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DAIRY, FOOD AND ENVIRONMENTAL

SANITATION

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A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

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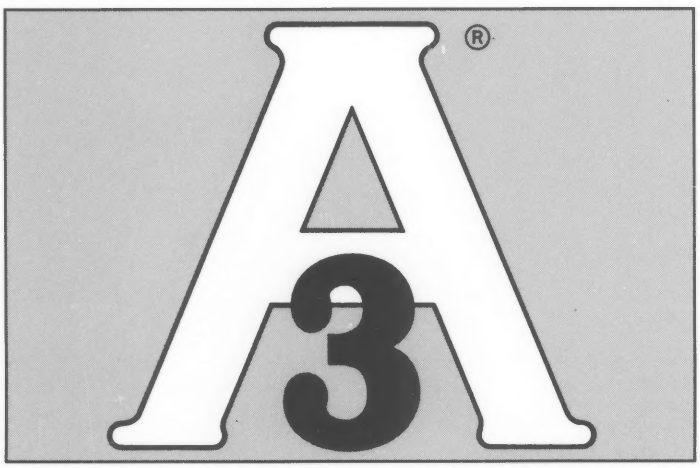

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Thoughts From the President . . .

By
Bob Sanders
IAMFES President

I bring you greetings from the office of your President. By the time you read this, the 77th IAMFES Annual Meeting will have been held and your new officers will have started their duties. In actuality as I write this, (June 17), the final plans are being made for the Annual Meeting. For those of you who attended the meeting, I am sure you enjoyed it. There were eighteen graduate student papers presented during the twenty sessions of the Annual Meeting. One of the student papers was from a Canadian University - a first time occurrence. In addition there were more than 120 speakers. These included speakers from four countries outside the United States. IAMFES is truly living up to its name and becoming International. Your past President, Ron Case, and Dee Buske, of the Ames office, have been working with several individuals in England and Europe in an effort to form an Affiliate of IAMFES for Europe.

Many of the IAMFES committees met during the Annual Meeting. They utilized this time to meet and culminate the work they had been carrying out during the past year. One of the committees meeting was the newly created committee to study the proposal for a name change for IAMFES. I would urge each of you who have a strong opinion on the proposal for a name change to make your feelings known to Mike Doyle, chairman of the committee, or to any other member of the committee. The other members are Ruth Fuqua, Dave Fry, Larry Roth, Harold Bengsch, Bill Coleman and Allen Katsuyama.

I would also like to welcome the two newest members to the IAMFES Executive Board. They are Harold Bengsch, Secretary and Ron Schmidt, Chairperson of the Affiliate Council. WELCOME ABOARD.

I should also thank the retiring past president, Bob Gravani, for the unceasing efforts that he has put forth during his five years on the Executive Board.

I will try to keep up the good work of your past presidents and continue this column each month. The November issue will carry a full account, along with pictures, of the events at the 77th Annual Meeting.

Thanks once again to the Illinois and Wisconsin Affiliates for hosting the 77th Annual Meeting.

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Dairy, Food and Environmental Sanitation CONTENTS

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The Antibiotic Residue Problem - A Veterinarian's Viewpoint

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The past calendar year has really been exciting for those of us involved in the dairy industry. Prices have continued to increase and at January 1st stood at record levels. With the exception of butter, minimal or no dairy products have been purchased by the Federal Government. However, there is a major problem that lies just beneath the current rosy surface of our industry - the antibiotic residue problem. The dairy industry's ability to market a wholesome, uncontaminated product that is viewed as such by a majority of the consumers in the United States is in serious jeopardy. Most people can remember the problems that occurred several years ago with contaminated Tylenol products that reached various market areas in the United States. What would happen to our industry if all milk or milk containing foods were recalled from stores' and consumers' shelves? The makers of Tylenol spent over 600 million dollars to gain back just some of the market share that they enjoyed before the poisoning scare.

With the revelations that approximately 70% of the milk samples in several metropolitan areas including Boston and Seattle were contaminated with Sulfamethazine, all in the dairy industry could also be faced with much more adverse publicity than we have seen in the recent past. There has been at least one segment of "60 Minutes" dealing with the potential contamination of milk products along with articles in many national newspapers and news magazines. This publicity is definitely not what the dairy industry needs today. Currently, what publicity has been generated has not shaken the confidence that American consumers have in dairy products as a source of wholesome, uncontaminated, nutritional components of our diet. However, those that are involved in the dairy industry need to realize the potential devastation that could concur to our complete marketing system if adulterated, contaminated milk is not removed from the market place.

Residue Testing Milk

For many years the dairy industry has operated on the principle that we can be saved by dilution. Some milk that might have low levels of contamination, is diluted with vast amounts of uncontaminated milk and we end up with no detectable residues in milk products.

The introduction with what is commonly referred to as the Charm II test certainly has changed this. The Charm II test and several recently introduced FDA tests are many times more sensitive than any of the current methods of detecting antibiotic or sulfa residues in milk employed by the majority of milk plants. In order for the dairy industry to survive, it is imperative to understand how some of these residues can be avoided in our milk at the farm level.

Unfortunately, at this point in time, there are not enough inexpensive farm tests that we can use to detect the extremely low levels of residues that the Charm II and other sophisticated tests are capable of detecting. This creates a real problem because some may feel that there is no contamination on a particular farm, when, there may be a contaminated feed source, an inadvertent use of an antibiotic, or an unobserved withdrawal time for certain drugs. However, these farms do not have residues that are red flagged with the conventional tests that are now being utilized at many milk plants. Therefore, this milk is mixed into the processing channels and it may not be until the product is actually on the shelf in the consumer form before the contamination is found. At that point, it is too late because the damage has been done with the product already in the market place. Here lies the problem for the dairy industry.

What Must We Do?

We certainly could complain about the adoption of these new sensitive tests by those in the industry who can afford the technology. However, before we make our complaints very loud and vocal, there are many things that we as dairy producers, dairy professionals, and especially dairy veterinarians can do to help insure that we are not contributing to antibiotic contamination of milk because of sloppy, on farm, medication procedures.

There is a fundamental change in the attitudes of both dairy producers and dairy veterinarians necessary to help resolve the potential nightmarish problems that we face with antibiotic residues. We need to change our attitude when it comes to disease problems in cows. Diseases need to be prevented, not treated.

It is astounding to see some of the drug products and conditions under which drugs are stored on many of our producing dairy farms. If many of these farms were depicted in national publications or TV broadcasts, the bottom would fall out of our market. All of us have seen this type of dairy in operation.

What is really amazing is to look back in the literature and see that 25 to 30 years ago, approximately 50% of the cows in the United States were infected with mastitis causing organisms in one or more quarters. Over the last 25 or 30 years, the veterinary profession and dairy producers

have thrown all possible antibiotic combinations either into cow's quarters, into their veins, or they have developed some other method of treating cows with antibiotic products. However, the level of mastitis basically is the same today as it was 25 or 30 years ago. There is a very conservative estimate on the part of NMC indicating that the average dairy cow in the United States is losing $181 per year because of mastitis. The technology, the research, and the data are at hand to help control mastitis. However, the adoption of this information has been very slow to trickle down and become a part of everyday management on most dairy farms. Many veterinarians and dairymen find it much easier to throw antibiotics at the problem than to really look at the causes of mastitis and make the management changes to reduce the level of mastitis that we see on our farms.

Field Observations

The few approved drugs for use in lactating animals, in many cases, are certainly not the most effective antibiotics to use in treating mastitis problems. My point is not to discourage or condemn the extra label use of antibiotics, but to use extra label antibiotics in a reasonable and well-thought-out treatment program that hopefully will insure that contaminated milk is not mixed into the normal processing channels.

Dairymen should work closely with veterinarians and to observe the withdrawal times that they recommend. In many cases, veterinarians leave written directions to hold the milk for "x" number of milkings. If you as a dairyman send that milk to your milk processing plant and request an antibiotic test on it, you find that in many cases, within a matter of two days, the milk test will be negative for antibiotics even though the withdrawal time may have been as long as 12 days. What do we do? We sell the milk.

The test that we have available at the local level, many times, will not have the sensitivity of some of the newer tests about which we are speaking. Without adequate cow side or milk plant testing of the same sensitivity, we really have a problem in maintaining an uncontaminated milk product for the consumer. There certainly is no way that the use of antibiotics can be eliminated from the average dairy farm in this country. However, drugs could and should be used in a wise and well-thought-out manner. Drugs should not be used without a label that tells both the milk withdrawal and the meat withdrawal times that must be observed prior to marketing these products. If your veterinarian mixes a specific prescription type item for use in a certain individual cow on your farm, be sure to find out exactly what is the necessary withholding time. In many cases, the veterinarian may not have a totally accurate answer and the time interval that he recommends may, in fact, be more than is necessary. But it needs to be observed.

We need to have milk and tissue residue withdrawal times established for products even if they are not approved in lactating animals. It is common knowledge that many products are being used in food producing animals to treat specific illnesses, but we do not have good clinical data to give us accurate withdrawal times. Many times veterinarians are faced with the task of coming up with a withdrawal time when there is not adequate data available. Most veterinarians tend to adopt recommended withdrawal times for which there is some evidence to suggest what is correct. Withdrawal time determination is a problem that veterinarians face after having had considerable training in the use of drugs and the preparation of drugs for use in animals.

What about the mixtures that are put together on the desk in the barn office? There may be as many as four or five active ingredients including a corticosteroid and possibly some other products that would help the diffusion of the drug through mammary tissue. What kind of withdrawal time would we put on this type of a product? The obvious answer is that we should not use this product. Dairymen would be well advised to use commercially prepared mastitis tube treatments and not to rely on either homemade products or even products that are routinely manufactured or put together for that use by practicing veterinarians. The potential problems with the contamination of these products with yeast and fungi and then the concurrent contamination of mammary tissue with these organisms warrants great concern. But of even greater concern, is how do we arrive at effective withdrawal times for "bathtub" mixtures? There is not any way to come up with an adequate withdrawal time for this type of product.

The Bottom Line

The production of quality, uncontaminated milk demands that:

1. Drugs be used only when necessary.
2. The treatments used have a prescribed withdrawal time.
3. These treatment products are stored on the farm in a manner such that they cannot contaminate the milk supply.

The ultimate responsibility for uncontaminated milk leaving the farm lies with the dairy producer and his veterinarian. Although the technology in some areas is way ahead of the technology that is available on the farm, rational, well-thought-out drug treatment programs can reduce dramatically the amount of adulterated milk that enters the marketplace. Producing uncontaminated milk remains the most important issue facing the dairy industry today.

We need to follow the viewpoint from a talk presented by John Adams at the National Mastitis Council summer meeting in Tampa, Florida. "We cannot fail in this challenge for the failure will be reflected in adverse consumer and government reaction. Our failure will lead to the loss of needed drug products and the loss of consumer confidence in our product. Let us all continue to work together so that we are able to continually reassure consumers that our milk supply is the safest it can possibly be! Our number one business as cooperatives is marketing milk for the highest return for the dairy farmer members. We cannot market contaminated products."

This paper was presented at the 29th Annual Meeting of the National Mastitis Council, Inc., in Louisville, Kentucky, February 12-14, 1990.

Dairy, Food and Environmental Sanitation, Vol. 10, No. 8, Pages 491-493 (August 1990)

Laboratory Robotic Automation through Intelligent System Control and Instrument/Data Networking

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Today many companies face stiff competition in the marketplace and, in order to remain competitive, they are being forced to do their jobs better by doing the "Right Thing Right". This philosophy cuts across all groups within the company from marketing, to purchasing and to the research and development group. One aspect of doing things better, is to follow the credo, "If it ain't broke, Improve It!". One of the programs of the Analytical Food Research group at Ocean Spray Cranberries, Inc. puts this belief to work by trying to improve appropriate laboratory procedures through automation. The goal of this program is to continually improve upon the efficiency and effectiveness of our support to various programs such as product development, pesticide screening and quality assurance.

The Automation Trend at Ocean Spray

Over the last several years, our lab has successfully implemented several different forms of automation, including: chromatographic data collection and processing, chromatographic auto-samplers and injectors, and an automated LC system with column and detector switching. However, up to now we have been unsuccessful in implementing a LIMS (Laboratory Information Management System) into our laboratory's operation. With these various experiences in automation, we felt a robotic laboratory automation project should be investigated next with the goal of providing us with a working automation system, but, more importantly, practical experience in this area of automation, that could be used to define other appropriate tasks that might benefit from this technology.

Roadblocks to Automation

In justifying and introducing automation, robotic or otherwise, into the laboratory, there should always be an appreciation for the problems or roadblocks that can be encountered in each situation. At Ocean Spray, we had three main roadblocks. We handle a variety of analyses, but may only have one or two samples to process per analysis. In addition, we needed to introduce automation in a manner that was easily assimilated into the everyday routine of our lab, and minimize the disruption to those people who would be working with the system. Therefore, in order for this to be a successful automation project, (one that would handle the types of sample analyses and sample loads we experienced and also be accepted and used by lab personnel) it had to be *flexible*. Many forms of automation are set up to deal with fixed, routine and mechanical tasks in the lab and by nature, are inflexible. However, in our lab, routine is the exception. The staff handles a variety of tasks, which if automated, require systems that enhance their flexibility, not limit them.

Robotic Automation Project

An important function of the analytical services lab involves the testing of various fruit juice concentrates purchased by Ocean Spray as ingredients for our products. This testing procedure was considered the most suitable for robotic automation because it was performed on a relatively routine basis, it provided a relatively high sample volume load and the personnel involved with this testing were eager and adaptable towards automation. The procedure involves analyzing different fruit juice concentrates for total titratable acidity, microbial contamination and sensory analysis. The rest of this paper will describe the process we went through over a one and a half year timeframe, to design, develop and implement this project.

System Design

To develop a robotic laboratory automation system for the concentrate QC testing program, we decided to implement the system in several phases. Together with our vendor, Source For Automation, (SFA), (Milford, MA), a detailed plan was devised which divided the project into three levels of implementation and provided a useful function at each development stage. Developing the system in this manner allowed a gradual incorporation of the system into the lab, provided a validation of the system at each stage, and permitted further researching and refinement of the plan as we progressed. The major feature designed into the system was to provide intelligent control over the system's operation. This control was provided through the use of an information database and sample barcoding. This eliminated the need for the system user to input specific dilution information for each sample, eliminated the requirement for loading the samples in any predefined order, and allowed the user to add new samples to the current process queue, without having to reset the system. A

second aspect of the system design, was to use "off-the-shelf" industry standard equipment instruments, interfaced and/or controlled by the system. Finally, we wanted the system design to provide both hardware and software modularity, allowing for future changes and/or updates.

Data Automation Phase

In the first phase of the project, we decided to automate the handling of the data associated with the concentrate QC testing program. It was necessary to have an understanding of the type of information needed to operate the system, and of the means in which the results were to be collected and managed. This phase was designed around a PC-AT for a workcell controller that runs a Lotus 1-2-3 macro control program and communicates to a Swedot (*Goteberg, Sweden*) barcode printer and Symbol Technologies (*Bohemia, NY*) Laserscan barcode reader using National Instruments' Lotus Measure (*Austin, TX*) RS-232 driver and SFA's RS-232 intelligent port expander (IPE).

The Lotus 1-2-3 macro-control program allows the technician to log samples into a Lotus spreadsheet for samples and results, using Ocean Spray's evaluation number for the sample. The technician would also enter the degree Brix (a refractometer value for the percent sugar) of the juice concentrate and the sample's IAN number (an Ocean Spray number identifying the ingredient). The program then does a lookup into a sample information database. This lookup returns the single strength juice concentration for the sample in degree Brix. The two sugar concentration values will be used by the Lotus 1-2-3 macro-control program in Phase Two to calculate the dilution factor and use it to determine how much concentrate must be weighed out to make up 250 mls of single strength juice. The program then prints off a barcode to be attached to the sample bottle which incorporates the sample evaluation number and dilution information. At this point in the system the sample is analyzed by the technician and the results recorded for entry back into the Lotus spreadsheet. The sample bottle barcode is read with the Laserscan barcode reader to open the Lotus spreadsheet for that sample and the program prompts the technician to enter the results for the sample into the database.

