (8/22/91)
1600 West Phelps
Springfield, Missouri 65801

08-17G Rupture Discs

422 BS & B Safety Systems, Inc. (6/12/84)
7455 E. 46th St.
Tulsa, Oklahoma 74133

407 Continental Disc Corp. (10/14/83)
4103 Riverside NW
Kansas City, Missouri 64150

08-17H Thermoplastic Plug Type Valves

577 Ralet-Defay (11/2/89)
(U.S. Agent GENICANAM, Chazy, NY)
66, Blvd. Poincare
1070 Brussels, Belgium

08-17I Steam Injected Heaters

560 Pick Heaters, Inc. (1/19/89)
P.O. Box 516
West Bend, Wisconsin 53095

09-08 Instrument Fittings and Connections Used on Milk and Milk Products Equipment

32 ABB Kent-Taylor Inc. (10/4/56)
A Subsidiary of Asea Brown Brveri, Inc.
(Formerly Taylor Instruments)
95 Ames Street
P.O. Box 110
Rochester, New York 14692

428 ARI Industries, Inc. (9/I2/84)
381 ARI Court
Addison, Illinois 60101

321 Anderson Instrument Co., Inc. (6/14/79)
RD #I
Fultonville, New York I2072

586 Beta Technology, Inc. (12/14/89)
105 Harvey West Blvd.
Santa Cruz, California 95060

315 Burns Engineering, Inc. (2/5/79)
I0201 Bren Rd., East
Minnetonka, Minnesota 55343

206 The Foxboro Company (8/I1/69)
33 Commercial Street
Foxboro, Massachusetts 02035

592 Claud S. Gordon Co. (2/27/90)
5710 Kenosha St.
P.O. Box 500
Richmond, Illinois 6007I

620 Larad Equipment (2/25/91)
26 Pearl Street
Bellingham, Massachusetts 02019

588 Minco Products, Inc. (12/20/89)
7300 Commerce Lane
Minneapolis, Minnesota 55432

418 Niro Hudson (4/2/84)
(Formerly Niro Atomizer Food & Dairy)
1600 County Road F
Hudson, Wisconsin 54016

487 Pyromation, Incorporated (I2/16/86)
521I Industrial Road
Fort Wayne, Indiana 46825

367 RDF Corporation (10/2/82)
23 Elm Ave.
Hudson, New Hampshire 03051

495 Rosemount Analytical Division (2/13/87)
2400 Barranca Pkwy.
Irvine, California 9271I4

420 Stork Food Machinery, Inc. (4/17/84)
P.O. Box 1258/Airport Parkway
Gainesville, Georgia 30503

32 Taylor Instrument (10/4/56)
Combustion Engineering, Inc.
400 West Avenue, P.O. Box 1I0
Rochester, New York 14692

444 Tuchenhagen North America, Inc. (6/17/85)
4119 Green Tree Road
Milwaukee, Wisconsin 53209

612 Viatran Corp & Haenni Druckmittler (12/13/90)
300 Industrial Drive
Grand Island, New York 14072

522 Weed Instrument Company, Inc. (I2/28/87)
707 Jeffrey Way
Round Rock, Texas 78664

10-03 Milk and Milk Products Filters Using Disposable Filter Media, as Amended

371 Alloy Products Corp. (12/10/82)
1045 Perkins Ave., P.O. Box 529
Waukesha, Wisconsin 53187

593 Filtration Systems (3/2/90)
Div. of Mechanical Mfg. Corp.
I0304 NW 50th St.
Sunrise, Florida 33351

435 Sermia International (11/27/84)
(Not available in USA)
26 Emilein Frenette
Ste-Therese
Quebec, Canada J7E 5K6

296 L. C. Thomsen, Inc. (8/25/77)
1303 43rd St.
Kenosha, Wisconsin 53140

35 Tri-Clover, Inc. (I0/15/56)
9201 Wilmot Road
Kenosha, Wisconsin 5314I

11-04 Plate-type Heat Exchangers for Milk and Milk Products

365 APV Baker AS (9/8/82)
(not available in USA)
Platinvej, 8
P.O. Box 329
DK-6000 Kolding
Denmark

20 APV Crepaco, INC. (9/4/56)
395 Fillmore Ave.
Tonawonda, New York 14150

17 Alfa-Laval Food & Dairy Co. (7/28/82)
(Div. of Alfa-Laval Inc.)
8400 Lake View Parkway
Pleasant Prairie, Wisconsin 53158

120 Alfa-Laval, Agri Inc. (12/3/59)
11100 No. Congress Ave.
Kansas City, Missouri 64153

30 Cherry-Burrell Corp. (10/2/56)
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

14 Chester-Jensen Co., Inc. (8/15/56)
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016

468 GEA Food and Process Systems Inc. (2/2/86)
8940 Route 108
Columbia, Maryland 21045

622 ITT Standard (2/25/91)
175 Standard Parkway
Cheektowaga, New York 14227
P.O. Box 1102
Buffalo, New York 14240-1102

326 Karbate Vicarb Inc. (2/4/80)
(Mfg. by vicarb, France)
21945 Drake Rd.
Strongsville, Ohio 44136

I5 Kusel Equipment Co. (8/15/56)
820 West St., P.O. Box 87

Watertown, Wisconsin 53094

360 Laffranchi Wholesale Co. (7/12/82)
P.O. Box 698
Ferndale, California 95536

657 Microfluidics Corp. (11/4/91)
90 Oak Street
P.O. Box 9101
Newton, Massachusetts 02164-9101

491 On-Line Instrumentation, Inc. (1/2/87)
P.O. Box 541
Hopewell Junction, New York 12533

414 Paul Meuller Co. (12/13/83)
P.O. Box 828
Springfield, Missouri 65801

279 The Schlueter Company (8/30/76)
(Mfg. by Samuel Parker, New Zealand)
216 Center Ave.
Janesville, Wisconsin 53547

650 Schmidt-Bretten, Inc. (10/3/91)
20475 Woodingham Drive
Detroit, MI 48221

658 Thermaline (11/15/91)
180-37th Street
Auburn, Washington 98001

610 Universal Dairy Equipment (12/13/90)
(Mgr. Skellerup Engineering,
Auckland, New Zealand)
11100 N. Congress Avenue
Kansas City, Missouri 64153

