DAIRY, FOOD AND ENVIRONMENTAL
Sanitation
A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL Sanitation, INC.
AUGUST 1999

- 3-A Hottest List
- 2000 IAMFES
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As I contemplated what I should write for this, my last column as your President, I reflected upon all the events and issues with which your Executive Board dealt in the past several years. This, of course, prompted me to also think about what the future would bring for IAMFES and how this might affect IAMFES Members. I decided that in my final column, I would discuss what I believe will be some important future changes that will affect IAMFES and its Members. This is pure speculation, so there is every chance I could be wrong. But I also might be right!

**Global economy and trade.**

There are few places in the world where the influence of global trade is not apparent in our daily lives. Products such as motor vehicles, consumer electronics, and clothing are often made in one country to be sold in another country, by companies with headquarters in still another. The same is true with foods. In recent years, the global economy has brought many new and exciting foods to areas in which they were previously not found. I believe this trend will continue and perhaps even accelerate in the near future. As people move from their native countries to settle in new ones, they will bring with them certain aspects of their culture, particularly a desire for their native cuisine. This desire will not only lead to increased demand for their unique foods in their new home, but expose their new neighbors to these foods. If past experience with ethnic foods is any indication, their new neighbors will quickly develop their own appreciation for the new foods, creating even more new demand. The end result is more importation of these unique foods. This will affect IAMFES in several ways. First, if we are to address the food safety issues associated with these new foods, we must develop or acquire the expertise to food safety unique to these products. The best source of expertise, of course, will be from new International Members in the producing countries themselves. In other words, we need to THINK globally if we are to address global issues.

**Communications.**

The rapid evolution in computing and telecommunications is having dramatic effects on the way both business and professional organizations function. The world wide web now allows us to access huge volumes of information and conduct business with vendors worldwide...instantly from your office or home. Many publications are now available entirely on line or for purchase on compact disc. This trend became apparent to the IAMFES Board and staff several years ago and led to the launching of our web page (www.iamfes.org). At that time, we anticipated that the web would be an alternate source of information for a limited number of our Members. However, both Members and non-members alike have accessed our web page far more than we ever imagined. In fact, it is quickly becoming the
primary source of Association information for both Members and non-members. As telecommunications and computing improve and evolve, your Association could potentially offer even more services that were unimaginable even a few years ago. Electronic versions of our journals are only a start. How about being able to directly access the IAMFES lending library via the Internet, perhaps to use in a training session in different countries... all at the same time! Of course, such possibilities will undoubtedly cost money and require lots of planning. But the time to think of how we can make such possibilities a reality is NOW.

Expanded and rapid communications can also have, and is having, unforeseen consequences that will affect food safety professionals. For example, the use of the Center for Disease and Prevention's FoodNet and PulseNet efforts have allowed rapid identification of disease outbreaks that may have been completely missed only a decade ago. In fact, identification of foodborne outbreaks has become so rapid that it is beginning to outpace the industry’s ability to react to the outbreak. The development of newer technology may bring even more information for us to deal with in even less time. Devices such as rapid response biosensors may eventually make it possible to immediately detect and identify pathogenic microorganisms or their toxins in foods. As such technology is developed, IAMFES will need to educate and inform its Members as to relevance of the new information generated by this technology data and how it is best used.

**Specialization.** The trend toward more specialization started several decades ago. The most obvious place it occurred was in professional services, such as medicine and law. However, this trend is also occurring in professional societies and having some profound effects. Professional associations such as IAMFES tend to develop their own unique character and reputation. Some associations gravitate towards a focus on more basic science whereas others more toward practical application of those same sciences. This can often lead to a rivalry in which the more scientific group looks at the more practical group as "unscientific" and the practical group looks upon the scientific group as "ivory tower." The truth is, both organizations can play important roles in maintaining and improving the safety of the world’s food supply and should be cooperating rather than distancing themselves from one another. I believe that as specialization increases, the most successful organizations will be those that forge alliances with those of compatible “specialties,” enabling them to share resources, knowledge, and membership bases. IAMFES should lead the way in developing such alliances.

Specialization is also occurring within organizations. No longer are we simply “sanitarians.” The whole field of food protection has become so broad that one simply can not be an “expert” in every aspect. So, we focus on specific commodities (meat, dairy, produce), areas of study (toxicology, microbiology, HACCP), and even delivery of food safety information (adult education, mass communication). Although this allows for greater depth of expertise in the individual, it also has the potential to fragment the organization. This can result in some individuals feeling disenfranchised and ultimately leaving the Association for another more “compatible” organization, as discussed above. The challenge to future IAMFES Executive Boards and Members will be to embrace greater professional growth and specialization while at the same time maintaining the traditionally friendly and family oriented character for which we are known.

Who really knows what the future will bring? But whatever it is, it is my hope and expectation that our Association will continue to be a forward-thinking group that will enable it to be the world’s leader in food protection.
While preparing for this year's Annual Meeting in Dearborn, we normally take time to look at the accomplishments of the Association since the last Annual Meeting. In doing so, there was quite a list and I thought it would be appropriate to share part of it with you at this time. If you attended the Business Meeting on August 2, this will be old news to you. If you were unable to attend the Business Meeting, the following information is provided for your benefit.

To begin with, we of course completed the 1998 IAMFES Annual Meeting with a record number of attendees. We had 1,152 attend our 85th Annual Meeting in Nashville and had close to 90 attend our pre-meeting workshops. Our Committees, Professional Development Groups and Task Forces met and had many timely recommendations for the Executive Board to consider.

At the 1998 Business Meeting, it was announced that Membership dues would remain the same if you paid your dues within 30 days of the invoice date. We have seen an excellent response to this program and the Executive Board recently voted to continue with the same structure through August of 2000. Therefore, no dues increase for two years in a row!

Another announcement in 1998 had to do with our shipping methods for journals mailed outside of North America. When the journals arrive in the country (or continent) of delivery, the journals join the regular, surface mail system. This has allowed our journals to be delivered around the globe in 10 to 15 days — a vast improvement over the three to five months with our old shipping method. We have received many supporting comments from Members who appreciate this service.

Beginning with the January issue of the *Journal of Food Protection*, a new printer was utilized. We were quite happy with our previous printer, but the new printer offered many benefits. The one that really sold us, was the ability of the printer to place the table of contents and abstracts for each issue of the journal on the Internet and link to our Web site.

Speaking of the Web site, it continues to grow with new information being added weekly. In January, we launched a total re-make of the Web site growing from approximately 10 pages to more than 40 pages of information. Now there are up to 100 pages! Included are the table of contents for *Dairy, Food and Environmental Sanitation*, the President's and my monthly column, Annual Meeting information (including an updated program), Audiovisual Library listing with an order form, and of course a Membership application form. If you haven't visited the IAMFES Web site for a while, please do so; I'm certain you will be impressed. There are too many pages of information available at www.iamfes.org to list here!
Last fall, we co-sponsored and worked in conjunction with the Food Microbiology Committee of the International Life Sciences Institute on a conference “National Food Safety Initiative: Implications for Microbial Data Collection, Analysis, and Application.” There were about 250 attendees at this conference. We were thrilled to be a part of this three-day presentation and hope to repeat the success again in the future.

This past April, we presented a Workshop in Washington, D.C. titled “An Insider’s Look at Microbial Risk Assessment” and had 35 participants.

Another success that we have experienced over the past year is a growth in Membership. I believe the Web site has brought our Association to the attention of interested persons around the world that might not have been able to learn about IAMFES otherwise. We have seen a great number of new Members submitting Membership Applications that were downloaded from the IAMFES Web site. We hope to see this trend continue! Of course Membership continues to grow because of the efforts of so many of our active Members. Please share with your colleagues the many benefits of your IAMFES Membership and encourage them to join and become actively involved in YOUR Association.

Although this is just a short summary of our accomplishments since our last Annual Meeting, I hope you can see that IAMFES Members, Executive Board, and our staff continue to do all we can to “Advance Food Safety Worldwide.”

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E-mail: iamfes@iamfes.org; Web site: www.iamfes.org
A Suggested Method for Evaluating Foodhandler/Processor Handwash Formulations

Daryl S. Paulson

SUMMARY

The regulatory function for assuring that antimicrobial handwash products are effective has been transferred to the FDA from the USDA. BioScience Laboratories, Inc. has designed a protocol for testing food-handler handwash products for antibacterial efficacy. It is based on the current healthcare personnel handwash evaluation in which a marker microorganism is used to contaminate subjects' hands, and the Glove Juice Sampling Procedure is used to establish the baseline population. Subjects' hands are then recontaminated ten successive times, and each contamination is followed by a hand-wash procedure with product. Glove juice samples are collected after inoculation/handwash procedures 1, 3, 7, and 10. The healthcare personnel handwash has been modified to simulate more closely the conditions of hand contamination that may be associated with food preparation: *Escherichia coli* is substituted for *Serratia marcescens* and, instead of the hands being directly inoculated with bacteria, hamburger is inoculated with *E. coli*, and the subjects knead the hamburger so as to contaminate the hands with bacteria as well as with a significant organic load. Also discussed in this article is the importance of assessing a test product's potential for causing skin irritation with repeated use.

INTRODUCTION

For years, little effort was directed toward assuring the antimicrobial effectiveness of handwashing products used by food-processing and food-preparation personnel (10). However, in recent years, recurrent outbreaks of serious *Escherichia coli* O157:H7 infection, as well as notable incidents of food contamination by other microorganisms throughout the country, have been of considerable concern to food industry sanitarians, politicians, and governmental regulatory agencies. In response, oversight of handwash product effectiveness requirements has been transferred from USDA to FDA.

Although consumers can become infected with disease-causing microorganisms in numerous ways — from contaminated countertops, undercooked, microbe-laden meat, etc. — the primary focus of this paper is microbially contaminated employees' hands (11). A significant number of food-associated disease outbreaks are due to microorganisms "picked up" on the employees' hands and then passed to consumers via hand/glove contact with food. Perhaps this phenomenon
most commonly occurs when food-handlers are contaminated by enteric microorganisms from contact with their own feces or the feces of others (usually via hand-to-hand or fomite-to-hand transmission) and do not remove these microorganisms via an effective handwash (12). The contaminant microorganisms are then passed to the food being prepared and in turn passed to consumers of the food. In contrast, microorganisms that reside permanently on the hand surfaces, i.e., normal skin flora, rarely pose any threat of infectious disease to oneself or others (18, 19). These microorganisms are more important in food spoilage, particularly in partially prepared foods such as pre-cooked chicken and fish.

The topical antimicrobial handwash products manufactured for removing contaminant microorganisms are generally both chemically and antimicrobially very similar to those used by healthcare personnel for washing between patient examinations. Food service products, however, should also effectively remove the "organic load" of food ingredients and fat. This is a critical point that can limit and even prevent the use by foodhandlers/processors of products very efficacious as healthcare personnel handwashes (13).

We at BioScience Laboratories, Inc. have developed an approach to testing the antimicrobial effectiveness of foodhandler handwash products in a worst-case situation that we believe will provide accurate, precise, and reliable data. The approach is based on the current Healthcare Personnel Handwashes Evaluation published in the FDA’s Tentative Final Monograph (TFM), with two exceptions (5). First, Escherichia coli (ATCC #11229) is substituted for Serratia marcescens (ATCC #14756) as the hand-contaminating microorganism. Second, the hands are inoculated not by pipette-transfer, but by hand-kneading Escherichia coli-contaminated hamburger, which provides a worst-case simulation of the food industry’s hand-cleansing requirements.

**MATERIALS AND METHODS**

Test solutions and other materials were as follows:

- Sterile Stripping Suspending Fluid (SSF).
- Product neutralizing fluid with 0.1% Triton X-100 and other appropriate product neutralizers to inactivate the antimicrobial action of the product collected from the hands during the Glove Juice Sampling Procedure.
- Otherwise, the antimicrobial compound is incubated with the microorganisms, allowing the product to be in contact with the microorganism for many hours, which could make the product appear to be more effective than it really is.
- Butterfield’s Phosphate Buffer Solution (BPB) for use as the diluent in the serial dilution schema (4).
- MacConkey Selective Enteric Agar containing appropriate test product neutralizers for use in selectively culturing the Escherichia coli.
- Tryptic Soy Broth (TSB) for use in the neutralization assay and for preparing the Escherichia coli inocula to be distributed into the ground hamburger.
- High-fat hamburger (20-25% fat) to provide an organic load, making it more difficult for the product to remove the marker contaminative microorganisms.

**SUBJECTS**

A sufficient number of overtly healthy subjects over age 18 but under 70 should be recruited into the study to ensure that at least 18 subjects per product evaluated complete the study. A reference product should be included in the study design to assure the internal validity of the study, i.e., that the reference product provides the same efficacy in this study as it has demonstrated in the past (17). Insofar as possible, to ensure an unbiased sampling, groups of subjects should be mixed as to sex, age, and race. All subjects must be free of clinically evident hand dermatoses, injuries to the hands or forearms, open hand wounds, hangnails, and/or any other disorders that might pose a health threat to the subject. Standard Institutional Review Board (IRB) procedures and protocols should be in place and used throughout this evaluation (IRB oversight and approval, as required by FDA assures the safety of human subjects employed in a test protocol).

**Product neutralization**

Prior to performing this evaluation, antimicrobial product neutralizers (inactivators) should be evaluated to confirm that they are effective for inactivating the antimicrobial compounds, but do not, themselves, inhibit microbial growth. The American Society for Testing and Materials (ASTM) document entitled “Standard Practices for Evaluating Inactivators of Antimicrobial Agents Used in Disinfectant, Sanitizer, Antiseptic, or Preserved Products (ASTM E 1054-91)” provides the methodology for this test. A standard one-way (factor) Analysis of Variance (ANOVA) model using a 95% confidence interval (α = 0.05) or a series of Student’s t tests corrected for repeated use can be employed to assure statistically significant results from the assay. When multiple t-tests are performed, the multiply estimated t-table values must be modified at the α term. The formula for this is \( \frac{\alpha}{n} = 1 - (1 - \alpha)^k \) where \( k \) is the number of t-tests performed; \( \alpha \) is standard alpha value, and \( \alpha^* \) is adjusted alpha value (3).

**Pre-test period**

A 7-day pre-test period is adequate to assure elimination of any antimicrobial action residual from use of medicated personal hygiene products. During this period, subjects should be instructed to avoid
use of medicated hand soaps, hand wipes, hand gels, lotions, deodorants, and shampoos as well as skin contact with solvents, detergents, acids, and bases or any other products known to affect the normal microbial populations of the skin. Each subject participant should be supplied a personal hygiene kit containing non-medicated soap, shampoo, deodorant, hand/skin lotion, and rubber gloves. The rubber gloves should be worn when contact with antimicrobials, solvents, detergents, acids, or bases cannot be avoided by the participant. Subjects should use the items in this kit for all relevant personal hygiene needs throughout their participation in the study. Finally, participants should avoid using UV tanning beds and swimming or bathing in biocide-treated pools or hot tubs.

**ESCHERICHIA COLI CONTAMINATION**

**Inoculum preparation**

To prepare the *Escherichia coli* (ATCC# 11229) inoculum, a 10-ml tube of Tryptic Soy Broth should be inoculated with a loopful of a stock culture and incubated at 30±2°C for 24±2 hours. After the incubation period, 1.0 ml of the 10.0 ml broth culture should be aseptically transferred to a 2-liter flask containing 1 liter of sterile Tryptic Soy Broth, which is then incubated for 20±2 hours at 30±2°C and checked for purity. The resulting culture is used to inoculate each 4-ounce (113 g) raw hamburger patty to achieve a contaminant level of approximately 5.0 X 10⁸ CFU/patty. The inoculated hamburger is then kneaded for 2 minutes by a gloved technician to distribute the *Escherichia coli* uniformly throughout the patty. The hamburger should be quantitatively assayed for recoverable, viable *Escherichia coli* at the beginning and end of the use period. That the raw hamburger often will have a bioburden prior to its inoculation is accommodated by this step.

**Subject safety**

For their safety, the human subjects should not be permitted to leave the laboratory test area for any reason once testing begins, because their hands will be contaminated with *Escherichia coli*. Additionally, subjects should be required to wear protective laboratory aprons and be instructed not to touch their garments, faces, or any other body parts with their contaminated hands during the testing period.

**Test and practice wash period**

Each subject will be employed for 4 to 5 hours on the test day. Each subject should be required to clip his/her fingernails to a free-edge of ≤ 2 mm, if this has not already been done. All jewelry will be removed from the hands and arms prior to beginning the test period.

A practice wash should be performed using a non-medicated “bland” soap and employing the wash procedure to be used in testing. The practice wash will ensure that each subject understands and is capable of repeatedly performing the wash procedure. The temperature of the water used for this and all subsequent wash cycles should be 40±2°C.

**Baseline bacterial count**

On the test day, each human subject will handle and knead a hamburger patty contaminated with *Escherichia coli* for 2 minutes. This constitutes the bacterial inoculation of the hands. This first inoculation cycle, which provides “baseline” inoculation recovery levels using the Glove Juice Sampling Procedure, should be followed with a 30-s handwash using non-medicated soap. The subject will repeat this procedure twice to produce a total of 3 baseline measurements, which are then averaged.

**Inoculation/wash procedures**

After completion of baseline sampling, each subject will manipulate an inoculated hamburger patty and then wash with the assigned test antimicrobial product according to label or supplied instructions. This will be followed by the Glove Juice Sampling Procedure.

Each subject will complete this inoculation/wash procedure a total of 10 consecutive times, with a minimum of 5 and a maximum of 15 minutes between procedures. The Glove Juice Sampling Procedure will be performed after inoculation/wash cycles 1, 3, 7, and 10. Following product application and hand-sampling, the subjects will perform a supervised 1-min hand rinse with 70% ethanol and air-dry, followed by a 4-min surgical scrub with a 4% Chlorhexidine Gluconate or 10% Povidone Iodine solution and a water rinse to remove any residual *Escherichia coli* (ATCC #11229) from the hands.

Following the prescribed wash, powder-free, loose-fitting sterile latex gloves are placed on the subject’s hands. At the designated sampling times, 75 ml of Sterile Stripping Suspending Fluid without product neutralizers is instilled into the sampling gloves. The wrists are secured, and an attendant massages the hand through the glove in a uniform manner for 60 seconds. A 5.0 ml aliquot of the glove juice (dilution 10⁰) is removed and serially diluted in Sterile Stripping Suspending Fluid with product neutralizers and Butterfield’s Phosphate buffer solution.

**Bacterial counts**

Duplicate spread plates are prepared from each dilution, using MacConkey Agar that contains tested antimicrobial product neutralizers, and incubated at 30±2°C for approximately 48 hours. *Escherichia coli* (ATCC #11229) will produce purple colonies with a metallic sheen on MacConkey’s Agar, and only those colonies should be counted. Those plates providing *Escherichia coli* (ATCC #11229) colony counts between 25 and 250 should preferentially be utilized as the data source. The estimated number of viable microorganisms recovered from each hand is obtained from the formula (14).
R\textsuperscript{2} = \left( \frac{\sum x_i}{n} \right) \times 10^{D}

where: \textit{R} = \text{estimated number of bacteria},
\textit{75} = \text{amount of stripping fluid dispersed into each sampling glove},
\sum x_i = \text{average of the duplicate agar plate counts}, \text{and } \textit{D} = \text{Dilution level.}

Because the \textit{R}-value represents an exponential mathematical distribution, statistical analysis should be conducted on a linearized data distribution. This is achieved by using an \textit{R}\textsuperscript{2} value in place of \textit{R}, where \textit{R}\textsuperscript{2} = \log_{10} \textit{R}.

**Statistical analysis**

A pre-post experimental design is utilized to evaluate and compare the antimicrobial effectiveness (7, 8). For example, such a design for two test products and one reference product would appear as follows:

**Pre-Product Application Samples**

\begin{align*}
\text{R(1)} & O(1)_{10} \quad \text{[1]}_{10} \quad O(1)_{10} \\
\text{R(2)} & O(2)_{10} \quad \text{[2]}_{10} \quad O(2)_{10} \\
\text{R(3)} & O(3)_{10} \quad \text{[3]}_{10} \quad O(3)_{10}
\end{align*}

**Post-Product Application Samples**

\begin{align*}
\text{A(1)} & O(1) \quad O(1) \quad O(1) \quad O(1)_{10} \\
\text{A(2)} & O(2) \quad O(2) \quad O(2) \quad O(2)_{10} \\
\text{A(3)} & O(3) \quad O(3) \quad O(3) \quad O(3)_{10}
\end{align*}

where \textit{R(1)} = \text{subjects randomly assigned to 1 of 3 products}; \textit{A(1)} = \text{independent variables 1 is test product, 2 is test product, and 3 is reference product}; \textit{O(i)} = \text{dependent variables = microbial counts at baseline (BL) and after the } i^{th} \text{ product use (washes 1, 3, 7 and 10).}

Prior to performing a statistical analysis, Exploratory Data Analysis should be performed on the data.