Analytical Automation Phase

In the second phase of the project, the automation of the tasks performed in concentrate testing was added to the system's operation by incorporating the equipment and instruments needed to do sample and solvent transfers, dilutions, stirrings, washings and titrations. The pumps, valves, stirrers, balance and pH meter listed in Figure 3 included such items as a Hamilton (*Reno, NV*) 941 dual 10ml syringe pump, a Cole Parmer (*Chicago, IL*) Masterflex computerized drive peristaltic pump, a Sartorius (*Bohemia, NY*) model 1419 toploading electronic balance, an Orion (*Cambridge, MA*) Model 501 analog pH meter, and Omega (*Stamford, CT*) 1131 A/DC for the titration module. The goal of this phase was to allow the technician to move the sample from station to station, while the task at each station was performed automatically under the system's control.

The main addition in this phase was a PC-XT as a workstation controller. The RS-232 port expander was moved to this workstation PC and a SFA Digital Input/Output Module (DIOM) was added for switch closure control of devices such as the stirrers. The PC-XT workstation runs compiled QuickBasic (*Microsoft, Redmond, WA*) programs written to interface with the instrument modules in the system, such as the electronic balance and syringe pump. The workstation executes these instrument subroutines, through the IPE, when called by an updated version of the Lotus 1-2-3 macro-control program running on the PC-AT workcell controller. The PC-AT communicates with the workstation over a direct RS-232 connection. The macro-control program executes the next step of the program after receiving a "done" flag from the workstation.

The balance was used in the system to weigh out the volumes of liquid being transferred by pipet, instead of attempting to dispense by volume. The density of the liquid was taken into account where necessary. In addition to providing gravimetric validation of all liquid transfers, the balance would provide an easy way to error check the performance of the system, after the system is totally automated in Phase Three. The sample would be moved to each station in the system by the operator when prompted to by the macro-control program, such as placing the sample at the balance station, stirring the sample after it has been diluted, or transferring an aliquot of the sample to the titration station, which runs as a software module under control of the PC-XT workstation.

Robotic Automation Phase

All that was necessary to implement the third phase of the project, was to install the robotic arm, the SFA Sample Transport System (STS). A Mektronixs (*Goleta, GA*) three axis motor controller card was installed in the PC-XT workstation. Another QuickBasic programs to provide for the teaching and naming of patterns that could be executed when called by a third updated version of the Lotus 1-2-3 macro-control program. The sample transport system is a three axis cartesian design robot using digital optical encoding on all three axes and has a universal, pneumatically actuated end effector attached for picking up the various containers used in the system and the transfer pipet.

System Updating

Several months after the initial completion of the robotic lab automation project, the system had to be dismantled due to relocation of our lab to our new Ocean Spray corporate headquarters. In planning to move and re-

install the system we were at a point where some changes and updates could be made. The system as originally designed, required two dedicated PCs in order to function: the workcell controller provided the system database and the Lotus 1-2-3 macro-control program and the workstation controller executed all the macro-control program commands to the system. This began an inefficient use of our computer hardware, since the PC-AT was used to run other lab programs. We also had found that it was difficult, but necessary to incorporate error checking in the macro-control program and that it could be accidentally changed if the user was not careful. We began to talk about these problems with Source for Automation. They proposed a lab system network, with the system workcell controller able to function independently of the individual workstations. The workcell controller or network server would download the operating information to the workstation controller or network node which would run a QuickBasic program in place of the Lotus 1-2-3 macro-control program. We decided to start incorporating this networked automation approach into the concentrate testing system.

Automation Networking Phase

In this fourth phase, the system was redesigned with the addition of a second SFA-IPE at the workcell controller, to which the barcode printer was attached, while leaving room to attach future workstations, such as a station for reading juice concentration and one for logging in samples. Communication between the workcell and the workstation is still accomplished using Lotus Measure, but now it is done through the SFA-ITEs attached to each PC. In addition, several hardware updates were made to the system, including a capping station for the micro dilution bottles, actuated through four states of operation by the SFA-DIOM.

A new Lotus 1-2-3 macro-program was written, which still maintains the sample information database but no longer controls the system by sending commands to the workstation. Instead, the macro-program sends the barcode string to the workstation. The sample information contained in the barcode is parsed into the QuickBasic program used to run the system. A compiled QuickBasic program was written to replace the original Lotus 1-2-3 macro-control program. From this program, we can maintain the system and set it up to run either locally at the workstation level or under supervisor control. When under supervisor control, the system looks for the barcode string from the workcell controller and parses the sample information contained in the barcode into the QuickBasic program used to run the system. In addition, several system error checks were incorporated into the QuickBasic control program, by using the electronic balance as previously mentioned.

With this "quasi" PC local area network (LAN), we have gained back the use of PC-AT workcell controller for other functions in the lab. In addition, the concept can be applied to a true LAN which, when tied in with a lab information management system, will produce a lab automation management system for the control and management of sample processing and sample data in the automated laboratory.

Conclusion

With careful planning, a multi-phased approach to the development of a lab robotic automation system for the testing of fruit juice concentrates was successfully implemented at Ocean Spray Cranberries, Inc. The use of a sample information database and barcodes provides users the flexibility to customize the system's operation for each type of sample. This flexibility may be applied at an even higher level where different QuickBasic programs can be called, based on the sample barcode information, to perform several different analyses with the same system hardware, such as a pesticide extraction or an LC or GC cleanup. Finally, this phased implementation approach provided a system of automation that was functional at each stage of development and provided a framework in which the system can evolve.

Acknowledgements

I would like to express my gratitude to Ms. Charlotte Oldham, who has been a valuable co-worker and asset to the development and success of this project. I would also like to thank Dr. Elia Coppola for the support he has given to this project.

Reprinted from Scientific Computing and Automation, December Issue. *David Cunningham earned his B.S. degree in Chemistry from the State University of New York, Albany Campus, and his Ph.D. degree in Food Chemistry from Cornell University, where his research concentrated on the odor active volatiles of apples. After a short stay with the Food and Drug Administration as a junior staff fellow, where he worked on fruit juice adulteration, he joined Ocean Spray Cranberries in 1985 as an analytical chemist. Currently, he is a senior research chemist with Ocean Spray where he is involved with analytical and process methods development, and is interested in the use of computers and automation in the lab.*

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Can Somatic Cell Counts Get Too Low?

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Research and field experience during the last decade has proven that elevated somatic cell counts have a negative effect on milk production/cow, milk processing characteristics, and overall quality and profitability of the dairy industry (1,6,12). Many producers have successfully strived to lower herd somatic cell counts, spurred on by quality premiums from processors. A major question that has arisen from this excellent shift in herd cell counts is "Can somatic cell counts be too low?" Better stated, the real question is "Are cows or herds with low cell counts at greater risk to mastitis infections due to lower immunity in the mammary gland?"

What are somatic cells?

Somatic cells are white blood cells or body defense cells whose primary functions are to eliminate infections and repair tissue damage. These cells are constantly circulating in the blood stream. When infection, irritation or damage occurs, the body then sends high quantities of somatic cells to the injured site. There are a few different types of cells. *Phagocytes* (PMN's and macrophages) are the primary somatic cells in the mammary glands (PMN's especially during infection). Their purpose is to phagocytize or engulf and destroy bacteria, flooding the infected site until most of the organisms are destroyed. *Lymphocytes* are another important somatic cell type. Although they are a small percentage of the total mammary cells, they may play a major role. *T lymphocytes* orchestrate or conduct the immune response through secretion of lymphokines (soluble immune factors). *B lymphocytes* (controlled by T lymphocyte) produce antibodies which are essential for presentation of bacteria for phagocytosis.

Somatic cells and the immune response are very specific. Somatic cells are sent in high number only when and where they are needed -- i.e. infected or damaged sites. Therefore, high somatic cell counts indicate mammary infection and the body is responding by sending somatic cells to the mammary gland to fight the infection and repair tissue damage.

Low somatic cell counts and infection risk

Are low SCC cows at greater risk to mastitis infections? Recent research at Virginia Polytechnic Institute (2) indirectly addressed this. One objective of the trial was to determine if low SCC cows on initial DHIA test in first lactation were at higher risk to mastitis infections as compared to cows with moderate or high SCC on initial test.

Data was comprised from 30 herds and 3432 first lactation animals. Milk, fat, and SCC measures were obtained from monthly DHI samples, and bacteriology was performed quarterly. Cows were grouped into 3 SCC classes based on initial first lactation test: <100,000 cells/ml, 100,000 - 400,000, and >400,000 cells/ml. Results for SCC, infection and production data for first and subsequent lactations is shown in Figure 1 and Table 1.

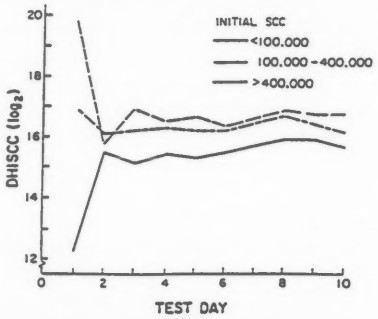

Figure 1. Mean logarithms, base 2 (log_2), somatic cell counts (SCC) in first lactations by classes of cell counts at initial test. DHI = Dairy Herd Improvement.

TABLE 1. Least squares means (LSM) and standard errors (SE) for variables in first and subsequent lactations for categories of initial somatic cell count.[1]

	Initial cell count					
	<100,000		100,000 to 400,000		>400,000	
	LSM	SE	LSM	SE	LSM	SE
First lactation						
DHISCC (log_2)	15.97	.11	16.68	.11	16.97	.13
BACSCC (log_2)	16.41	.19	17.22	.20	18.07	.24
INF, %	48	4	75	5	75	6
INF1, %	8	3	18	3	25	3
INF2, %	44	5	66	3	61	6
Subsequent lactations						
DHISCC (log_2)	16.30	.18	16.71	.18	16.95	.20
BACSCC (log_2)	17.57	.35	17.81	.35	17.97	.38
INF, %	44	8	33	8	56	8
INF1, %	20	4	21	4	22	3
INF2, %	42	9	51	7	33	8

[1] DHISCC = Somatic cell count at DHI test; BACSCC = SCC at bacteriological sampling; log_2 = logarithm, base 2; INF = percent sample : positive; INF1 = percent with major pathogens; INF2 = percent with minor pathogens.

Although differences were small, the initial rankings based on cell counts were maintained through first and subsequent lactations. Differences among initial classes for infection percentages consistently favored low cell count animals. Results gave no indication that cows initially low in cell count were at greater risk to subsequent mastitis infections.

Cell numbers or cell competency

Cell function and Staph. aureus infection

Recent research has centered on the issue of what's most important for infection protection - strict cell numbers or competency of cells. Research examining cell function in chronic *Staph. aureus* cows provides some answers.

Animals used for this research were experimentally infected chronic *Staph. aureus* cows with cell counts consistently exceeding 1 million cells/ml. Lymphocytes from infected animals were unresponsive to stimulation as compared to uninfected animals (Figure 2)(9). Phagocytic ability of milk leukocytes was also reduced (8) and high numbers of phagocytic cells (as seen during mammary infection) had a detrimental effect on lymphocyte function (10). These results show that it's not strictly cell numbers. If it were only cell numbers, how can a cow with a 1 million cell count harbor an infection like *Staph. aureus*? The answer is that the competency of these cells is compromised and depressed.

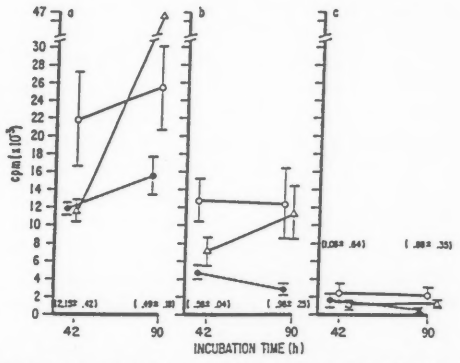

Figure 2. Incorporation of [³H]thymidine by milk lymphocytes from a) uninfected cows (n=6), b) uninfected glands of infected cows (n=21), and c) infected glands (n=21) after 42 and 90 h of incubation in vitro. Responses to the mitogens Concanavalin A (o—o), phytohemagglutinin-P (Δ—Δ), and pokeweed mitogen (•—•) are shown. Values in parentheses indicate blastogenesis of unstimulated lymphocyte cultures.

Intramammary devices (IMD)

Much research has been conducted to artificially elevate SCC using IMD's and potentially afford protection via this SCC increase (3,5,7,11,16). IMD's used have either been polyethylene loops or glass beads strung on a nylon string. They are placed in the gland or teat cistern, respectively, using a special cannula. Their purpose was to stimulate a continual low influx of somatic cells to enhance mammary gland immunity. A 4000 cow US-Israel field study has been completed but final results are not published. However, preliminary data and data from controlled studies show the following:

1) Similar infection rates between IMD and control animals in field studies-potential for decreased environmentals.
2) Lower infection rates for IMD quarters in controlled challenge studies;
3) Loops and pre-existing infections act synergistically - can get blood, clots, and clinical mastitis. Loop quarters may show these symptoms (15-25% of time) even when uninfected;
4) IMD provides non-infectious irritation and inflammation;
5) Milk loss in controlled studies (3-6 lbs./day decrease-IMD);
6) Milk loss in field studies - highly variable between herds and studies;
7) Elevated bulk tank and individual cow SCC - decreased quality premiums, potential lost milk production;
8) Short-lived effects due to plaque formation

Research has shown that the loop may be useful for severe coliform infections, potentially decreasing severity of toxic signs and symptoms. This may be due to the constant influx or enhanced speed at which cells enter the gland, rather than strict cell number.

Vitamin E - selenium and environmental mastitis

Research at Ohio State and Penn State (4,13,14,15) have evaluated Vit E - Se in its role in prevention of environmental intramammary infection. The initial Ohio study (15) showed a 37% reduction in clinical mastitis and a 62% decrease in duration of clinical symptoms in animals supplemented with adequate Vit E - Se as compared to deficient animals. Results of a second study (14) involving 55 first lactation animals are shown in Figure 3. Animals supplemented Vit E -Se during the dry and early postpartum periods had: 1) 42% reduction in calving infections; 2) 32% reduction in clinical mastitis (57% during first four days of lactation); 3) 45% shorter infection duration; 4) 59% reduction in quarter days infected; and 5) 68% reduction in high cell count cows. Low plasma Se was associated with increased mastitis in the Penn State study (4).

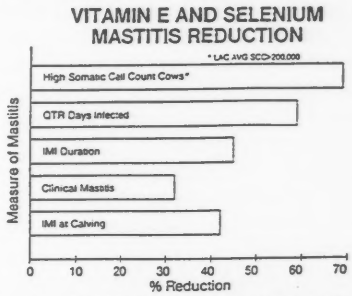

Figure 3. The reduction in mastitis parameters following dietary supplementation in first lactation dairy cows. Measures of mastitis were: 1) HIGH SOMATIC CELL COUNT COWS (lactation average somatic cell counts greater than 200,000 cells/ml); 2) QTR DAYS INFECTED (percent mammary, quarter lactation days infected); 3) IMI DURATION (duration of intramammary infections other than C. bovis); 4) CLINICAL MASTITIS (reduction in new clinical cases); and 5) IMI AT CALVING (intramammary infections present at calving).

Current research at Ohio State shows that animals supplemented with adequate Vit E - Se show an increased speed of recruitment of cells to the mammary gland as compared to deficient animals (unpublished data). Current Penn State research shows increased cell competency in supplemented, adequate Vit E - Se cows and herds as well as increased speed of recruitment to the mammary gland (unpublished data).

Vit E - Se supplementation probably works on circulating blood cells. Vit E - Se are integral to immune function and may enhance circulating cell function and competency. This, in turn, may enhance the cell's ability to respond to infection faster. Similar results have been seen with Vit E - Se supplementation and metritis, thus further evidence for its effects at the level of blood cells.

Cell number or cell competency?

There's no question that a finite number of cells is needed once an infection invades the udder. However, the previously described research elucidates the importance of

cell competency and speed of cell recruitment to the mammary gland as major factors in infection prevention.

Low SCC vs. high SCC herds

Why do low SCC cows get clinical mastitis, which is sometimes toxic or lethal? Is it decreased immunity or because those are the only potential pathogens facing the herd? Characteristics of infections in high and low SCC herds are shown below:

High SCC (>400,000)	**Low SCC (<200,000)**
- contagious mastitis (invasive)	- environmental mastitis (opportunistic)
- mainly subclinical	- clinical (high temp., systemic)
- many cows and quarters	- few cows or quarters
- major milk losses	- little secretory damage
- few or no environmentals (opportunists)	- massive lower gland damage - potential milk/cow losses

High SCC herds (>400,000) mainly deal with high levels of contagious, invasive organisms (*Staph. aureus, Strep. ag*). These infections are usually subclinical but harbor many cows and quarters and cause substantial udder damage and milk loss. If clinical, they are usually mild with a few flakes, clots, and some swelling. Environmental infections are rarely seen since they are opportunists and can't compete with the highly invasive organisms.