12-05 Tubular Heat Exchangers for Milk and Milk Products

614 Alfa-Laval Food & Dairy (12/27/90)
(Manufactured by Spiraflo Indus.
Australia)
8400 Lake View Parkway, Suite 500
Pleasant Prairie, Wisconsin 53158

628 Alfa-Laval Food & Dairy Company (5/2/91)
8400 Lakeview Parkway
Suite #500
P.O. Box 500
Pleasant Prairie, WI 53158

438 APV Crepaco, INC. (12/10/84)
395 Fillmore Avenue
Tonawanda, New York 14150

248 Allegheny Bradford Corp. (4/16/73)
P.O. Box 200 Route 219 South
Bradford, Pennsylvania 16701

243 Babson Brothers Company (10/31/72)
Dairy Systems Division
140 West Gale
Galesville, Wisconsin 54630

605 Cherry-Burrell (8/30/90)
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

103 Chester-Jensen Co., Inc. (6/6/58)
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016

613 Efrex Corp. (12/27/90)
11 Kitty Hawk Drive
Pittsford, NY 14534-1620

298 Feldmeier Equipment, Inc. (1/28/85)
6800 Town Line Road
P.O. Box 474
Syracuse, New York 13211

307 G & H Products Corp. (5/2/78)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53141

217 Girton Manufacturing Co. (1/31/71)
Millville, Pennsylvania 17846

616 ITT Standard
175 Standard Pkwy
P.O. Box 1102
Buffalo, New York 14240-1102

238 Paul Mueller Co. (6/28/72)
P.O. Box 828
Springfield, Missouri 65801

96 C. E. Rogers Co. (3/31/64)
So. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

532 Scherping Systems (6/8/88)
801 Kingsley St.
Winsted, Minnesota 55395

392 Stork Food Machinery, Inc. (6/9/83)
(Mfg. by Stork, Netherlands)
P.O. Box 1258/Airport Parkway
Gainesville, Georgia 30503

591 Thermotech/Div. of Fristam Pumps, Inc. (2/8/90)
2410 Parview Rd.
Middleton, Wisconsin 53562

632 Yula Corporation (6/4/91)
330 Bryant Avenue
Bronx., New York 10474

13-08 Farm Milk Cooling and Holding Tanks

240 Babson Brothers Company (9/6/72)
Dairy Systems Division
1400 West Gale
Galesville, Wisconsin 54630

4R Dairy Equipment Co. (6/15/56)
1919 So. Stoughton Rd.
Madison, Wisconsin 53716

179R Heavy Duty Products (Preston) Ltd. (3/8/66)
(Not available in USA)
1261 Industrial Rd.
Cambridge (Preston)
Ontario, Canada N3H 4W3

12R Paul Mueller Co. (7/31/56)
1600 W. Phelps, P.O. Box 828
Springfield, Missouri 65801

611 Universal Dairy Equipment (12/13/90)
11100 N. Congress Avenue
Kansas City, Missouri 64153

16-05 Evaporators and Vacuum Pans for Milk and Milk Products

254 APV Crepaco, Inc. (1/7/74)
165 John L. Dietsch Square
Attleboro Fall, Massachusetts 02763

132 APV Crepaco, INC. (10/26/60)
395 Fillmore Ave.
Tonawanda, New York 14150

277 Alfa-Laval, Inc. (8/19/76)
Contherm Division
P.O. Box 352, 111 Parker St.
Newburyport, Massachusetts 01950

639 Damrow Company (7/10/91)
421-6th Street South
Winsted, Minnesota 55395

500 Dedert Corporation (4/9/87)
20000 Governors Drive
Olympia Fields, Illinois 60461

311 GEA Food and Process Systems Inc. (8/28/79)
8940 Route 108
Columbia, Maryland 21045

273 Niro Evaporators, Inc. (5/20/76)
(Formerly Niro Atomizer
Food and Dairy)
9165 Rumsey Road
Columbia, MD 21045

107R C.E. Rogers Co. (7/31/58)
So. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

299 Stork Food Machinery, Inc. (11/17/77)
(Mfg. by Stork, Holland)
P.O. Box 1258/Airport Parkway
Gainesville, Georgia 30503

186R Marriott Walker Corp. (9/6/66)
925 E. Maple Rd.
Birmingham, Michigan 48011

17-07 Formers, Fillers and Sealers of Single Service Containers for Milk and Milk Products

366 Autoprod, Inc. (9/15/82)
(An Alcoa Subsidiary)
5355 115th Avenue N.
Clearwater, Florida 34620

192 Cherry-Burrell Corp. (1/3/67)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

382 Combibloc, Inc. (4/15/83)
(Mfg. by Jagenberg, West Germany)
4800 Roberts Rd.
Columbus, Ohio 43228

324 Erca USA, Inc. (11/29/79)
(Mfrd. by Erca, France
72A Grays Bridge Road
Brookfield, Connecticut 06804

488 Fords Holmatic Inc. (12/22/86)
1750 Corporate Dr.-Suite 700
Norcross, Georgia 30093

619 Hassia Verpackungsmaschinen GmbH (2/22/91)
6479 Ranstadt 1/Hessen Germany
(Hassia USA, Inc. 39 Plymouth St.
Fairfield, New York 07007)

648 Interkemek AB (9/23/91)
Nyttorp
S-693 00 Degerfors
Sweden
US Rep: FlowTech, Inc.
P.O. Box 71986
Marietta, Georgia 30007-1986

473 International Paper Company (6/12/86)
Extended Shelf Life Division
4020 Stirrup Creed Drive Bldg. 200
P.O. Box 13318
Research Triangle Park, North Carolina 27709