**Skin irritation evaluations**

A topical antimicrobial product can be usefully evaluated for its irritation potential compared to that of competitors’ products in a multiple product study. One can link the skin irritation and antimicrobial evaluations together or perform the skin irritation study as a free-standing evaluation. For the latter approach, the investigator must recruit a set number of human volunteers who meet protocol and the Institutional Review Board (IRB) requirements for participating in the study. The subjects should be placed on a restricted “conditioning” products regimen for 7 days, just as in the antimicrobial efficacy study. This brings all subjects’ skin conditions to a common state and eliminates the biasing influences of extraneous products on outcomes for the tested product(s). The subjects’ hand can then be “baseline” graded for dryness, swelling, chafing, rash, redness, cracking, fissures, etc.
Depending on the study’s intent, a visual examination or transepidermal instrumentation measurement of water loss and skin moisture content can be performed to collect these baseline values.

The subjects then use the product(s) in a standardized manner for 10 to 50 washes per day over the course of 1 to 4 days. Following each wash, every fifth wash, or some other pre-determined standard time interval, the hands are evaluated visually and/or instrumentally.

When using transepidermal water loss instrumentation, standard parametric statistics — \( t \) tests or ANOVA — can be used. However, nonparametric statistical models are more appropriate than parametric ones for analyzing data from visual grading, which is a subjective rating system (9). Nonparametric statistics do not utilize parameters (mean, standard deviation, and variance) in evaluating data and are often used when the sample size is small (12). Additionally, with small sample sizes such as may be encountered in pilot studies, normal data distribution cannot be assured, and nonparametric statistics are therefore preferred. A normal “bell curve” distribution is not a requirement for nonparametric models although it is for parametric ones (2).

Common nonparametric models include the following:

**The Mann-Whitney Statistic.** This test, the nonparametric analog of Student’s \( t \) test (1), is used to compare two product groups to one another. Unlike the parametric Student’s \( t \) test that must assume a normal “bell-shaped” distribution, the Mann-Whitney statistic requires only that the sample data collected be randomly selected.

Kruskal-Wallis Model. This nonparametric analog of a one-factor ANOVA model (6, 16) is used to evaluate multiple groups in terms of one factor, such as the comparative irritation effects of five different hand soaps.

**CONCLUSION**

In manufacturing topical antimicrobial products for use in the food industry, it is important that they be tested modeling environmental conditions (e.g., organic fat load). This will assure that the products sold are effective in degenerating the hands. Moreover, it is important to know the irritation potential of the product so it can be designed to be not only effective but nonirritating to the skin of the user.

**ABOUT THE AUTHOR**

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**REFERENCES**

**Guidelines to Prevent Post-Processing Contamination from *Listeria monocytogenes***

R. Bruce Tompkin, Virginia N. Scott, Dane T. Bernard, William H. Sveum, and Kathy Sullivan Gombas

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**INTRODUCTION**

This document is intended to apply to refrigerated, ready-to-eat (RTE) foods that support the growth of *Listeria monocytogenes*, although the guidelines may be applied to other products to minimize contamination with *L. monocytogenes*. However, not all the guidelines listed below apply in all situations. The controls for *L. monocytogenes* will be product, process and plant specific; therefore, these recommendations should be considered only as guidelines. These guidelines may need to be adjusted as we gain new knowledge and better understand how to control *L. monocytogenes* in the plant environment.

Listeriosis is a serious disease that is caused by the bacterium *L. monocytogenes* and that results primarily from consumption of contaminated foods (4, 5). Although listeriosis can occur in otherwise healthy adults and children, certain populations—pregnant women, neonates, the elderly, and immunosuppressed individuals are more susceptible to listeriosis (4, 5). Foods implicated in outbreaks and in sporadic cases have been limited to a few refrigerated products that supported the growth of the organism to high numbers (4).

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**SUMMARY**

Extensive efforts to control *Listeria monocytogenes* can reduce the frequency and level (CFU/g or cm²) of contamination, but it is not possible, given currently available technology, to eradicate it from the processing environment or totally eliminate the potential for contamination of finished products. Because of the serious nature of listeriosis in the susceptible population, industry must take stringent measures to control *L. monocytogenes* in ready-to-eat foods in which the organism can grow. This document provides practical guidelines for preventing recontamination of products with *L. monocytogenes*, including controls directed toward preventing contamination of product contact surfaces and preventing the establishment and growth of the organism in niches in the plant environment. Although this document focuses on refrigerated, ready-to-eat products that support the growth of *L. monocytogenes*, the guidelines may be applied to other products to minimize contamination. The guidelines, which cover General Considerations, Processing Operations, Packaging and Storage Operations, Equipment Considerations, General Plant Sanitation, and Employee Personal Hygiene, also provide general guidance on environmental monitoring programs that use indicator organisms such as “generic Listeria” to verify the effectiveness of the *L. monocytogenes* control program.
**TABLE 1. Common sites of *L. monocytogenes* contamination**

- Filling or packaging equipment
- Conveyors
- Solutions used in chilling food
- Slicers, dices, shredders, blenders, etc. used after heating or decontaminating and before packaging
- Collators used for assembling.arranging product for packaging
- Racks for transporting finished product
- Hand tools, gloves, aprons, etc. that contact exposed finished product
- Spiral freezers/blast freezers
- Containers such as bins, tubs, or baskets used for holding food while it is waiting to be further processed or packaged

*L. monocytogenes* is widespread in the environment; it is found in soil, water, sewage, and decaying vegetation and can be isolated readily from humans, domestic animals (including pets), raw agricultural commodities, food processing environments, and the home. The organism is found in a wide variety of foods, including meats, poultry, vegetables, dairy products, and fishery products, in fact, in just about any cool, damp environment. This is one reason why floor drains frequently contain high populations of *Listeria* spp. Because of its pervasiveness, the organism is constantly re-introduced into the plant environment. Extensive efforts to control *L. monocytogenes* can reduce the amount and level of contamination, but cannot, given currently available technology, eradicate it from the processing environment or totally eliminate the potential for contamination of finished products. However, because of the serious illness, and even death, that it can cause in susceptible individuals, it is imperative that industry take stringent measures to control the potential for contaminating RTE foods. Because U.S. regulatory agencies consider *L. monocytogenes* in RTE foods an adulterant, they will request that companies recall product that is found to contain *L. monocytogenes*.

Providing effective control of *L. monocytogenes* is challenging and, because it can be very resource intensive, management must be committed to expending the resources necessary to resolving the problem, protecting the business, and assuring consumer safety. Employees must be trained to understand the problem, the potential sources of the organism, and the specific controls the plant is employing for control of *L. monocytogenes*. This employee training will go far beyond the normal training in Good Manufacturing Practices (GMPs). Management should strive to instill a sense of personal responsibility for the safety and quality of the food that is being produced.

**TABLE 1. Common sites of *L. monocytogenes* contamination**

Because *L. monocytogenes* is present on raw ingredients, many processing plants have adopted steps to destroy or remove the organism to the extent possible within the operation. For cooked products, the plant should verify that the heat treatment is adequate to destroy *L. monocytogenes*. This document does not focus on how to establish and validate such a process; instead, the focus for heat-treated products will be on preventing recontamination of products that are subsequently handled or further processed (sliced, repackaged, etc.). Most of the risk of contamination with *L. monocytogenes* is from potential recontamination after heating; in general, there is a low risk of *L. monocytogenes* surviving a heat treatment.

This document can also be applied to operations in which there is no heat treatment to destroy *L. monocytogenes*, but in which there is a need to minimize contamination of the product. These operations may include steps to remove the organism by peeling, washing, etc. Control in these operations must focus not only on reducing the numbers of *L. monocytogenes* on products by physical means, but also on preventing the establishment and growth of *L. monocytogenes* in the environment.

Because *L. monocytogenes* will continue to be introduced into a plant's environment, control must be directed toward preventing its establishment and growth in the environment. *L. monocytogenes* recontamination can come from multiple sources, and control through Hazard Analysis and Critical Control Points (HACCP) CCPs is therefore usually impractical; prerequisite programs are the foundation for *L. monocytogenes* control, with GMPs, sanitation, and training targeted toward specific control of this organism. While some may not agree with this position, the focus should be on having a program to control recontamination by *L. monocytogenes* rather than on what the specific controls are called.

To verify *L. monocytogenes* control, plants should implement an environmental monitoring program for an indicator such as *Listeria* spp. (8). This program, specific to the plant, should detail the areas to be sampled for *Listeria* spp. ("generic *Listeria"), the frequency of sampling, and the action to be taken when *Listeria* spp. is detected. This...
TABLE 2. Examples of L. monocytogenes reservoirs in the plant

<table>
<thead>
<tr>
<th>Equipment framework and other equipment in the area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floors</td>
</tr>
<tr>
<td>Drains</td>
</tr>
<tr>
<td>Walls, especially if there are cracks that retain moisture</td>
</tr>
<tr>
<td>Ceilings, overhead structures, catwalks</td>
</tr>
<tr>
<td>Condensate</td>
</tr>
<tr>
<td>Insulation in walls or around pipes and cooling units that has become wet</td>
</tr>
<tr>
<td>Trolleys, forklifts, walk-alongs</td>
</tr>
<tr>
<td>Cleaning tools such as sponges, brushes, floor scrubbers</td>
</tr>
<tr>
<td>Maintenance tools</td>
</tr>
</tbody>
</table>

aspect of a control program will be covered in detail later in the document.

CONTROL GUIDELINES

These guidelines are organized into General Considerations, Processing Operations, Packaging and Storage Operations, Equipment Considerations, General Plant Sanitation, and Employee Personal Hygiene.

General considerations

A control program for L. monocytogenes should emphasize the more common sources of direct product contamination. The greatest risk for product contamination occurs when a product contact surface is contaminated. This risk is highest between the point where a food is cooked, pasteurized, decontaminated, etc. and the point where the food is packaged. To effectively manage the risk of product contamination, it is necessary to assess where along the product flow the exposed food is most likely to become contaminated. This is generally wherever something has direct contact with the unpackaged product. Examples of some common sites of contamination are shown in Table 1.

Other areas of the environment can serve as indirect sources of L. monocytogenes. These areas may harbor the organism and under certain conditions lead to contamination of product contact surfaces or the food. Controlling the presence of L. monocytogenes in the environment can reduce the risk that product or a product contact surface will become contaminated. The significance of these areas will vary depending upon the facility, the process(es), the temperature and humidity of the room, and the food. Examples of places where L. monocytogenes may occur are shown in Table 2.

Consideration should also be given to the potential for L. monocytogenes to be brought back into the clean environment, which may occur because of traffic in the processing and packaging areas (people and equipment, such as trolleys and forklifts, entering from more contaminated points in the operation) or unscheduled equipment maintenance.

It should be recognized that, in a plant with an effective control program, L. monocytogenes contamination, when it occurs, is line or equipment specific. Although random isolated contamination with L. monocytogenes is possible in a controlled environment, contamination more likely will occur after the organism has become established in a niche, after which routine cleaning and sanitizing become ineffective. As the equipment is operated, the bacteria work their way out of the niche and become deposited onto the outer surfaces of the equipment. As product moves over or through the equipment, the contamination is spread downstream to other areas along the product flow. This situation can be corrected only by identifying the source or niche of L. monocytogenes growth and eliminating it. Some of the sites found to be potential harborage are shown in Table 3.

In addition to the possible establishment of L. monocytogenes in a niche, certain conditions that have led to product contamination deserve extra attention. Examples of conditions that have caused problems and should be viewed as “red flags” include the following:

a. A packaging line is moved or modified significantly.

b. Used equipment is brought from storage or another plant and installed into the process flow.

c. An equipment breakdown occurs.

d. Construction or major modifications are made to an RTE product area (e.g., replacing refrigeration units or floors, replacing or building walls, modifying sewer lines).

e. A new employee, unfamiliar with the operation and L. monocytogenes controls, has been hired to work in, or to clean equipment in, the RTE product area.

f. Personnel who handle RTE product touch surfaces or equipment that are likely to be contaminated (e.g., floor, trash cans) and do not change gloves or follow other required procedures before handling product.
TABLE 3. Potential harborage sites for L. monocytogenes

<table>
<thead>
<tr>
<th>Potential harborage sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hollow rollers for conveyors</td>
</tr>
<tr>
<td>Roller guards</td>
</tr>
<tr>
<td>Slicers, dicers</td>
</tr>
<tr>
<td>On/off switches</td>
</tr>
<tr>
<td>Rubber seals around doors</td>
</tr>
<tr>
<td>Damp insulation</td>
</tr>
<tr>
<td>Fibrous or porous conveyor belts</td>
</tr>
<tr>
<td>Conveyor scrapers, especially if frayed and in poor condition</td>
</tr>
<tr>
<td>Open bearings within equipment such as slicers, strippers, etc.</td>
</tr>
<tr>
<td>Hollow implements, including box cutters</td>
</tr>
<tr>
<td>Trash cans and other such ancillary items</td>
</tr>
<tr>
<td>Standing water in production areas</td>
</tr>
<tr>
<td>Cleaning tools, including mops and sponges</td>
</tr>
<tr>
<td>Poorly maintained in-line air filters through which compressed air must pass</td>
</tr>
<tr>
<td>Wet rusting or hollow framework</td>
</tr>
<tr>
<td>Motor housings</td>
</tr>
<tr>
<td>Walls/crevices of spiral freezers</td>
</tr>
<tr>
<td>Ice makers</td>
</tr>
<tr>
<td>Cracked hoses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential harborage sites</th>
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</table>

- g. Periods of heavy production make it difficult to clean the floors of holding coolers as scheduled.
- h. A drain backs up.
- i. Product is caught or hung up on equipment, resulting in stagnant product in the system, which can be a major site of microbial growth during production; the equipment should be modified to eliminate areas where product stops moving along or through a processing line.
- j. Raw or underprocessed product is detected in a cooked product area. If this occurs, the process must be stopped, the unacceptable product removed, and the equipment recleaned and sanitized.
- k. Frequent product changeovers on a packaging line necessitate changing forming pockets, dies or molds, line speeds, etc.
- l. Personnel are used interchangeably for packaging raw and cooked products.
- m. Production increases, requiring wet cleaning of down lines in the same room as lines running products.
- n. Heat exchangers become compromised (e.g., with pinholes).
- o. Equipment parts, (tubs, screens, etc.) are cleaned on the floor.
- p. Waste bins in the RTE area are not properly maintained, cleaned, and sanitized; personnel handling product may contact these items and then contaminate product and/or product contact surfaces.
- q. Traffic flow between raw and ready-to-eat areas is not adequately controlled (e.g., maintenance personnel and their tools, outside contractors, etc.).

**Processing operations**

As noted before, meat, poultry, vegetables, dairy products, seafood, and other raw ingredients may be contaminated with L. monocytogenes, although the presence of the organism and the levels of contamination vary widely (4, 5). These ingredients should be managed as if they are contaminated, and steps should be taken to prevent cross-contamination from raw ingredients to products that have been treated to eliminate or reduce the contamination.

Separating raw products from semi-finished and finished products is key to preventing cross-contamination.

1. Wherever possible, flow of product through the operation, from the raw ingredients to the finished product should be linear.

- a. Plants and/or practices must be rearranged, if necessary, to improve the flow of product, equipment, and people to ensure separation of raw from cooked or treated product.
- b. In some operations, it may be necessary to establish positive air flow on the “clean” side of the operation relative to the “dirty”
TABLE 4. Areas that should be cleaned with quats or peracid sanitizers

<table>
<thead>
<tr>
<th>Area</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drains</td>
<td>Daily</td>
</tr>
<tr>
<td>Floors</td>
<td>Daily</td>
</tr>
<tr>
<td>Waste containers &amp; storage</td>
<td>Daily</td>
</tr>
<tr>
<td>Walls</td>
<td>Weekly/monthly</td>
</tr>
<tr>
<td>Condensate drip pans</td>
<td>Weekly/monthly</td>
</tr>
<tr>
<td>HVAC</td>
<td>Weekly/monthly</td>
</tr>
<tr>
<td>Coolers</td>
<td>Weekly/monthly</td>
</tr>
<tr>
<td>Spiral freezers</td>
<td>Semi-annually</td>
</tr>
</tbody>
</table>

side (e.g., maintain negative air pressures in raw product areas and positive pressures on the clean or finished product side).

2. Operations must be compartmentalized as needed to enhance the separation of raw ingredients and processed products.
   a. Dedicated washing areas and CIP/COP (clean in place, clean out of place) systems should be provided for cooked or treated product equipment and raw processing equipment.
   b. Rework and trash barrels for cooked or treated product areas should be labeled or color coded and not be used elsewhere in the plant. They must be cleaned and sanitized daily, or more frequently if environmental sampling data indicate this is necessary.
   c. Before the start of operation each day, hoses are to be removed if possible from the manufacturing areas where RTE products are exposed. Otherwise, they must be properly hung and controlled during production.
   d. Separate utensils, carts, racks, totes, equipment, cleaning utensils, etc., color coded where practical, should be used for the RTE product area.
   e. Where possible, overhead fixtures should be eliminated in the RTE area, especially over open product zones; overhead fixtures should be on a scheduled maintenance and cleaning program.
   f. Where possible, wet process areas should be isolated from other production areas; at a minimum, standing water should be removed as soon as possible.

3. Traffic flow patterns between the raw ingredients and the processed products sides of the operation must be controlled to prevent transfer of *L. monocytogenes* from the "dirty" or "raw" side of the operation to the "clean" or "cooked" side. Some specific measures which should be considered for controlling the transfer of *L. monocytogenes* to clean areas are as follows:
   a. Equipment, utensils and people in raw and cooked areas should not be interchanged during the working day.
   b. Drains from the "dirty" or "raw" side should not be connected to those in the "clean" or "cooked" side.
   c. As an option, plant management may install foot baths; if they are installed, they must be properly maintained to prevent their becoming a source of contamination. Maintaining clean dry floors is preferred to the use of foot baths, unless there is a specific need that cannot be addressed otherwise. Foot bath solutions should contain stronger concentrations of sanitizer than would normally be used on equipment (e.g., 200 ppm iodophor, 400 to 800 ppm quaternary ammonium compound); a minimum depth of 2 inches of solution is recommended. Chlorine is not recommended for this use as it becomes too quickly inactivated; if chlorine is used, attention must be given to monitoring and maintaining its strength. Foot baths will be ineffective if cleated boots are carrying large particles of dirt or plant waste.
   d. As another option, a foam disinfectant may be sprayed on the floor as people or rolling stock (carts, forklifts, etc.) enter the room.
Water used in processing operations in which it will come in contact with product, e.g., chill water for RTE products and for blanched vegetables to be used in RTE products, should contain an antimicrobial agent known to be effective against *L. monocytogenes* and approved for the specific application at the levels used.

**Packaging and storage operations**

Pallets entering the packaging room must be clean, dry and in good condition, and exposed products must be stored and packaged in a clean, dry environment, for the following reasons:

a. Bacteria cannot multiply without water; therefore, if the environment is clean and dry, *L. monocytogenes* remains dormant or perhaps dies.

b. There is less transfer of bacteria from surfaces if the surfaces are clean and dry.

c. The spread of contamination by vehicular and pedestrian traffic is reduced considerably if the floors are clean and dry.

d. The cooling units in packaging and coolers for exposed product should have dehumidifying capability. To facilitate the removal of humid air and to dry floors after cleaning, it may be necessary to exhaust air outside the plant. Heating air within a room can also be effective for removing moisture at the end of the cleaning/sanitizing process.

e. Equipment considerations

   Proper design and maintenance of equipment is essential.

   a. Equipment must be designed to facilitate cleaning and to minimize sites where microbial multiplication can occur. Acceptability of the design from a microbiological and sanitation standpoint should be reviewed before any new or replacement equipment is acquired.

   b. Previously used equipment, even though visually clean, may harbor pathogens; such equipment must be thoroughly cleaned and sanitized, disassembling as needed, prior to putting it into production.

   c. Equipment must be properly maintained to minimize breakdowns and the attendant risk of contamination during repair.

   d. Damaged, pitted, corroded, or cracked equipment should be repaired or replaced.

   e. Equipment or catwalk framework should not be hollow, which could allow water to collect and harbor *L. monocytogenes*.

   f. Lubricants that contain additives (e.g., sodium benzoate) that are listericidal should be used; lubricants can become contaminated with product residue and become a center for growth of *L. monocytogenes*.

   g. Conveyor designs and locations that are difficult to clean and sanitize must be avoided. Conveyors for product prior to packaging should not contain hollow rollers. Conveyors or other processing equipment in which product is exposed should not be locate near the floor, as this is a likely source of *L. monocytogenes*. Overhead conveyors should be avoided if possible, as they are more difficult to clean, sanitize and inspect; a safety ladder should be provided, or the conveyor should be designed so it can be lowered for cleaning.

   h. Racks used for transporting exposed cooked product should have cover guards over the wheels to prevent spray from the wheels onto the rack and product as the racks are moved.

i. Racks used in operations after products are cooked can be a significant source of contamination if not properly cleaned and sanitized before use; the most reliable method of sanitizing racks is with heat. Heat can be applied by (1) a hot water (180°F) rinse in a rack washer in which the racks will reach a temperature of 160°F or higher, (2) steam applied in a cabinet after cleaning in a rack washer, or (3) placing the racks into an oven and applying moist heat to raise the temperature of the racks to 160°F or higher. When heat is used to sanitize, it is essential that the equipment be thoroughly cleaned so the heat does not bake the soil on, making it more difficult to remove, and resulting in more contamination problems in the future.

j. Regular maintenance schedules should be adopted and followed to minimize the potential for harborages and to reduce the potential for contamination of equipment due to unscheduled repair operations.

k. For maintenance of equipment in the cooked, RTE product area it may be necessary to use tools dedicated to this area or to sanitize tools prior to use in this area. Maintenance personnel should wear clean smocks that are not used in raw material areas. Equipment should be re-sanitized after maintenance work on or around product contact surfaces.