Low SCC herds are generally low in contagious invasive pathogens. Thus, when they do get infections, they are environmental. Environmental infections, when clinical, are sometimes characterized by high temperature, systemic signs, toxic effects, and sometimes death. These organisms are opportunistic, not invasive, thus most animals who get these are usually suppressed or heavily stressed (dry cows, early lactation animals). Because of this, environmental infection prevalence is usually confined to a few cows or quarters. There is little secretory damage with these infections, but great potential for lower gland damage which can usually be repaired.

Low SCC cows or herds are not more susceptible to environmental organisms, but rather it's usually the only organism they are continually exposed to. Unfortunately, the clinical signs are very vivid and thus get the attention of many producers.

Somatic cells: What is really needed?

Somatic cells and the immune response are very specific. There is always a circulating army of cells waiting to be dispatched to areas of infection or irritation in the udder. There is no need for high cell levels in the udder to afford protection. These cells can potentially harm the gland (epithelial damage upon gland entry, tissue damage as a result of lytic enzyme release from dying cells, leading to lost milk production). However, when infection or irritation occurs and cells are needed, the key is to mobilize competent cells to the udder as fast as possible. The key to this is healthy animals. If an animal is healthy, she'll respond to mammary infection with adequate cells regardless of how low her SCC actually is.

The key to success is healthy animals. This starts with balanced nutrition, including vitamins and micronutrients. Coupled to this should be excellent milking management and herd health. The final major key is EXCELLENT HERD SANITATION. Limit what gets on those teat ends! If an infection doesn't get to the teat end, then animals won't need to utilize or tax their somatic cell army.

OVERALL GOAL -- LOWEST SCC

The overall goal for producers and our industry is to produce and process milk with the lowest cell counts. For the producer, the lowest cell count means increased income from more milk/cow, a higher milk price, and decreased mastitis costs. Residue risks and treatment woes are also reduced. Lowest cell count milk means increased profits for processors due to higher quality and quantity of product as well as reduced processing costs. The ultimate benefactor is the consumer who gets a consistent supply of highest quality dairy products at the most economical price.

So can the somatic cell count be too low? The research and field data say NO. If this isn't convincing enough, then just ask the producer with a herd cell count <100,000 cells/ml. Their testimonial will provide the icing for the cake.

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Sanitation Controls for Cold Cup Soft Drink Vending Machines

Phillip B. Kneller[1], Radheshyam K. Jayaswal[2] and Larry M. Eils[3]

Abstract

This study evaluated sanitation problems associated with cold cup soft drink vending machines, and was conducted in four phases to determine the likelihood of microbial contamination. Phase one examined the soft drink syrups and their ability to support microbial growth. Phase two examined the vending machine as a source of microbial contamination. Phase three investigated the possibility of the water sources introducing microbes into the soft drinks, and phase four examined the sanitary quality of the soft drink itself. Two vending machines were utilized in this study. One was cleaned and sanitized frequently, and served as the experimental machine. The other machine was not cleaned and sanitized, and served as a control. Comparisons are provided to determine the effects of sanitation on possible microbial contamination. Both machines were operated under normal vending conditions. It was determined that soft drinks of this nature are low risk foods since the growth of pathogens does not occur readily. However, the growth of spoilage organisms is of some concern as yeasts, molds, and some bacteria can grow at the low pH and high water activity of these drinks.

Merchandising various food items through coin operated vending machines in the United States is an established industry. The concern is that food items could be contaminated and may be public health hazards unless they are vended through properly designed machines and operated in a sanitary manner. The vending industry and public health officials have developed design and operating criteria and have promulgated codes and regulations governing vending machines to minimize the likelihood of vended food items becoming a serious public health risk.

This research specifically reviewed the public health risks associates with machines that vend post mix soft drinks in cups. These vending machines utilize syrup concentrates for the various soft drinks which are mixed with carbon dioxide and water to provide the consumer with a carbonated beverage. The major concern of this study was to examine the potential for contamination of these drinks dispensed from machines under normal vending conditions.

The research attempted to answer the following questions:

1. What is the ability of soft drink syrups to support the growth of microbial contaminants?
2. What is the possibility that the vending machine and the dispensed cups could be a source of contamination while operating under normal vending conditions?
3. What is the possibility that the water supply necessary for vending carbonated soft drinks could be a source of contamination while operating under normal vending conditions?
4. What is the possibility that the final product, the soft drink itself, will support microbial growth?
5. What are the effects of frequent cleaning and sanitizing on the possibility of microbial contamination of soft drinks from cold cup vending machines?

Literature searches on this specific topic revealed few sources examining carbonated beverages from vending machines. Eagon and Green (1) inoculated bottled carbonated soft drinks with high doses of *Escherichia coli*. *Staphylococcus aureus*, and *Salmonella enteritidis* and recapped them quickly to maintain carbonation. No viable organisms were found after sixteen hours. La Rocco, et al., and Little, et al. (4,5), developed methods of determining yeast contamination in carbonated beverages through the detection of adenosine triphosphate to rapidly identify this contamination for quality control. Harris (3) examined carbonated beverages as a safe alternative to unsafe water sources for travelers to foreign countries and concluded that, while not absolutely safe, carbonated beverages were still a reasonable alternative to often questionable local water supplies. Mallman and Harley (6) conducted research on sanitation problems associated with cold cup carbonated beverage vending machines. This study examined the bactericidal nature of the soft drink concentrates (syrups), contamination from the water supply, and bacterial counts from the drinks themselves, and concluded that carbonated beverages exhibited bactericidal activity which varied from 37.8 to 100 percent reduction depending upon the fountain syrup used.

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The Mallman and Harley study was conducted in 1951 and no further research specific to cold cup vending machines has been conducted. Over the years syrups have changed little except for the introduction of diet syrups, along with tea and lemonade concentrates. The National Automatic Merchandising Association contacted Illinois State University to review the likelihood of contamination associated with these types of vending machines and to provide more current data for the industry.

Materials and Methods

Cultures

Organisms employed in this study were *Staphylococcus aureus, Salmonella typhi, Psuedomonas aeruginosa, Sarcina lutea, Bacillus subtilis, Saccharomyces cerevisiae*, and *Penicillium chrysogenum* (from the American Type Culture Collection). The molds and bacteria were grown on Potato Dextrose Agar (PDA) slants at 25°C and Luria Bertani Agar (LBA) slants at 28°C, respectively, and were subcultured several times before using. Syrups utilized in this study were supplied by the Service America Corporation, Bloomington, Illinois.

Organism viability

To establish whether the soft drink syrups could be a source of contamination to the final drink, microbial activity was observed by measuring pH, water activity, and survival potential of various microbes in the following syrup concentrates:

Cola I	Cola II
Diet Cola I	Diet Cola II
Lemon-Lime	Unsweetened Tea
Diet Lemon-Lime	Pink Lemonade

The syrups were placed into test tubes in 9 ml quantities and autoclaved for 15 minutes at 121°C. After cooling the tubes were seeded with 1 ml suspensions of one of the following test organisms.

Staphylococcus aureus	1×10^9/ml
Salmonella typhi	1.2×10^9/ml
Psuedomonas aeruginosa	1.065×10^9/ml
Sarcina lutea	1.6×10^6/ml
Bacillus substilis	6×10^8/ml
Saccharomyces cerevisiae	7.6×10^6/ml
Penicillium chrysogenum	5×10^6/ml

The seeded tubes were incubated for a period of seven days at temperatures of 4°C, 25°C and 37°C. After 48 hours and 7 days incubation, a portion (0.2 to 0.5 ml) of each culture was plated on LB agar, or PD agar, to determine counts of viable organisms.

Water activity

Water activity is used to describe the availability of water for biological functions. It is defined as the ratio of the vapor pressure of a particular solution to that of pure water. As solutes are added, the vapor pressure of the solution decreases and the overall water activity falls below one. In order to measure the overall reduction in water activity caused by the various solutes in the syrups, a Wescor model 5100B vapor pressure osmometer was used to measure the change in dew point associated with the pressure of osmotically active solutes.

Determination of pH

The pH of a food is one of several factors that determine the survival and growth of microorganisms during processing, storage, and distribution. A direct reading electronic pH meter, designed to correct for osmotic gradients with an accuracy of $\pm$ 0.01, was used to determine the pH of each syrup.

Cold cup vending machine installation and maintenance

In a cooperative effort with the National Automatic Merchandising Association and Illinois State University, the Service America Corporation was called to install two cold cup carbonated beverage vending machines. The two machines were located side by side in the Health Sciences building at a site well suited for vending machine use and sanitation. All drinks were dispensed at reduced costs to encourage heavy use over the four week test period. One machine was washed with detergent, rinsed and sanitized with a 200 ppm solution of chlorine every Monday, Wednesday and Friday and served as the experimental machine. The other machine was not cleaned and sanitized and served as the control. Sampling procedures were identical to determine the effects of cleaning and sanitizing upon contamination levels.

Determination of contamination

To examine the cold cup vending machines as a potential source of microbial contamination under normal operation, the syrup nozzle, cup rim, and cup guide were sampled with a sterile swab, at noon each day of the study. Each swab was placed in a 10 ml sterile saline solution, and a portion of the suspension was plated on LB agar. The plates were incubated at 37°C and viable bacteria counts, (CFU/ml), were determined after 48 hours.

The potential of the water supply as a source of contamination was examined by sampling the water source twice each day at 8:00 a.m. and 4:00 p.m., and by sampling the carbonated water three times each day at 8:00 a.m., noon, and 4:00 p.m. All samples were held at 4°C until plated, but never longer than 24 hours. The bacterial population of these water samples was determined by plating a portion (0.2 to 0.5 ml) of sample on nutrient agar. The plates were incubated at 37°C and examined at the end of 48 hours.

Bacterial analysis of each finished drink was utilized to determine its sanitary quality. Samples of each beverage were taken at noon, and held at 4°C, never longer than 24 hours, until a portion (0.2 to 0.5 ml) was plated on LB agar. Once again, the plates were incubated at 37°C and examined at the end of 48 hours.

Results

Phase one of the study examined the ability of the soft drink syrups to support the growth of microbes. A sample of each syrup was seeded with large numbers of organisms as described in materials and methods. The results are shown in (Table 1). In cases of *S. aureus, S. typhi, P. aeruginosa*, and *S. lutea*, the reduction in the numbers of organisms is nearly complete regardless of holding temperature. Certain syrups, such as diet lemon-lime, diet cola II and the unsweetened tea, did provide some growth after 48 hours, but reduction continued when examined at 7 days. The *B. subtilis* survived to a marked extent due to the presence of spores as observed through staining. The results indicated these syrups to be highly bactericidal, and would restrict bacterial growth if microbes were introduced by the operator during the filling process.

Table 1

OBSERVED MICROBIAL GROWTH IN SYRUPS

(COUNTS PER ml)

SYRUPS AND INCUBATION LENGTHS	NUMBERS OF MICROBES AT GIVEN INCUBATION TEMPERATURES																			
	STAPHYLOCOCCUS AUREUS			SALMONELLA TYPHOSA			PSEUDOMONAS AERUGINOSA			SARCINA LUTEA			BACILLUS SUBTILIS			SACCHOROMYCES CEREVISIAE			PENICILLIUM CHRYSOGENUM		
	4°C	25°C	37°C	4°C	25 C	37 C	4°C	25°C	37°C	4°C	25°C	37°C	4°C	25°C	37 C	4°C	25 C	37°C	4°C	25°C	37°C
COLA I																					
48 hrs	460	230	0	10	20	0	0	10	0	10	0	0	$4.3X10^5$	$1.35X10^5$	$5X10^3$	0	0	10	0	0	0
7 days	10	40	300	0	0	420	10	10	40	10	10	80	$1.8X10^5$	$1.28X10^5$	$1.72X10^3$	80	0	0	0	0	0
DIET COLA 0																					
48 hrs	110	10	0	0	0	0	0	140	0	0	0	0	$2X10^4$	$2X10^4$	$2X10^4$	0	0	0	0	100	0
7days	0	0	110	0	0	0	0	0	80	10	0	40	$3X10^4$	$7.77X10^4$	$1.8X10^3$	0	0	0	0	0	0
LEMON/LIME																					
48 hrs	220	140	0	280	110	0	0	0	0	0	0	0	$6X10^5$	$6X10^5$	$5X10^4$	$2.5X10^4$	0	0	$6.4X10^4$	0	0
7days	0	0	70	10	0	80	0	0	80	0	0	100	$1.2X10^5$	$8X10^4$	$4X10^4$	0	0	0	000	0	0
DIET LEMON/LIME																					
48 hrs	$1.4X10^3$	40	540	40	10	0	10	10	0	0	0	0	$6X10^4$	$0X10^5$	$0.6X10^3$	0	0	0	0	0	0
7 days	420	10	140	0	0	80	0	0	40	0	0	80	$1.6X10^5$	$7.8X10^4$	$2.9X10^3$	80	10	10	0	0	0
COLA 0																					
48 hrs	100	420	0	0	10	0	0	0	0	0	0	0	$3X10^5$	$1.2X10^4$	$9X10^4$	$2X10^3$	0	0	300	0	0
7days	100	100	80	0	0	80	0	0	80	0	0	10	$3.7X10^5$	$1.2X10^5$	$8.6X10^4$	80	0	0	0	0	0
DIET COLA 0																					
48 hrs	$1.1X10^3$	750	160	0	80	0	0	0	0	0	0	0	$6X10^4$	$1.6X10^5$	$1.3X10^4$	0	0	0	0	0	0
7 days	0	0	100	0	80	0	0	0	80	0	0	0	$6X10^4$	$1.8X10^5$	$6X10^3$	10	0	0	0	0	0
TEA																					
48 hrs	320	$1.8X10^5$	0	0	0	0	10	0	0	0	0	0	$9X10^4$	$2.5X10^5$	$7X10^4$	0	0	0	$1.6X10^3$	$2.4X10^4$	0
7 days	0	10	10	10	10	10	0	00	0	0	0	0	$7X10^3$	$2.6X10^5$	$2.5X10^3$	0	0	0	$2.1X10^5$	0	0
LEMONADE																					
48 hrs	200	380	200	40	0	10	0	0	0	0	0	0	$2.5X10^3$	$1.6X10^5$	$4.2X10^3$	000	00	10	$4.9X10^5$	0	0
7 days	0	0	10	0	0	0	0	0	80	0	0	0	$5.5X10^4$	$1.6X10^5$	$1.3X10^5$	0	0	0	0	0	0

The spoilage organisms, *S. cerevisiae* and the penicillium species, also greatly reduced in numbers. In certain syrups, such as the lemon-lime, cola II, unsweetened tea, and the pink lemonade, growth did occur. These types of organisms tend to be osmotolerant and find syrups of this nature favorable for growth. They are a major concern for quality control in the production of syrups and often preservatives are added to reduce spoilage. It should be noted that in every case, the highest growth observed occurred at the lowest temperature, 4°C. This is the least likely storage temperature for syrups in a vending machine.

The syrups were further examined for the potential growth of microbes by obtaining their pH and water activities, (Table 2). The pH of the syrups ranged from 1.8 for cola II to 4.6 for the unsweetened tea. Bacterial growth would be expected to decrease as pH decreased. The range of water activity (8) for the syrups was a low of .894 for the lemon-lime and a high of the tea. Thus, the high pH and high water activity of the diet lemon-lime, diet cola II, and the unsweetened tea could permit the bacterial growth observed.

Phase two examined the potential for the vending machine itself to be a source of contamination by swabbing the nozzles, cup rims, and cup guides of both machines used in the study. Some microbial growth was observed from both the experimental and the control machines, (Table 3). In each situation, counts obtained from the experimental machine, which was cleaned and sanitized, were lower.