220 Tetra-Pak EquipUS (4/24/71)
2285 University Avenue
St. Paul, MN 55114
(formerly Liquipak)

330 Milliken Packaging (8/26/80)
(Mfg. by Chubukkikai, Japan)
White Stone, South Carolina 29353

442 Milliken Packaging (2/21/85)
White Stone, South Carolina 29386

137 Pure-Pak, Inc. (10/17/62)
850 Ladd Road
Walled Lake, Michigan 48088

281 Purity Packaging Corp. (11/8/76)
800 Kaderly Dr.
Columbus, Ohio 43228

511 Remy Division (8/14/87)
(Mfg. by E. P. Remy, France)
2096 Gaither Road, Suite 119
Rockville, Maryland 20850

482 Serac Inc. (8/25/86)
300 Westgate Drive
Carol Stream, Illinois 60188

351 Tetra Pak Inc. (1/7/82)
(Mfg. by A. B. Tetra, Italy)
889 Bridgeport Ave.
P.O. Box 807
Shelton, Connecticut 06484-0807

19-04 Batch Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amended

141 APV Crepaco, INC. (4/15/63)
100 South CP Ave.
Lake Mills, Wisconsin 53551

146 Cherry-Burrell Corp. (12/10/63)
P.O. Box 35600
Louisville, KY 40232-5600

286 O. G. Hoyer, Inc. (12/8/76)
(Mfg. by O. G. Hoyer A/S, Denmark)
201 Broad Street
Lake Geneva, Wisconsin 53147

465 Leon's Frozen Custard (12/17/85)
3131 S. 27th Street
Milwaukee, Wisconsin 53151

573 Processing Machinery & Supply Company (9/28/89)
(Mfg. by PMS Italiana, Italy)
1108 Frankford Ave.
Philadelphia, Pennsylvania 19125

412 Sani Mark, Inc. (11/28/83)
2020 Production Drive
Indianapolis, Indiana 46241

355 Emery Thompson Machine & Supply Co. (3/9/82)
1349 Inwood Ave.
Bronx, New York 10452

22-04 Silo-type Storage Tanks for Milk and Milk Products

154 APV Crepaco, Inc. (2/10/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

168 Cherry-Burrell Corp. (6/16/65)
(A Unit of AMCA Int'l, Inc.)
575 E. Mill Street
Little Falls, New York 13365

160 DCI, Inc. (4/5/65)
P.O. Box 1227, 600 No. 54th Ave
St. Cloud, Minnesota 56301

181 Damrow Co. (5/18/66)
(Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

312 Feldmeier Equipment, Inc. (9/15/78)
6800 Town Line Road
P.O. Box 474

Syracuse, New York 13211

439 JV Northwest Inc. (1/22/85)
28120 SW Boberg Rd.
Wisonville, Oregon 97070

460 Niro Hudson (11/5/85)
1600 Country Road "F"
Hudson, Wisconsin 54016

155 Paul Mueller Co. (2/10/65)
1600 W. Phelps, P.O. Box 828
Springfield, Missouri 65801

503 Ripley Stainless Ltd. (5/1/87)
(Not available in USA)
RR #3, Site 41
Summerland, British Columbia V0H 1Z0

479 Scherping Systems (8/3/86)
801 Kingsley Street
Winsted, Minnesota 55395

165 Walker Stainless Equipment Co., Inc. (4/26/65)
Elroy, Wisconsin 53929

23-01 Equipment for Packaging Frozen Desserts, Cottage Cheese, and Similar Milk Products, as Amended

174 APV Crepaco, Inc. (9/28/65)
Filling & Wrapping Systems Div.
1303 Samuelson Road
Rockford, Illinois 61109

209 Doboy Packaging Machinery Incorp. (7/23/69)
869 S. Knowles Ave.
New Richmond, Wisconsin 54017

499 Fords Holmatic, Inc. (3/19/87)
1750 Corporate Dr., Suite 700
Norcross, Georgra, 30093

222 Sweetheart Packaging (11/15/71)
10100 Reistertown Road
Owing Mills, Maryland 21117
(Formerly Fort Howard Pkg. Corp.)

635 Interbake Foods (7/10/91)
Dairy Division
2220 Edward Holland Drive
Suite 301
Richmond, Virginia 23230

343 O.G. Hoyer, Inc. (7/6/81)
(Mfg. by Alfa Hoyer, Denmark)
201 Broad St.
Lake Geneva, Wisconsin 53147

626 Klockner Bartelt, Inc. (4/2/91)
5501 N. Washington Blvd.
Sarasota, FL 34243-2283

447 Mateer-Burt Co., Inc. (7/22/85)
(Mfg. by Trustpak, England)
436 Devon Park Drive
Wayne, Pennsylvania 19087

537 Osgood Industries, Inc. (7/19/88)
601 Burbank Rd.
Oldsmar, Florida 34677

24-01 Non-coil Type Batch Pasteurizers

158 APV Crepaco, INC. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

161 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

187 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

519 Feldmeier Equipment, Inc. (10/22/87)
6800 Town Line Road
P.O. Box 474
Syracuse, New York 13211

166 Paul Mueller Co. (4/26/65)
P.O. Box 828
Springfield, Missouri 65801

25-01 Non-coil Type Batch Processors for Milk and Milk Products

159 APV Crepaco, INC. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

162 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

188 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

167 Paul Mueller Co. (4/26/65)
P.O. Box 828
Springfield, Missouri 65801

564 Precision Stainless, Inc. (2/27/89)
3300 E. Pythian
Springfield, Missouri 65801

448 Scherping Systems (8/1/85)
801 Kingsley Street
Winsted, Minnesota 55395

520 Stainless Fabrication, Inc. (12/8/87)
633 N. Prince Lane
Springfield, Missouri 65802

202 Walker Stainless Equip. Co., Inc. (9/24/68)
618 State St.
New Lisbon, Wisconsin 53950

26-02 Sifters for Dry Milk and Dry Milk Products

173 Blaw-Knox Food & Chemical Equip. Co. (9/20/65)
P.O. Box 1041
Buffalo, New York 14240

634 Great Western Mfg. Co. (7/10/91)
2017 South Fourth Street
P.O. Box 149
Leavenworth, Kansas 66048

363 Kason Corp. (7/28/82)
1301 East Linden Ave.
Linden, New Jersey 07036

430 Midwestern Industries, Inc. (10/11/84)
915 Oberlin Rd., P.O. Box 810
Massillon, Ohio 44648-0810

185 Rotex, Inc. (8/10/66)
1230 Knowlton St.
Cincinnati, Ohio 45223

656 Separator Engineering Ltd. (11/4/91)
(Not Available in the U.S.A.)
810 Ellingham Street
Pointe Clair, Quebec, Canada H9R 3S4