**General plant sanitation**

a. Sanitation procedures designed to control *L. monocytogenes* should be used. The frequency of cleaning...
and sanitizing the equipment and environment of a plant depends upon experience and microbiological data. Visual inspection is very important in verifying equipment cleanliness. Routine microbiological testing (e.g., Aerobic Plate Count) allows the plant to develop a baseline for comparison purposes, observe trends, and detect a developing sanitation problem. ATP monitoring systems can also be useful tools for monitoring overall sanitation in the plant. However, these procedures (visual inspection, APC counts, ATP monitoring) do not give the same degree of assurance that _L. monocytogenes_ is not present as does environmental testing for _Listeria_ spp. (as outlined later in this document).

b. Successful control of _L. monocytogenes_ requires consistency and attention to detail, following these steps: (1) dry clean, (2) pre-rinse the equipment, (3) visually inspect the equipment, (4) foam and scrub the equipment, (5) rinse the equipment, (6) visually inspect the equipment, (7) clean the floors, (8) sanitize the equipment and floors, (9) conduct post-sanitation verification, (10) dry the floors, (11) clean and put away supplies. Some equipment may require disassembling prior to cleaning and sanitizing and may need to be re-sanitized after re-assembling.

c. Quaternary ammonium compounds (quats) have been found to be effective against _L. monocytogenes_ and leave a residual germicidal effect on surfaces. In addition, sanitizers containing peracetic acid and peroctanoic acid have been shown to be effective against biofilms containing _L. monocytogenes_. Areas that should be sanitized with such compounds and a suggested frequency are shown in Table 4.

d. The cleanup crew should receive special training in proper procedures to control _L. monocytogenes_, as well as close monitoring and correction to improve and maintain a high level of performance.

e. Priority must be given to rooms and equipment used for holding and packaging exposed ready-to-eat product. Areas where products are stored or processed are of lower priority because inadequately cleaned equipment in raw processing areas has not been associated with a problem of _L. monocytogenes_ in finished product. Consideration should be given to assigning the most capable and experienced personnel to areas where RTE products are handled and packaged.

f. It is very desirable, even necessary in some cases, to have a person on the staff whose primary responsibility is to monitor the cleaning and sanitizing process whenever it occurs to be certain it is done correctly. This person should recognize the urgency of having the plant ready on time for startup, but this concern must be secondary to the necessity that the plant is correctly cleaned and sanitized. Extensive experience indicates that, if the equipment is properly cleaned and sanitized before start-up, then the risk of contamination from equipment during production through two shifts is minimal.

g. Mid-shift cleanups should be eliminated wherever possible, because they produce aerosols and add water to the environment, which can spread _L. monocytogenes_; they are therefore counterproductive in that they increase the risk of _L. monocytogenes_ contamination and make it more difficult to control _L. monocytogenes_.

h. Some plants have found the following sanitizing procedure to be helpful: After cleaning the equipment, apply a high level of sanitizer (e.g., 800 ppm quat), allow it to stand for about 20 minutes, rinse thoroughly, and then apply the normal level of sanitizer (e.g., 200 ppm quat or chlorine). At the end of the production week, the high level of sanitizer can be left on the equipment until shortly before start-up. The sanitizer is then rinsed off, the normal level is applied, and the room is prepared for start-up. Under certain circumstances, it may be beneficial to spray an aerosol of 200 ppm quat into a room as a final step in the cleaning and sanitizing process; weekly or monthly fogging may be useful.

i. Rotating other sanitizers (e.g., chlorine, acid-anionic, peracid and iodophors) into the sanitation program may provide for greater effectiveness. Consideration can be given to using new peracid-based sanitizers and others that have been demonstrated to be effective against _L. monocytogenes_.

j. Equipment should be modified so it is simple in design, is easy to clean, and has fewer maintenance problems, because breakdowns during production increase the risk of _L. monocytogenes_ contamination.

k. Sanitizing with high temperatures, if manufacturers' instructions permit such application, may be particularly useful for biofilms.
l. Hot water/steam sanitation is an especially effective alternative to chemical sanitation where equipment is difficult to clean. Wherever possible, steam should be applied as a final step for difficult-to-clean equipment. One method is to place a metal cover over the equipment and then inject steam. In some cases, equipment can be steamed in a cook oven. The goal is to heat the equipment so it reaches at least 160°F throughout. A holding period of an hour or more is desirable. For equipment that is more sensitive to heating, it is necessary to use a lower temperature (e.g., 145°F) and a longer holding time. (See earlier cautions about thorough cleaning prior to application of heat.)

m. Plastic tubs that can be stacked have been achronic problem if they are not cleaned and sanitized daily; they must not be put on the floor, unless placed on a clean plastic mat.

n. Because infrequent cleaning of coolers used for holding cooked product commonly causes increased L. monocytogenes problems, particularly in the busy summer season, these coolers should be emptied and cleaned at least once per week (or month) depending upon level of use and conditions of the coolers, and floors should be kept dry.

o. Spiral freezers used for freezing unpackaged product should be cleaned twice a year; infrequent defrosting, cleaning, and maintenance of these can be sources of L. monocytogenes problems.

p. Condensate that accumulates in drip pans of refrigeration units should be directed to a drain via a hose, with care taken to ensure that the hose does not become blocked. Solid forms of sanitizers (e.g., blocks or donuts of quats) can be placed in the drip pan to control microbial growth; in addition to the routine use of sanitizers, drip pans should be cleaned regularly.

q. If compressed air is used to remove debris from equipment during production, it should be recognized that this can increase the risk of contamination by being a source of L. monocytogenes when in-line filters are not maintained or replaced with regularity. Thus, when compressed air must be used directly on product or product contact surfaces, the air should be filtered at the point of use and the filters maintained. This practice should be restricted, preferably, to cleaning certain equipment (e.g., packaging machines) at the end of production before cleaning begins.

r. Coolers or other rooms should never be cleaned when exposed RTE product is present. Covering the product with plastic or paper cannot be relied on; all unpackaged product should be removed from the room before cleaning begins.

s. Equipment should not be dismantled and washed on the floor.

t. The best method for cleaning floors is to use a powdered caustic cleaner, apply water as needed, use a dedicated, color-coded brush to clean the floor, and then thoroughly rinse, using a low volume hose, and sanitize the floor. Newer cleaners and sanitizers may be more effective for controlling L. monocytogenes on the floor. Floor scrubbers can be helpful, particularly for cleaning large open spaces such as hallways.

The equipment used for cleaning must be maintained and properly cleaned so that it does not become a source of contamination. Application of powdered citric acid to certain areas of the floor may be effective for controlling L. monocytogenes, provided the floor has been properly cleaned and dried before applying the citric acid. For maximum effectiveness, the surface of the floor should be maintained at pH 5.0 or below with litmus paper used to check the pH. Although this may help control L. monocytogenes, the condition of the floor should be monitored, as the acid condition will cause deterioration that eventually will necessitate replacing the floor.

u. Floor drains must be designed and maintained to prevent backups. If a backup occurs, production must cease, open product removed from the room for disposition, the drain cleared, and the area carefully cleaned with caustic, and then rinsed and sanitized. Splashing of solutions onto equipment during the process must be avoided. The floor should then be dried. A high pressure hose must never be used to clear a drain; the aerosol created will spread contamination throughout the room.

v. Whenever possible, trench drains should be eliminated.

w. Bactericidal drain rings are recommended.

x. Floor drains should be cleaned and sanitized in a manner that prevents contamination of other surfaces in the room. Floor drain brushes must be at least 1/4 inch smaller than the diameter of the drain opening, or a splash guard must be used to prevent splashing during
cleaning. Utensils for cleaning drains should be dedicated to that purpose to minimize the potential for contamination. If floor drains are cleaned first, it may be necessary to clean and sanitize them again at the end of the process.

y. Cleaning tools should be sanitized using 600-1000 ppm quat solutions and stored either dry or in quat solutions maintained at 1000 ppm.

**Employee personal hygiene**

Personal hygiene practices with *L. monocytogenes* control as a major objective should be established. The following information should become part of employee training for *L. monocytogenes* control.

a. Clean gloves, smocks, and aprons are essential to protect against product contamination. Ideally, there should be one color smock for the raw side of the operation and one for the processed side. Disposable gloves and aprons should be used wherever possible in cooked product areas. Disposable paper sleeves (arm covers) can provide another barrier for those who handle exposed product. Disposable items should be discarded when the work area is left and replaced with new when the employee returns. Some garments (e.g., smocks) may be left in the department and re-used, provided they are clean. Gloves should be replaced if damaged. The use of gloves does not preclude the need for employees to wash hands regularly.

b. Everyone working in areas where RTE products are exposed must clearly understand that the purpose of wearing clean garments and disposable gloves is to protect the product from contamination, to protect employees from getting dirty.

c. If an unclean surface is touched, then hands should be washed and gloves changed.

d. Equipment and soiled clothing must not be stored in lockers.

e. If possible, a person in the packaging line should be assigned to pick up material from the floor, remove trash, and perform other housekeeping tasks. This person must not work on a packaging line or handle product that will be packaged or replaced on the line.

f. Rubber boots that are non-porous and easily cleaned, which experience indicates are better for *L. monocytogenes* control than other footwear, are necessary where footbaths are used.

g. Gloves should be replaced if necessary due to contamination, not to protect the product from contamination, nor to protect employees from getting dirty.

**ENVIRONMENTAL MONITORING PROGRAM TO VERIFY CONTROL**

An environmental monitoring program is necessary to verify control. The actions to be taken when environmental or product contact surfaces give positive results will vary with each company's policy and action plans, which may change over time based on knowledge of the operation and its controls, the risk of contaminating product, regulatory requirements, and other factors. It must be emphasized that there are many approaches to controlling *L. monocytogenes*; and that what works for one company may not be appropriate for another.

**General principles for verification of environmental monitoring**

Environmental monitoring (microbiological testing) should focus on a non-pathogenic indicator such as *Listeria* spp. or *Listeria*-like organisms (e.g., organisms that blacken Fraser broth or produce black colonies on a *Listeria* selective-differential agar), because these indicators will be found more frequently in the environment than *L. monocytogenes* and because test results are available more quickly. Monitoring results should alert the plant to potential problem areas, prompting further investigation and focusing of additional control efforts, as necessary. Corporate goals for reduction of positives should be established to encourage continuous improvement. A detailed set of action plans should be developed to control the risk of *L. monocytogenes* in the event that the corporate goals are not met.

Each plant, product, and process must be evaluated to determine the appropriate monitoring points. Each packaging line should be regarded as an independent unit for monitoring and control. It is recommended that both food contact surfaces and non-food contact surfaces that have the potential to contaminate product be tested. One approach might be to separate testing into environmental sites, product contact sites, and product itself, keeping in mind that because *L. monocytogenes* will not be found frequently
in products in operations following these control guidelines, and because it will not be uniformly distributed, product testing will not be a reliable indicator that *L. monocytogenes* contamination has not occurred. Thus, the emphasis of the program discussed here is on testing for *Listeria*-like organisms in the environment to verify control. There can be many variations on how this is done. Some guidelines, which follow, are illustrated in Figures 1 and 2.

**Environmental testing**

Plants should determine the points to sample and the frequency of sampling based on knowledge of their specific operation and the controls that have been put into place, as well as any microbiological data available. Suggested areas include support structures, overhead areas or structures, walls, floors, drains, and room air. Weekly sampling is recommended initially for most wet areas, where *L. monocytogenes* can grow; in dry-cleaned areas sampling may be less frequent.

The number of sampling points and the frequency of sampling may be adjusted based on results over time. For example, repeated negative findings may suggest that a sampling site may be eliminated or frequency of sampling for a particular area may be decreased.

Statistical Process Control (SPC) may be used to track results and identify the need to take action.

Plants should determine the action to be taken if *Listeria* spp. is detected at frequencies exceeding the upper control limit, target, or "trigger" that the plant has set (although some attention should be given to cleaning and sanitizing an area when any positive result is found). Because the reasons for a positive finding are likely to be plant-specific, remedial actions will vary; the following points should be considered in determining remedial actions for environmental positives:

- Detection of *Listeria* spp. in an environmental monitoring sample does not necessarily indicate a microbiological control problem; it does indicate that additional investigation should be undertaken. Thus, a positive environmental monitoring sample does not mean that plants must shut down the line and take immediate remedial action.

- When environmental monitoring results indicate a trend toward an increased incidence of *Listeria* spp., plants should investigate to determine the reason(s) for the increase and should take action to reduce the level again. Increased environmental positives may trigger a shift to the troubleshooting or problem-solving mode, depending on the company's specific action plan.

  - If a positive sample is detected, and the sample was a composite sample, the individual samples should be tested to pinpoint the location of the positive.
  
  - Additional samples should be taken from the environmental area where the positive was detected. These samples may indicate that additional remedial actions are needed in this area. Again, this may trigger a shift to the troubleshooting or problem-solving mode, depending on the company's specific action plan.

  - If, after remedial actions have been applied, additional samples are positive, the environment should be intensively cleaned and retested.

  - Sampling of (additional) food contact surfaces in the areas where environmental positives are detected should be considered.

    - If, after remedial actions have been applied, additional samples yield negative results, the plant would return to routine monitoring.

**Food contact surface testing**

Food contact surfaces may be sampled routinely for *Listeria*-like organisms as a verification that environmental controls are preventing *L. monocytogenes* contamination of surfaces; alternatively, they may be sampled only when environmental monitoring suggests a possible problem.

As with environmental sampling, plants should determine the points to sample, the time of day for sampling, and the frequency of sampling based on knowledge of their spe-
Figure 2: Product contact surface testing for indicators of Listeria contamination

Monitoring

- Negative: Continue Routine Monitoring
- Positive: Troubleshooting Investigation
  - Positive: Preventive/Corrective Actions
  - Negative: Return to Routine Monitoring

Verification Swabs

- Positive: Additional Corrective Actions, Possible Targeted Product Testing
- Negative: Return to Routine Monitoring

Product testing

Plants may decide to test product as a result of positive food contact surfaces. In addition, random product testing may be considered as a component of a verification program to assess that the control/monitoring program is effective in preventing product contamination. Effective programs do not necessarily require product testing; finished product testing has limited utility (for reasons indicated previously), even as a verification tool. Whenever product is sampled, the lots should be held until the laboratory results are available.

Plants must determine the action to be taken in the event that L. monocytogenes is detected in a product sample.

Environmental sampling guidelines

When taking swab or sponge samples, a scientifically acceptable method must be used. Samples may be composited where scientifically appropriate; where possible, the remaining portion of each individual sample should be retained until composite results are obtained, in case additional testing of individual samples is necessary.

Packaging line samples (product contact surfaces) should be from areas as large as practical. Environmental samples should represent a constant area (e.g., 1.5 ft. × 1.5 ft., 2 ft. × 3 ft., etc.)

Floor drains represent an almost constant problem area; a corporate decision should be made on whether or not to include drains in the environmental sampling program. A separate goal for drains may be appropriate.

Any testing for Listeria, whether it be environmental or finished product testing, should be conducted by a laboratory adhering to Good Laboratory Practices (3). It is recommended that the laboratory participate in a proficiency or check sample program for Listeria, where possible. It should be recognized that error rates occur with any laboratory test, and controls should be in place to help detect laboratory errors and to assure that the laboratory can properly identify the organism.

Problem solving

When an effective control program for L. monocytogenes is in place, the primary source of contamination is often a niche where the organism has become established and is multiplying. When L. monocytogenes finds a niche, the contamination will be line-specific. In general, the contamination will flow downstream along a packaging line. When seeking the source of a niche, sponge samples should be collected and analyzed individually, not as composites. Additional sites should be sampled along the line and sampling should be done more frequently throughout the day. Suspected pieces of equipment should be torn down, collecting samples of suspicious sites and materials. The equipment should be cleaned and sanitized as it is being reassembled. If cleaning and sanitizing are unsuccessful, it may be necessary to remove sensitive
electronics, oil and grease and apply heat to 160°F. Small parts can be placed in an oven; larger equipment can be shrouded and steam applied under the tarp. Lower temperatures for longer times may also be effective. The possibility that employee practices may be involved in the contamination should also be considered, in which case refresher training in the controls necessary to prevent *L. monocytogenes* contamination may be necessary or advantageous.

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**REFERENCES**

Nominations are now being accepted by the Nominating Committee for the office of IAMFES Secretary. A representative from the industry sector will be elected in the spring of 2000 to begin serving at the conclusion of the IAMFES 2000 Annual Meeting for the year 2000-2001.

Letters of nomination, including a biographical sketch are to be submitted to the Committee Chairperson no later than November 1, 1999. After the close of nominations, the Committee will review the nominees and select two (or more) persons to be presented to the Membership for voting.

The Secretary-Elect is determined by a majority of votes cast through a mail vote taken in the spring of 2000. Official Secretary duties begin at the conclusion of the IAMFES 2000 Annual Meeting. The elected Secretary serves as a Member of the Executive Board of IAMFES for a total of five years succeeding to President, then serving as Past President. Board meetings are scheduled a minimum of three times a year and other commitments may be necessary.

For more information regarding duties and requirements of the position, please contact David Tharp, Executive Director at 800.369.6337 or 515.276.3344; Fax: 515.276.8655; E-mail: dtharp@iamfes.org.