TABLE 3

MICROBIAL VIABILITY* ON VENDING MACHINE SURFACES

	EXPERIMENTAL			CONTROL		
DAY	NOZZLE	CUP RIM	CUP GUIDE	NOZZLE	CUP RIM	CUP GUIDE
1	10	0	0	40	10	0
2	0	10	0	0	0	0
3	10	10	0	10	0	30
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	10	0	0
7	0	0	0	0	0	0
8	0	0	0	50	0	0
9	0	10	0	0	0	0
10	30	0	0	0	0	0
11	0	0	10	0	0	0
12	0	0	0	0	0	0
13	0	0	0	10	0	40
14	0	0	0	0	140	10
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	100
19	0	0	0	0	0	130

* COUNTS PER ml

TABLE 2

SYRUP pH AND WATER ACTIVITY

SYRUP	pH	WATER ACTIVITY
COLA I	1.95	.948 -.898
DIET COLA I	2.81	.996 -.992
LEMON/LIME	3.20	.946 -.894
DIET LEMON/LIME	3.37	.996 -.992
COLA II	1.80	.948 -.898
DIET COLA II	3.20	.996 -.992
TEA (UNSWEETENED)	4.60	.996 -.992
LEMONADE	2.71	.948 -.898

During phase three of the study, the water supply and carbonated water were examined as potential sources of contamination. Significant counts per ml were observed, (Table 4), and can be associated with two factors. The first factor is the source of the water. The two vending machines were supplied by a single water line which had not been in service for at least four years prior to the start date of this study. The line was not thoroughly flushed at the time of installation of the machines and large numbers of bacteria, confirmed in the laboratory as heterotrophic, were present. These counts are not indicative of a normal water source. However, the types of organisms and the number of organisms found, presented little or no health risk to consumers. Studies indicate that concentrations of these organisms in water must approach numbers of 10^6 to 10^{10} to be infective to an individual whose health has already been compromised (2,7).

TABLE 4

MICROBIAL VIABILITY* IN VENDING MACHINE WATER

	SOURCE WATER				CARBONATED WATER					
	EXPERIMENTAL		CONTROL		EXPERIMENTAL			CONTROL		
DAY	8am	4pm	8am	4pm	8am	noon	4pm	8am	noon	4pm
1	1500	—	1400	—	3400	0	0	170	0	0
2	500	—	270	—	2600	0	10	130	0	0
3	1800	3600	200	120	1500	0	3600	10	10	1070
4	2000	0	460	0	2800	0	0	400	0	0
5	4120	4000	3700	260	6000	20	4000	2300	20	250
6	14,440	14,000	640	280	26,000	0	0	17,000	20	0
7	42,800	35,000	240	1400	60,000	12,400	7000	6000	500	130
8	110,000	3700	4900	700	1500	100	580	20,000	0	10
9	100	12,000	0	1060	7000	0	5400	470	70	1400
10	22,000	6800	36,000	700	28,000	1120	3000	16,500	320	800
11	67,000	3000	36,000	3800	26,000	11,000	9300	1500	12,800	1500
12	96,000	6700	62,400	6800	7300	1700	1500	17,000	6000	9400
13	36,000	2300	112,000	1500	2400	1540	2500	1180	2500	5600
14	10,200	3000	34,000	3320	9600	280	2100	5500	6000	5100
15	12,000	1100	56,000	3060	13,200	900	1640	38,000	1200	660
16	12,000	6800	6000	700	8500	4000	1760	1240	1660	50
17	14,000	—	3800	—	2300	2500	—	22,000	600	—
18	10,600	210	1300	1300	4900	300	210	2400	1400	1200
19	5100	300	16,000	1100	3600	500	300	1460	1340	1100

* COUNTS PER ml
NO SAMPLES TAKEN/MACHINE MALFUNCTION

TABLE 5

MICROBIAL VIABILITY* IN DISPENSED DRINKS

	EXPERIMENTAL							CONTROL						
DAY	COLA I	DIET COLA I	LEMON/LIME	DIET LEMON/LIME	COLA II	DIET COLA II	TEA	LEMONADE	COLA I	DIET COLA I	LEMON/LIME	DIET LEMON/LIME	COLA II	DIET COLA II	TEA	LEMONADE
1	0	0	0	0	0	0	10	0	0	0	0	0	0	0	30	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	10	10	20	20	10	0	40	0	0	40	20	80	0	0	180	20
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	0
5	0	0	0	0	10	0	70	10	0	0	0	0	0	10	2800	0
6	0	0	0	0	0	0	30	0	0	0	0	0	0	0	3400	0
7	0	0	0	0	0	0	20	0	0	0	0	0	0	0	6000	0
8	0	0	10	0	0	0	200	0	0	0	40	0	0	0	7600	0
9	0	0	70	0	10	0	440	0	0	0	10	0	0	0	4300	0
10	0	0	30	0	0	0	3000	0	0	0	20	0	0	0	2000	0
11	10	10	80	0	0	100	3000	0	0	0	420	0	0	190	8100	0
12	0	20	480	0	0	270	3480	0	280	100	2320	0	120	2030	9300	0
13	0	0	10	0	10	10	2700	0	20	0	1680	0	0	10	2500	0
14	10	0	10	0	0	0	2800	0	0	0	1220	0	10	0	3400	0
15	0	0	0	0	0	0	270	0	0	0	50	0	0	0	1500	0
16	0	0	10	0	0	0	140	0	0	0	100	0	0	0	1700	0
17	0	0	0	0	0	0	700	0	0	0	420	0	10	0	2500	0
18	0	20	10	0	0	10	920	0	20	30	200	220	10	100	6800	0
19	0	10	70	10	0	0	480	0	10	10	0	0	0	0	1090	0

*COUNTS PER ml

The other contributing factor to the high counts observed can be associated with the presence of the point-of-use filter in both vending machines. These filters function to improve the quality of the drink by reducing the contaminants that cause bad taste and odor, turbidity, hardness, and other undesirable effects. However, the heterotrophic bacteria that are found in the water source for these machines are often retained and colonize the filters. During low flow rate periods, such as overnight and weekend non-use periods, increased bacterial growth can occur in the filter resulting in dosing organisms into the drinks when flow rates are increased during vending. Evidence of this concept is shown when the counts from the water source and carbonated water are observed. The counts were highest on the mornings following weekends, which were days six, ten, and fifteen of the study and generally decreased with continued use during the day.

In the fourth phase of the study, the finished drink was measured for its sanitary quality, (Table 5). Knowing the water source contained high counts per ml and some of the syrups were less bactericidal than the others, an amount of bacterial activity was expected. The degree of bacterial activity exhibited by the drink was largely dependent upon the syrup used. The highest counts observed occurred in the unsweetened tea which had a high pH and high water activity in the control vending machine which was not cleaned and sanitized.

Discussion

This study indicates that cold cup soft drinks dispensed from vending machines are highly self-sanitizing. This is clearly evidenced by the large reduction of microbes found in the seeded syrups and the reduction of microbes found in the finished drink. However, these soft drinks are not totally incapable of supporting microbial activity. Spore forming bacteria will survive the unfavorable conditions for growth that are present in the syrups. Spoilage organisms, such as yeasts and molds, also grow in the syrups, and the finished drinks with a high pH and/or a high water activity are subject to contamination from a water source of poor quality. Conditions for microbial loading of the final drink from a vending machine serviced by a poor quality water source may be exacerbated by colonizing activity occurring in or on the point-of-use filters which are present.

Contamination introduced by the vending machine itself does not appear to be a major risk, as counts obtained from swabs taken from the cup rims, cup guides, and nozzles were low. This risk may be further reduced by cleaning and sanitizing. The experimental vending machine demonstrated lower counts per ml than the control in the final drinks and from the swab samples taken from the machine surfaces. Due to the short duration of this study, the long term effects of machine sanitizing were not clearly demonstrated.

Acknowledgments

This research was supported by Coca-Cola USA and the National Automatic Merchandising Association. The vending machines and all the necessary supplies were provided by Service America Corporation through Mr. Douglas Otto. Technical assistance was provided by Ms. Patti Kaufmann and Mr. Jeffrey Bohner was greatly appreciated.

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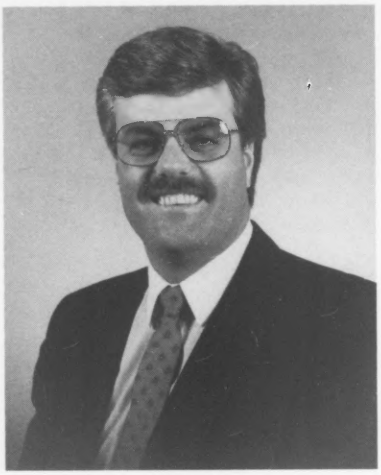
News



Custom Control Products Inc. Appoints New Sales and Marketing Manager

Custom Control Products Inc. has appointed Per-Olof Andersson as sales and marketing manager. Mr. Andersson, formerly with Ampco Pumps, earned a B.S. degree in mechanical engineering from Kattegattskolan Technical College of Halmstad, Sweden, in 1982 and has seven years experience in sales and marketing for the food, dairy and pharmaceutical industries. He will be responsible for sales and marketing of the company's engineering design services, custom control systems and various product lines in North America.

Custom Control Products Inc., of Racine, Wisconsin, was founded in 1959 and acquired by Irv and Shirley Scheel in 1970. Custom Control Products Inc. is an electrical process engineering group that designs and builds cost effective electrical automation control systems for the food, dairy and beverage industries. Custom Control Products Inc. is still owned and operated by the Scheel family.

Du Pont Awards Competition

The Du Pont Awards for innovation in food processing and packaging technology is a worldwide industry competition inaugurated in 1986, to recognize food industry advances that utilize plastic packaging materials. Sponsored by the Du Pont Company in cooperation with the National Food Processors Association (NFPA), the competition has received hundreds of entries from 16 different countries.

In 1989, for the first time, the Awards program included an environmental category to recognize any new product or technology employing an innovative approach to encourage or provide for the reuse of plastic food packaging, to help decrease the amount of packaging in the waste stream.

Recognizing innovation in all aspects of food processing and packaging, the Awards are designed to encourage and accelerate further developments in the industry. The broad focus shows that contributions made at virtually any segment of the industry result in innovations which enhance products and processes and benefit consumers.

Products test-marketed or commercialized between June 15, 1989, and November 15, 1990, are eligible for the 1990 competition.

Entries are evaluated on the following criteria:

- Degree of innovation represented in the development
- Breadth of application (today and in the future)
- Significance/impact on industry or consumers

Winners are announced at the annual meeting of the National Food Processors Association and receive a specially-commissioned acrylic sculpture created by Delaware artist Margaret Scott Kincannon.

For more information regarding the Du Pont Awards Competition contact Carolmarie Citra (302)774-0821.

David K. Bandler Wins DeLaval Dairy Extension Award

In recognition of excellence in the field of dairy extension, David K. Bandler of Cornell University has been selected as the recipient of the 1990 DeLaval Dairy Extension Award.

The award, consisting of $1500 and a plaque, was presented June 26, 1990 at the 85th Annual Meeting of the American Dairy Science Association, North Carolina State University, Raleigh.

Bandler has provided leadership in the Dairy Extension and Food Science Department of Cornell University and New York State for over 25 years. As Department Extension leader, he has become an expert in the areas of milk quality assurance and flavor control, diary products processing technology, nutritional labeling of dairy products, standards and registration for the dairy industry, and consumer information for home processing of dairy products. His expertise, enthusiasm, and cooperative spirit are well known at Cornell, especially within the College of Agriculture and Life Sciences, Human Ecology and Veterinary Medicine, where in

addition to extension functions, he teaches and carries on research!

But it is beyond the campus that Dave's gift for motivating and working with others produces its greatest benefits; his assistance to dairy processing plants and cooperatives is invaluable. Bandler is a master of communicative media. He produces a weekly radio program heard on 12 stations throughout New York State. He produces his own slides, movies, videos, and audio cassettes as teaching aids. He has authored or coauthored over 150 articles, bulletins, booklets, and short course manuals. He is a favored speaker at state, national, and international meetings. Bandler has served on many university, state, and ADSA committees.

Bandler obtained his B.S. degree in Dairy Industry from Cornell University in 1955 and was commissioned a 2nd Lieutenant in the United States Army. He served 13 years of active and reserve duty in the Quartermaster Corps and then the Corps of Engineers and left the service in 1968 as a Captain. Bandler spent 9 years on the New York Legislative Committee on imitation food products. In 1965, Bandler joined Cornell University as an Extension Specialist in Dairy Processing and received a M.S. in 1971. In 1987 he was awarded the title of Professor at Cornell University.

Alfa-Laval Agri, Inc. has generously supported outstanding achievements in dairy extension through this ADSA award since 1951. Alfa-Laval Agri, Inc., selling De Laval equipment, is the world's largest dairy farm supplier.

Buckhorn Announces Plastic Recycle Program

Buckhorn Inc., a manufacturer of reusable plastic containers, has launched a container buy-back program to recover worn or damaged products for reprocessing. The program is an important recycling alternative where environmental restrictions prohibit the disposal of plastics in a landfill.

The recycling program is designed to recover high-density polyethylene exclusively. Buckhorn has restricted the items which qualify for the recovery program to products which it manufactures. The restriction gives the company better control of the quality and consistency of its reprocessed material.

The Company's long-term goal for the recycling program is use at least 15 percent recovered materials in the manufacture of its non-food container products.

Old containers are shipped to a central location for cleaning, regrinding and reprocessing. The reprocessed material is then mixed with virgin polymers and remolded in a variety of non-food container items.

Buckhorn issues credits against future orders as the base for its buy-back program. The program effectively reduces the cost of disposal and lowers replacement container cost. The program, in effect since March 1990, expands the Company's commitment to providing environmentally safe products and services.

Buckhorn Inc., a Myers Industries company, manufactures reusable plastic containers for industrial, commercial and consumer applications.

For additional information contact: Rob Rothfuss, Buckhorn Inc., 55 W. TechneCenter Drive, Milford, OH 45150 (1-800-543-4454).

National Restaurant Association Board Elects New Officers, Directors

Michael E. Hurst, owner of the 15th Street Fisheries in Fort Lauderdale, Florida, has been elected to serve as chairman of the board and president of the National Restaurant Association for the 1990-91 term.

Hurst assumed the association's leadership position at the National Restaurant Show, succeeding Harris H. "Bud" Rusitzky in the post.

An association director since 1979, Hurst has served as chairman of the Strategic Planning and Monterey Wine Festival Task Forces and chairman of the Convention, Membership and Public Relations Committees. He is also trustee of the association's Educational Foundation.

In addition to running his Fort Lauderdale operation and working as a restaurant operations consultant, Hurst frequently addresses groups on marketing, motivation and sales promotion. He serves on the faculty of Florida International University's School of Hospitality Management as full professor, teaching restaurant management and food and beverage merchandising.

Among Hurst's numerous awards are the 1976 and 1986 Ivy Awards, *Restaurants and Institutions*; 1975 Michigan State University Alumnus of the Year (School of Hotel and Restaurant Management); and one of the 10 most outstanding graduates in the U.S., 1953, *Who's Who*.

Hurst holds a B.A. in restaurant management and a M.A. in accounting from Michigan State University.

John R. Farquharson, president of ARASERVE, a division of ARA Services, Inc., Philadelphia, has been elected to serve as association vice president for the 1990-91 term.

Farquharson has served on the association board since 1982. His committee chairmanships have included Membership, Government Relations and Political Education. Joining ARA Services in 1960, Farquharson has spent his entire professional career with ARA. ARASERVE, the division he heads, has 45,000 employees with annual sales of approximately two billion dollars.

Richard E. Marriott, vice chairman of the board of directors of the Marriott Corporation, Washington, DC, has been elected to serve as association treasurer for the 1990-91 term.

A director of the association since 1983, Marriott has chaired the Political Education and State Relations committees. Within the Marriott Corporation, he serves on the company's finance committee and is responsible for the Government Affairs division. He is also chairman of First Media Corporation, a family-owned independent broadcasting firm.

In addition to the new officers, seven new directors have been elected to serve on the association's board: Stanley S. Briggs, Utah Food & Catering, Salt Lake City, UT; Donald F. Karcher, Carl Karcher Enterprises, Anaheim, CA; C. Scott Langham, S&S Cafeterias, Columbia, SC; Dean Rasmussen, Grandmother's, Inc., Omaha, NE; Richard E. Rivera, TGI Friday's, Inc., Addison, TX; Eugene A. Sayler, Old Country Kitchen, Inc., Portland, OR; and John Clark Stevens, Kentucky Fried Chicken, Wichita, KS.