172 Sweco, Inc. (9/1/65)
7120 Buffington Rd.
Florence, KY 41042

176 Sprout-Bauer Inc. (1/4/66)
(Subsidiary of Combustion Engineering)
Muncy, Pennsylvania 17756

27-01 Equipment for Packaging Dry Milk and Dry Milk Products

353 All-Fill, Inc. (3/2/82)
418 Creamery Way
Exton, Pennsylvania 19341

618 Hayssen Manufacturing Company (2/18/91)
(Manufactured by Yamato Scale Co.
Akasi, 673, Japan)
5300 Highway 42 North
P.O. Box 571
Sheboygan, Wisconsin 53082-0571

625 Ishida Scales Mfg. Co., Inc. (4/2/91)
44, Sanno-Cho, Shogoin
Sakyo-Ku, Kyoto, Japan
US Rep: Heat & Control
225 Shaw Rd.
S. San Francisco, CA 94080

409 Mateer-Burt Co. (10/31/83)
436 Devon Park Dr.
Wayne, Pennsylvania 19087

476 Stone Container Corporation (7/17/86)
1881 West North Temple
Salt Lake City, Utah 84116-2097

497 Triangle Package Machinery Co. (2/26/87)
6655 West Diversey Ave.
Chicago, Illinois 60635

28-01 Flow Meters for Milk and Milk Products

272 Accurate Metering Systems, Inc. (4/2/76)
1651 Wilkening Court
Schaumburg, Illinois 60173

253 Badger Meter, Inc. (1/2/74)
4545 W. Brown Deer Rd.
P.O. Box 23099
Milwaukee, Wisconsin 53223

518 Bailey Controls Company (10/16/87)
29801 Euclid Avenue
Wickliffe, Ohio 44092

359 Brooks Instruments (6/11/82)
407 West Vine St.
Hatfield, PA 19440

660 Danfoss A/S (11/20/91)
DK-6430
Nordborg, Denmark
US Rep: Danfoss Electronics
2995 Eastrock Drive
Rockford, Illinois 61109

469 Endress + Hauser, Inc. (3/3/86)
2350 Endress Place
Greenwood, Indiana 46142

599 Euromatic Machine & Oil Co., Ltd (4/26/90)
P.O. Box 297
St. Helier
Jersey C.I. UK

540 EXAC Corporation (8/12/88)
6410 Via Del Oro
San Jose, California 95119

226 Fischer & Porter Co. (12/9/71)
County Line Rd.
Warminster, Pennsylvania 18974

477 Flowdata Inc. (7/31/86)
1784 Firman Drive
Richardson, TX 75081

506 Flow Technology, Inc. (6/17/87)
4250 East Broadway Road
Phoenix, Arizona 85040

224 The Foxboro Company (11/16/71)
33 Commercial Street
Foxboro, Massachusetts 02035

649 Geo Technology (10/2/91)
12312 E. 60th Street
Tulsa, Oklahoma 74146

661 G/H Products Corp. (11/21/91)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53142

562 Great Lakes Instruments, Inc. (2/6/89)
8855 North 55th Street
Milwaukee, Wisconsin 53223

630 Halliburton Services (5/28/91)
Drawer 1431
Duncan, Oklahoma 73536-0602

574 Hersey Measurement Co., Inc. (10/12/89)
150 Venture Blvd.
P.O. Box 4585
Spartanburg, South Carolina 29305

512 Hoffer Flow Controls, Inc. (8/17/87)
107 Kitty Hawk Lane
Elizabeth City, NC 27909

474 Hydril Production (6/30/86)
Technology Division
330 North Belt East
Houston, Texas 77032-3411

535 Invalco, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

399 E. Johnson Engineering & Sales (8/3/83)
11 N. Grant St.
Hinsdale, Illinois 60521

529 Krohne America, Inc. (5/18/88)
(Mfg. by Altometer, Holland)
One Intercontinental Way
Peabody, Massachusetts 01960

378 Micro Motion, Inc. (2/16/83)
7070 Winchester Circle
Boulder, Colorado 80301

490 Rosemount Inc. (1/8/87)
12001 Technology Dr.
Eden Prairie, Minnesota

585 Schlumberger Industries Ltd. (12/7/89)
(Mfg. by Schlumberger, England)
11321 Richmond Ave.
Houston, Texas 77082-2615

587 Schlumberger Ind., Measurement Div. (12/18/89)
(Mfg. by Schlumberger, France)
1310 Emerald Rd.
Greenwood, South Carolina 29646