Send a letter of nomination for Secretary of IAMFES, along with a biographical sketch of nominee, to the Nominations Chairperson:

C. Dee Clingman
DARDEN Restaurants, Inc.
P.O. Box 593330
Orlando, Florida 32859-3330
Phone: 407.245.5330
Fax: 407.245.5173
E-mail: dclingman@darden.com

Nomination deadline is November 1, 1999.
New Members

CANADA
Richard Arsenault
Canadian Food Inspection Agency
Nepean, Ontario

Denis Borys
Neilson Dairy
Halton Hills, Ontario

Ramnik Gambhir
Thomas J. Lipton
Rexdale, Ontario

Alexander O. Gill
University of Manitoba
Winnipeg, Manitoba

Rena Hubers
Ontario Ministry of Agriculture
Guelph, Ontario

Jacques Depault
Canadian Food Inspection Agency
Nepean, Ontario

Eun Na Lee
University of Alberta
Edmonton, Alberta

John Lytwyn
Health Canada
Hamilton, Ontario

Alison Poon
Alberta Agriculture, Food
and Rural Development
Edmonton, Alberta

FRANCE
Patrice Arbault
Diffchamb SA
Lyon

UNITED STATES

CALIFORNIA
Dawn M. Knudsen
University of California-Davis
Davis

Kenneth W. Wong
Dole Thailand Ltd.
Westlake Village

COLORADO
R. Todd Bacon
Colorado State University
Fort Collins

DELAWARE
James L. Bruce
Qualicon, Inc.
Wilmington

FLORIDA
Marjorie E. Jones
Marriott International
Port St. Lucie

Jim Lowder
Triarc Restaurant Group
Fort Lauderdale

ILLINOIS
Miles Foster
Tetra Pak Inc.
Vernon Hills

Figen Kosebalaban
Illinois Institute of Technology
Arlington Heights

Rich Reeves
Nauvoo Cheese Co.
Nauvoo

Brian K. Turner
Educational Foundation of the NRA
Chicago

INDIANA
Mike Hoover
Elkhart Co. Health Dept.
Goshen

IOWA
Philip W. McMillan
Wells Blue Bunny Inc.
LeMars

KANSAS
Jimmy F. Gosch
Kansas State University
Manhattan

Kristen L. Henderson
Kansas State University
Manhattan

DeeAndra L. Lambert
Kansas State University
Manhattan

Maria T. Ortega
Kansas State University
Manhattan

KENTUCKY
Marienne A. Anandappa
University of Kentucky
Lexington

Melissa C. Newman
University of Kentucky
Lexington

John H. Summers
KY River District Health Dept.
Hazard
MARYLAND
Karen L. Henry
McCormick & Co., Inc.
Hunt Valley

MSRL Solomon
USDA-ARS
Beltsville

MASSACHUSETTS
Gregory W. Durbin
Gene-Trak Systems
Hopkinton

Richard J. Nortz
Allied Domecq Retailing USA
Braintree

William K. Shaw, Jr.
University of Massachusetts
Amherst

MICHIGAN
Rojesh Sharma
Michigan State University
East Lansing

MINNESOTA
Patrick F. Denor
Schwan's Sales Enterprises
Marshall

Melissa D. Kalik
Minnesota Dept. of Agriculture
St. Paul

MISSOURI
Mary E. Fandrey
Missouri Dept. of Health
Jefferson City

NEW JERSEY
Gary Cohen
Unisource
Ramsey

Siobain M. Duffy
New Brunswick

Andrew Flanders
SGS-US Testing Co.
Fairfield

Rebecca I. Montville
Rutgers University
North Brunswick

Melissa Willits
M & M/Mars
Hackettstown

NEW YORK
Genevieve Johnson
Cornell University
Geneva

Margaret Venuto
Cornell Cooperative Extension
of Monroe County
Rochester

OHIO
Jama L. Fox
Dubois, Sharonville

OREGON
Janeen M. Novotny
Carlton Packing Co.
Carlton

Wayne E. Weber
WEW Consulting
Salem

PENNSYLVANIA
Michael L. May
Quaker Maid Meats, Inc.
Shillington

Alan Sauter
Dietrich's Milk Products
Middlebury Center

Dike Ukuu
USDA, Wyndmoor

RHODE ISLAND
Michael D. DeCesare
Daniele Prosciutto
Pascoag

TENNESSEE
Surjit S. Kamra
J. M. Smucker Co.
Memphis

TEXAS
Sherri L. Koepnick
City of Brenham, Brenham

WASHINGTON
Melissa Tucker
H-E-B, San Antonio

OREGON
G. Kere Kemp
Alcide Corporation
Redmond

WISCONSIN
Rhonda D. Pinckney
University of Wisconsin-Madison
Madison

New IAMFES Sustaining Member
Jan Payne
Rhodia, Inc.
Madison, Wisconsin
**New Members**

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Rena Hubers  
Ontario Ministry of Agriculture  
Guelph, Ontario

Jacques Depault  
Canadian Food Inspection Agency  
Nepean, Ontario

Eun Na Lee  
University of Alberta  
Edmonton, Alberta

John Lytwyn  
Health Canada  
Hamilton, Ontario

Alison Poon  
Alberta Agriculture, Food  
and Rural Development  
Edmonton, Alberta

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Port St. Lucie

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Illinois Institute of Technology  
Arlington Heights

Rich Reeves  
Nauvoo Cheese Co.  
Nauvoo

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Elkhart Co. Health Dept.  
Goshen

**KANSAS**

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Kansas State University  
Manhattan

Kristen L. Henderson  
Kansas State University  
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DeeAndra L. Lambert  
Kansas State University  
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**KENTUCKY**

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University of Kentucky  
Lexington

Melissa C. Newman  
University of Kentucky  
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John H. Summers  
KY River District Health Dept.  
Hazard

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WEF Consulting
Salem

PENNSYLVANIA
Michael L. May
Quaker Maid Meats, Inc.
Shillington

Alan Sauter
Dietrich’s Milk Products
Middlebury Center

DIKE UKUKU
USDA, Wyndmoor

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WASHINGTON
G. Kere Kemp
Aldie Corporation
Redmond

WISCONSIN
Rhonda D. Pinckney
University of Wisconsin-Madison
Madison

New IAMFES Sustaining Member

Jan Payne
Rhodia, Inc.
Madison, Wisconsin
**Videojet Appoints Bryan M. Weber, Vice President Marketing**


Mr. Weber brings 16 years of progressive experience in manufacturing and research engineering, new products marketing, management consulting and division general management to this position. His background covers many industries including consumer products, oil/chemicals, automotive, retail and business-to-business services. Mr. Weber most recently held the position of vice president and general manager of cleanroom services with ARAMARK Uniform Services. Other previous positions include consulting with A.T. Kearney Management Consultants, marketing manager for The NutraSweet Company, project leader also with NutraSweet and facilities and project engineer for The Quaker Oats Company. In addition to ongoing management of the current product profile, Mr. Weber will focus on new products and new markets in support of Videojet’s continued successful growth.

Mr. Weber received his B.S. in chemical engineering from Purdue University, and holds his masters of management with distinction from Northwestern University.

**IAFIS Welcomes New CFO**

International Association of Food Industry Suppliers (IAFIS) President Charlie Bray has announced that Tom Collinson has joined the organization as chief financial officer.

Collinson is responsible for financial operations of the association, foundation and Worldwide Food Expo, LLC. He is also responsible for the building operations, human resources and information systems. He serves as the primary contact for the finance and investment committee and the audit committee, and oversees the development and monitoring of the annual business plan.

Collinson has ten years experience in non-profit accounting. His most recent position was director of finance for Chesapeake Bay Foundation, a $15 million charitable organization saving the Chesapeake. Prior to that he spent six years at the Food Marketing Institute (FMI), where he began his career as an analyst. He advanced to accounting manager and then controller. At FMI, Collinson developed a strong background in good financial controls and budgeting, and had the opportunity to work under the tutelage of Charlie Bray, IAFIS President for almost three years.

Collinson received a B.S. in accounting from Frostburg State University in 1990. He became a certified public accountant in 1998.

**Uniqema Expands Crop Protection Additives Technical Staff**

Frank Hartmann and Richard M. Herbert have been hired as development associates for Uniqema’s Crop Protection Additives Division in the Americas region.

Frank Hartmann will provide technical support to customers concerning formulation technology and conduct applied research of surfactants in formulation technology and adjuvancy. Hartmann has been with the ICI group for seven years, previously serving as a senior development chemist at ICI Agricultural Surfactants in Belgium. Hartmann was educated in Belgium and has a degree in industrial agricultural engineering.

Richard Herbert has also been hired as development associate for Uniqema’s Crop Protection Additives Division, providing technical support and product development services for Uniqema customers. Prior to working for Uniqema, Herbert worked as a research chemist and senior project chemist for FMC Corporation in Princeton, N.J. Herbert received a B.S. in accounting from Frostburg State University in 1990. He became a certified public accountant in 1998.

**Wargo Joins IFT Foundation as Director of Development**

Carol Wargo, M.A., C.F.R.E., C.V.A., is the new director of development of the Institute of Food Technologists (IFT) Foundation in Chicago. She will work with IFT constituencies to build the foundation’s endowment fund, market sponsorship opportunities, and create donor recognition programs.

Wargo has served as executive director of the resource center for the elderly in Chicago, where she was responsible for all fundraising activities. Prior to that, she was...
program director of the National
Runaway Switchboard in Chi¬
cago.

Wargo received her bach¬
elor’s degree in communications
from Purdue University and her
master’s degree in marketing from
Webster University.

EPTC Names Western
Regional Manager

Marvin Mears, president and
chief executive officer,
announced that John K. Mitchell,
formerly of Pacesetter Energy
Systems (Fresno), has been named
Central Valley regional manager of
Environmental Products &
Technologies Corporation.

Mitchell has over 30 years
experience in the agricultural
industry in sales, marketing and
management, including 20 years
as owner/operator of Mitchell
Farms (Corcoran, CA). He is an
experienced agricultural consult¬
ant whose areas of expertise
include field operations supervi¬
sion and evaluation, equipment
appraisal, credit management,
agricultural waste treatment and
dual fuel/cogeneration systems
for agribusiness. Mitchell majored
in ag business at the College of
the Sequoias (Visalia) and Califor¬
nia State University Fresno and
studied business at the University of
Maryland.

Mitchell will head up EPTC’s
California Central Valley market¬
ing efforts, focusing on sales and
service to California’s central
region, where the concentration
of animal waste produced by the
region’s nearly 1,600 dairies
poses acute environmental and
health concerns. Recent enact¬
ment of more stringent environ¬
mental legislation has targeted the
overwhelming majority of re¬
gional farm operations, for which
EPTC’s closed-loop waste manage¬
ment system is a viable, cost-
effective solution to the animal
waste problem.

Eakins Named as Technical
Sales Representative
for Bell Laboratories in
Northeast-North States

Bell Laboratories, Inc. an¬
ounced that Vicki Eakins,
formerly Bell’s marketing coordina¬
tor, took over as technical sales
representative for the northeast-
north states in April.

Eakins brings to the position
five years of first-hand experience
and technical knowledge solving a
broad range of pest control
problems.

Joining Bell in 1994, Eakins
obtained field experience as a tech¬
nical representative for Canada,
working with commercial, indus¬
trial, and swine and poultry
accounts. Through her dealings
with organizations, such as the
American Institute of Baking, she
further garnered technical knowl¬
dge that will help PCOs control
rodent infestations. In 1998, she
became Bell’s technical marketing
coordinator, putting her expertise
into the development of technical
training programs.

Eakins, who is based in New
Jersey, provides technical and sales
support to Bell distributors and
PCOs in northern New Jersey,
New York, Rhode Island, Massa¬
chusetts, Connecticut, Vermont,
Maine and New Hampshire. As
part of Bell’s sales and marketing
team, she works with distributors
and PCOs, providing technical
information and practical advice
on the best use of Bell products.
She also visits sites of rodent
infestations with PCOs, providing
technical advice on rodent control
strategies.

Eakins holds a B.S. in journal¬
ism and marketing from the Univer¬
sity of Wisconsin-Madison.
US Lacks a Consistent Farm-to-Table Approach to Egg Safety

The Food and Drug Administration (FDA) has not established a prevention-based approach to shell egg production and processing that would reduce or eliminate *Salmonella Enteritidis* contamination by identifying, controlling, and monitoring known safety risks. At the state level, 13 states, responsible for about 38 percent of the nation’s egg production, have established voluntary prevention-based programs for egg farms. However, because these programs use different approaches to testing for the presence of *Salmonella Enteritidis* and monitoring the farms, they do not provide a uniform level of risk reduction. Moreover, the Food Safety and Inspection Service (FSIS) does not require a prevention-based approach in processing plants where eggs are broken to create egg products. The first national requirement to refrigerate eggs at 45°F or below from the time they are packed until they reach the consumer may not be as effective as possible in reducing the risks from eggs contaminated with *Salmonella Enteritidis*. Responsibility for implementing the refrigeration requirement is split between two federal agencies.

The FSIS has issued regulations that took effect in August 1999, eight years after the Congress passed the legislation requiring that eggs be refrigerated after packing until they reach retail locations such as restaurants, institutions, and grocery stores. However, once eggs reach these locations, federal regulations will not require that they be refrigerated because the FDA has not yet issued the necessary regulations. In addition, many experts believe greater risk reduction could be achieved by cooling the internal contents of eggs more quickly than the law will require.

Inconsistent policies and practices in three areas have weakened the nation’s egg safety efforts. Only about half the states have followed the FDA US recommendation that they require food service operators to use pasteurized eggs or egg products when serving populations, such as the elderly in nursing homes, that are more likely to suffer severe health consequences from eating contaminated eggs. In addition, inconsistent policies on returning eggs from grocery stores to processors to be repackaged, relabeled, and returned to the retail level and inconsistent practices for expiration dating on egg cartons can mislead consumers about the eggs, freshness and may pose a food safety risk. The current organizational and regulatory framework for egg safety makes it difficult to ensure that resources are directed to the areas of highest risk and that policies are effectively coordinated. For example, the FSIS provides daily full-time inspection of egg product plants where eggs are pasteurized to kill harmful bacteria, whereas the FDA almost never inspects egg farms where eggs can be contaminated. In addition, although we reported in 1992 on the need for better coordination between the FDA and the Department of Agriculture on egg safety issues, each agency is developing its own labeling requirements for egg cartons that will become effective at different times, and the agencies have still not agreed on a comprehensive unified approach for improving egg safety.

The Codex Alimentarius Commission Approves Guidelines for Organic Food

International guidelines for the production, processing, labeling and marketing of organically produced food were approved by the joint FAO/WHO Codex Alimentarius Commission, the highest international body on food standards. The Commission met from 28 June to 3 July with representatives from 98-member countries, one observer country, the European Community and 63 non-governmental organizations.

Prepared by the joint FAO/WHO Food Standards Programme and the Commission’s Committee on Food Labelling, the “Guidelines for the Production, Processing, Labelling and Marketing of Organic Food” clearly define the nature of organic food production and prevent claims that could mislead consumers about the quality of the product or the way it is produced. The final objective is to provide the consumer with a choice while giving assurances that organic agriculture standards have been met.

The Codex Alimentarius Commission adopted 35 new food standards, 4 codes of good hygienic practice and 220 maximum residue limits in food. However, it decided to postpone
setting maximum residue limits for Bovine Somatotropin (BST) until a consensus is reached. All the decisions taken at this meeting were on the basis of a full consensus of member countries.

The Commission approved the establishment of an intergovernmental task force to speed up the elaboration of standards for foods derived from biotechnology. A proposal by Japan underlines that “safety assessment of foods derived from biotechnology is becoming more important as the volume and trade of these foods, including genetically modified organisms, increases every year.” It is hoped that these standards will be elaborated and adopted by the year 2003.

Two other intergovernmental task forces were set up by the Commission to elaborate standards respectively for animal feeding and fruit juices. The importance of good animal feeding was illustrated by the recent international crisis provoked by dioxin contaminated food in Belgium while revised standards for fruit juices are needed to protect the consumer and prevent fraudulent practice.

Stressing the importance of the meeting, Mr. John Lupien, Director of FAO’s food and nutrition Division, said the Codex system is the key to protect the health of consumers, ensure fair trade practices and harmonize international food standards. “Much more needs to be done to improve food quality in a world where international food trade, currently valued at more than US dollars 500 billion annually, is growing rapidly,” Mr. Lupien added. The Commission also approved a proposal to establish a Codex Coordinating Committee for the Near East which will define the problems and needs of the region concerning food standards and food control. The committee will promote exchange of information, recommend standards for products of interest to the region and develop regional standards. In addition, the Codex Alimentarius Commission amended the general standards for the labelling of pre-packaged foods to include new requirements covering hypersensitivity (food allergy and intolerance) and established a limit of 15ug/kg for aflatoxin in peanuts requiring further processing.

Regarding its procedural manual, the Commission decided that every effort should be made to ensure that food standards be reached by consensus. “It was one of the most productive Commission sessions in many years and one which made changes to ensure the Commission’s viability for the future,” said Mr. Alan Randell, Senior Officer of the joint FAO/WHO Food Standards Programme.

Risk of Transmitting Mad Cow Disease is Minimal in the United States

There is currently minimal risk of transmitting the degenerative brain disorder known as “mad cow disease” (bovine spongiform encephalopathy [BSE]) to humans in the United States, according to an article in the June 23/30 issue of the Journal of the American Medical Association (JAMA).

Litjen Tan, Ph.D., and colleagues at the American Medical Association’s Council on Scientific Affairs in Chicago, reviewed current scientific literature on BSE and related diseases. The Council presented its report and recommendations to the AMA House of Delegates, which adopted the recommendations at its 1998 Annual Meeting.

BSE is a disease in cows that belongs to a family of chronic, progressive and always fatal neurodegenerative disorders called transmissible spongiform encephalopathies (TSEs). Other TSEs include the sheep disease, scrapie, and the human brain disease, Creutzfeldt-Jakob Disease (CJD).

Researchers have hypothesized that an infectious protein known as a prion is the agent responsible for TSEs. BSE was first diagnosed in 1986. It begins with signs of anxiety, restlessness and aggressive behavior, leading to the name “mad cow disease.” The authors conclude that the risk of contracting a human TSE from cattle in the United States is minimal for the following reasons: BSE has not been shown to exist in the United States. Adequate regulations exist to prevent entry of foreign sources of BSE into the United States; adequate regulations exist to prevent undetected cases of BSE from uncontrolled amplification within the US cattle population; and adequate preventive guidelines exist to prevent high-risk bovine material from contaminating products intended for human consumption.

There have been 173,126 cases of BSE in the United Kingdom. Unique circumstances in the United Kingdom caused the emergence and propagation of BSE in cattle, including widespread use of meat and bone meal cattle feed derived from scrapie-infected sheep, and adoption of a new type of processing that did not reduce the amount of infectious prions prior to feeding the authors write. Many of these circumstances do not exist in the United States. No cases of BSE have been found in the United States.

In 1995, a new variant form of CJD disease was identified in the United Kingdom. Known as nv-CJD, it occurs among younger people and presents very different clinical and pathologic features from other forms of CJD.

As of January 31, 1999, there have been 39 cases of nv-CJD in the United Kingdom and one case in France.

Data suggest that nv-CJD results from transmission of the BSE prion to humans, the authors write. In the United Kingdom, human infection with nv-CJD probably resulted from ingestion...
of BSE-contaminated beef. The extent to which the human population might be affected by nv-CJD is still unknown.

The United Kingdom and the European Union have taken steps to minimize the risk of further contamination of cattle with BSE, to eradicate any existing BSE cases, and to eliminate human exposure to the BSE agent.

New Egg Safety Steps Announced; Safe Handling Labels and Refrigeration Will Be Required

Continuing their joint efforts to combat foodborne illness, the US Department of Agriculture’s Food Safety and Inspection Service (FSIS) and the US Department of Health and Human Services’ Food and Drug Administration (FDA) announced three important new measures to prevent illnesses caused by contaminated eggs.

The FDA is proposing to require safe handling statements on labels of shell eggs to warn consumers about the risk of illness caused by Salmonella Enteritidis (SE). FDA’s proposed handling instructions will contain the following statement on each carton of eggs: Safe Handling Instructions: Eggs may contain harmful bacteria known to cause serious illness, especially in children, the elderly, and persons with weakened immune systems. For your protection: Keep eggs refrigerated; cook eggs until yolks are firm; and cook foods containing eggs thoroughly.

In addition, for the first time, there will be a uniform federal requirement that all eggs and egg products packed for consumers be refrigerated at 45° or below. Retail establishments governed by the proposed FDA regulation include supermarkets, restaurants, delis, caterers, vending operations, hospitals, nursing homes and schools. In addition, FSIS is issuing a directive applying the refrigeration requirement to warehouses and other distribution locations that store shell eggs packed into containers destined for consumers, including transport vehicles. A joint FDA-FSIS risk assessment found that refrigeration makes it more difficult for SE bacteria to grow.

Finally, the President’s Council on Food Safety will develop by November 1 a strategic plan to further improve the safety of shell eggs and processed egg products. The strategic plan will address the issue of controlling pathogens, including SE, and will suggest further steps to help better coordinate egg safety from the farm to the table.

“The Clinton Administration has made ensuring food safety a top priority,” said Agriculture Secretary Dan Glickman. “These additional steps will help educate consumers and reduce foodborne illness caused by contaminated eggs.”

“Eggs are a good source of protein and can be a healthy and economical contribution to a well-balanced diet,” said HHS Secretary Donna E. Shalala. “However, they need proper handling or they could potentially be the source of foodborne illness.”

From 1996 to 1998, there has been a 44 percent decrease in the number of illnesses caused by SE, according to the Foodborne Diseases Active Surveillance Network, known as “FoodNet,” a collaborative effort of FSIS, FDA, and the Centers for Disease Control and Prevention. The measures announced may prevent up to 66,000 illnesses and 40 deaths per year. SE outbreaks have been attributed to undercooked eggs or foods containing under-cooked eggs served in homes, private gatherings, commercial establishments such as restaurants, hospitals, nursing homes and schools.

Persons infected with SE microorganisms may experience diarrhea, fever, abdominal cramps, headache, nausea and vomiting. Children, the elderly and persons with weakened immune systems may develop severe or even life-threatening illness.

FDA and FSIS share federal regulatory responsibility for egg safety, with the regulation of shell eggs primarily the responsibility of FDA. In May 1998, FSIS and FDA announced plans for additional measures to ensure the safety of eggs and requested public comments on these plans. These announcements are the latest steps in that ongoing effort.

The FDA proposal is on display in the Federal Register. Written comments and recommendations on the proposed rule will be accepted for the next 75 days. FSIS’ directive takes effect on August 27.

MU Food Scientist Trains Food Sanitarians to Teach Food Safety as They Inspect Kitchens

It’s a moment restaurant owners dread: the announced arrival of a city or county health inspector, thermometer and clipboard in hand, ready to hand out demerits for food safety violations.

The other side of the story comes from the inspectors themselves. They steal a line from Rodney Dangerfield — they get no respect. It’s a tough job showing up in an eatery’s kitchen, playing the “bad guy,” looking for violations that could result in fines or even shutting down the restaurant.
Doug Holt from the University of Missouri-Columbia is trying to make the inspectors’ jobs easier. He’s conducting a series of 13 train-the-trainer sessions for inspectors (called sanitarians) across Missouri to make their jobs educational.

“Better than handing out demerits, I believe in a teachable moment,” said Holt, MU associate professor of food science.

“When you walk in a place and find cockroaches, use that moment to teach them what to do to prevent cockroaches rather than hit people over the head,” he said. “You have a teachable moment.”

The Missouri Department of Health sponsors Holt’s two-day course. The training helps the sanitarians to conduct smoother inspections and to train restaurant workers in food safety.

“Regulatory requirements for receiving food-handling certificates vary across the state. This can be a problem for operators of restaurants located in different cities. Yet the techniques for safe food handling are the same,” he said.