USA Showcase '91 Scheduled for Hungary

American-based companies who want to expand into Eastern Europe will have a unique opportunity to present their products and services, while learning more about the Eastern Europe marketplace, at USA Showcase '91 set for October 17 through 20, 1991, in Budapest, Hungary.

Held in cooperation with the Hungarian Ministry of Trade and the Hungarian Chamber of Commerce, the purpose of the conference and exhibition is to bring together U.S.-based companies that want to expand into Eastern Europe and those in the Eastern European business community who want to acquire American technology, equipment and services. The Hungarians have specifically requested that American food processing and packaging equipment be represented.

At USA Showcase '91 conferences and seminars are scheduled for exhibitors who want to learn the specifics of doing business in the Eastern Europe marketplace. Both U.S. and Hungarian government officials will be available for private counseling sessions between U.S. firms and potential customers.

All exhibitors will be invited to participate in a pre-show mission, six months in advance, to familiarize them with the Hungarian business environment. Seminars and workshop sessions will include exhibitors, Hungarian government agencies and the Hungarian business community. Excursions are planned to a number of industrial complexes, manufacturing facilities and retail outlets.

Participation is limited to U.S.-based companies, and USA Showcase '91 will have space to accommodate only about 275 exhibitors. For more information on USA Showcase '91 contact Bill Healey, Senior Vice President, European Conferences and Exhibitions for Walpole Productions (713)266-0610 or FAX (713)266-6657.

United Dairy Industry Association News

Milk Regaining Respect as Shield Against Ulcers

Milk-rich diets were long advocated as a buffer against corrosive stomach acid until the recent advent of powerful anti-ulcer drugs. But milk is now being reevaluated for its ability to gently and more permanently protect delicate stomach linings, says Lenard Lichtenberger, Ph.D., professor of physiology, University of Texas, from its secretions. If this becomes accepted by the medical community, milk could once again be "prescribed" to help provide relief to the 10 percent of the U.S. population that suffers from painful peptic ulcers.

For more information contact Lisa Coe or Chris Stube at (708)696-1860.

Food and Environmental Hazards To Health

Update: *Salmonella enteritidis* Infections and Grade A Shell Eggs - United States, 1989

Salmonella enteritidis (SE) remains an important cause of outbreaks and sporadic cases of gastroenteritis in the United States. This report summarizes three outbreaks in 1989 that were associated with *Salmonella*-contaminated Grade A eggs.

Suffolk County, New York. An outbreak of gastroenteritis occurred among 21 of 24 persons who attended a baby shower on July 1. Severe diarrhea, vomiting, fever, and cramps occurred a median of 9 hours (range: 5.5-57 hours) after the shower. Twenty ill persons sought medical care, and 18 were hospitalized. One attendee who was 38 weeks pregnant delivered while ill; the infant subsequently developed SE septicemia and required prolonged hospitalization. Additional secondary cases occurred in two household members of primary case-patients. SE was isolated from stool or rectal swab cultures of all 21 primary and three secondary case-patients.

All 21 ill attendees, but none of the three attendees who remained well; reported eating a homemade baked ziti pasta dish consisting of one raw egg and ricotta cheese combined in a large baking pan with cooked tomato meat sauce and refrigerated overnight. The ziti dish was baked for 30 minutes at 350°F (176.7 C) immediately before serving. Several attendees commented that the center of the ziti was still cold when served. SE was isolated from samples of the leftover baked ziti and from a pool of seven eggs from the original carton. The eggs were supplied by a New Jersey egg producer; SE was isolated from several flocks tested at the farm.

Carbon County, Pennsylvania. The Pennsylvania State Department of Health was notified of gastroenteritis in 12 of 32 persons who attended an office party on August 24. Symptoms included diarrhea (100%), headache (58%), abdominal pain (42%), nausea (42%), fever (25%), and vomiting (17%). The median incubation period was 27.5 hours (range 7-72 hours). Of three persons who were hospitalized, two recovered. The third person, a 40-year old previously healthy man, experienced severe diarrhea and high fever, was admitted to an emergency room on the fourth day of illness, and died within 2 hours. Clinical course and autopsy findings were compatible with acute salmonellosis; postmortem blood, urine, and stool cultures yielded SE.

The only food and beverages served at the party were six pies (two fruit-bases pies and four egg-based custard pies), coffee, and juice. Illness was associated with consumption of the custard pies (relative risk=8.6; 95% confidence interval=1.3-58.6). All the pies had been prepared August 23 by a commercial bakery and held without refrigeration for approximately 21 hours before consumption. Two other cases of *Salmonella* (identified as group D, which includes SE) infection were reported in persons who did not attend the office party but who ate custard pie prepared by this bakery on the same day. The source of the eggs is unknown.

Knox County, Tennessee. An outbreak of SE gastroenteritis occurred among persons who patronized a restaurant on April 8. Twenty-seven cases were reported to the county health department; stool cultures from 23 persons all yielded SE. At least 24 ill persons reported onset of fever, abdominal cramps, and diarrhea within 48 hours after eating at the restaurant; 11 were hospitalized. All had eaten either Hollandaise or Bernaise sauce on April 8. Ten meal companions of ill persons were contacted; non had developed illness or had eaten Hollandaise or Bernaise sauce ($p<0.01$). Both sauces were prepared with Grade A extra-large eggs that were heated but not thoroughly cooked. No other food item was consumed by >20% of those who became ill. The eggs were traced to a farm in Indiana.

Editorial Note: Since 1979, isolation rates of SE have increased dramatically in New England and, more recently, in the mid-Atlantic states. As of October 31, 1989, 49 SE outbreaks had been reported for 1989; these outbreaks have been associated with 1628 cases and 13 deaths (including 12 deaths in nursing homes). From 1985 through 1988, state health departments reported 140 SE outbreaks associated with 4976 ill persons (of whom 896 were hospitalized) and 30 deaths. Contaminated food was implicated in 89 (64%) outbreaks; Grade A shell eggs were implicated in 65 (73%) of these. From 1985 to 1989, the proportion of outbreaks from outside New England and the mid-Atlantic regions increased from 5% to 43%.

Foods containing a single SE-contaminated egg can cause outbreaks of severe illness. Salmonellosis can be especially severe in infants <3 months of age, in the elderly, and in persons who are immunocompromised. Most SE-associated deaths occur in nursing home residents, but salmonellosis can be fatal in otherwise healthy hosts when ingested in sufficient doses.

Thorough cooking kills *Salmonella*. Contaminated eggs that are liquid or runny after light cooking can contain *Salmonella*. When eggs are heavily contaminated, standard cooking methods for many egg-containing foods (including Hollandaise and Bernaise sauces, meringue, and scrambled and soft-boiled eggs) may not kill all *Salmonella*. If raw or incompletely cooked eggs are held at room temperature for >2-4 hours, the risk of outbreaks of *Salmonella* infections may increase because *Salmonella* can grow to high concentrations under such conditions.

In regions where egg-associated salmonellosis has been identified, the public should be advised to not eat raw or undercooked eggs. In addition, consumers should avoid eating foods that contain raw eggs, such as Caesar salad, homemade eggnog, and homemade mayonnaise. Foods made with pasteurized eggs (e.g., commercial eggnog, ice

cream, and mayonnaise) are safe to eat. In hospitals and nursing homes, where high-risk patients may be exposed, the risk for outbreaks can be reduced by use of pasteurized egg products in recipes that require pooled eggs and by proper preparation and storage of foods containing eggs. Bulk-quantity pasteurized egg products are available commercially for use in food-service establishments.

Clinicians and microbiologists are encouraged to report cases of salmonellosis to local and state health departments. Because some strains of SE isolated from patients in the northeast are reported to produce minimal H_2S, suspect isolates that otherwise resemble *Salmonella* should not be discarded on this basis alone. To help characterize sporadic cases and to assist in epidemiologic investigations, *Salmonella* isolates can be serotyped by state public health laboratories. When eggs are implicated, investigation of outbreaks and notification of state agriculture departments and the U.S. Department of Agriculture are crucial in efforts to identify sources of contaminated eggs and to develop and implement control measures.

Information on cooking and handling eggs safely is available from the U.S. Department of Agriculture Meat and Poultry Hotline (800)535-4555 and from county extension home economists.

MMWR 1/5/90

Legionnaires' Disease Outbreak Associated with a Grocery Store Mist Machine - Louisiana, 1989

On October 31, 1989, the Louisiana Department of Health and Hospitals received reports from two physicians of an outbreak of pneumonia among residents of Bogalusa (population 16,000) and the surrounding parish. An investigation confirmed 33 cases of Legionnaires' disease (LD) among persons hospitalized with pneumonia between October 10 and November 13. Patients ranged in age from 36 to 88 years (median: 64 years); 25 (76%) were female. *Legionella pneumophila* serogroup 1 (Lp1), monoclonal antibody subtype 1,2,5,6, was identified by direct fluorescent antibody test of lung tissues from autopsies of two patients who died of pneumonia during the outbreak.

A case-control study of 28 cases and 56 controls, frequency matched by primary physician, age, and chronic-disease status, found that case-patients were no more likely than controls to live or travel within 200 meters of any identified cooling towers within the town in the 10 days before illness. However, case-patients were more likely to report shopping at one grocery store (grocery store A) in the 10 days before illness. Among case-patients and controls who shopped at grocery store A, case-patients were more likely to spend >30 minutes in the store and to select produce items located close to an ultrasonic mist machine. In follow-up interviews of the three case-patients who did not report shopping at grocery store A in the 10 days before illness, two reported visiting the store but were unsure if their visits occurred within 10 days of illness, and one reported shopping there 12 days before onset of illness. No cases occurred among employees (median age: 23.5 years) of grocery store A.

Lp1 subtype 1,2,5,6 was isolated from water in the reservoir of the mist machine. The machine was installed in the store during October 1988 and continuously generated an aerosol over one section of the produce display. The mist was generated by ultrasonic transducers located in the machine's reservoir. In early December, the machine was turned off and removed from grocery store A. Under controlled conditions at CDC, Lp1 was added to the reservoir of the machine and viable Lp1 in respirable droplets (<5μm) was isolated from mist produced by the machine.

Editorial Note: LD occurs primarily after inhalation of Lp1 contained in mists from aerosol-producing devices such as cooling towers, evaporative condensers, whirlpool baths, showers, and respiratory therapy equipment. Investigations of LD outbreaks can be challenging because of the potential exposure to many aerosol-producing sources during the disease's 2-10 day incubation period; these sources often contain *L. pneumophila* without being associated with disease.

Although the infectious dose of *L. pneumophia* for humans is unknown, one study suggests that disease can occur in susceptible persons exposed to one colony-forming unit of *L. pneumophila* per 50 L of air. Susceptible persons include the elderly and persons with a history of smoking or with underlying health conditions, including chronic lung or renal disease, malignancy, diabetes mellitus, and use of immunosuppressive medications. Employees from grocery store A, who did not develop LD, may have been less susceptible than affected persons.

Proliferation of *Legionella*, presumably introduced through water supplies, occurs most readily in systems with reservoirs (e.g., cooling towers and hot water systems) that are relatively stagnant and have temperatures of 25-42°C (77-108°F). Systems similar to the one used in grocery store A (Commonly referred to as "foggers") account for <10% of produce misting systems used by retail food stores nationwide (Food and Drug Administration [FDA], unpublished data). These systems generate mists by ultrasonic transducers located in reservoirs containing municipal water. They differ from other misting systems used more commonly in grocery stores that generally create mists in intermittent cycles by passing water directly through spray heads. These latter systems may generate larger, less respirable droplets than those produced by ultrasonic machines. No evidence exists that the more commonly used systems pose a risk of transmitting legionellosis.

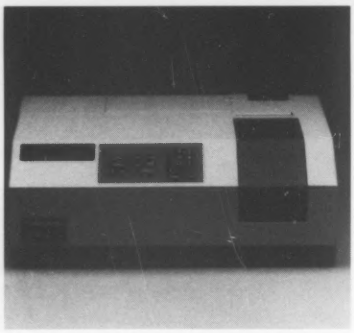
Data suggesting that use of humidifiers may be associated with risk of LD have been limited to case reports and a study in which subclinical infection occurred in laboratory animals exposed to aerosols from a humidifier contaminated with *L. pneumophila*. This investigation

provides further evidence that an ultrasonic humidifier contaminated with *Legionella* can transmit LD to humans. Although some ultrasonic humidifiers used in other settings appear similar in design to the machine associated with this outbreak, their role in sporadic cases or outbreaks of LD is unknown.

Further studies are needed to evaluate factors that influence colonization of *Legionella* in misting machines and humidifiers and to identify design features that affect the potential for transmitting disease. Studies are also needed to determine the lowest concentration of *L. pneumophila* necessary for generation of respirable droplets containing the bacteria. Until such information is available and prevention methods can be refined, ultrasonic mist machines and humidifiers should be drained and cleaned regularly, following manufacturers' latest recommendations. For ultrasonic mist machines used in produce sections of grocery stores, FDA has issued guidelines that specify weekly disassembly and cleaning, which includes use of a hypochlorite solution (at least 50 ppm). General guidelines on the cleaning and maintenance of humidifiers in other settings have been issued by the Consumer Product Safety Commission.

MMWR 2/23/90

Industry Products



The new Lambda 2 Routine Kinetics System from Perkin-Elmer provides a high-performance, cost-effective package for routine determination of enzyme activity and enzymatic substrate concentrations in applications where biochemical photometric analysis is required.

New Lambda 2 Routine Kinetics System Provides Enzyme and Substrate Analysis Methods

A new cost-effective, time-saving kinetics system from Perkin-Elmer provides a complete package for routine photometric determination of enzyme activity and enzymatic substrate concentrations in analytical applications ranging from pharmaceutical and food analysis to biochemistry and clinical chemistry.

The Lambda 2 Routine Kinetics System consists of Perkin-Elmer's Lambda 2 UV/VIS Spectrometer with built-in Enzyme and Substrate Kinetics Method software, as well as an optional 6- or 13-cell changer, and a unique accessory for temperature measurement in the cuvette.

A proven success in Europe, the Lambda 2 Kinetics System is designed for flexible, uncomplicated operation. It stores up to 20 methods and helps reduce both time and potential errors by providing a wide range of programmable parameter selections for variable analyses of enzyme activity and substrate concentrations. With scan speeds of up to 2880 nm per minute and two different modes for slope calculation, the Lambda 2 Kinetics System also calculates photometric linearity up to 3A for increased dynamic range.

Perkin-Elmer Corp. - Norwalk, CT

Please circle No. 263
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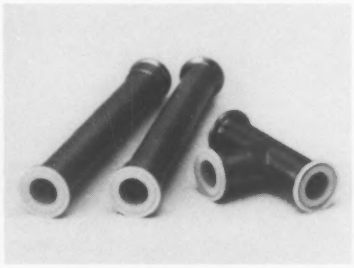
Gold-Shield™ Safety Lamps for Insect Electrocutors

Insect-O-Cutor®, after several years of testing and research, now offers their Gold-Shield™ line of Shat-R-Shield® safety-coated insect attraction lamps. The special ultraviolet-stabilized coating permits maximum passage of black light while protecting personnel and product from glass in the event of accidental lamp breakage. The coating provides a sealed envelope which also prevents escape of phosphor and mercury from the fluorescent tube in the event of breakage.

Insect-O-Cutor® - Stone Mountain, GA

Please circle No. 264
on your Reader Service Card



New Sani-Lined stainless, steel tubing, features a non-metallic lining which resists protein build-up often found in conventional systems.

Sanitary-Lined Tubing Eliminates Protein Build-Up

New Sani-Lined stainless steel tubing, features a non-metallic lining which resists protein build-up often found in conventional systems.

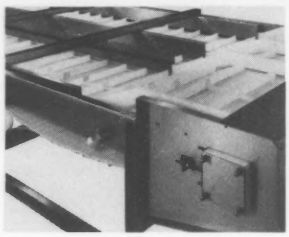
Sani-Lined sanitary systems are ideal for pharmaceutical and bio-technology applications where corrosion, stray voltage and/or ionic exchange must be eliminated.

The tubing provides a sanitary stainless steel outerhousing and sanitary ferrules. The teflon lining prohibits proteins from sticking and restricing ID.

The sanitary tubing can also be installed into existing systems for acidic food products, protein and whey processing, viscous products, etc., which have lost their sanitary 150-180 grit or polished finish.