550 Sparling Instruments Co., Inc. (10/26/88)
4097 N. Temple City Blvd.
P.O. Box 5988
El Monte, California 91731

270 Taylor Instrument (2/9/76)
Combustion Engineering, Inc.
400 West Avenue, P.O. Box 110
Rochester, New York 14692

265 Tokheim Automation (3/10/75)
P.O. Box 38269
Dallas, Texas 75238
(formerly Emerson Elec. Co.)

386 Turbo Instruments, Inc. (5/11/83)
(Mfg. by Turowerk, West Germany)
4 Vashell Way

Orinda, California 94563

664 XO Technologies, Inc. (12/16/91)
28020 Avenue Stanford
Valencia, California 91355

29-00 Air Eliminators for Milk and Fluid Milk Products

340 Accurate Metering Systems, Inc. (6/2/81)
1651 Wilkening Court
Schaumburg, Illinois 60173

662 G/H Products Corp. (11/21/91)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53142

436 Scherping Systems (11/27/84)
801 Kingsley Street
Winsted, Minnesota 55395

30-01 Farm Milk Storage Tanks

421 Paul Mueller Co. (4/17/84)
P.O. Box 828
Springfield, Missouri 65801

31-01 Scraped Surface Heat Exchangers, as Amended

290 APV Crepaco, INC. (6/15/77)
100 South CP Ave.
Lake Mills, Wisconsin 53551

274 Alfa-Laval, Inc. (6/25/76)
Contherm Div.
P.O. Box 352, 111 Parker St.
Newburyport, Massachusetts 01950

323 Cherry-Burrell Corp. (7/26/79)
Process Equipment Division
P.O. Box 35600
Louisville, KY 40232-5600

496 FR Mfg. Corp. (2/23/87)
2807 South Highway 99
Stockton, California 95202

361 N.V. Terlet (7/12/82)
(US Agent Manning & Lewis-NJ)
P.O. Box 62
7200 AB Zutphen
Netherlands

32-00 Uninsulated Tanks for Milk and Milk Products

397 APV Crepaco, INC. (6/21/83)
100 South CP Ave.
Lake Mills, Wisconsin 53551

264 Cherry-Burrell Corp. (1/27/75)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

268 DCI, Inc. (11/21/75)
600 No. 54th Ave., P.O. Box 1227
St. Cloud, Minnesota 56301

354 C.E. Rogers Co. (3/3/82)
S. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

441 Scherping Systems (3/1/85)
801 Kingsley St.
Winsted, Minnesota 55395

339 Walker Stainless Equip. Co., Inc. (6/2/81)
618 State St.
New Lisbon, Wisconsin 53950

33-00 Polished Metal Tubing for Dairy Products

310 Allegheny Bradford Corp. (7/19/78)
P.O. Box 200 Route 219 South
Bradford, Pennsylvania 16701

413 Azco, Inc. (12/8/83)
P.O. Box 567
Appleton, Wisconsin 54912

308 Rath Manufacturing Co., Inc. (6/20/78)
2505 Foster Ave.
Janesville, Wisconsin 53545

368 Rodger Industries Inc. (10/7/82)
(Not available in USA)
P.O. Box 186, RR1
Blenheim, Ontario
Canada N0P 1A0

335 Stainless Products, Inc. (12/18/80)
1649-72nd Ave., Box 169
Somers, Wisconsin 53171

289 Tri-Clover, Inc. (1/21/77)
9201 Wilmot Road
Kenosha, Wisconsin 53141

331 United Industries, Inc. (10/23/80)
1546 Henry Ave.
Beloit, Wisconsin 53511

34-01 Portable Bins

647 Thomas Conveyor Company (9/18/91)
Tote System Division
555 So. I-35W
Burleson, Texas 76028

35-00 Continuous Blenders

578 ACT Laboratories, Inc. (11/3/89)
P.O. Box 1107
McMurray, Pennsylvania 15317

527 Arde Barinco, Inc. (3/15/88)
500 Walnut Street
Norwood, New Jerey 07648

526 Bepex Corp./Schugi (3/15/88)
(Mfg. by Lelystad, Netherlands)
333 Taft St. NE
Minneapolis, Minnesota 55413

590 Chemineer Inc. (1/23/90)
125 Flagship Dr.
North Andover, Massachusetts 01845

417 Cherry-Burrell (2/7/84)
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

464 Dairy Service Mfg., Inc. (12/12/85)
4630 W. Florissant Ave.
St. Louis, Missouri 63115

642 Mondomix Holland b.v. (8/7/91)
Reeweg 13
P.O. Box 98
1394 ZH Nederhorst den Berg
The Netherlands
US Rep: Carrier Assoc.
50 Dunnell Lane
Paawtucket, Rhode Island 02860-5828

36-00 Colloid Mills

293 Cherry-Burrell (8/25/77)
611 Sugar Creek Road
Delavan, Wisconsin 53115

608 Kinematica (10/17/90)
170 Linden Street
Wellesley, Massachusetts 02181

37-01 Liquid Pressure and Level Sensing Devices

576 Ametek/Mansfield & Green Division (10/13/89)
8600 Somerset Dr.
Largo, Florida 34643

318 Anderson Instrument Co., Inc. (4/9/79)
R.D. #1
Fultonville, New York 12072

659 Bindicator Company (11/20/91)
1915 Dove Street
Port Huron, Michigan 48060

525 Caldwell Systems Corporation (3/4/88)
2450 Armstrong Street
Livermore, CA 94550
(Formerly Zantel Instruments)

640 Dresser Industries (7/16/91)
Instrument Division
250 East Main Street
Stratford, Connecticut 06497

663 Dresser Industries (12/4/91)
Instrument Division
210 Old Gate Lane
Milford, Connecticut 06460

405 Drexelbrook Engineering Co. (9/27/83)
205 Keith Valley Rd.
Horsham, Pennsylvania 19044

423 Dynisco (6/15/84)
Ten Oceana Way
Norwood, Massachusetts 02062

459 Endress + Hauser, Inc. (10/17/85)
2350 Endress Place
Greenwood, Indiana 46142

524 Flow Technology, Inc. (1/14/88)
4250 E. Broadway Road
Phoenix, Arizona 85040

463 The Foxboro Company (12/6/85)
33 Commercial Street
Foxboro, Massachusetts 02035

651 Granzow, Inc. (10/3/91)
2300 CrownPoint Executive Drive
Charlotte, North Carolina 28227
(Mfr: Kubler AG
Baar, Switzerland)