Holt tells participants to know their audience, whether in teaching workers or conducting an inspection.

Talking to a group of 16-year-old fast food workers is a lot different than dealing with a chef in a fine restaurant, he said. “You also have to consider gender, educational levels, and racial and ethic issues in working with people,” he said.

“A typical sanitary may inspect 200 restaurants a year,” Holt said. “About a third of them also conduct regular training session for food service workers.”

“The idea of my course is to teach them how to teach groups of food workers,” said Holt. “I want the community to see sanitarians as a resource rather than someone who comes in and watches over you. This is important,” Holt says, “in light of increased national interest in consumer food safety.”

In 1998, 42 outbreaks of E. coli O157:H7 were reported, according to the national publication, Food Protection Report. Outbreaks sickened 777 people, and three of them died. For the first time, coleslaw was identified as a carrier of E. coli infection. It also made more people sick than any other single food.

Coleslaw, blamed for two large restaurant outbreaks in North Carolina and Indiana, caused 175 illnesses. Drinking water and pool water caused the second greatest number of illnesses, accounting for 147 illnesses and one death.

Ground beef was suspected in 10 outbreaks causing 83 illnesses and one death.

Sanitarians learn tips on effective lectures, demonstrations, and use of video and visual aids in their work. These are the main things sanitarians look for when inspecting a restaurant kitchen: the temperature of hot foods must be kept above 140°F and temperature of cold foods must be below 45°F; a special food thermometer must be readily available; food must be stored properly, not spoiled and not in damaged cans; and stored food must be properly covered.

In addition, chemicals like silver polish or disinfectants must not be kept near food or food preparation areas. There should be no evidence of vermin. Kitchen staff should wear hats and gloves, and not eat, drink or smoke. There should be no dirty dishrags on countertops, and dishes should be stacked upside-down.

NSF International: The Public Health and Safety Company

NSF International announced a new trademark: The Public Health and Safety Company as a provider of a broad range of public health and safety services.

Modern means of communication, including the Internet, have fostered growing international awareness of documented food, water and indoor airborne illnesses. Reports of E. coli O157:H7 in beef and apple juice, Listeria in fish and dairy products, Cryptosporidium and Giardia in drinking water, and cases of sick building syndrome identify critical health problems which both sometimes lead to death and create significant economic hardships. It is not uncommon for companies to be forced out of business virtually overnight as a result of major recalls and financial liabilities.

According to Dr. Dennis R. Mangino, President and Chief Executive Officer, “It is clear that the first decade of the new millennium will be the most important ever for public health and safety. We have experienced greater than a fourfold increase in demand for our services throughout the 1990s. That trend is expected to continue. NSF International is broadening its services in public health expertise standards and product, and management certification to meet that demand. For example, NSF recently expanded its accreditation to include certification of electrical products.”
A GHPD Line of Positive Displacement Pumps Handles a Wide-range of Viscosities

GHPD positive displacement pumps from Alfa Laval Flow, Inc. allows the pumping of viscous product through a system while ensuring low, product shear. The GHPD delivers a combination of rugged, low-maintenance construction with efficient, gentle pumping through a wide range of viscosities. And, it was the first pump of its kind to meet demanding hygienic standards by offering clean-in-place (CIP) capabilities.

The GHPD pumps are authorized to carry the 3A symbol and are USDA approved for both the dairy and egg industries. The pump’s Hyclean seal keeps working parts away from the pumped material to ensure product integrity at all times. Twelve models to choose from include capacities ranging up to 466 gallons/minute. Alfa Laval Flow, Inc., Pleasant Prairie, WI

Labplas Inc. Introduces a Lab Blender which Gives Accurate and Efficient Analytical Results

Labplas Inc., has announced a lab blender which is easy-to-use, sturdy, and is developed and manufactured in Quebec, Canada. Through its simplicity and versatility, the Labeasy will homogenize a wide range of materials, from liquids or solids to powders or pastes, all while maintaining the sample in a controlled, contamination-free environment. Be it pharmaceutical batch preparations, bacterial counts for food microbiology or any other variety of applications, the Labeasy will make easy work of the client’s sample preparation needs.

In order to meet customer satisfaction, Labplas designed a lab blender, which may increase both reliability and efficiency within the laboratory. The elimination of needless components found in similar machines and its attention to quality workmanship has made the Labeasy a durable product, which requires minimum mechanical maintenance.

To ensure outstanding durability and facilitate cleaning, every visible part inside the blending chamber is made of stainless steel while the rear aluminum cover has been anodized and coated with an enamel finish. For additional security, in the event of any spills within the blending chamber, an integrated safety basin was envisioned that may hold up to 450 ml. The idea was to recuperate any spills which may occur. The door is removable allowing for easy cleaning. Furthermore, tools are not required to remove or install the Labeasy paddles as this can be done by simply rotating the locking clip and pulling outwards, which makes maintenance that much easier.

The Labeasy was subjected to many quality control tests which were performed at the Center of Research and Development — Department of Agriculture, located at St-Hyacinthe, Quebec. It has been certified to meet all CSA and UL regulations.

The main market focus for the Labeasy is in the field of food microbiology and dairy products. It is in these industries where samples of dairy foods, meat, poultry, fruits and vegetables, as well as those of any other food product which must be prepared, are taken in order to perform bacterial counts for food safety and quality control testing. Other markets include the clinical, industrial and medical industries which use the machine for analytical sample mixing.

Labplas Inc., Ste-Julie, Quebec, Canada

The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.
Eka Chemicals Inc. announces new ECF Technology for Water Treatment — First to Receive EPA Approval

The first sodium chloride-based C1O2 process to receive EPA registration for use as a disinfectant in drinking water and wastewater in the SVP-Pure™ technology is developed and marketed by Eka Chemicals Inc. In addition to the significant cost advantages over chlorine-based systems, the process achieves chemical conversions of 95% without undesirable by-products or the implementation of very sizable, costly systems.

The two chemical feed system adopts Eka Chemicals' patented hydrogen peroxide chemistry and applies a proprietary blend of sodium chloride and hydrogen peroxide, called Purate™, to provide the most economical and user-friendly process. In comparison to competitive technologies, the environmentally friendly SVP-Pure™ chemistry requires no gaseous or liquid chlorine feed and no chloride ion addition, thus eliminating by-product chlorine.

In addition to receiving EPA registration, Purate™ is certified in compliance with ANSI/NSF Standard 60. This standard sets health effect criteria for all chemicals used in water treatment.

Eka Chemicals Inc., Marietta, GA

Salmonella Testing: Rapid Results with Culture Confirmation from Dynal

Dynabeads® anti-Salmonella is designed for rapid, immunomagnetic selective enrichment (IMS) of Salmonella directly from pre-enrichment broths. The rapid and simple protocol (less than 30 minutes) saves 24 hours of valuable testing time compared to standard culture methods because Dynabeads® anti-Salmonella simply replaces the use of selenite or tetrathionate selective enrichment broths. Isolated Salmonella colonies (or negative results) are achieved in 48 hours from receipt of sample.

Dynabeads® anti-Salmonella are uniform, superparamagnetic microspheres (2.8 microns in diameter) with affinity purified antibodies on their surface. When incubated with a sample, Dynabeads® will bind their target bacterium forming a bacterium: magnetic bead complex. This complex is separated from the heterogeneous sample by performing the test in a magnetic test tube rack (Dynal MPC-M). The isolated and concentrated bacterium: bead complex can then be cultured on any selective culture medium.

This highly sensitive system will detect as few as 100 organisms/ml of pre-enriched sample. Complete detection is achieved over 200 serotypes (1400 strains) of Salmonella have been tested. The concentration and purification of the sample by immunomagnetic separation (IMS) improves bacterial isolation and thus is useful for cultural confirmation of other presumptive methods. The protocol is simple and reagents are shelf stable. The versatility provided by this methodology will allow testing of many different sample types while enhancing the efficiency of existing manual and automated detection methods.

Dynal, Inc., Lake Success, NY

DuraGuard™ Columns Now Available from J&W

J&W Scientific introduces DuraGuard™. These columns are equipped with a built-in guard column, retention gap or mass spectrometer transfer line. Guard columns are used to trap non-volatile sample residues. Retention gaps are used to focus the injected sample to improve the peak shapes when using on-column and splitless injectors. The guard column, retention gap or transfer line and the analytical column are made with a single, continuous piece of fused silica tubing, thus eliminating the need for a union to attach the deactivated fused silica tubing to the analytical column.

Installation hassles, peak shape problems and leaks associated with unions are history. Samples containing difficult analyses such as pesticides or drugs can be chromatographed without any undesirable contributions from the unions.

J&W Scientific Inc., Folsom, CA

Reader Service No. 293

Becton Dickinson Microbiology Systems Announces Prepared Herrold's Egg Yolk Agar

The Herrold's Egg Yolk Agar conveniently prepared in 20 x 112 mm size tubes containing 9 ml of medium. Herrold's Egg Yolk Agar with Mycobactin J is used for the cultivation of Mycobacterium paratuberculosis (M. avium ssp. paratuberculosis) from animal fecal and tissue specimens. Culture of M. paratuberculosis is crucial for the detection of infected, asymptomatic animals as well as for the diagnosis of Johne's Disease. The medium may be used to culture specimens from cattle (dairy and beef), small ruminants (including sheep and goats), zoo animals and wild ruminants (including elk, deer and bison).
For complete test requirements, Becton Dickinson Microbiology Systems offers Herrold’s Egg Yolk Agar prepared either with or without the addition of Mycobactin J. The medium is available without added mycobactin to permit confirmation of mycobactin dependency, a characteristic that distinguishes M. paratuberculosis from other mycobacteria. M. paratuberculosis will grow on Herrold’s Egg Yolk Agar with Mycobactin J but will not grow on Herrold’s Egg Yolk agar without mycobactin. Other mycobacteria are able to grow on both media.

Using prepared tubes of BBL™ Herrold’s Egg Yolk Agars saves material, labor and overhead costs usually associated with the laborious preparation of the agar on a small scale. Thus, use of prepared tubes allows more time to be devoted to critical laboratory activities. BBL™ Herrold’s Egg Yolk Agar features the highest quality BBL brand peptones and additives. Reproducibility is achieved through a critically-monitored GMP manufacturing process that has demonstrated substantially equivalent performance as compared to freshly prepared laboratory media in documented field evaluation studies. The familiar, widely used “slant surface” format provides optimal surface area for growth and visualization.

BBL™ Herrold’s Egg Bulk Agar contains sodium pyruvate to promote growth of M. paratuberculosis. In addition, the medium contains the antifungal agent amphotericin B to help reduce fungal contamination and malachite green to suppress gram-positive spore-forming bacteria that may survive the decontamination process for fecal specimens. Becton Dickinson Microbiology Systems, Sparks, MD

New Cost Effective, Aluminum-Safe, Foam Cleaner for Food and Beverage Plants from Oakite Products, Inc.

Oakite Products, Inc.’s FiSan-ACF is a liquid, aluminum-safe, chlorinated foam cleaner, specifically formulated to tackle difficult cleaning problems in food and beverage plants. The USDA authorizes FiSan-ACF for use in federally inspected meat and poultry plants.

A well-balanced blend of superior soil removing, high foaming and chlorine release agents, FiSan-ACF performs well at energy saving ambient temperatures. The product can be used in concentrations as low as 2 percent by volume of water, through foam generating equipment, making it an extremely economical cleaner. FiSan-ACF generates rich foam that clings to surfaces such as stainless steel and aluminum processing equipment, walls, floors, overhead piping and other hard to reach areas, cleaning them thoroughly and rendering them odor-free. It is safe enough to be used manually or in a soak application on aluminum pans and parts. FiSan-ACF is ideal for use in meat and fish packaging plants, canneries, dairies, soft drink plants, breweries, wineries, bakeries, and other food and beverage processing facilities.

Oakite Products, Inc., Berkeley Heights, NJ
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### EMPLOYMENT OPPORTUNITIES

**Quality Assurance/Lab Manager**

Large dairy manufacturing firm in the Mid-Atlantic region seeking a Quality Assurance/Lab Mgr. Five years experience in food & plant safety as well as lab mgmt. required. Excellent compensation package. Fee paid. Fax resume to 540-667-0505 or call Cindy Whetzel at 800-275-2342.

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The 3-A Symbol Story

The 3-A Sanitary Standards Symbol Administrative Council, known throughout the industry as the "3-A Symbol Council," was organized in 1956. Its purpose is to grant authorization to use the 3-A Symbol on equipment that meets 3-A Sanitary Standards for design and fabrication.

A Modern Concept

The modern concept of the 3-A program was established in 1944 when the Dairy Industry Committee (DIC) was formed. DIC is one of the three industry segments involved in the preparation of 3-A Sanitary Standards. These industry segments are:

- **Processors**, represented by DIC
- **Equipment Manufacturers**, represented by IAFIS
- **Sanitarians**, represented by IAMFES

Use of the Symbol

Voluntary use of the 3-A Symbol on dairy equipment:

- assures processors that equipment meets sanitary standards
- provides accepted criteria to equipment manufacturers for sanitary design & fabrication
- establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A Sanitary Standards Symbol Administrative Council
1500 Second Avenue S.E., Suite 209
Cedar Rapids, IA 52403

319-286-9221 phone
319-286-9290 fax
## Holders of 3-A Symbol Council Authorization as of June 30, 1999

Questions or statements concerning any of the holders’ authorizations listed below, model numbers or the equipment fabricated should be addressed to:
Administrative Officer, 3-A Symbol Council, 1500 Second Avenue, SE, Suite 209, Cedar Rapids, IA 52403; Phone 319.286.9221; Fax 319.286.9290

### 01-07 Storage Tanks for Milk and Milk Products

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<th>Address</th>
<th>Authorization Date</th>
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</thead>
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<td>APV Americas - Lake Mills</td>
<td>100 South CP Avenue, Lake Mills, Wisconsin 53551</td>
<td>5/1/56</td>
</tr>
<tr>
<td>DCI, Inc.</td>
<td>P.O. Box 1227, 600 No. 5th Avenue St. Cloud, Minnesota 56301</td>
<td>10/28/59</td>
</tr>
<tr>
<td>Paul Mueller Co.</td>
<td>1600 W. Phelps Street Springfield, Missouri 65801</td>
<td>6/29/60</td>
</tr>
<tr>
<td>Scherping Systems</td>
<td>801 Kingsley Street Winsted, Minnesota 55395</td>
<td>2/28/85</td>
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<tr>
<td>Walker Stainless Equipment Co., Inc.</td>
<td>902 - 2nd Main Street Elroy, Wisconsin 53929-0126</td>
<td>10/4/56</td>
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### 02-09 Pumps for Milk and Milk Products

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<tr>
<th>Holder</th>
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<th>Authorization Date</th>
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<td>Alfa Laval Pumps Ltd.</td>
<td>Birch Road Eastbourne, East Sussex BN23 6PQ, England</td>
<td>8/25/98</td>
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<tr>
<td>Alfa Laval Flow</td>
<td>Birch Road Eastbourne, East Sussex BN23 6PQ, England</td>
<td>8/25/98</td>
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<tr>
<td>APV Americas - Lake Mills</td>
<td>100 South CP Avenue, Lake Mills, Wisconsin 53551</td>
<td>4/29/87</td>
</tr>
<tr>
<td>APV Americas - Lake Mills</td>
<td>100 South CP Avenue, Lake Mills, Wisconsin 53551</td>
<td>11/25/97</td>
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<td>Allweiler AG, Werk Bottrop</td>
<td>Kirchhellenring 77-79 D-46244 Bottrop Germany</td>
<td>5/15/89</td>
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<tr>
<td>Ampco Pumps Co.</td>
<td>4000 W. Burnham Street Milwaukee, Wisconsin 53215</td>
<td>9/14/94</td>
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<tr>
<td>Babson Brothers Company</td>
<td>Dairy Systems Division 20905 West Gale Avenue Galesville, Wisconsin 54630-0659</td>
<td>2/20/70</td>
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<td>Blackmer/Mouvex</td>
<td>1809 Century Ave., SW Grand Rapids, Michigan 49509</td>
<td>3/1/99</td>
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<td>Bombas Bornemann S.R.L.</td>
<td>Armenia 2898 (1605) Munro, Argentina</td>
<td>5/16/97</td>
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<td>Bomemann Pumps, Inc.</td>
<td>P.O. Box 1769 Matthews, North Carolina 28105</td>
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<tr>
<td>Boumatic</td>
<td>1919 S. Stoughton Road P.O. Box 8050 Madison, Wisconsin 53716</td>
<td>6/25/93</td>
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<td>CSF Inox S.P.A.</td>
<td>Strada per Bibbiano 7 - Montecchio E. (RE) Italy</td>
<td>6/25/93</td>
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<td>Conexiones Inoxidables</td>
<td>de Puebla S.A. de C.V. Vicente Guerrero No. 211 Xicotepex de Juarez Edo, Puebla, Mexico</td>
<td>1/18/93</td>
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<td>Conexiones Inoxidables</td>
<td>4735 Lansing Drive North Olmsted, Ohio 44070</td>
<td>3/17/95</td>
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<td>Drum Industries, Inc.</td>
<td>2501 Constant Comment Place Louisville, Kentucky 40299</td>
<td>3/17/95</td>
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<td>Flowtech Inc. - Tekniflow, Inc.</td>
<td>1701 Spinks Drive Marietta, Georgia 30067</td>
<td>4/1/92</td>
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<td>Fluid Metering, Inc.</td>
<td>5 Aerial Way, Suite 500 Syosset, New York 11791</td>
<td>1/10/86</td>
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828 Flux Pumps Corp.  
4430 Commerce Circle  
Atlanta, Georgia 30346  
(4/13/95)

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

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

400 Netzsch Incorporated  
119 Pickering Way  
Exton, Pennsylvania 19341-1393  
(8/15/84)

65R Alfa Laval Flow Inc./G & H Products  
8201-104th Street, P.O. Box 581909  
Pleasant Prairie, WI 53158-0909  
(5/22/57)

827 PACKO Diksmuide NV  
Cardijnlaan 10  
B8600 Diksmuide, Belgium  
(Not available in the USA)  
(4/14/95)

325 Johnson Pumps (U.K.) Ltd.  
Highfield Industrial Estate  
Edison Road, Eastbourne  
East Sussex, England BN23 6PT  
(US Rep.: Viking Pump, Inc.  
406 State Street, P.O. Box 8  
Cedar Falls, Iowa 50613)  
(12/19/79)

701 Pierre Guerin SA  
BP. 12 - 79210  
Mauze-Sur-Le-Mignon  
France  
(Not Available in the USA)  
(10/27/92)

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

241 Puriti, S.A. de C.V.  
Alfredo Nobel 39  
Industrial Puente de Vigas  
Tlanepantla, Mexico  
(US Rep.: Waukesha Cherry-Burrell  
611 Sugar Creek Road  
Delavan, WI 53115)  
(9/12/72)

502 Inoxpa, s.a.  
Carrer Dels Telers, 54  
17820 Banyoles  
Spain  
(US Rep.: Jensen Fittings Corp.  
107-111 Goundry Street  
North Tonawanda, NY 14120)  
(4/28/87)

D-31683 Obernkirchen, Germany  
(01/08/99)

148R Moyno Industrial Products  
A Division of Robbins & Myers, Inc.  
P.O. Box 960  
Springfield, Ohio 45501-0960  
(4/22/64)

603 Johnson Pump (UK) Ltd.  
Highfield Industrial Estate  
Edison Road, Eastbourne  
East Sussex, England BN236PT  
(US Rep.: Viking Pump, Inc.  
406 State Street, P.O. Box 8  
Cedar Falls, Iowa 50613)  
(8/16/90)

810 O.M.A.C. SRL Pompe  
Via G. Falcone 8, I-42948  
Rubiera (RE) Italy  
(US Rep.: Sanchelima International, Inc.  
1781-83 N.W. 93rd Avenue  
Miami, Florida 33172)  
(1/2/95)

604 Johnson Pump (UK), Ltd.  
Highfield Industrial Estate  
Edison Road, Eastbourne  
East Sussex, England BN236PT  
(US Rep.: Viking Pump, Inc.  
406 State Street, P.O. Box 8  
Cedar Falls, Iowa 50613)  
(8/16/90)

934 Pladot Ein Harod  
Kibbutz Ein Harod Meuhad  
18965 Israel  
(US Rep.: Robert E. Turner  
P.O. Box 4595  
Gettysburg, Pennsylvania 17235-4595)  
(8/6/97)

841 Johnson Pump (UK), Ltd.  
Highfield Industrial Estate  
Edison Road, Eastbourne  
East Sussex, England BN236PT  
(US Rep.: Viking Pump, Inc.  
406 State Street, P.O. Box 8  
Cedar Falls, Iowa 50613)  
(8/18/95)

1004 Q-Pumps S.A. de C.V.  
Acceso A #108, Fracc.  
Inc. Jurica, 76130  
Queretaro, Mexico  
(US Rep.: Q-Pumps, S.A.  
P.O. Box 148  
Zion, Illinois 60099)  
(3/3/99)