Sani-Tech - Andover, NJ

Please circle No. 265
on your Reader Service Card



Brine Tank Conveyor

Kamflex Series 810 Brine Conveyor for handling blocks of cheese through an all welded construction, one-piece tank. A heated brine solution is recirculated through inlet tubes located on tank. Special features include USDA Dairy accepted plastic belt for brine tanks; washdown motor; adjustable, covered, non-corrosive UHMWPE bearings; infeed and discharge guarding, and easy-cleaning frames and structure. Consult Kamflex for their line of cheese conveying equipment including the new 3A Series 714 and 814 engineered and built to your exact specifications.

Kamflex Corporation - Carol Stream, IL

Please circle No. 266
on your Reader Service Card

The Monarch Division Introduces a New Non-Phosphate Cleaning Program

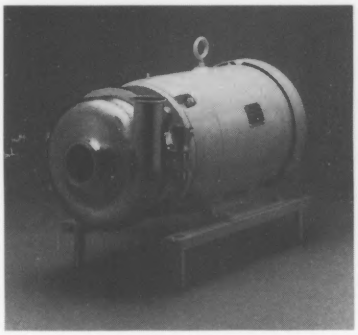
The Monarch Division of H.B. Fuller Company has introduced a new non-phosphate cleaning program for food processing plants. To meet customer needs for reducing the phosphate content in plant effluent, the Monarch Division has developed six new non-phosphate products.

The new non-phosphate cleaning program helps plants realize both environmental and economic benefits. The environmental benefits deal directly with the quality of the surface water supply. The economic benefits for a reduced phosphate program may be found in the improved efficiencies within the plant, through the reduction of lost product and the reduction in surcharge costs for phosphate treatment.

Information about the new non-phosphate cleaning program includes literature on the six new non-phosphate products and a non-phosphate brochure explaining the effects of phosphorus in the environment.

H.B. Fuller Company - Minneapolis, MN

Please circle No. 267
on your Reader Service Card



Waukesha Pumps Introduces 'New Generation' Stainless Steel Centrifugal Pump to Sanitary, Industrial Marketplace

For the first time in its 50+ year history, Waukesha Pumps - Cherry-Burrell Fluid Handling Division, is entering the centrifugal pump market with its new 2000 Series featuring six models in maximum capacities to 1,000 GPM.

Waukesha has departed from the "norm" in centrifugal pump design with an integrally cast 316L stainless steel impeller and motor shaft sleeve that allows direct assembly to a stronger JM Type motor for maximum rigidity and minimum running clearances. This eliminates the troublesome stub shaft assembly.

Designed primarily for sanitary and high-purity applications, the 2000 Series has full CIP capabilities and meet76s 3A Standards. All wetted parts are cast 316L stainless steel. Non-sanitary options include unpolished exterior housing with seal options that include commercially available units.

According to the firm, the new design corrects flaws inherent with other centrifugal pumps including vibration, short bearing life, high NPSH requirements, high seal maintenance cost and poor tolerance of adverse operating conditions.

Waukesha Pumps - Delavan, WI

Please circle No. 268
on your Reader Service Card

Sanitary Lubricant Available in Handy Aerosol Spray Cans

A sanitary, solid film lubricant is now available in aerosol cans for easy application to sanitary parts that require lubrication. Just removing the cap, pushing the release button, and spraying quickly, lubricates sanitary equipment.

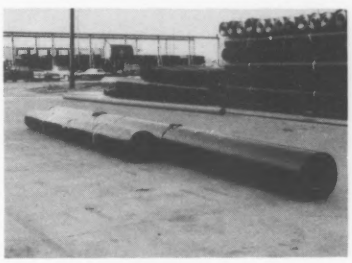
This heavy duty lubricant conforms with U.S. Public Health Recommendations and is made with 100% FDA, and USDA approved liquid petroleum and other ingredients. Containing no animal or vegetable fats, odorless and tasteless, this neutral lubricant will not contaminate, taint, or harm food products.

The product is recommended for use wherever lubrication is required in sanitary equipment. It is formulated for use in restaurants and food service establishments, food processing and packaging plants, dairies, ice cream plants, soft serve outlets, candy plants, beverage plants, meat plants, fish processing plants, and poultry processing plants.

"Haynes[R] Lubri-Film™", when applied, forms a thin, protective coating that adheres to most surfaces. It stays in working areas which aids in protection from corrosion. Lubri-Film™ can be applied to wet or dry surfaces.

Ashby, Dillon Inc. - Rocky River, OH

Please circle No. 269
on your Reader Service Card



Gundle Announces New 34-Foot Wide Liner

Another industry breakthrough from Gundle .. the widest polyethylene liner in the industry without factory seams. Gundle Lining Systems, Houston, Texas, the largest manufacturer of high density polyethylene liners in the world is now manufacturing material that is over 34 feet wide in various thicknesses. The new width of liner is available as Gundline HD, (high density polyethylene) and Hyperlastic (very low density polyethylene). The 34 foot wide liner produced by Gundle allows for faster installation by the reduction of field seams.

Gundle Lining Systems - Houston, TX

Please circle No. 270
on your Reader Service Card

Thermologg Eliminates Lateral Temperature Deviation

Science/Electronics introduces the **ThermoLogg** temperature monitoring system. The microprocessor based battery operated **ThermoLogg** system, integrating the latest design features, has just been released. The unit is available with up to 8 RTD temperature inputs which locate off the logger for precise placement of temperature sensors in conveyor baking ovens, thereby assuring test repeatability for proper burner/heat adjustment.

ThermoLogg is just 3.25" high and weighs less than 15 pounds, utilizes precision stainless steel-sheathed sensors having a response time between .3 and .6 seconds; overall temperature range is 33 to 600°F with 10-bit resolution; on-board memory of 13,000 readings with a lithium battery, which has a typical life of one year; PC interface is RS232 serial; kit contains all necessary hardware and software, including computer interconnect cable and 9-pin serial port adaptor. Insulation allows the logger to remain in an oven for up to 3 hours at 500°F. The entire system, including sensor placement hardware, is packed for transport and storage in a molded polypropylene carrying case.

Science/Electronics - Dayton, OH

Please circle No. 271
on your Reader Service Card

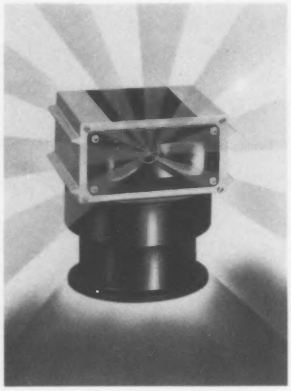
New Cationic Polymers for Industrial Sludge Dewatering

Drew has recently introduced the DREWFLOC[R] 2400 series emulsion flocculants especially for use in industrial sludge dewatering and wastewater clarification. These highly active products have been formulated to work at lower dosages than typical emulsion polymers, plus result in significant chemical savings as well as in sludge disposal savings.

The use of a novel cationic monomer is the key to their superior cost performance. Further, the products are compatible with any existing feed system and are available in drums, totes and bulk. Additional information and product samples are available upon request.

Drew Industrial Division - Boonton, NJ

Please circle No. 272
on your Reader Service Card



Drive Rats out for Good ... With the Pulsating Sounds of the Rat-X Ultrasonic Repeller

Rat-X ultrasonic "sound in the round" drives rats away with sounds they can't stand. A revolving electronic unit "shoots" rats with harmless sound ... makes a 360-degree sweep every 30 seconds.

You can't hear the frequency, but rats can't tolerate the pulsating sound waves.

Simply plug the unit into any 115 V outlet. Its solid state sound generator uses less current than a 10-watt bulb. The unit pays for itself quickly when measured against the rat damage it prevents. Also available in a non-revolving, single direction model.

Rat-X Inc. - Chicago, IL

Please circle No. 273
on your Reader Service Card

Bug Guard Paint-On Pesticide

Current technology accounts for a surprising assortment of specialty paints and coatings. Unfortunately, most of us are either unaware of these products or we find them unavailable in small volumes or prohibitively expensive.

Bug Guard Anti-Insect Coating is a special purpose coating which provides insect control - and its effective lifetime is one of its most distinguishing features.

Bug Guard is designed to give *years* of reliable pest control. This is achieved by encapsulating (bonding) its active ingredient, Chlorpyrifos, into a polymer, a resin solid, within its formulation. The technique used in the formulation of Bug Guard reduces the volatile nature of Chlorpyrifos thereby significantly increasing its effective life and prolonging the killing power of the coating.

The active ingredient in Bug Guard (chlorpyrifos) is absorbed through the mucous membranes on the pads of the insects' appendages, thereby affecting the central nervous system. Depending on the species and size of the insect, contact with the coating can cause death within minutes.

Environmental Coatings Inc. - Forestville, MD

Please circle No. 274
on your Reader Service Card

A Two-Way Rupture Disk to Protect Against Vacuum and Overpressure

A new series of two-way rupture disks that safeguard against damage caused by both vacuum and overpressure in processing and storage systems is now available from *BS&B Safety Systems, Inc.* Constructed in 316 stainless steel and PTFE, the VAC-SAF™ meets high level sanitary standards, permitting its use in sanitary applications throughout the food and pharmaceutical industries as well as in the chemical and petrochemical industries.

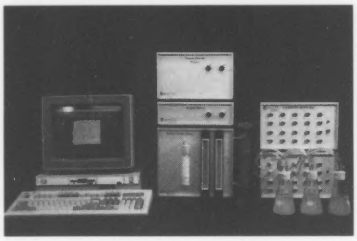
The device consists essentially of a perforated, domed and slotted metal foil top-section with a PTFE seal membrane on its concave side. The seal is held in place by a central plastic stud through an orifice in the metal dome.

The unit is mounted in a disk-holder or Safety Head with its convex side to atmosphere. Asymetric locating pins in the Safety Head ensure correct orientation of the disk. When dangerous vacuums occur in the vessel or system being protected (for example, through rapid liquid withdrawal or the condensation of steam during steam-sterilization of a food processing vessel), the PTFE seal snaps back against an arrangement of knife blades which cuts it open. Air-flow through the perforations in the domed metal section then relieves the vacuum. Alternatively, should a given over pressure build up in the protected vessel or system, the metal section and its PTFE seal will both burst outwards together.

The disks can be applied throughout the process industries for combined vacuum relief and overpressure protection. They can also be used, with the assembly inverted, for light overpressure relief down to 4" Water Column.

BS&B Safety Systems - Tulsa, OK

Please circle No. 275
on your Reader Service Card



Bacteria and Fungus Detector

New 20 Channel O_2/CO_2Bio-Respirometer from Columbus Instruments detects bacteria or fungus growth by measuring the oxygen consumption and CO_2 production resulting from biological activity. It features a remarkable sensitivity of 0.2 microliter O_2/hour.

Principle is similar to the "old" Warburg apparatus, but due to the precision of the O_2 and CO_2 sensors and computer automation, measurements are much easier and 10 times more accurate.

For testing, a sample of the culture is placed in an enclosed container. Oxygen depletion plus CO_2 production in the container is then measured with very high precision over a programmed period lasting from 4 minutes to a few hours. Periodically, air in the chamber(s) is automatically refreshed, results are printed and the measurement is repeated. Up to 20 sample chambers can be monitored at the same time with periodic printouts and data disk storage. The entire system utilizes an IBM-PC/AT compatible computer for its automation and data collection.

This instrument has already proven itself in early detection of bacterial contamination of infant formula and in testing grains for aflatoxin.

Columbus Instruments - Columbus, OH

Please circle No. 276
on your Reader Service Card

Updates

AIB Food Plant Sanitation Workshop For Food Plant Employees

AIB is again offering regional sanitation workshops in an effort to provide a better opportunity for food processors and their employees to receive sanitation basics and product safety training.

Workshops will be:

August 28-29	**Holiday Inn North Atlanta, GA**
September 11-12	**Sheraton Resort City of Industry, CA**

Designed for those who have never had the opportunity to attend a sanitation program, the workshops will benefit sanitation supervisors, receiving supervisors, quality assurance technicians, and new plant employees. The workshops introduce the basics of food plant sanitation and update employees with the latest sanitation principles and technologies.

Included in these two-day workshops are presentations and reference material handouts concerning regulations affecting and regulating the food industry, the organization and development of sanitation programs, foreign material control, the current Good Manufacturing Practices (GMP's), pest control and identification, microbiology, cleaning compounds and sanitation management.

Supplementing presentations and lecture materials, participants receive AIB's Basic Food Plant Sanitation Manual, and AIB's Consolidated Standards for Food Safety, each a valuable tool for future use as a reference and guideline.

Presented informally to encourage participation, time has been set aside for an open forum and question and answer session to encourage discussion. Course objective is to expose each participant to the importance of product safety and the need for active participation by all employees in the food plant.

If you have any questions or need additional information, please call or write: Registrar, AIB, 1213 Bakers Way, Manhattan, KS 66502; or call, 1-913-537-4750, or 1-800-633-5137.

Flour, Shortenings and Minor Ingredients in Cookies, Crackers and Baked Snacks

Production supervisors, research and quality assurance personnel and purchasers in the cookie and cracker industry will profit from the week-long American Institute of Baking seminar, Flour, Shortening and Minor Ingredients, September 17-21 in Manhattan, Kansas.

With a lineup of speakers from industry, education and AIB's own excellent staff, the seminar takes a detailed look at cookie and cracker ingredients and what they do.

The first two days focus on flour. Thrust of the discussion will be to show how information about flour is transmitted to wheat breeders and flour millers. Another goal will show how flour components affect baking quality. Topics include: assessments of flour quality in new wheat varieties, flour quality specifications, a miller's point of view on soft flour, computerized controls for weight and temperature in bulk flour installations, components and their effect on quality, practical discussion of controlling flour quality, and assessing flour quality with standard lab instruments.

Another two days will be spent on the use of shortenings. Among the topics will be: properties of fats and oils, sources, functions of fats and oils, fats and oils for creme fillings, an update on government labeling regulations, animal shortenings, tropical oils, bulk handling of fats and oils, antioxidants, hydrogenation and plasticizing shortenings.

The final day of the seminar is devoted to ingredients and food additives. How are these additives used in cookie and cracker production? What is their function? Topics include: function of sodium bicarbonate, ammonium bicarbonate, leaveners, enzymes, emulsifiers and product evaluation.

To register call (913)537-4750 or (800)633-5137 right now, and ask for the registrar. She'll place your name on the reservation list today. Telex: 881039 AIB MAN UD.

Gravani Receives Gamma Sigma Delta Award

On May 7, 1990, the Cornell University Chapter Gamma Sigma Delta, the society of agriculture, had their induction ceremony and initiated outstanding alumni, faculty and students into membership in the organization.

During the awards banquet that followed, Dr. Robert B. Gravani, Associate Professor of Food Science at Cornell received the society's Distinguished Extension Award for his contributions to extension programming.

PS Forum For Professional Sanitarians

The annual IAMFES meeting in Illinois was exceptional. Papers were presented on subjects ranging from infection problems in immunocompromised populations to new test methods for detecting salmonella and other microbes in food.

This year's conference demonstrated what IAMFES does best in providing a wide range of environmental health professionals new technical and scientific information related to food safety and other environmental issues. Without organizations like IAMFES, that provide a forum for the exchange and discussion of current research findings, Sanitarians would still be checking health cards during inspections. This year's format of special interest symposiums was very effective.

The only bad aspect of going to a conference is coming back to an overflowing in-basket. The in-basket on this desk is no exception. This would be a good time to go through a number of items that have been on my desk for several months.

The first two items are from the Association of Official Analytical Chemists (AOAC). AOAC has produced two excellent training posters that should be posted in every health department office for Sanitarians. "Classification of Visible (Exterior) Can Defects" defines technical terms used in describing the construction of hermetically sealed containers and illustrates defects that every Sanitarian needs to be able to identify. "Classification of Visible Exterior Flexible Package Defects" is another AOAC poster that is highly recommended. Both posters are in full color and can be purchased from AOAC, 2300 Wilson Boulevard, Suite 400, Arlington, VA 22201.

The next comes from the Iowa State University Press which has published *Food Sanitation and Safety Study Course*. Written by Suzanne Koury, R.D., this text provides a 16 lesson course for food service workers on the essentials of food service sanitation. The book is designed as a self-study, but can be used for in-service training. It would make an excellent text for training new employees, especially those working in health care facilities. The cost is under $15. More information on *Food Sanitation and Safety Study Course* can be obtained from: Iowa State University Press, 2121 E. State Avenue, Ames, Iowa 50010.