633 Griffith Industrial Products Company (6/21/91)
P.O. Box 111
Putnam, CT 06260

557 Honeywell, Inc. (12/21/88)
Industrial Controls Div.
1100 Virginia Drive
Fort Washington, Pennsylvania 19034

629 Intrinsic Safety Equipment of Texas (5/20/91)
907 Bay Star
Webster, TX 77598-1531

598 Invalco, Inc. (3/22/90)
P.O. Box 556
Tulsa, Oklahoma 74101

572 ITT Conoflow (9/25/89)
P.O. Box 768
Rt 78
St. George, South Carolina 29477

396 King Engineering Corp. (6/13/83)
P.O. Box 1228
Ann Arbor, Michigan 48106

501 Lumenite Electronic Company (4/27/87)
2331 N. 17th Avenue
Franklin Park, Illinois 60131

596 Magnetrol International (3/20/90)
5300 Belmont Rd.
Downers Grove, Illinois 60515

627 Milltronics Process Measurements (4/12/91)
709 E. Stadium Drive
Arlington, TX 76011

419 Niro Hudson (4/2/84)
(Formerly Niro Atomizer Food & Dairy)
1600 County Road F
Hudson, Wisconsin 54016

597 NUOVA FIMA S.p.A. (3/20/90)
(not available in USA)
Via C. Battisti 59
28045 - INVORIO (N0) Italy

523 Paper Machine Components, Inc. (1/3/88)
Miry Brook Road
Danbury, Connecticut 06810

554 Par Sonics, Inc. (11/30/88)
P.O. Box 1127
State College, Pennsylvania 16804

563 PI Components Corp. (2/13/89)
10825 Barely Lane, Suite H
Houston, Texas 77070

644 Princo Instruments, Inc. (8/22/91)
1020 Industrial Highway
Southampton, Pennsylvania 18966-4095

328 Rosemount Inc. (5/22/80)
12001 Technology Dr.
Eden Prairie, Minnesota

515 Setra Systems, Inc. (9/14/87)
45 Nagag Park
Acton, Massachusetts 01720

583 S.J. Controls, Inc. (11/11/89)
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Coming Events

1992

March

•**6, The 1992 National Frozen Food Month Kick-Off Dinner**, sponsored by the Central Indiana Frozen Foods Association, will be held at the Indiana Roof Ballroom, Indianapolis, IN. For more information contact the Central Indiana Frozen Foods Association, Attention: Gerald Carter, P. O. Box 50872, Indianapolis, IN 46250; (317)842-7700.

•**10-11, Milk Procurement Workshop**, sponsored by the organizations of the International Dairy Foods Association, will be held at the Clarion Hotel St. Louis, St. Louis, MO. For more information contact IDFA Marketing & Training Institute, Attn: Registrations, 888 Sixteenth Street, NW, 2nd Floor, Washington, DC 20006-4103; (202)296-4250.

•**10-11, Safety for Food Plant Sanitation Workers**, sponsored by the American Institute of Baking, will be held at the Sheraton Poste Inn, Cherry Hill, NJ. For more information contact AIB, 1213 Bakers Way, Manhattan, KS 66502; or call (913)537-4750, (800)633-5137.

•**10-12, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For registration information contact Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**11, U. W. Dairy Manufacturer's Conference**, sponsored by the University of Wisconsin-Extension, will be held at The Paper Valley Hotel, Appleton, WI. For more information, contact Bill Wendorff, Dept. of Food Science, 1605 Linden Drive, Madison, WI 53706; (608)263-2015.

•**11-13, Cell Culture and Hybridomas: Quality Control and Cryopreservation Techniques**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**12-14, Dairy Distribution Conference**, sponsored by the Milk Industry Foundation and International Ice Cream Association, will be held at the San Diego Princess Hotel, San Diego, CA. For more information contact IDFA Marketing & Training Institute, 888 Sixteenth Street, NW, 2nd Floor, Washington, DC 20006-4103; (202)296-4250.

•**16-18, Food Product Development/Ingredient Technology,** sponsored by the University of California-Davis, Davis, CA. Contact: Sharon Munowitch, University Extension, University of California, Davis, CA 95616-8727, (916)757-8896.

•**16-19, Better Process Control School,** sponsored by the University of California-Davis, Davis, CA. Contact: Sharon Munowitch, University Extension, University of California, Davis, CA 95616-8727, (916)757-8896.

•**18, Indiana Dairy Industry Conference** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

•**23-25, Principles of Quality Assurance**, sponsored by the American Institute of Baking, will be held at AIB, 1213 Bakers Way, Manhattan, KS. For more information contact AIB at (913)537-4750 or (800)633-5137.

•**23-27, Midwest Workshop in Milk, Food and Environmental Sanitation** will be held at The Ohio State University, Department of Food Science and Technology, 2121 Fyffe Road, Columbus, OH 43210-1097. For more information contact David Dzurec at (614)292-7723.

•**23-27, Recombinant DNA: Techniques and Applications**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**26-27, Safety for Food Plant Sanitation Workers**, sponsored by the American Institute of Baking, will be held at the Embassy Suites-North, Dallas, TX. For more information contact AIB, 1213 Bakers Way, Manhattan, KS 66502; or call (913)537-4750, (800)633-5137.

•**26-27, Introduction to Methodologies for Microbiologists and Sanitarians**, Fifth Annual Meeting of the Nebraska Association of Milk and Food Sanitarians, to be held at the University of Nebraska, Lincoln, NE. For more information call Dr. Susan Sumner, (402)472-7807. To register, write to Dr. Fred Cook, ConAgra Frozen Foods, 6 ConAgra Drive, Omaha, NE 68102.

•**30-April 1, Polymerase Chain Reaction (PCR™) Applications/Cycle DNA Sequencing**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**30-April 3, Wisconsin Cheese Technology Short Course** will be held at the University of Wisconsin, Madison, WI. For more information, contact Bill Wendorff, Department of Food Science, (608)263-2015.

•**30-31, Sanitation By Design Seminar**, sponsored by ASI Food Safety Consultants', will be held in St. Louis, MO. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

April

•**7-9, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Econo Lodge, 333 Northwest Loop 410, San Antonio, TX. For registration information contact Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**10-11, International Lyme Diease Conference** includes Public Health and Veterinary Track, Stamford, CT, contact The Lyme Disease Foundation (203)871-2900.

•**12-15, Application of Predictive Microbiology and Computer Modeling Techniques to the Food Industry (SIM International Workshop)**, will be held at the Hyatt Regency Hotel, Tampa, FL. For information, contact Dr. Robert L. Buchanan, Microbial Food Safety Research Unit, USDA-ARS-ERRC, 600 East Mermaid Lane, Philadelphia, PA 19118, call (215)233-6620, FAX (215)233-6581.