996 Johnson Pump (UK), Ltd.  
Highfield Industrial Estate  
Edison Road, Eastbourne  
East Sussex, England BN236PT  
(1/8/99)

595 seepex, Inc.  
511 Speedway Drive  
Enon, Ohio 45323  
(3/16/91)

673 Alfa Laval Pumps, Inc.  
9201 Wilmot Road  
Kenosha, Wisconsin 53142  
(4/16/92)

678 Shanley Pump & Equipment, Inc.  
2525 S. Clearbrook Drive  
Arlington Heights, Illinois 60005  
(5/11/92)

911 Sigma Equipment Corp.  
39 Westmoreland Avenue  
White Plains, New York 10606  
(3/20/97)
04-04 Homogenizers and Reciprocating Pumps

75 APV Gaulin
500 Research Drive
Wilmington, Massachusetts 01887
(9/26/57)

390 American Lewa, Inc.
132 Hopping Brook Road
Holliston, Massachusetts 01746
(6/9/83)

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

558 Microfluidics International, Corp.
P.O. Box 9101
30 Ossipee Road
Newton, Massachusetts 02164-9101
(11/4/91)

847 Stork Food & Dairy Systems, Inc.
P.O. Box 1258
1024 Airport Parkway
Gainesville, Georgia 30503
(8/25/95)

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

379 Brenner Tank Mauston, Inc.
N. 3760 Hwy. 12 & 16
Mauston, Wisconsin 53948
(3/15/83)

756 Beall Trailers of California
1301 South Avenue
Turlock, California 95380-5108
(2/21/94)

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

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

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

85 Polar Tank Trailer, Inc.
Holdingford, Minnesota 56540
(12/20/57)

653 Tremcar
1, Tougas Street
Iberville, Quebec, Canada J2X 2P7
(US Rep.: Bay State Tr. & Tr.
527 Winthrop
Rehobeth, Massachusetts 02769)

25 Walker Stainless Equip. Co., Inc.
625 State Street
New Lisbon, Wisconsin 53950
(9/28/56)

437 West-Mark
2704 Railroad Avenue, P.O. Box 100
Ceres, California 95307
(11/30/84)

943 LBT Stainless, Inc.
Route 5, Box 480
Manning, SC 29102
(11/11/97)

10-03 Milk and Milk Products Filters
Using Disposable Filter Media

593 Filtration Systems
Div. of Mechanical Mfg. Corp.
10304 N.W. 50th Street
Sunrise, Florida 33351
(3/2/90)

435 Scermia International
771 Boul. Industriel
Blainville, Quebec Canada J7C 3V3
(US Rep.: Edward W. Fox, Jr.
1200 Rolling Ridge Way, #403
Bloomington, Indiana 47403)

296 L. C. Thomsen, Inc.
1303 43rd Street
Kenosha, Wisconsin 53140
(8/25/77)
11-05 Plate-type Heat Exchangers
for Milk and Milk Products

880 AGC Engineering
8869 SE 58th St. Avenue
Portland, Oregon 97206
(9/8/82)

365 APV Heat Exchanger AS
Platinvej, 8
DK-6000 Kolding
Denmark
(Not available in the USA)

20 APV Americas
395 Fillmore Avenue
Tonawanda, New York 14150
(9/4/56)

17 Tetra Pak Engineering
101 Corporate Woods Parkway
Vernon Hills, Illinois 60061
(8/30/56)

718 Babson Bros. Co.
Dairy Systems Div.
1400 West Gale Avenue
Galesville, Wisconsin 54630
(3/8/95)

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

14 Chester-Jensen Co., Inc.
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016
(8/15/52)

791 The Coburn Co., Inc.
834 E. Milwaukee Street, Box 147
Whitewater, Wisconsin 53190
(9/14/94)

468 GEA Ecoflex North America, Inc.
7150 Distribution Drive
Louisville, Kentucky 40232-2528
(2/2/86)

622 ITT Standard
175 Standard Parkway
Cheektowaga, New York 14227
(2/25/91)

414 Paul Mueller Co.
P.O. Box 828
Springfield, Missouri 65801
(12/13/88)

912 Pladot Ein Harod
Kibbutz Ein Harod Meuhad
18965 Israel
(US Rep.: Robert E. Turner
P.O. Box 4595
Gettysburg, Pennsylvania 17325-4595)
(4/3/97)

279 The Schlueter Company
3410 Bell Street, P.O. Box 548
Janesville, Wisconsin 53547-0548
(8/30/76)

650 API Schmidt-Bretten, Inc.
2777 Walden Avenue
Buffalo, New York 14225
(10/3/91)

670 Flomax International, Ltd.
2 Robert Street
P.O. Box 14537
Panmure, Auckland
New Zealand
(US Rep.: Masport, Inc.
6140 McCormick Drive
Lincoln, Nebraska 68507)
(3/3/99)

1005 Schmidt Thermal Processing Ltd.
P.O. Box 31-247
Milford, Auckland, New Zealand
(US Rep.: Westfalia Dairy Systems, Inc.
1862 Brummel Drive
Elk Grove Village, Illinois 60007
(11/15/91)

658 Thermaline
180-37th Street
Auburn, Washington 98001
(7/11/96)

885 Tranter, Inc. Texas Division
1900 Old Burk Highway
Wichita Falls, Texas 76304
(12/13/90)

610 Universal Dairy Equipment
11100 N. Congress Avenue
Kansas City, Missouri 64153

12-05 Tubular Heat Exchangers
for Milk and Milk Products

886 API Ketema Heat Transfer Technology
2300 W. Marshall Drive
Grand Prairie, Texas 75051
(7/16/96)

438 APV Americas Heat Transfer
395 Fillmore Avenue
Tonawanda, New York 14150
(12/10/84)

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

243 Babson Brothers Company
Dairy Systems Division
20903 West Gale Avenue
Galesville, Wisconsin 54630
(10/31/72)

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

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

712 Enerquip, Inc.
611 North Road
P.O. Box 467
Medford, Wisconsin 54451
(2/24/93)

889 FMC Corporation-FranRica Systems
P.O. Box 30127
Stockton, California 95213-0127
(9/5/96)

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

217 Girton Manufacturing Co.
P.O. Box 900
Millville, Pennsylvania 17846
(1/31/71)
17-09 Formers, Fillers and Sealers of Single Service Containers for Fluid Milk and Fluid Milk Products

1031 ACMA USA, Inc.
501 Southlake Boulevard
Richmond, Virginia 23236
(US Rep.: AUTOPROD Inc.
5355 115th Avenue North
Clearwater, Florida 33760)

939 BWI KP Aerofill
807 West Kimberly Road
Davenport, Iowa 52808-3848

382 SIG Combibloc, Inc.
4800 Roberts Road
Columbus, Ohio 43228

192 Evergreen Packaging
2400 6th Street S.W., P.O. Box 3000
Cedar Rapids, Iowa 52406

488 BWI Fords Holmatic, Inc.
1750 Corporate Drive, Suite 700
Norcross, Georgia 30093

1009 Federal Manufacturing Company
201 West Walker Street
Milwaukee, Wisconsin 53204-0215

1029 FORMSEAL
1 rue de l’Epée Royale
14700 FALAISE
France

619 Hassia Verpackungsmaschinen GmbH
Heerweg 19
D-63691 Ranstadt
Germany
(US Rep.: Hassia USA, Inc.
1210 Campus Drive West
Morganville, New Jersey 07751)

735 Kvalitetsproduktion AB
S-693 29 Degerfors, Sweden
(US Rep.: Flowtech, Inc.
1900 Lake Park Drive, Suite 345
Smyrna, Georgia 30080)

330 Milliken Packaging
P.O. Box 736
White Stone, South Carolina 29353

AUGUST 1999 – Dairy, Food and Environmental Sanitation 581
19-04 Batch and Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amended

141 Waukesha Cherry-Burrell
P.O. Box 35600
Louisville, Kentucky 40232-5600
(4/15/63)

146 Waukesha Cherry-Burrell Corp.
P.O. Box 35600
Louisville, Kentucky 40232-5600
(12/10/63)

286 Tetra Pak Hoyer, Inc.
P.O. Box 280
Lake Geneva, Wisconsin 53147
(12/8/76)

355 Emery Thompson Machine & Supply Co.
1349 Inwood Avenue
Bronx, New York 10452
(3/9/82)

22-07 Silo-type Storage Tanks for Milk and Milk Products

154 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551
(2/10/65)

160 DCI, Inc.
P.O. Box 1227, 600 No. 54th Avenue
St. Cloud, Minnesota 56301
(4/5/65)

312 Feldmeier Equipment, Inc.
6800 Town Line Road
P.O. Box 474
Syracuse, New York 13211
(9/15/78)

439 JV Northwest, Inc.
390 S. Redwood Street
Canby, Oregon 97013
(1/22/85)

155 Paul Mueller Co.
1600 W. Phelps, P.O. Box 828
Springfield, Missouri 65801
(2/10/65)

503 Ripley Stainless, Ltd.
RR #3, Suite 41
Summerland, British Columbia V0H 1Z0
(Not available in the USA)

479 Scherping Systems
801 Kingsley Street
Winsted, Minnesota 55395
(8/3/86)

675 Stainless Fabrication, Inc.
4455 W. Kearney
Springfield, Missouri 65803
(4/22/92)

165 Walker Stainless Equipment Co., Inc.
625 State Street
New Lisbon, Wisconsin 53950
(4/26/65)

23-02 Equipment for Packaging Viscous Dairy Products

174 APV Crecapco
A Division of APV North America, Inc.
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(9/28/65)

902 A.T.S. Engineering, Inc.
7270 Torbram Road, Unit 23
Mississauga, Ontario Canada L4T 3Y7
(1/10/97)

(US Rep.: L and A Package Sales
356 Millstone Road
Clarksburg, New Jersey 08510
and Packaging Specialist
4500 Greenville Avenue
Dallas, Texas 75206)
366 AUTOPPROD, Inc.
5355 - 115th Avenue N
Clearwater, Florida 33760
(9/15/83)

96 BENHIL-GAST Verpack
ungsmaschinen GmbH
Jagenbergstrasse 1
D-41468 Neuss
Germany
(5/98)

965 BENHIL-GAST Verpack
ungsmaschinen GmbH
Jagenbergstrasse 1
D-41468 Neuss
Germany
(5/27/98)

868 Cryovac-Sealed Air Corporation
P.O. Box 464
Duncan, South Carolina 29223-0464
(3/5/97)

853 Elmar Industries
200 Gould Avenue, P.O. Box 245
Buffalo, New York 14043-0245
(10/11/95)

1030 FORMSEAL
1 rue de l’Epee Royale
14700 Falaise, France
(6/18/99)

674 Hayssen Manufacturing
225 Spartangreen Boulevard
Duncan, South Carolina 29334
(4/20/92)

447 GEI International, Inc.
700 Pennsylvania Drive
Exton, Pennsylvania 19341-0439
(7/22/85)

942 Oden Corporation
255 Great Arrow Avenue
Buffalo, New York 14207-3024
(10/28/97)

870 Phoenix Engineering & Design Co.
4634 Case Drive, P.O. Box 1467
Jaynsville, Wisconsin 53546
(3/22/96)

343 Tetra Pak Hoyer, Inc.
P.O. Box 280
Lake Geneva, Wisconsin 53147
(7/6/81)

679 Consolidated Biscuit Co.
312 Rader Road
McComb, Ohio 43858
(6/1/92)

635 Interbake Dairy Ingredients Div.
2821 Emerywood Parkway, Suite 210
Richmond, Virginia 23294
(7/10/91)

760 Jordan Manufacturing, Inc.
1688 County Road 192
Crossville, Alabama 35902
(2/23/94)

537 Osgood Industries, Inc.
601 Burbank Road
Oldsmar, Florida 34677
(7/19/88)

990 PACK LINE, Ltd.
4, Hapatish Street
Holon 58815
Israel
(US Rep.: Rabbecco, Inc.
2601 Miles Road
Warrensville Heights, Ohio 44128)
(11/24/98)

666 RapidPak
2530 West Everett Street
Appleton, Wisconsin 54914-4958
(3/5/92)

740 Raque Food Systems, Inc.
11002 Decimal Drive
Louisville, Kentucky 40299
(6/25/93)

222 Sweetheart Packaging
10100 Reistertown Road
Owing Mills, Maryland 21117
(11/15/71)

891 World Cup Packaging Corporation
777 Progressive Lane
South Beloit, Illinois 61080
(9/20/96)

24-02 Non-coil Type Batch Pasteurizers

158 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(3/24/65)

187 DCI, Inc.
P.O. Box 1227, 600 No. 5th Avenue
St. Cloud, Minnesota 56302
(9/26/66)

166 Paul Mueller Co.
P.O. Box 828
Springfield, Missouri 65801
(4/26/65)

1025 Pladot Ein Harod
Kibbutz Ein Harod
Meuhad 18965 Israel
(5/25/99)

878 Walker Stainless Equipment
625 State Street
New Lisbon, Wisconsin 53950
(5/14/96)

25-02 Non-coil Type Batch Processors
for Milk and Milk Products

159 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(3/24/65)

188 DCI, Inc.
P.O. Box 1227, 600 No. 5th Avenue
St. Cloud, Minnesota 56301
(9/26/66)

725 InoxTech, Inc.
6705 Route 132
Ville Ste-Catherine
Quebec, Canada J0L 1E0
(4/14/93)

167 Paul Mueller Co.
P.O. Box 828
Springfield, Missouri 65801
(4/26/65)

687 SANIFAB
528 North Street
Stratford, Wisconsin 54484
(8/3/92)

448 Scherping Systems
801 Kingsley Street
Winsted, Minnesota 55395
(8/1/85)
26-03 Sifters for Dry Milk and Dry Milk Products

752 Andritz Sprout-Bauer
35 Sherman Street
Muncy, Pennsylvania 17756
(1/28/94)

363 Kason Corp.
67-71 East Willow Street
Millburn, New Jersey 07041
(7/28/82)

430 Midwestern Industries Inc.
915 Oberlin Road, P.O. Box 810
Massillon, Ohio 44648-0810
(10/11/84)

185 Rotex, Inc.
1230 Knowlton Street
Cincinnati, Ohio 45223
(8/10/66)

656 Separator Engineering Ltd.
810 Ellingham Street
Pointe Clair, Quebec, Canada H9R 3S4
(11/4/91)

172 Sweco, Inc.
Division of Emerson Electric Company
7120 Buffington Road
Florence, Kentucky 41042
(9/1/65)

27-04 Equipment for Packaging Dry Milk and Dry Milk Products

353 All-Fill, Inc.
418 Creamery Way
Exton, Pennsylvania 19341
(3/2/82)

935 Bossar S.A.
Poligono Industrial Roca
C./ San Marti s/n.
08100 Martoreles
(Barcelona)
Spain
(US Rep.: Kason Corp.
1301 E. Linden Avenue
Linden, New Jersey 07036)
(8/8/97)

831 Custom Equipment Design
1057 Highway 80 East, P.O. Box 4807
Monroe, Louisiana 71203
(5/9/95)

618 Yamato Scale Co., Ltd.
5-22 Saemba-Chou
Akashi, Hyogo 673-8688 Japan
(2/18/91)

625 Ishida Company Ltd.
44, Sanno-Chou, Shogoin
Sakyo-Ku, Kyoto, Japan
(US Rep.: Heat & Control
21121 Cabot Boulevard
Hayward, California 94545-1132)
(4/2/91)

922 Ishida Co., Ltd.
44 Sanno-Chou, Shogoin
Sakyo-Ku
Kyoto, Japan
(US Rep.: Heat & Control, Inc.
21121 Cabot Boulevard
Hayward, California 94545-1132)
(5/9/97)

409 GEL International, Inc.
700 Pennsylvania Drive
Exton, Pennsylvania 19341-0439
(10/31/83)

905 Pacmac, Inc.
1161 Armstrong Avenue
P.O. Box 360
Fayetteville, Arkansas 72702-0360
(2/13/97)

998 SIG Pack Eagle Corporation
2107 Livingston Street
Oakland, California 94606
(3/1/99)

895 Spiroflow-Orthos Systems, Inc.
2806 Gray Fox Road
Monroe, North Carolina 28110
(11/27/96)

497 Triangle Package Machinery Co.
6655 West Diversey Avenue
Chicago, Illinois 60635
(2/26/87)

28-03 Flow Meters for Milk and Milk Products

270 ABB Instrumentation, Inc.
125 E. County Line Road
Warminster, Pennsylvania 18974
(2/9/76)

272 Accurate Metering Systems, Inc.
1651 Wilkening Court
Schaumburg, Illinois 60173
(4/2/76)

253 Badger Meter, Inc.
4515 W. Brown Deer Road
P.O. Box 23099
Milwaukee, Wisconsin 53223
(1/2/74)

884 Bailey-Fischer & Porter GmbH
Dranstfeld Strasse, Gottingen 37079
Germany
(US Rep.: Bailey-Fischer & Porter
125 E. County Line Road
Warminster, Pennsylvania 18974)
(7/12/96)

956 Blancett Fluid Flow Meters
100 E. Felix Street South, Suite 190
Fort Worth, Texas 76115-4548
(3/19/98)

979 Bopp & Reuther Messtechnik GmbH
Carl-Reuther Strasse 1
D-68305 Mannheim
Germany
(US Rep.: Metron Technology
2005 - 10th Street
Boulder, Colorado 80302)
(9/9/98)

359 Brooks Instrument Division
407 West Vine Street
Hatfield, Pennsylvania 19440
(6/11/82)

660 Danfoss A/S
DK-6430
Nordborg, Denmark
(US Rep.: Danfoss Electronics
2995 Eastrock Drive
Rockford, Illinois 61109)
(11/20/91)

950 Delta M Corp.
1003 Larsen Drive
Oak Ridge, Tennessee 37830
(1/19/98)
| 692 | Endress & Hauser Flowtec AG | Kägenstrasse 7  
|     |                         | CH - 4153 Reinach, Switzerland  
|     |                         | (US Rep.: Endress & Hauser, Inc.  
|     |                         | 2350 Endress Place  
|     |                         | Greenwood, Indiana 46143)  
| 226 | Bailey Fischer & Porter Co.  
|     | 125 E. County Line Road  
|     | Warminster, Pennsylvania 18974  
| 477 | Flowdata, Inc.  
|     | 1817 Firman Drive  
|     | Richardson, Texas 75081-1826  
| 506 | Flow Technology, Inc.  
|     | 1250 East Broadway Road  
|     | Phoenix, Arizona 85040  
| 224 | The Foxboro Company  
|     | 35 Commercial Street  
|     | Foxboro, Massachusetts 02035  
| 717 | Gemu Valves, Inc.  
|     | 3800 Camp Creek Parkway  
|     | Ste. 102, Bldg. 2400  
|     | Atlanta, Georgia 30331  
| 649 | Geo Technology Corporation  
|     | 12312 E. 60th Street  
|     | Tulsa, Oklahoma 74146  
| 1035 | GRUPPO ISOIL S.p.A.  
|     | Via F.lli Gracchi 27  
|     | 20092 Cingello Balsamo  
|     | Milano Italy  
|     | (US Rep.: Liquid Controls, LLC  
|     | 105 Albrecht Drive  
|     | Lake Bluff, Illinois 60044-2242)  
| 661 | Alfa Laval Flow, Inc.  
|     | G & H Division  
|     | 8201 - 10th Street, P.O. Box 581909  
|     | Pleasant Prairie, Wisconsin 53158-0909  
| 630 | Halliburton Services  
|     | Drawer 1431  
|     | Duncan, Oklahoma 73536-0346  
| 574 | Aaliant  
|     | 150 Venture Boulevard  
|     | P.O. Box 4585  
|     | Spartanburg, South Carolina 29305  
| 512 | Hoffer Flow Controls, Inc.  
|     | 107 Kitty Hawk Lane  
|     | Elizabeth City, North Carolina 27909-4585  
| 744 | Honeywell IAC  
|     | 1100 Virginia Drive  
|     | Fort Washington, Pennsylvania 19034  
| 735 | Honeywell, Inc.  
|     | 1100 Virginia Drive  
|     | Fort Washington, Pennsylvania 19034-3260  
| 265 | Flow Automation  
|     | 9303 Sam Houston Parkway South  
|     | Houston, Texas 77099-5298  
| 535 | FMC Invalco, Inc.  
|     | (An FMC Corporation Subsidiary)  
|     | P.O. Box 1183  
|     | Hutchinson, Kansas 67504  
| 764 | Yokogawa Industrial Automation America Inc.  
|     | 4 Dart Road  
|     | Newman, Georgia 30265-1040  
| 840 | KOBOLD Instr. Inc.  
|     | 1801 Parkway View Drive  
|     | Pittsburgh, Pennsylvania 15205  
| 871 | KOBOLD Instr. Inc.  
|     | 1801 Parkway View Drive  
|     | Pittsburgh, Pennsylvania 15205  
| 529 | KROHNE, Inc.  
|     | 7 Dearborn Road  
|     | Peabody, Massachusetts 01960  
| 972 | Liquid Controls, LLC  
|     | 105 Albrecht Drive  
|     | Lake Bluff, Illinois 60044-2242  
| 1034 | Liquid Controls, LLC  
|     | 105 Albrecht Drive  
|     | Lake Bluff, Illinois 60044-2242  
| 778 | Magnecrol Intl., Inc.  
|     | 5300 Belmont Road  
|     | Downers Grove, Illinois 60515  
| 378 | Micro Motion, Inc.  
|     | 7070 Winchester Circle  
|     | Boulder, Colorado 80301  
| 932 | Nitto Seiko Co., Ltd.  
|     | 623 Japan, 30  
|     | Nobu-Chō  
|     | Ayabe Kyoto  
|     | (US Rep.: Endress & Hauser Flowtec AG  
|     | Division USA  
|     | 2350 Endress Place  
|     | P.O. Box 246-1  
|     | Greenwood, Indiana 46142)  
| 938 | norax, Inc.  
|     | 10728 S. 92nd Street  
|     | Franklin, Wisconsin 53132  
| 1019 | Pacific Flow Controls  
|     | 170-F Alamo Plaza, Suite 177  
|     | Alamo, California 94507  
| 729 | Peck Measurement, Ltd.  
|     | Kings Worthy, Winchester  
|     | Hampshire, England S023 7QA  
|     | (US Rep.: Peck Measurement  
|     | 1035 Landsbury, Ste. 300  
|     | Houston, Texas 77099-3407)  
| 490 | Rosemount, Inc.  
|     | 12001 Technology Drive  
|     | Eden Prairie, Minnesota 55344  
| 585 | Solartron  
|     | 11521 Richmond Avenue  
|     | Houston, Texas 77082-2615  
| 587 | Schlumberger Ind., Measurement Div.  
|     | 1310 Emerald Road  
|     | Greenwood, South Carolina 29646  
| 550 | Sparling Instruments Co., Inc.  
|     | 4097 N. Temple City Boulevard  
|     | P.O. Box 5988  
|     | El Monte, California 91731  
| 715 | Thermal Instrument Co.  
|     | 217 Sterner Mill Road  
|     | Trevose, Pennsylvania 19053  
| 1021 | Toshiba Corporation  
|     | 1, Toshiba-Cho  
|     | Fuchu-Shi, Tokyo 183 Japan  
| 803 | Turck, Inc.  
|     | 3000 Campus Drive  
|     | Plymouth, Minnesota 55441-2656  