Also EPA administers The President's Environmental Youth Awards Program. This program has two components: the regional certificate program and the national awards competition. All youth participants receive a regional certificate, signed by the President of the United States, honoring them for their efforts in environmental protection. Information and entry forms on the youth awards program can be obtained from your regional EPA office.

Finally, the FDA Retail Food Protection Branch has issued a number of food code interpretations ranging from chemically treated wood to moldy cheese. Sanitarians and other professionals involved in food safety should have copies of these interpretations for reference. A listing of FDA code interpretations is provided below:

FOOD AND DRUG ADMINISTRATION
RETAIL CODE INTERPRETATIONS 1983-87

This is a listing of FDA Retail Code Interpretations issued during the period 1983 through 1987. Date of issue and the code section covered by the interpretation are provided. Single copies can be obtained from state health authorities responsible for food safety, regional FDA offices, or the FDA Retail Food Protection Branch at 200 C Street, SW, Room 3025, Washington, DC 20204.

Date	Code Section	
3/29/83	2-102	Food Supplies - Special Requirements for Retaining Shell-Stock "Tags"
3/21/84	4-103	Materials - Wood - Use of Chemically Treated Wood
3/30/84	1-102(q)	Food Protection - Baked or Boiled Potatoes Considered to be Potentially Hazardous Foods
3/30/84	6-701	Insect and Rodent Control - Effectiveness of Ultrasonic Pest Control Devices
4/16/84	2-201	Food Protection - Customer Self-Service of Bulk Food
4/23/84	1-102(q)	Definitions - Potentially Hazardous Food - Cooked Bacon
4/27/85	7-704(b)	Poisonous or Toxic Materials - Automatic Insecticide Dispensers
5/3/84	2-403(b)	Food Preparation - Product Temperature Criteria for Microwave Cooking of Pork, Pork Products and Beef Roasts
5/3/84	7-703	Poisonous or Toxic Materials - Storage
5/14/84	2-401	Food Preparation - Between-Use Storage of Food Preparation Utensils
5/23/84	1-102(q)	Definitions - Soy Protein Products Considered to be Potentially Hazardous Foods
6/25/84	3-101	Employee Health - Transmission of Herpes by Food or Food Contact Surfaces
7/16/84	3-201	Personal Cleanliness - Coins and Currency as Potential Fomites
7/19/84	6-503	Handwashing Supplies - Bar Soaps as Fomites
2/20/85	2-101	Food Supplies - Moldy Cheese
5/17/85	7-806	Premises - Acceptability of Pets in Common Dining Areas of Group Residences
7/8/85	1-102(q)	Definitions - Potentially Hazardous Food - Hard Boiled Eggs with Shells Intact
7/8/85	5-103	Equipment and Utensil Cleaning and Sanitization - pH of Iodine Sanitizing Solutions
8/23/85	4-101	Materials- Reuse of Plastic Food Containers
8/29/85	5-103	Equipment and Utensil Cleaning and Sanitization - Temperature of Chemical Sanitizing Rinse
8/29/85	2-201	Food Protection - Refilling of Take-Home Beverage Containers
11/7/85	7-803	Premises - Clothes Dryers
11/7/85	7-804	Premises - Storage of Soiled Linens and Clothes in Cold Rooms
12/20/85	6-101	Water Supply - Interruption of Potable Water Supply

3/18/86	5-104	Equipment and Utensil Cleaning and Sanitization - Conversion of Warewashers from Hot Water to Chemical Sanitization
5/9/86	1-102(q)	Definitions - Potentially Hazardous Foods
8/12/86	4-103	Materials - Wooden Paddles in Confectionery Operations
6/11/87	2-101	Food Supplies - Wild Mushrooms
8/21/87	2-403	Food Preparation - Raw, Marinated or Partially Cooked Fishery Products
9/3/87	6-701	Insect and Rodent Control - Devices for Electrocuting Flying Insects
9/10/87	2-101	Food Supplies- Sulfiting Agents on Food in Retail Food Establishments

Homer C. Emery, RS
Chair, FDA Interpretations Committee

August Field Inspection Quiz

1. Which of the following metals would pose the greatest risk of migrating to foods from ceramics?
   A. Nickel B. Lead
   C. Aluminum

2. Current FDA standard for lead leaching from plates is:
   A. 10 mg/L B. 7 mg/L
   C. 100 ug/L D. 50 ug/L

3. Current FDA standard for lead leaching from cups is:
   A. 50 ug/L B. 5 mg/L
   C. 2.5 mg/L D. 7 mg/L

4. Current FDA standard for lead leaching from large storage containers is:
   A. 7 mg/L B. 2.5 mg/L
   C. 50 ug/L D. 0.1 mg/L

5. Current EPA standard for lead in drinking water is:
   A. 7 mg/L B. 50 ug/L
   C. 5 mg/L D. 2.5 mg/L

NOTE: *The FDA Consumer* magazine has published excellent articles on ceramicware and lead. See the following issues: Jan 89; Dec 88; Sept 88; Sept 87; July/Aug 87.

Answers to June FIQ: 1. (D); 2. (A); 3. (D); 4. (C); 5. (A).

Affiliate News

Gil Murrey, left, completes his term as President and Hugh Wilson accepts the responsibility for the coming year.

Eleventh Annual Meeting of TAMWFP

The eleventh annual meeting of TAMWFP was held May 31, 1990 at the Ramada Inn-Airport, Nashville, TN with 54 members and guests in attendance.

Gil Murrey, president, presided at the meeting. David Waddell, assistant commissioner, TN Department of Agriculture, gave the Welcome. Hugh Wilson served as morning session chairman.

Jerry Kozak of the International Ice Cream Association, Washington, spoke on Frozen Dessert Regulations and Labeling.

After a Milk Break, Dr. Timothy Burchan of University of Tennessee, Knoxville, spoke on Animal Waste in Tennessee. Mr. Frank Bains of Allied-Signal, Inc., Baton Rouge, LA, spoke on Recycling Plastics in the Dairy Industry.

Dan Alexander gave the Invocation and a buffet luncheon was held.

Kenneth Whaley served as afternoon session chairman.

Service awards were presented by Dennis Lampley to (1) Kenneth Whaley for outstanding service to the dairy industry, (2) Henry Menees for outstanding service to the Association (3) Gil Murrey for outstanding leadership as president.

Checks for $200.00 were presented to Dr. Bob Demott of UT to assist graduate students at the University in attending the paper competition at the IAMFES annual meeting.

Dr. David McClary of Eli-Lily Company, Atlanta, gave a report on the status of BST.

Bob Beard of Eco Lab gave a talk on Liquid Waste Management in Dairy Plants.

After a Milk Break, Dee Buske of IAMFES, gave a report on IAMFES activities. President Gil Murrey presided over the business session.

On a motion by Tom Herbert and seconded by Mike Bradberry, the vote was unanimous to dispense with reading the minutes of the last meeting.

Upcoming IAMFES Affiliate Meetings

SEPTEMBER

•**13-14, Minnesota Sanitarians Association, Inc.** Annual Conference will start at 1:00 p.m. on September 13 at the Earle Brown Center, University of Minnesota. Annual meeting will start at 4:30 p.m. on September 13 with the Awards Banquet at 6:00 p.m. at the Holiday Inn, Shoreview. For further information call Roy E. Ginn at (612)785-0484.

•**17-19, Indiana Environmental Health Association Annual Meeting**, at the Ramada Inn, Jeffersonville, IN. For more information, contact Tammi Barrett at (317)633-0173.

•**17-19, New York State Association of Milk and Food Sanitarians Annual Meeting**, at the Sheraton Inn-Syracuse, Liverpool, NY. For more information contact Paul Dersam, 27 Sullivan Rd., Alden, NY 14004, (716)937-3432.

•**19-20, Wisconsin Joint Educational Conference Annual Meeting**, Pioneer Inn, Oshkosh, WI. For more information contact Neil Vassau (608)267-3504.

•**25-26, California Association of Dairy and Milk Sanitarians Annual Meeting**, Ontario Hilton, Ontario, CA. For more information contact Jack Coppes, P.O. Box 9234, Whittier, CA 90608, (213)699-4313

•**26-28, Kansas Association of Sanitarians Annual Meeting**, Red Coach Inn, Salina, KS. For more information contact John Davis, 1900 East 19th, Wichita, KS 67214, (316)268-8351.

OCTOBER

•**9-10, North Dakota Environmental Health Association's 1990 Fall Educational Conference and Meeting** will be held at the Holiday Inn, Grand Forks, ND. For more information please feel free to contact Mel Fischer, Bismarck Fire and Inspections, 1020 East Cental Avenue, Bismarck, ND 58501 (701)258-2070.

NOVEMBER

•**14-15, Alabama Dairy & Food Conference** to be held at the Howard Johnson Motor Lodge in Birmingham. For more information contact Tom McCaskey at (205)844-1518.

•**28, Ontario Food Protection Association Annual Meeting**, will be held at the Airport Hilton Hotel, Toronto, Ontario. The title of the all-day symposium is "FOOD PROTECTION: HOT TOPICS FOR THE '90's". For more information, please contact program convenors: Garth Sundeen (416)239-8411 or FAX (416)239-2416 or Patrick Kwan (416)671-5080 or FAX (416)671-5176.

On behalf of the Tennessee Affiliate, Dennis Lampley, right, presents a check in the amount of $200 to Dr. B. J. Demott for partial travel expenses for two graduate students to attend the National Meeting of IAMFES.

Dennis Lampley gave the financial report. Cecil White gave the audit report; Mary Lou Hopper gave the membership report; and Ronnie Wade gave the nominating report.

On a motion by Ken Whaley and seconded by Dr. Demott, the group voted unanimously to elect the recommended slate of officers by acclamation.

New officers are:

President	Hugh Wilson, Athens
President Elect	Ed Miller, Lewisburg
Vice President	Dr. Ann Draughon, Knoxville
Sec. - Treasurer	Dennis Lampley, Bon Aqua
Archivist	Ruth Fuqua, Mt. Juliet
Board Member at Large	Dave Simmler, Deans, Memphis
Past President	Gil Murrey, Murfreesboro

A brief discussion was held on changing the name of IAMFES. On a motion by Dr. Demott and seconded by Cecil White, the group voted unanimously to delegate Ruth Fuqua to oppose any name change for IAMFES.

Hank Menees served as door prize chairman. The grand prize, a country ham, was won by James Scott of the Department of Health and Environment.

Meeting Adjourned.

A service award is presented by Dennis Lampley, left, to Hank Menees.

A service award is presented by Dennis Lampley, left, to Ken Whaley.

New IAMFES Members

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Jim Bollman
Kelco Division of Merck & Co.
San Diego

Linda Hanna
Rio Linda Chemical Co., Inc.
Sacramento

Marcia McGlochlin
Clover Stormetta Farms Inc.
Petaluma

Oren A. Mosher
Eagle Machinery Co.
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Kenneth R. Weis
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Janet L. Martin
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Health & Mental Hygiene
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Pauline Flynn
Gene-Trak Systems
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5027 Pine Ridge Ave
Cheyenne, WY 82009
307-777-5978

Holders of 3-A Symbol Council Authorization on August 15, 1990

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

115 A-L Stainless Inc. (9/28/58)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

325 Albin Pump, Inc. (12/19/79)
(Mfg. by Albin Motor, Sweden)
120 Interstate N. Pkwy. E. #208
Atlanta, Georgia 30339-2103

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

29R Cherry-Burrel Corp. (10/3/56)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

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

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

595 Pumpen - und Maschinenbau (3/16/90)
Fritz Seeberger KG
Scharnholzstrasse 344
4250 Bottrop, FRG
West Germany
(U.S. Rep. Peacock Service, OH)

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

595 Pumpen - und Maschinebau
Fritz Seeberger KG
Scharnholzstrasse 344

4250 Bottrop, FRG
West Germany
(U.S. Rep. Peacock Service, OH)

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

332 TCI-Superior (12/10/80)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115-0953

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

582 Tri-Clover Canada, Ltd. (11/9/89)
P.O. Box 430
220 Park Road North
Brantford, Ontario N3T 5P3

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

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

329 Valex Products Corp. (6/10/80)
6080 Leland Street
Ventura, California 93003

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

5R Waukesha Pumps (5/6/56)
(A Unit of AMCA Int'l. Inc.)
1250 Lincoln Ave.
Waukesha, Wisconsin 53186

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

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. (12/20/57)
(A Unit of AMCA Int'l., Inc.)
2400-6th St., SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

309 Niro Atomizer Food & Dairy Inc. (7/19/78)
(Mfg. by Masinfabriken, Denmark)
1600 County Road F
Hudson, Wisconsin 54016

558 SOAVI B. & FIGLI S.p.A. (1/3/89)
(not available in USA)
43100 Parma (Italy)
VIA M. Da Erba Edoari, 29A

425 TCI-Superior (8/31/84)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115-0953

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

189 A & L Tougas, Ltee (10/3/66)
(not available in USA)
1 Tougas St.
Iberville, Quebec, Canada

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

New Lisbon, Wisconsin 53950

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

443 Badger Meter, Inc. (5/1/85)
6116 East 15th Street
Tulsa, Oklahoma 74158

82R Cherry-Burrell Corp. (12/11/57)
(A Unit of AMCA Int'l. Corp.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

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

509 Fitting Speciality (8/7/87)
1303 35th Street
Kenosha, Wisconsin 53140

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

287 Koltek, Inc. (1/14/77)
Div. of Alfa Laval
(Mfg. Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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

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

300 Superior Stainless, Inc. (11/22/77)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115

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

581 Tri-Clover Canada, Ltd. (11/9/89)
P.O. Box 430
220 Park Road North
Brantford, Ontario N3T 5P3

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

278 Valex Products Corp. (8/30/76)
6080 Leland Street
Ventura, California 93003

08-17A Compression Type Valves

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

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

566 Advance Fittings Corp. (3/31/86)
218 Centralia St.
Elkhorn, Wisconsin 53121

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

555 Cherry-Burrell Corp. (12/11/57)
2400 6th Street S.W.
Cedar Rapids, Iowa 52406

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

559 Koltek, Inc. (1/6/89)
Div. of Alfa Laval
(Mfg. by Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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

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

579 Tri-Clover Canada, Ltd. (11/9/89)
P.O. Box 430
220 Park Road North
Brantford, Ontario N3T 5P3

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

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, TX 77060

544 Valex Corp. (8/30/76)
6080 Leland St.
Ventura, California 93003

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. (12/11/57)
2400 6th Street S.W.
Cedar Rapids, Iowa 52406

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

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

09-07 Instrument Fittings and Connections Used on Milk and Milk Products Equipment

428 ARI Industries, Inc. (9/12/84)
381 ARI Court
Addison, Illinois 60101

321 Anderson Instrument Co., Inc. (6/14/79)
RD #1
Fultonville, New York 12072

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

315 Burns Engineering, Inc. (2/5/79)
10201 Bren Rd., East
Minnetonka, Minnesota 55343

206 The Foxboro Company (8/11/69)
33 Commercial Street
Foxboro, Massachusetts 02035

592 Claud S. Gordon Co. (2/27/90)
5710 Kenosha St.
P.O. Box 500
Richmond, Illinois 60071

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

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

487 Pyromation, Incorporated (12/16/86)
5211 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 92714

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 110
Rochester, New York 14692

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

522 Weed Instrument Company, Inc. (12/28/87)
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.
10304 NW 50th St.
Sunrise, Florida 33351

435 Sermia Equipment Limited (11/27/84)
(Not available in USA)
2511 Barbe Avenue
Chomedey, Laval, Quebec, Canada H7T 2A2

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

580 Tri-Clover Canada, Ltd. (11/9/89)
P.O. Box 430
220 Park Road North
Brantford, Ontario N3T 5P3

35 Tri-Clover, Inc. (10/15/56)
9201 Wilmot Road
Kenosha, Wisconsin 53141

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)
(A Unit of AMCA Int'l. Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

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

15 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

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

575 Pro Sales, Inc. (10/13/89)
107 2nd Street NW
Auburn, Washington 98001

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

426 TCI-Superior (8/31/84)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115-0953

12-05 Tubular Heat Exchangers for Milk and Milk Products

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

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

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

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

13-08 Farm Milk Cooling and Holding Tanks

49R A-L Stainless Inc. (12/5/56)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