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

•**25-29, The Sixth Conference for Food Protection** will be held at the Tremont Plaza Hotel, Baltimore, MD. For further information contact Leon Townsend, Executive Secretary, Conference for Food Protection, 110 Tecumseh Trail, Frankfort, Kentucky 40601, (502)695-0253.

•**27-28, 10th Annual Biotechnology Patent Conference**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

-•**29-30, Food Safety and Sanitation Short Course**, sponsored by the American Association of Cereal Chemists, to be held in Minneapolis, MN. For more information, contact AACC, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; (612)454-7250; FAX (612)454-0766.

May

•**3-6, Centennial Conference of the Ice Cream Short Course** to be held at the J.O. Keller Conference, The Pennsylvania State University, 306 Ag. Administration Building, University Park, PA 16802. For further information call (814)865-8301, FAX (814)865-7050.

•**4-5,Food Safety for Zero Defects Seminar**, sponsored by ASI Food Safety Consultants', will be held in St. Louis, MO. For more information call Christine VerPlank or Nancy Sullivan toll-free at (800)477-0778 or, in MO, (314)725-2555, or write, ASI, P.O. Box 24198, St. Louis, MO 63130.

•**4-6, Food Processing Automation Conference**, sponsored by the Food & Process Engineering Institute, will be held at the Hyatt Regency, Lexington, KY. For more information, contact Jon Hiler, Conference Manager, FPEI, 2950 Niles Road, St. Joseph, MI 49085-9659; Phone (616)429-0300, FAX (616)429-3852.

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

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

•**11-14, Purdue Aseptic Processing and Packaging Workshop** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, Phone: (317)494-8279.

•**13-15, Microscopy/Photomicrography**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805

•**19-22, Hybridomas & Monoclonal Antibody Techniques**, sponsored by the American Type Culture Collection, will be held in Rockville, MD. For more information contact ATCC/Workshops, 12301 Parklawn Drive, Rockville, MD 20852; (301)231-5566; FAX (301)770-1805.

•**25-29, Trace Elements in Health and Disease**, Third ISTERH (International Society for Trace Elements Research in Humans) Conference, and Fourth NTES (Nordic Trace Elements) Conference, to be held in Stockholm, Sweden. For more information contact ISTERH/NTES 1992, Scientific Secretariat, Dr. Lars-Olof Plantin, Clinical Research Centre, Huddinge Hospital, S 141 86 HUDDINGE, Sweden; Phone: +46-8 746 55 68; FAX: +46-8 746 74 83.

June

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

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

July

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

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

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

August

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

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

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

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

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

September

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

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

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

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

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October

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

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

November

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

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_____	Procedures to Investigate Waterborne Illness $5.00/member; $7.50/non-member	_____
_____	Procedures to Investigate Foodborne Illness - new 4th Edition $5.00/member; $7.50/non-member	_____
_____	Procedures to Investigate Arthropod-borne and Rodent-borne Illness $5.00/member; $7.50/non-member	_____
_____	Procedures to Implement the Hazard Analysis Critical Control Point System $5.00/member; $7.50/non-member	_____
_____	Pocket Guide To Dairy Sanitation $.50/member; $.75/non-member (minimum order of 10) ($2.50 shipping for each order of 10)	_____

Multiple copies available at reduced prices.

Subtotal _____
Shipping _____
Add $1.50 for first item. $.75 for each additional item
Booklet Total _____

3-A Sanitary Standards

Qty.		Total $
_____	Complete set 3-A Dairy Standards $33 member; $49.50 non-member	_____
_____	Complete set 3-A Dairy & Egg Standards $48 member; $72 non-member	_____
_____	3-A Egg Standards $28 member; $42 non-member	_____
_____	Five-year Service on 3-A Sanitary Standards 3-A Dairy & Egg Standards $44 member; $66 non-member	_____

Subtotal _____
U.S. Shipping _____
Add $3.25 for each item
Shipping
Outside U.S. _____
Add $8.25
3-A Sanitary Standards Total _____

PRINT OR TYPE . . . ALL AREAS MUST BE COMPLETED IN ORDER TO BE PROCESSED

Name _____ Company Name _____
Job Title _____ Office Phone # _____
Address _____
City _____ State/Province _____ Country _____ Zip _____

PAYMENT MUST BE ENCLOSED IN ORDER TO PROCESS

____ CHECK OR MONEY ORDER
____ MASTER CARD
____ VISA
____ AMERICAN EXPRESS

U. S. FUNDS on U. S. BANK

CARD # _____
EXP. DATE _____
YOUR SIGNATURE _____

MAIL ENTIRE FORM TO:

IAMFES
502 E. LINCOLN WAY
AMES, IA 50010-6666

($25.00 minimum Charge Card Order)
OR USE YOUR CHARGE CARD 1-800-369-6337
1-800-284-6336 (Canada)
515-232-6699 **FAX 515-232-4736**

IAMFES

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

MEMBERSHIP APPLICATION

MEMBERSHIP

- ❑ **Membership *Plus* $80**
  (Includes *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection*)
- ❑ **Membership with *Dairy, Food and Environmental Sanitation* $50**
- ❑ **Check here if you are interested in information on joining your state/province chapter of IAMFES**

SUSTAINING MEMBERSHIP

- ❑ **Membership with BOTH journals $450**
  Includes exhibit discount, July advertising discount, company monthly listing in both journals and more.