**29-01 Air Eliminators for Milk and Fluid Milk Products**

| 340 | Accurate Metering Systems, Inc.  
|     | 1651 Wilkening Court  
|     | Schaumburg, Illinois 60173  

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662 Alfa Laval Flow, Inc. G & H Division 8201 - 104th Street, P.O. Box 581909 Pleasant Prairie, Wisconsin 53158-0909
436 Scherping Systems 801 Kingsley Street Winsted, Minnesota 55395

30-01 Farm Milk Storage Tanks
421 Paul Mueller Co. P.O. Box 828 Springfield, Missouri 65801

31-02 Scraped Surface Heat Exchangers
290 APV Americas - Lake Mills 100 South CP Avenue Lake Mills, Wisconsin 53551
323 Waukesha Cherry-Burrell Process Equipment Division P.O. Box 35600 Louisville, Kentucky 40232-5600
274 Alfa Laval Thermal, Inc. 111 Parker Street Newburyport, Massachusetts 01950
496 FMC Corp. Fran Rica Systems P.O. Box 50127 Stockton, California 95213-0127
361 N.V. Terlet P.O. Box 62 7200 AB Zutphen Netherlands (US Agent Manning & Lewis-NJ)
964 Schroder GmbH & Co. KG Falkenstr. 51-57 D-23564, Lubeck Germany (US Rep.: Schroder N.A. Corp. 12780 Westlinks Drive Fort Myers, Florida 33915)

32-02 Uninsulated Tanks for Milk and Milk Products
397 APV Americas - Lake Mills 100 South CP Avenue Lake Mills, Wisconsin 53551
268 DCI, Inc. 600 No. 54th Avenue, P.O. Box 1227 St. Cloud, Minnesota 56301
708 Lee Industries, Inc. P.O. Box 688 Phillipsburg, Pennsylvania 16866
844 Paul Mueller Co. 1600 West Phelps Street Springfield, Missouri 65801
354 C.E. Rogers Co. 1895 Frontage Road, P.O. Box 118 Mora, Minnesota 55051
683 SANIFAB, Inc. Stratford, Wisconsin 54484

441 Scherping Systems 801 Kingsley Street Winsted, Minnesota 55395
852 Viatiec, Inc. 1220 State Street Hastings, Michigan 49058
339 Walker Stainless Equip. Co., Inc. 625 State Street New Lisbon, Wisconsin 53950

33-01 Polished Metal Tubing for Dairy Products
310 Allegheny Bradford Corp. P.O. Box 200 Route 219 South Bradford, Pennsylvania 16701
812 A.T.I. s.r.l. Viale Resegone 7 22036 Erba (Como) Italy (US Rep.: Norca Corporation 185 Great Neck Road Great Neck, New York 11022)
413 Azco, Inc. P.O. Box 567 Appleton, Wisconsin 54912
736 Kvalitetsproduktion AB S693 29 Degerfors, Sweden (US Rep.: Flowtech, Inc. 1900 Lake Park Drive, Ste. 345 Smyrna, Georgia 30080)
308 Rath Manufacturing Co., Inc. 2505 Foster Avenue Janesville, Wisconsin 53545
368 Rodger Industries Inc. P.O. Box 186, R.R. 1 Blenheim, Ontario Canada N0P 1A0 (Not available in the USA)
776 TGPRO Bangkok, Thailand (US Rep.: Kurt Orban Partners Kurt Orban 450 Kings Road Brisbane, California 94005)
775 Trent Tube P.O. Box 77 East Troy, Wisconsin 53120
531 United Industries, Inc. 1546 Henry Avenue Beloit, Wisconsin 53511

34-02 Portable Bins
916 Custom Metalcraft, Inc. 2332 East Division P.O. Box 10587 GS Springfield, Missouri 65808
647 Thomas Conveyor Company Tote System Division P.O. Box 2916 Fort Worth, Texas 76173-2916
35-00 Continuous Blenders

869 ADMIX, Inc. (3/14/96)
234 Abby Road
Manchester, New Hampshire 03103-3332

527 Arde Barinco, Inc. (3/15/88)
500 Walnut Street
Norwood, New Jersey 07648

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

417 Waukesha Cherry-Burrell
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

825 GEI International, Inc. (3/30/95)
700 Pennsylvania Drive
Exton, Pennsylvania 19341

914 International Mixing Tech. s.a.r.l.
469 Avenue Louis Herbeaux
F-59240 Dunkerque
France
(US Rep.: I.M.T. USA
6946 Paseo Laredo
San Diego, California 92037)

642 Mondomix B.V. (8/7/91)
Recweg 13
P.O. Box 98
1394 ZH Nederhorst den Berg
The Netherlands
(US Rep.: Mondomix
1 West Illinois Street, Suite 300
St. Charles, Illinois 60174)

1027 Polar Process Inc. (6/18/99)
P.O. Box 190
92 Albert Street E.
Platts ville, Ontario, Canada N0J 1S0

680 Quadro Engineering, Inc. (6/3/92)
613 Colby Drive
Waterloo, Ontario
Canada N2V 1A1
(US Rep.: Quadro, Inc.
55 Bleeker Street
Milburn, New Jersey 07041-1414)

766 Semi-Bulk Systems (4/28/94)
159 Cassens Court
Fenton, Missouri 63026-2543

724 Silverson Machines, Inc. (4/14/93)
P.O. Box 589
355 Chestnut Street
East Longmeadow, Massachusetts 01028

36-00 Colloid Mills

808 Boston Shearpump, Inc. (12/16/94)
170 Linden Street
Wellesley, Massachusetts 02181-7919

846 IKA Works, Inc. (9/7/95)
2635 North Chase Parkway, S.E.
Wilmington, North Carolina 28405-7499

915 IKA Works, Inc. (4/17/97)
2635 North Chase Parkway, S.E.
Wilmington, North Carolina 28405-7499

608 Kinematica, Inc. (10/17/90)
19 Normandy Road
Newton, Massachusetts 02166

293 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115

38-00 Cottage Cheese Vats

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

385 Stoelt ing, Inc. (5/5/83)
502 Highway 67
Kiel, Wisconsin 53042-1600

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

381 Marriott Walker Corp.
925 E. Maple Road
Birmingham, Michigan 48809

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

41-01 Mechanical Conveyors

631 Flexicon Corporation (5/28/91)
1375 Strykers Road
Phillipsburg, New Jersey 08865

894 Spiroflow-Orthos Systems, Inc.
2806 Gray Fox Road
Monroe, North Carolina 28110

42-01 In-Line Strainers

855 Flowtech Inc. (10/30/95)
1701 Spinks Drive S.E.
Marietta, Georgia 30067-8925

655 TriClover, Inc. (10/23/91)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

1023 Ultrafilter, Inc. (5/11/99)
3560 Engineering Drive
Norcross, Georgia 30092

606 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115

44-02 Air Hydraulically or Mechanically Driven Diaphragm Pumps

958 American LEWA, Inc.
132 Hopping Brook Road
Holliston, Massachusetts 01746-1499

959 American LEWA, Inc. (4/15/98)
132 Hopping Brook Road
Holliston, Massachusetts 01746-1499

937 Versa-Matic Pump Company (9/18/97)
6017 Enterprise Drive
Export, Pennsylvania 15632-8969

1012 Versa-Matic Pump Company (3/19/99)
6017 Enterprise Drive
Export, Pennsylvania 15632-8969

713 Warren Rupp, Inc., A Unit of IDEXX Corp. (2/5/93)
800 North Main Street
P.O. Box 1568
Mansfield, Ohio 44905

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833 Wilden Pump & Engr. Co. 22069 Van Buren Street Grand Terrace, California 92313-5651 (6/22/95)
805 Tri-Clover P.O. Box 1413 Kenosha, Wisconsin 53141-1413 (11/18/94)

**45-00 Cross Flow Membrane Modules**

807 CeraMem Separations 20 Clematis Avenue Walkham, Massachusetts 02154 (11/30/94)
786 North Carolina SRT, Inc. 221 James Jackson Avenue Cary, North Carolina 27513 (9/24/94)

**46-01 Refractometers and Optical Sensors**

981 AW Company 8809 Industrial Drive Franksville, Wisconsin 53126-9337 (9/16/98)
785 Bran & Lubbe, Inc. 1025 Busch Parkway Buffalo Grove, Illinois 60089 (9/2/94)
955 Epsilon Industrial Inc. 5020 Campbell Boulevard Baltimore, Maryland 21236-4968 (3/17/98)
859 The Electron Machine Corp. 15820 CR 450 West Umatilla, Florida 32784 (11/4/95)
800 EMS Industrial Inc. 2215 Grand Avenue Parkway Austin, Texas 78728 (10/24/94)
783 James C. Camp dba Advanced Process Systems 95 Wyngate Drive Newnan, Georgia 30265 (9/2/94)
940 K-Patents OY P.O. Box 77 Fin-01511 Vantaa, Finland (10/23/97)
697 Liquid Solids Control, Inc. P.O. Box 259 Farm Street Upton, Massachusetts 01568 (10/21/92)
751 Maselli Measurements, Inc. Via Baganza, 43100 Parma, Italy (US Rep.: Maselli Measurements, Inc. P.O. Box 7571 Stockton, California 95267) (1/20/94)
921 optek-Danulat Inc. 279 South 17th Avenue, Suite 10 West Bend, Wisconsin 53095 (4/30/97)
767 Foss NIR Systems, Inc. 12101 Tech Road Silver Spring, Maryland 20904 (6/6/94)
750 PT Papertech, Inc. #301 - 2609 Westview Drive North Vancouver B. C. Canada V7N 4M2 (1/20/94)

(US Rep.: BD Services Corporation 300 North Commercial Street Bellingham, Washington 98227) (4/24/97)
919 Foss NIR Systems, Inc. 12101 Tech Road Silver Spring, Maryland 20904 (9/15/93)
742 Reflectronics, Inc. 3009 Montavesta Road Lexington, Kentucky 40502 (12/10/96)

**47-00 Pumps for Cleaning & Sanitizing Solutions**

897 Ampco Pumps Company 4000 West Burnham Street Milwaukee, Wisconsin 53215 (12/29/92)

**50-00 Level Sensing Devices**

705 Bindicator Company 1915 Dove Street Port Huron, Michigan 48060 (12/29/92)
772 Alfa Laval Flow, Inc. 8201 - 104th Street, P.O. Box 581909 Pleasant Prairie, Wisconsin 53158-0909 (6/10/57)
780 L. C. Thomsen, Inc. 1303 - 43rd Street Kenosha, Wisconsin 53140 (8/31/57)
239 LUMACO 9-11 East Broadway Hackensack, New Jersey 07601 (6/3/72)
788 Puriti, S.A. De C. V. Alfredo Nobel No. 39 Fracc. Ind. Pte. de Vigas Tlalnepan, Mexico (US Rep.: Waukesha Cherry-Burrell 611 Sugar Creek Road Delavan, Wisconsin 53115) (9/12/72)
781 Robert James Sales, Inc. 699 Hertel Avenue, Suite 260 Buffalo, New York 14207 (8/31/94)
357 Tanaco Products 3860 Loomis Trail Road Blaine, Washington 98230 (4/15/82)
777 Tech Control Ent. 3725 N. Murray Road Otis Orchard, Washington 99027 (8/2/85)
790 Tri-Clover, Inc. P.O. Box 1413 Kenosha, Wisconsin 53141-1413 (10/15/56)
759 VNE Corporation 1149 Barbery Drive Janesville, Wisconsin 53545 (3/16/78)
761 Waukesha Cherry-Burrell 611 Sugar Creek Road Delavan, Wisconsin 53115 (12/17/57)

588 Dairy, Food and Environmental Sanitation – AUGUST 1999
**52-01 (Formerly 08-17H) Thermoplastic Plug Type Valves**

907 LAUFER International AG
Finkenweg 2
D-88709 Meersburg, Germany
(US Rep.: M. G. Newell Corporation 115 N. 20th Street Tampa, Florida 33605)

577 Ralet-Defay
66, Boulevard Poincare
1070 Brussels, Belgium
(US Agent GENICANAM, Chazy, New York)

**53-01 (Formerly 08-17A) Compression Type Valves**

484 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(10/22/86)

952 APV Fluid Handling-America
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(1/30/98)

730 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(4/21/93)

552 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799
(11/23/57)

245 Babson Brothers Company
Dairy System Division
P.O. Box 659
20903 West Gale Avenue
Galesville, Wisconsin 54630
(2/12/73)

443 Badger Meter, Inc.
6116 East 15th Street
Tulsa, Oklahoma 74112
(4/30/85)

686 Bardiani Valvole S.R.L.
Via G. Vittorio, 30/B
43045 Forenovo (PR) Italy
(US Rep.: Sanchelima Int. 1763 Northwest 93rd Avenue
Miami, Florida 33172)

1010 Candiga/CIA, S.A.
c/Telers, 54-Apto 174
17820 Banyoles, Spain
(Not available in the USA)

538 Cipriani, Inc. - Tassalina S.P.A.
23195 La Cadena Drive, Suite 103
Laguna Hills, California 92653
(7/31/88)

716 Conexiones Inoxidables
de Puebla S.A. de C.V.
Vicente Guerrero No. 211
Xicotepec de Juarez
Edo, Puebla Mexico
(US Rep: Ben Dolphin Consulting
4735 Lansing Drive
North Olmsted, Ohio 44070)

376 Defontaine of America, Inc.
16720 W. Victor Road
New Berlin, Wisconsin 53151
(1/25/83)

530 Alfa Laval Flow, Inc.
G & H Division
8201 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909
(5/31/88)

607 FLOWERVE Corporation
510 Parkway View Drive
Pittsburgh, Pennsylvania 15205-1410
(9/25/90)

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

881 MTS Milchtechnik AG
Saint Galler Strasse 19
CH-9042 Speicher AR
Switzerland
(US Rep.: Mr. James Lucas
Lucas & Associates
642 Alvarado St., #306
San Francisco, California 94114)

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

652 Pierre Guerin SA
BP 12 - 79210
Mauze-Sur-Le-Mignon
France
(Not Available in the USA)

551 Puriti, S.A. de C.V.
Alfredo Nobel 39
Fracc. Ind. Puente de Vigas
Tlahuapan, Mexico
(US Rep.: Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115)

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

978 Relco Unisystems Corporation
2281 - 3rd Avenue SW, P.O. Box 1689
Willmar, Minnesota 56201
(8/31/98)

748 Richards Industries Valve Group
3170 Wasson Road
Cincinnati, Ohio 45209-2381
(1/11/94)

944 Samson Controls, Inc.
4111 Cedar Boulevard
Baytown, Texas 77520
(11/11/97)

762 Stainless Products, Inc.
1649 - 72nd Avenue
Somers, Wisconsin 53171-0169
(12/18/80)

806 Steri Technologies, Inc.
857 Lincoln Avenue
Bohemia, New York 11716
(11/23/94)

804 Sudmo North America, Inc.
4786 Colt Road
Rockford, Illinois 61109
(11/18/94)

823 Sudmo North America, Inc.
4786 Colt Road
Rockford, Illinois 61109
(3/17/95)

954 Taylor Valve Technology
8300 S.W. 8th Street
Oklahoma City, Oklahoma 73128
(2/25/98)
542 L.C. Thomsen, Inc.  
1303-43rd Street  
Kenosha, Wisconsin 53140  
(8/31/88)

544 Tri-Clover, Inc.  
P.O. Box 1413  
Kenosha, Wisconsin 53141-1413  
(10/15/56)

467 Tuchenhagen North America, Inc.  
9165 Rumsey Road  
Columbus, Maryland 21045  
(1/13/86)

1008 UNIVALVE S.A.  
Z.A. du Mittelfeld 1, rue Alfred Kastler  
F 67300 Schiltigheim, France  
(Not available in the USA)  
(3/3/99)

561 VACU-PURG, Inc.  
214 West Main Street  
P.O. Box 159  
Fredericksburg, Iowa 50630  
(1/26/89)

584 Valvinox, Inc.-SGRM Division  
650 1ere Rue.  
Iberville-QUE-Canada J2X 3B8  
(Not Available in the USA)  
(11/27/89)

796 VNE Corp.  
1149 Barberry Drive  
Janesville, Wisconsin 53547  
(10/11/94)

555 Waukesha Cherry-Burrell  
611 Sugar Creek Road  
Delavan, Wisconsin 53115  
(12/11/57)

54-02 (Formerly 08-17B) Diaphragm-Type Valves

565 APV Americas - Lake Mills  
100 South Cp Avenue  
Lake Mills, Wisconsin 53551-1799  
(10/22/86)

877 APV Americas - Lake Mills  
100 South Cp Avenue  
Lake Mills, Wisconsin 53551-1799  
(5/14/96)

980 APV Fluid Handling America  
100 South Cp Avenue  
Lake Mills, Wisconsin 53551-1799  
(9/15/98)

615 AsepCo  
1101 San Antonio Road, #301  
Mountain View, California 94043  
(1/4/91)

814 Burkert Contromatic Corporation  
2602 McGaw Avenue  
Irvine, California 92714  
(2/2/95)

953 Burkert Contromatic Corporation  
2602 McGaw Avenue  
Irvine, California 92614  
(2/2/98)

745 Cashco, Inc.  
P.O. Box 6, Hwy. 140 West  
Ellsworth, Kansas 67439-0006  
(12/9/93)

617 Defontaine of America, Inc.  
16720 W. Victor Road  
New Berlin, Wisconsin 53151  
(2/1/91)

856 Flowtech, Inc.  
1900 Lake Park Drive, No. 345  
Smyrna, Georgia 30080  
(10/30/95)

637 Gemu Valves, Inc.  
3800 Camp Creek Parkway  
Bldg. 2600, Suite 110  
Atlanta, Georgia 30331  
(7/10/91)

514 H. D. Bauman Inc.  
35 Mirona Road  
Portsmouth, New Hampshire 03801-5317  
(8/24/87)

203R ITT Engineered Valves  
33 Centerville Road  
Lancaster, Pennsylvania 17603-2064  
(11/27/68)

494 Tri Clover Inc.  
Division of Alfa Laval  
P.O. Box 1413  
Kenosha, Wisconsin 53141-1413  
(3/23/99)

55-01 Boot Seal Valves for Milk & Milk Products

821 Keofitt A/S  
Snaremosevej 27  
DK-7000 Fredericia  
Denmark  
(US Rep.: Keofitt, Inc.  
c/o Leman  
2920-3000 Wolff Street  
Racine, Wisconsin 53404)

56-00 (Formerly 08-17E) Inlet and Outlet  
Leak-Protector Plug Valve

34E Tri-Clover, Inc.  
P.O. Box 1413  
Kenosha, Wisconsin 53141-1413  
(10/15/56)