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

273 Niro Atomizer Food & Dairy, Inc. (5/20/76)
1600 County Rd F
Hudson, Wisconsin 54016

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

427 TCI-Superior (8/31/84)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115-0953

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)

5355 - 115th Ave. No.
Clearwater, FL 34620

346 B-Bar-B, Inc. (10/21/81)
E. 10th & McBeth, P.O. Box 909
New Albany, New York 47150

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 Conoffast (11/29/79)
(Mfg. by ERCA, France)
1600 Harvester Road
West Chicago, Illinois 60185

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

352 GMS Engineering (1/12/82)
1936 Sherwood St.
Clearwater, Florida 34625

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

516 Leifeld + Lemke USA (9/18/87)
(Mfg. by Leifeld + Lemke, West Germany)
25 Whitney Road
Mahwah, New Jersey 07430

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)
1209 Capitol Drive
Addison, Illinois

351 Tetra Pak Inc. (1/7/82)
(Mfg. by A. B. Tetra, Italy)
889 Bridgeport Ave.
P.O. Box 807
Shelton, Connecticut 06484-0807

211 Twinpak, Inc. (Canada) (2/4/70)
(Not available in USA)
1840 Route Trans-Canada
Dorval, Quebec, Canada H9P 1J8

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)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

262 A-L Stainless Inc. (11/11/74)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

536 Stainless Fabrication, Inc. (7/14/88)
620 N. Prince Lane
Springfield, Missouri 65802

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 Rd.
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 Fort Howard Packaging Corporation (11/15/71)
P.O. Box 19130
Green Bay, Wisconsin 54307-9130

343 O.G. Hoyer, Inc. (7/6/81)
(Mfg. by Alfa Hoyer, Denmark)
201 Broad St.
Lake Geneva, Wisconsin 53147

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

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

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, PA 19341

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

265 Tokheim Automation 3/10/75)
P.O. Box 38269
Dallas, TX 75238
(formerly Emerson Elec. Co.)

359 Brocks Instruments (6/11/82)
407 West Vine St.
Hatfield, PA 19440

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

562 Great Lakes Instruments, Inc. (2/6/89)
8855 North 55th Street
Milwaukee, Wisconsin 53223

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)
149 Highway 26
Port Monmouth, New Jersey 07758

474 Hydril Production (6/30/86)
Technology Division
3300 North Belt East
P.O. Box 60458
Houston, Texas 77205-0458

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

475 Koltek, Inc. (7/15/86)
Div. of Alfa Laval
(Mfg. Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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

386 Turbo Instruments, Inc. (5/11/83)
(Mfg. by Turowerk, West Germany)
4 Vashell Way
Orinda, California 94563

29-00 Air Eliminators for Milk and Fluid Milk Products

340 Accurate Metering Systems, Inc. (6/2/81)
1651 Wilkening Court
Schaumburg, Illinois 60173

485 Koltek, Inc. (11/18/86)
Div. of Alfa Laval
(Mfg. by Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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)
(A Unit of AMCA Int'l., Inc.)
2400-6th St., SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

496 FranRica 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

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, MN 55413

590 Chemineer Inc. (1/23/90)
125 Flagship Dr.
North Andover, Massachusetts 01845

417 Cherry-Burrell (2/7/84)
Anco/Votator Division
P.O. Box 35600
Louisville, Kentucky 40232

464 Dairy Service Mfg., Inc. (12/12/85)
4630 W. Florissant Ave.
St. Louis, Missouri 63115

36-00 Colloid Mills

293 Waukesha Pumps (8/25/77)
(A Unit of AMCA Int'l., Inc.)
1250 Lincoln Ave.
Waukesha, Wisconsin 53186

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

481 Computer Instruments Corp. (8/14/86)
100 Madison Ave.
Hempstead, L.I., New York 11550

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

557 Honeywell, Inc. (12/21/88)
Industrial Controls Div.
1100 Virginia Drive
Fort Washington, Pennsylvania 19034

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

419 Niro Atomizer Food & Dairy Inc. (4/2/84)
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

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)
2248 Obispo Ave. #203
Long Beach, California 90806

498 Statham Division of Solartron Transducers (3/5/87)
2230 Stratham Blvd.
Oxnard, California 93033

285 Tank Mate Div/Monitor Mfg. Co. (12/7/76)
P.O. Box AL
Elburn, Illinois 60119

410 Viatran Corporation (11/1/83)
300 Industrial Drive
Grand Island, New York 14072

569 WEISS Instruments, Inc. (5/24/89)
(Mfg. by Nuova-Fima, Italy)
85 Bell St.
West Babylon, New York 11704

600 Weksler Instruments Corporation
800 Mill Rd
Freeport, NY 11520-0808

525 Zantel Instrument (3/4/88)
P.O. Box 81248
Lafayette, LA 70598

38-00 Cottage Cheese Vats (In Press)

541 Kusel Equipment Company (9/16/88)
820 West St.
Watertown, Wisconsin 53094

385 Stoelting, Inc. (5/5/83)
P.O. Box 127
Kiel, Wisconsin 53042-0127

40-01 Bag Collectors for Dry Milk and Dry Milk Products

504 General Resource Corporation (5/15/87)
201 3rd Street South
Hopkins, Minnesota 55343

381 Marriott Walker Corp. (4/12/83)
925 E. Maple Rd.
Birmingham, Michigan 48011

453 MikroPul Corporation (9/4/85)
10 Chatham Road
Summit, New Jersey 07901

456 C. E. Rogers Company (9/25/85)
P.O. Box 118
Mora, Minnesota 55051

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Coming Events

1990

SEPTEMBER

•**10-13, 104th Annual AOAC International Meeting & Exposition**, to be held at the Clarion Hotel, New Orleans, Louisiana. For more information contact: Margaret Ridgell, AOAC, Suite 400, 2200 Wilson Blvd., Arlington, VA 22201-3301 (703)522-3032.

•**11-13, Wyoming Public Health Sanitarians Association Annual Meeting**, to be held at the Hilton Inn, Casper, WY. For more information contact Sandi Palmer, President, at (307)638-8545.

•**12-14, Environmental Regulation Course** presented by Executive Enterprises, Inc. will be held at the Hotel Pontchartrain, Two Washington Blvd, Detroit, MI (313)965-0200. For more information call (800)831-8333 or (212)645-7880 (outside the U.S.).

•**13, Warehouse Sanitation Workshop** to be held in Kent, WA, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**13-14, Minnesota Sanitarians Association, Inc.** Annual Conference will start at 1:00 p.m. on September 13 at the Earle Brown Center, University of Minnesota. Annual meeting will start at 4:30 p.m. on September 13 with the Awards Banquet at 6:00 p.m. at the Holiday Inn, Shoreview. For further information call Roy E. Ginn at (612)785-0484.

•**13-14, Annual Wisconsin Laboratory Association's Educational Conference** will be held in Brookfield, WI. The Conference will be held at the Mariott Convention Center. For more information please contact Mr. Malin Benicek, Sanofi Bio Ingredients, 620 Progress Avenue, Waukesha, WI 53186.

•**13-16, International Symposium on Bovine Mastitis** will be held at the Westin Hotel in Indianapolis, IN. The Symposium is jointly sponsored by the National Mastitis Council (NMC) and the American Association of Bovine Practitioners (AABP) and will be held in conjunction with the AABP 23rd Annual Conference. For additional information contact Ann Saeman, Director of Operations, National Mastitis Council, 1840 Wilson Boulevard, Suite 400, Arlington, VA 22201 USA; (703)243-8268.

•**17-19, Indiana Environmental Health Association Annual Meeting**, at the Ramada Inn, Jeffersonville, IN. For more information contact Tammi Barrett at (317)633-0173.

•**17-19, New York State Association of Milk and Food Sanitarians Annual Meeting**, at the Sheraton Inn-Syracuse, Liverpool, NY. For more information contact Paul Dersam, 27 Sullivan Rd., Alden, NY 14004, (716)937-3432.

•**17-19, Sanitation and Safety for Food Processors and Warehousers** sponsored by the American Sanitation Institute will be held at the Embassy Suites Hotel in downtown St. Louis, MO. The program will feature prominent guest speakers in the national food industry, and topics will include FDA and USDA updates, incoming goods and in-house inspections, and insect and rodent control. For more information please contact Nancy Sullivan or Christine Verplank at ASI, 7625 Page Boulevard, St. Louis, MO 63133, or by calling (800)325-3371 (in Missouri (314)725-2555).

•**17-19, Baking Production Technology** to be held in Dallas, TX, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**17-19, Maintaining Ingredient and Product Quality** to be held in Dallas, TX, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**17-19, In-Store and Retail Bakery Training** to be held in Dallas, TX, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**17-21, Flour, Shortening and Minor Ingredients, In Cookies, Crackers and Baked Snacks** to be held in Dallas, TX, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**19-20, Wisconsin Joint Educational Conference Annual Meeting**, Pioneer Inn, Oshkosh, WI. For more information contact Neil Vassau (608)267-3504.

•**21, 1990 Fall Symposium "Food Protection Technology in Food Service System: Challenge for the 1990's** to be held at the Holiday Inn, Airport North in Atlanta, GA. For more information contact Joe Frank, University of Georgia, Athens, GA 30602 (404)542-2286.

•**24-28, Maintenance Management** to be held in Manhattan, KS, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**25-27, Environmental Regulation Course** presented by Executive Enterprises, Inc. will be held at the Dallas Marriott Park Central, 7750 LBJ Freeway @ Coit Road, Dallas, TX 75251 (214)233-4421. For more information call (800)831-8333 or (212)645-7880 (outside the U.S.).

•**25-28, Florida Public Health Association** will hold its 1990 Annual Educational Conference at the Altamonte Springs Hilton in Altamonte Springs, Florida. For more information contact Sandra F. Magyar, P.O. Box 11148, Jacksonville, FL 32211.

•**26, Warehouse Sanitation Workshop** to be held in Cherry Hill, NJ, presented by The American Institute of Baking. For more information call (913)537-4750 or (800)633-5137.

•**26-27, Joint Annual Convention of the South Dakota State Dairy Association and Dairy Fieldmen's Association** to be held at the Holiday Inn, Brookings, SD. For information contact Dr. John Parsons, Dairy Science Department, SDSU, Box 2104, Brookings, SD 57007 (605)688-4116.

•**26-28, Kansas Association of Sanitarians Annual Meeting**, Red Coach Inn, Salina, KS. For more information contact John Davis, 1900 East 19th, Wichita, KS 67214, (316)268-8351.

. . . On My Mind

Steven K. Halstead
IAMFES Executive Manager

FLOODS

It is mid-June as I write this. Last Friday and Saturday, central Iowa received over 5 inches of rain. Every creek, river, and gutter was flooded. The Sunday night news painted a bleak picture of our abilities to even get to work on Monday. Those fears were unfounded.

We are now cleaning up the mess. As you might expect, the media loves the human interest aspect. Last night, the TV showed three young boys--probably about 10 years old--playing in the flood water, while in the background we could hear a women telling the reporter about the horrible smell and the yuch! involved in the clean up. The women went on to say "The whole place smells like a sewer!"

We know that our sewage disposal systems for the most part end up dumping into a river or stream. When those streams are full of flood water the whole system backs up and before long, raw sewage is mixed into the stream.

No doubt the reporter thought she was contrasting the work and play aspects of the flood. It probably never occurred to her that the boys were playing in the sewer. I'm sure she never would have allowed it!

One doesn't have to be a sanitarian to come to the conclusion that if you wouldn't swim in a sewer, then you shouldn't swim in a flood.

Have we done everything we can to get that message across?

REGULATOR OR CONSULTANT?

While attending the annual meeting of our South Dakota affiliate earlier this month, I heard a story that really got me to thinking.

The sanitarian stopped by a restaurant to do an inspection. The manager was upset that he hadn't been warned of the inspection. (He didn't have time to get the floor swept!) Ignoring the floor, the sanitarian proceeded to the walk-in cooler to find the air temperature near the door to be 55°F. Clearly, there was a problem.

The sanitarian worked with the manager to get the temperature back down to where it should be--a task that took over an hour. As the sanitarian left, the manager made it clear that he resented the state's intrusion into his business affairs and railed against the fact that he had to pay taxes to support the sanitarian.

The restaurant/manager was not cited for unsafe practices. Nobody got sick and sued the store. It didn't cost the manager anything to get his problem solved.

Was the sanitarian a regulator or a consultant? Did he do the right thing? Will he do it again?

A QUICKIE

A sanitarian is one of those people who, if they do their work properly, we never think about. But if they mess up....

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

IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc.

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Company _____

Address _____

City _____ State/Prov. _____

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101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
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107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	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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The Lucky Ones

These children have cheated death. Not long ago, each of them passed through the ordeal of cancer. Modern therapies administered to them at St. Jude Children's Research Hospital saved their lives.

And thousands of other children live today because of the love and dedication of St. Jude's researchers, doctors and nurses.

But there was something else that saved these precious kids. They were rescued by the many Americans who cared enough about the suffering of children to support a hospital devoted entirely to helping children with catastrophic diseases.

St. Jude depends upon donations from concerned people like you to continue its work.

For more information on how you can help, write to St. Jude, P.O. Box 3704, Memphis, TN 38103, or call 1-800-877-5833.

Give the children a chance to live!

ST. JUDE CHILDREN'S RESEARCH HOSPITAL
Danny Thomas, Founder

If you're not running a Charm, you're running a risk.

You're looking at a partial list of antibiotics and mycotoxins you can catch with the Charm Tests.

You are also looking at a partial list of antibiotics other tests can't detect.

So if you want to take a chance on somebody else's test, good luck.

But if you want to be sure, be sure you run a Charm.

(See if you can find the new tests added in 1990!)

+ CHARM COWSIDE

■ CHARM TEST I

◆ CHARM TEST II

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+■◆ Penicillin BT
+■◆ Penicillin G
(Benzylpenicillin)
(Benzathine)
(Potassium)
(Procaine)
(Sodium)
(Benethamine)
(Calcium)
+■◆ Penicillin N
+■◆ Penicillin O
+■◆ Penicillin S
+■◆ Methicillin
+■◆ Nafcillin
+■◆ Ticarcillin
+■◆ Penicillin V
(Benzathine)
(Hydrabamine)
(Potassium)
+■◆ Oxacillin
+■◆ Cloxacillin
(Benzathine)
+■◆ Dicloxacillin
+■◆ Flucloxacillin
+■◆ Ampicillin
(Trihydrate)
+■◆ Amoxicillin
(Trihydrate)
+■◆ Piperacillin
+■◆ Hetacillin
+■◆ Carbenicillin
+■◆ Cephalothin
(Cephaloglycin)
+■◆ Cephapirin
+■◆ Cephradine
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+■◆ Cefotiam
+■◆ Cefoxitin
+■◆ Cefroxadine
+■◆ Cefsulodin
+■◆ Ceftazidime
+■◆ Ceftezole
+■◆ Ceftizoxime
+■◆ Cephalosporin C
+■◆ Cephamycins

TETRACYCLINES

■◆ Tetracycline
■◆ Chlortetracycline
■◆ Oxytetracycline
■◆ Demeclocycline
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MACROLIDES

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■◆ Erythromycin
■◆ Spiramycin
■◆ Oleandomycin
■◆ Tylosin
■◆ Lincomycin
■◆ Clindamycin

◆ NOVOBIOCIN

◆ SPECTINOMYCIN

■◆ CHLORAMPHENICOL

◆ BACITRACIN

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+■◆ Sulfamethizole
+■◆ Sulfisoxazole
+■◆ Sulfadiazine
+■◆ Sulfacetamide
+■◆ Sulfanilamide
+■◆ Sulfamethazine
+■◆ Sulfadimethoxine
+■◆ Sulfabromomethazine
+■◆ Dapsone
+■◆ Sulfathiazole
+■◆ Sulfamethoxazole
+■◆ Sulfachlorpyridazine
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+■◆ Sulfaquinoxaline
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+■◆ Sulfaethoxypyridazine
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AMINOGLYCOSIDES

◆ Dihydrostreptomycin
◆ Streptomycin Sulfate
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◆ Tobramycin
◆ Gentamicin
◆ Kanamycin
◆ Neomycin

MYCOTOXINS

◆ Aflatoxin M_1, M_2
◆ Aflatoxin B_1, B_2, G_1, G_2

ANTIBODY TESTS

◆ GENTAMICIN

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■◆ SULFAMETHAZINE

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