STUDENT MEMBERSHIP

- ❑ **Membership *Plus* including BOTH journals $40**
- ❑ **Membership with *Dairy, Food and Environmental Sanitation* $25**
- ❑ **Membership with the *Journal of Food Protection* $25**

*Student verification must accompany this form

❑ **Surface**
❑ **AIRMAIL**

POSTAGE CHARGES: Outside the U.S. add $15 per journal surface rate **OR** $95 per journal AIRMAIL rate. **U.S. funds only, drawn on U.S. Bank.**

PRINT OR TYPE . . . ALL AREAS MUST BE COMPLETED IN ORDER TO BE PROCESSED

Name_____ Company Name_____

Job Title _____ Office Phone #_____

Address_____ FAX # _____

City_____ State/Province_____ Country_____ Zip_____

Renewal_____ New Membership/Subscription_____

PAYMENT MUST BE ENCLOSED IN ORDER TO PROCESS

MAIL ENTIRE FORM TO:

IAMFES
502 E. LINCOLN WAY
AMES, IA 50010

____ CHECK OR MONEY ORDER
____ MASTER CARD
____ VISA
____ AMERICAN EXPRESS

U.S. FUNDS on U.S. BANK

CARD #_____

EXP. DATE _____

YOUR SIGNATURE_____

OR USE YOUR CHARGE CARD 1-800-369-6337
(800)284-6336 (Canada)
515-232-6699
FAX 515-232-4736

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

IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc

DFES
2/92

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

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

Name _____ Title _____

Company _____

Address _____

City _____ State/Prov. _____

Country _____ Zip _____

Phone Number _____

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

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

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

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

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Ames, Iowa 50010

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Ames, Iowa 50010

The Sheraton Centre Toronto

Welcomes the 79th IAMFES Annual Meeting

July 26-29, 1992

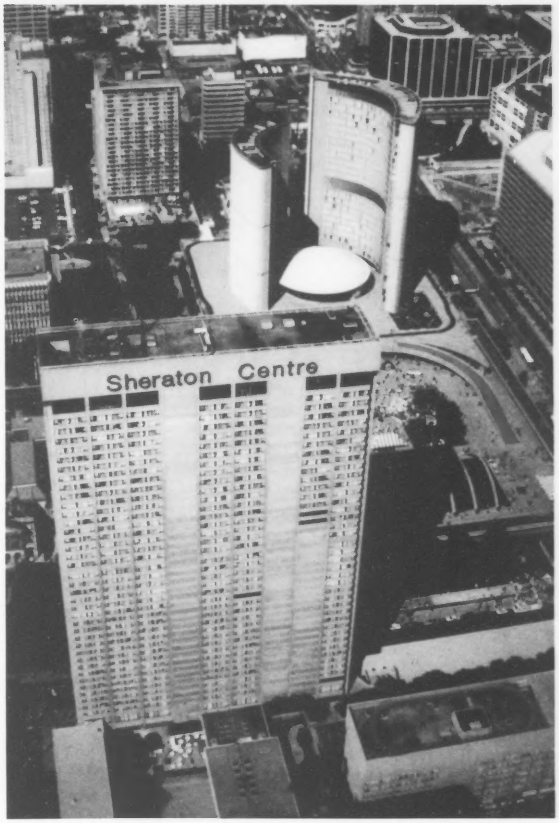
and Invites You and Your Family to Experience and Enjoy the Hospitality of Toronto

The Sheraton Centre Toronto Hotel & Towers
A Great Hotel!

The Sheraton Centre, **recipient of Meetings and Conventions magazine's prestigious Gold Key Award in 1989, 1990 and 1991,** features guest rooms and suites to suit everyone's taste. Our 1,394 rooms and suites are located in the 43-floor Queen Tower and in the 11-floor Richmond Tower. There are eleven non-smoking floors and twenty one rooms adapted for physically disabled guests. Guests will be delighted with our $47 million dollar renovation.

The Towers

The Towers provides upgraded deluxe accommodations for the discriminating business or convention traveller. A "hotel within a hotel," the Towers comprises 150 rooms located on the 20-25th floors of the Queen Tower. Guests check in and out at the reception desk on the 20th floor. The Towers Lounge, where coffee and tea are available all day, and hors d'oeuvres are served each afternoon, is provided for Towers guests. A complimentary continental breakfast is also offered. In addition to superb facilities and upgraded amenities, a butler, service attendant and receptionist are on duty from 6 am - 11 pm seven days a week to ensure all guests' needs are met. Towers guests also enjoy privileges at the Adelaide Club, a premier health and fitness club in the First Canadian Place.



Hospitality Suites

Ten elegant hospitality suites, located on the 4th floor of the Queen Tower, are individually decorated. Suites accommodate from 12 to 100 people at any one time for guests' entertainment needs.

Underground System

The Sheraton Centre is ideally located with direct underground access to The Bay Department Store, the entire Eaton Centre Shopping Mall, and more than 1,000 shops and retail services. The underground system also connects the Sheraton Centre with City Hall, the office towers of Bay Street, the Toronto Stock Exchange, and Union Station. Shopping, dining, transportation, and the pedestrian skyway linking Union Station with the fabulous SkyDome and the CN Tower make Toronto's underground city a visitor's delight.

Sheraton Centre Facilities

Enjoy a variety of dining pleasures at our eight restaurants:

Winter Palace
Postcards
Lion Dog
Reunion Bar
Bites Cafe
Good Queen Bess Pub
Brown Bag
Aloha Lagoon Poolside

and our cocktail lounges provide a relaxing respite from the day's activities:

Lion Dog Lounge & Long Bar
Reunion Bar & Lounge
Aloha Lagoon
Pinnacle Bar & Lounge
Good Queen Bess Pub

Retail Shops & Services

The Plaza at the Sheraton Centre has more than 65 stores, restaurants, and services, including fine souvenirs, fashions for men and women, and some terrific fast food outlets.

Health Facilities

Wonderful Indoor/Outdoor swimming year-round, Hot Tub, Saunas, Exercise Room, and Registered Massage Therapist are all at our guests' disposal.

A Little Charm Can Really Grow on You.

Charm I/ Cowside II

...is better than ever! The ideal system for any plant, it detects beta-lactams, sulfa drugs — and now *tetracyclines and macrolides!*

- ✓ **PMO approved test** for beta-lactams (liquid reagents)
- ✓ **Meets safe levels** for more drugs than any other test in its class
- ✓ **Quantitative** results
- ✓ **Lowest-priced** system of its kind
- ✓ **Equipment supplied** through reagent purchase plan
- ✓ Simple and **user friendly**
- ✓ Use for **all dairy products**

CHARM SCIENCES INC.

36 FRANKLIN STREET, MALDEN, MA 02148-4120 U.S.A. TEL: (617) 322-1523 FAX: (617) 322-3141

Please circle No. 185 on your Reader Service Card

Nothing works like a Charm.