57-01 (Formerly 08-17F) Tank Outlet Valve

531 Alfa Laval Flow, Inc.  
G & H Division  
8201 - 104th Street, P.O. Box 581909  
Pleasant Prairie, Wisconsin 53158-0909  
(5/31/88)

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

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

58-00 (Formerly 08-17M) Vacuum Breakers  
and Check Valves

843 APV Americas-Lake Mills  
100 South CP Avenue  
Lake Mills, Wisconsin 53551  
(8/24/95)

986 CME  
No. 21, Alley 6, Lane 71  
Lin-Sen Road  
Taoyuan, Taiwan  
(US Rep.: Bradford Cast Metals  
P.O. Box 33  
Elm Grove, Wisconsin 53122)  
(10/26/98)

691 Defontaine of America, Inc.  
16720 W. Victor Road  
New Berlin, Wisconsin 53151  
(9/19/92)

855 Alfa Laval Flow, Inc.  
G & H Division  
P.O. Box 1413  
Kenosha, Wisconsin 53141-1413  
(6/22/95)
<table>
<thead>
<tr>
<th>Number</th>
<th>Company Name</th>
<th>Address</th>
<th>City, State, Zip Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1014</td>
<td>Check-All Valve Manufacturing Co.</td>
<td>1800 Fuller Road</td>
<td>Des Moines, Iowa 50265</td>
</tr>
<tr>
<td>968</td>
<td>SINMAG FITTING CORPORATION</td>
<td>6F, No. 23, Wu-Chiang 6th Road</td>
<td>Wu-Ku Hsiang, Taiwan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2241 Quebec Avenue South</td>
<td>St. Louis Park, Iowa 55426</td>
</tr>
<tr>
<td>834</td>
<td>Stanfos, Inc.</td>
<td>3908-69th Avenue</td>
<td>Edmonton, Alberta</td>
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<tr>
<td></td>
<td></td>
<td>Canada T6B 2V2</td>
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<tr>
<td>689</td>
<td>VNE Corporation</td>
<td>1149 Barberry Drive</td>
<td>Janesville, Wisconsin 53547</td>
</tr>
<tr>
<td>908</td>
<td>Waukesha Cherry-Burrell</td>
<td>611 Sugar Creek Road</td>
<td>Delavan, Wisconsin 53115</td>
</tr>
<tr>
<td>291</td>
<td>Accurate Metering Systems Inc.</td>
<td>12850 Route 39</td>
<td>Sardinia, New York 14134</td>
</tr>
<tr>
<td>284</td>
<td>Bristol Equipment Co.</td>
<td>210 Beaver Street</td>
<td>Yorkville, Illinois 60560-0696</td>
</tr>
<tr>
<td>407</td>
<td>Continental Disc Corp.</td>
<td>3160 W. Heartland Drive</td>
<td>Liberty, Missouri 64068</td>
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<tr>
<td>854</td>
<td>Fike Metal Prod.</td>
<td>704 South 10th Street</td>
<td>Blue Springs, Missouri 64015</td>
</tr>
<tr>
<td>892</td>
<td>Oklahoma Safety Equipment Company</td>
<td>1701 West Tacoma</td>
<td>Broken Arrow, Oklahoma 74012</td>
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<tr>
<td>728</td>
<td>APV Americas</td>
<td>395 Fillmore Avenue</td>
<td>Tonawanda, New York 14150</td>
</tr>
<tr>
<td>811</td>
<td>Hydro-Thermal Corporation</td>
<td>400 Pilot Court</td>
<td>Waukesha, Wisconsin 53188</td>
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<tr>
<td>991</td>
<td>Komax Systems, Inc.</td>
<td>508 East E Street</td>
<td>Wilmington, California 90744</td>
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<td>560</td>
<td>Pick Heaters, Inc.</td>
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<td></td>
<td></td>
<td>P.O. Box 516</td>
<td>West Bend, Wisconsin 53095</td>
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<tr>
<td>874</td>
<td>QJet DSI, Inc.</td>
<td>704 Powell Lane, P.O. Box 350</td>
<td>Lewiston, New York 14092-0350</td>
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<tr>
<td>795</td>
<td>Able Hose &amp; Rubber, Inc.</td>
<td>2307 E. Hennepin Avenue</td>
<td>Minneapolis, Minnesota 55413</td>
</tr>
<tr>
<td>774</td>
<td>The Briggs Co.</td>
<td>3 Bellecor Drive</td>
<td>New Castle, Delaware 19720</td>
</tr>
<tr>
<td>758</td>
<td>Crouch Supply Co.</td>
<td>P.O. Box 163829</td>
<td>Ft. Worth, Texas 76161</td>
</tr>
<tr>
<td>721</td>
<td>Dixon Valve &amp; Coupling Co.</td>
<td>800 High Street</td>
<td>Chestertown, Maryland 21620-1196</td>
</tr>
<tr>
<td>913</td>
<td>JGB Enterprises, Inc.</td>
<td>115 Metropolitan Drive</td>
<td>Liverpool, New York 13088</td>
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<tr>
<td>757</td>
<td>Nelson-Jameson, Inc.</td>
<td>P.O. Box 647</td>
<td>South Gate, California 90280-7590</td>
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<tr>
<td>727</td>
<td>Nagel Process Technologies Group</td>
<td>924 Marcon Boulevard</td>
<td>Allentown, Pennsylvania 18103</td>
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<tr>
<td>799</td>
<td>R/W Connection</td>
<td>936 Links Avenue</td>
<td>Landisville, Pennsylvania 17538</td>
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<tr>
<td>698</td>
<td>Sanitary Couplers, Inc.</td>
<td>275 South Pioneer Boulevard</td>
<td>Springsboro, Ohio 45066</td>
</tr>
<tr>
<td>700</td>
<td>Titan Industries, Inc.</td>
<td>P.O. Box 1007</td>
<td>South Gate, California 90280-7590</td>
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<tr>
<td>1018</td>
<td>Advance Fittings Corporation</td>
<td>218 West Centralia Street</td>
<td>Elkhorn, Wisconsin 53121</td>
</tr>
<tr>
<td>380</td>
<td>Allegheny Bradford Corp.</td>
<td>P.O. Box 200 Route 219 South</td>
<td>Bradford, Pennsylvania 16701</td>
</tr>
<tr>
<td>79R</td>
<td>APV Americas - Lake Mills</td>
<td>100 South CP Avenue</td>
<td>Lake Mills, Wisconsin 53551-1799</td>
</tr>
<tr>
<td>682</td>
<td>Andron Stainless, Ltd.</td>
<td>6170 Tomken Road</td>
<td>Mississauga, Ontario 5L5T 1X7</td>
</tr>
<tr>
<td>349</td>
<td>APN, Inc.</td>
<td>921 Industry Road</td>
<td>Caledonia, Minnesota 55921</td>
</tr>
<tr>
<td>Company Name</td>
<td>Address Details</td>
<td>Contact Date</td>
<td></td>
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<tr>
<td>APV Americas - Lake Mills</td>
<td>100 South CP Avenue, Lake Mills, Wisconsin 53551-1799</td>
<td>12/31/96</td>
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<tr>
<td>ARMATURENWERK HOTENSLEBEN GmbH</td>
<td>Schulstraße 5-6, 39393 Holensleben, Germany</td>
<td>1/2/98</td>
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<tr>
<td>Becker, Inc.</td>
<td>P.O. Box 1258, 6705 14th Avenue, Kenosha, Wisconsin 53140</td>
<td>4/5/99</td>
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<tr>
<td>Bradford Cast Metals</td>
<td>P.O. Box 33, Elm Grove, Wisconsin 53122</td>
<td>2/25/91</td>
<td></td>
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<tr>
<td>Swagelok</td>
<td>29500 Solon Road, Solon, Ohio 44139-3492</td>
<td>8/4/92</td>
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<tr>
<td>CME</td>
<td>No. 21, Alley 6, Lane 71, Lin-Sen Road, Taoyuan, Taiwan</td>
<td>10/26/98</td>
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<tr>
<td>CEME Chiang Sung Enterprise Co., Ltd.</td>
<td>No. 65 Sheng Kung 1st Road, Peitou Industrial Park, Changhua, Taiwan ROC</td>
<td>4/24/98</td>
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<tr>
<td>CANDIGRA y CIA, S.A.</td>
<td>C/. Telers, 54-Aptdo. 174, 17820 Banyoles, Spain</td>
<td>1/2/98</td>
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<tr>
<td>Cipriani, Inc. - Tassalini S.P.A.</td>
<td>23195 LaCadena Drive, Suite #103, Laguna Hills, California 92653</td>
<td>8/27/91</td>
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<tr>
<td>GIVACON</td>
<td>416 E. Alondra Boulevard, Gardena, California 90248</td>
<td>4/30/98</td>
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<td>Conexiones Inoxidables</td>
<td>de Puebla S. a. de C. V., Vicente Guerrero No. 112, Xicotepec de Juarez, Edo. Puebla, Mexico</td>
<td>10/1/92</td>
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<tr>
<td>Dixson Valve and Coupling Company</td>
<td>800 High Street, Chestertown, Maryland 21620-1196</td>
<td>3/3/99</td>
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<tr>
<td>Fastest, Inc.</td>
<td>2315 Hampden Avenue, St. Paul, Minnesota 55114</td>
<td>7/21/98</td>
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<tr>
<td>FLOWMECA</td>
<td>47 rue du Bois Chaland, LISSES, 91029 Evry Cedex, France</td>
<td>12/22/97</td>
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<tr>
<td>Food &amp; Dairy Quality Mgmt. Inc. (QMI)</td>
<td>245 E. 6th Street, Suite 416, St. Paul, Minnesota 55101</td>
<td>7/10/95</td>
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<td>Alfa Laval Flow, Inc.</td>
<td>G &amp; H Division, 8201 - 104th Street, P.O. Box 581909, Pleasant Prairie, Wisconsin 53158-0909</td>
<td>6/10/57</td>
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<td>Hassia Verpackungsmaschinen GmbH</td>
<td>Heerweg 19, D63691, Ranstad, Germany</td>
<td>6/5/97</td>
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<td>Irving Polishing &amp; Mfg., Co., Inc</td>
<td>5704 46th Street, Kenosha, Wisconsin 53144-1899</td>
<td>7/15/94</td>
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<td>Jensen Fittings Corp.</td>
<td>107-111 Goundry Street, North Tonawanda, New York 14120-5998</td>
<td>9/11/85</td>
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<tr>
<td>King Lai International Co., Ltd.</td>
<td>No. 10, The 6th Street, Youth Industrial Zone, Taichung, Taiwan ROC</td>
<td>7/31/97</td>
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<td>Lee Industries, Inc.</td>
<td>P.O. Box 688, Philipsburg, Pennsylvania 16866</td>
<td>5/31/83</td>
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<td>Parker Hannifin Corp.</td>
<td>UHP Products Division, 1005 A Cleaner Way, Huntsville, Alabama 35805</td>
<td>11/6/92</td>
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<tr>
<td>Paul Mueller Co.</td>
<td>1600 W. Phelps Street, Box 828, Springfield, Missouri 65801</td>
<td>5/3/68</td>
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<tr>
<td>Nalge Process Technologies Group</td>
<td>924 Marcon Boulevard, Allentown, Pennsylvania 18103</td>
<td>4/14/93</td>
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</table>
242 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico
(US Rep.: Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115)
424 Robert-James Sales, Inc. (8/31/84)
699 Hertel Avenue, Suite 260
Buffalo, New York 14207
699 Rodger Industries, Inc. (10/23/92)
P.O. Box 186
Blenheim, Ontario
Canada N0P 1A0
(Not available in the U.S.A)
1007 Rotary Systems Inc. (3/3/99)
1036 McKinley Street
Anoka, Minnesota 55303
969 SINMAG FITTING CORPORATION (7/2/98)
6F, No. 23, Wu-Chuang 6th Road
Wu-Ku Hsiang
Taipei Hsien, Taiwan
(US Rep.: MarketNet
2241 Quebec Avenue South
St. Louis Park, Minnesota 55426)
334 Stainless Products, Inc. (12/18/80)
1649-72nd Avenue, Box 169
Somers, Wisconsin 53171
741 Steel & O'Brien Mfg., Inc. (8/26/93)
12850 Route 39
Sardinia, New York 14134
391 Stork Food & Dairy Systems, Inc. (6/9/83)
P.O. Box 1258
1024 Airport Parkway
Gainesville, Georgia 30503
449 Tech Controls Enterprise Co., Ltd. (8/2/85)
3725 N. Murray Road
Otis Orchard, Washington 99027
73R L.C. Thomsen, Inc. (8/31/57)
1303-43rd Street
Kenosha, Wisconsin 53140
34R Tri-Clover, Inc. (10/15/56)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413
987 Trident Stainless Manufacturing Ltd. (10/26/98)
4635 Burgoyne Street, Units 17-18
Mississauga, Ontario
L4W 1V9 Canada
(US Rep.: Steve Byskosh
500 Berwick Court
Schuamberg, Illinois 60193)
1017 United Pacific Distributors Supply, Inc. (4/7/99)
1040 Wallace Place
City of Industry, California 91748
707 Valvinox, Inc., SG RM Div. (1/5/93)
650-1st Street
Iberville, Quebec, Canada J2X 3B8
(Not available in the USA)
304 VNE Corporation (3/16/78)
1149 Barberry Drive
Janesville, Wisconsin 53547
82R Waukesha Cherry-Burrell (12/17/57)
611 Sugar Creek Road
Delavan, Wisconsin 53115
1006 Westfalia Landtechnik of Australia Pty. Ltd. (3/3/99)
4 Saligna Drive
Tullamarine, Victoria
Australia 3043
(US Rep.: Westfalia Dairy Systems, Inc.
1862 Brummel Drive
Elk Grove, Illinois 60007)

64-00 (Formerly 08-17N) Pressure Reducing and Back Pressure Regulating Valve

782 CASHCO, Inc. (8/31/94)
P.O. Box 6
Elisworth, Kansas 67439-0006
753 Alfa Laval Flow, Inc. (2/1/94)
G & H Division
8201 - 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909
769 Richards Industries Valve Group (6/6/94)
3170 Wasson Road
Cincinnati, Ohio 45209-2381

65-00 Sight /& or Light Windows & Sight Indications & Contact with Milk & Milk Products

849 Jacoby TarBox Division of (9/25/95)
Clark Reliance Corp.
16635 Foltz Industrial Parkway
Strongsville, Ohio 44136
867 J. M. Canty, Inc. (2/19/96)
6100 Donner Road
Lockport, New York 14096
929 Darrell A. Beer (7/18/97)
d.b.a. SHAE Industries
P.O. Box 1268
2201 Pinnacle Parkway
Twinsburg, Ohio 44087
845 L. J. Star Inc. (9/7/95)
P.O. Box 1116
121 W. North Street
Healdsburg, California 95448
890 Moisture Systems (9/14/96)
117 South Street
Hopkinton, Massachusetts 01748
970 SINMAG FITTING CORPORATION (7/2/98)
6F, No. 23, Wu-Chuang 6th Road
Wu-Ku Hsiang
Taipei Hsien, Taiwan
(US Rep.: MarketNet
2241 Quebec Avenue South
St. Louis Park, Minnesota 55426)
974 Steel and O'Brien Mfg., Inc. (8/7/98)
12850 Route 39
Sardinia, New York 14134
818 Tri-Clover, Inc. (3/10/95)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413
<table>
<thead>
<tr>
<th>68-00 Ball-Type Valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>1032 Bowlswitch USA, Inc.</td>
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<tr>
<td>6580 Valley Center Drive</td>
</tr>
<tr>
<td>Radford, Virginia 24141</td>
</tr>
<tr>
<td>1022 Bradford Castmets, Inc.</td>
</tr>
<tr>
<td>P.O. Box 35</td>
</tr>
<tr>
<td>Elm Grove, Wisconsin 53122</td>
</tr>
<tr>
<td>898 Fluid Transfer</td>
</tr>
<tr>
<td>Division of Lee Ind., Inc.</td>
</tr>
<tr>
<td>514 W. Pine Street</td>
</tr>
<tr>
<td>Pittsburgh, Pennsylvania 16866</td>
</tr>
<tr>
<td>931 LUMACO</td>
</tr>
<tr>
<td>9-11 East Broadway</td>
</tr>
<tr>
<td>Hackensack, New Jersey 07601</td>
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<table>
<thead>
<tr>
<th>73-00 Shear Mixers, Mixers and Agitators</th>
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</thead>
<tbody>
<tr>
<td>901 Admix, Inc.</td>
</tr>
<tr>
<td>234 Abby Road</td>
</tr>
<tr>
<td>Manchester, New Hampshire 03103-3332</td>
</tr>
<tr>
<td>957 Admix, Inc.</td>
</tr>
<tr>
<td>234 Abby Road</td>
</tr>
<tr>
<td>Manchester, New Hampshire 03103-3332</td>
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<table>
<thead>
<tr>
<th>74-00 Sensors and Sensor Fittings and Connections</th>
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<tbody>
<tr>
<td>32 ABB Instrumentation, Inc.</td>
</tr>
<tr>
<td>125 E. County Line Road</td>
</tr>
<tr>
<td>Warminster, Pennsylvania 18974</td>
</tr>
<tr>
<td>738 ABB Instrumentation, Inc.</td>
</tr>
<tr>
<td>125 E. County Line Road</td>
</tr>
<tr>
<td>Warminster, Pennsylvania 18974</td>
</tr>
<tr>
<td>747 Alloy Engineering Co., Inc.</td>
</tr>
<tr>
<td>504 Seaview Avenue</td>
</tr>
<tr>
<td>Bridgeport, Connecticut 06607</td>
</tr>
<tr>
<td>576 Ametek Test and Calibration Instruments Division</td>
</tr>
<tr>
<td>8600 Somerset Drive</td>
</tr>
<tr>
<td>Largo, Florida 34643</td>
</tr>
<tr>
<td>822 Ametek/US Gauge Division</td>
</tr>
<tr>
<td>PMT Products</td>
</tr>
<tr>
<td>820 Pennsylvania Boulevard</td>
</tr>
<tr>
<td>Feasterville, Pennsylvania 19053</td>
</tr>
<tr>
<td>318 Anderson Instrument Co., Inc.</td>
</tr>
<tr>
<td>156 Auriesville Road</td>
</tr>
<tr>
<td>Fultonville, New York 12072</td>
</tr>
<tr>
<td>428 ARI Industries, Inc.</td>
</tr>
<tr>
<td>381 ARI Court</td>
</tr>
<tr>
<td>Addison, Illinois 60101</td>
</tr>
<tr>
<td>659 Bindicator Company</td>
</tr>
<tr>
<td>1915 Dove Street</td>
</tr>
<tr>
<td>Port Huron, Michigan 48060</td>
</tr>
<tr>
<td>706 Bindicator Company</td>
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<tr>
<td>1915 Dove Street</td>
</tr>
<tr>
<td>Port Huron, Michigan 48060</td>
</tr>
<tr>
<td>926 BOURDON - SEDEME S.A.</td>
</tr>
<tr>
<td>125, rue de la Marre</td>
</tr>
<tr>
<td>B.P. 214 11103</td>
</tr>
<tr>
<td>Vendome Cedex</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>(US Rep.: Rawson &amp; Co., Inc.</td>
</tr>
<tr>
<td>P.O. Box 924288</td>
</tr>
<tr>
<td>Houston, Texas 77292-4288)</td>
</tr>
<tr>
<td>872 Brookfield Eng. Lab, Inc.</td>
</tr>
<tr>
<td>11 Commerce Boulevard</td>
</tr>
<tr>
<td>Middleboro, Massachusetts 02346</td>
</tr>
<tr>
<td>359 Brooks Instrument Division</td>
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<tr>
<td>407 West Vine Street</td>
</tr>
<tr>
<td>Hatfield, Pennsylvania 19440</td>
</tr>
<tr>
<td>315 Burns Engineering, Inc.</td>
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<tr>
<td>10201 Bren Road, East</td>
</tr>
<tr>
<td>Minnetonka, Minnesota 55343</td>
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<tr>
<td>525 Caldwell Systems Corporation</td>
</tr>
<tr>
<td>600 S. Sunset, Unit D</td>
</tr>
<tr>
<td>Longmont, Colorado 80501</td>
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<tr>
<td>910 CEMCO Mfg., Inc.</td>
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<tr>
<td>1120 North Peria</td>
</tr>
<tr>
<td>Tulsa, Oklahoma 74106-1904</td>
</tr>
<tr>
<td>850 Chicago Stainless Equip.</td>
</tr>
<tr>
<td>1280 S.W. 34th Street</td>
</tr>
<tr>
<td>Palm City, Florida 34990-3308</td>
</tr>
<tr>
<td>672 Computer Instruments Corp.</td>
</tr>
<tr>
<td>1000 Shames Drive</td>
</tr>
<tr>
<td>Westbury, New York 11590</td>
</tr>
<tr>
<td>829 DCT Instruments/Sensotec, Inc.</td>
</tr>
<tr>
<td>2080 Arlington Lane</td>
</tr>
<tr>
<td>Columbus, Ohio 43228-4112</td>
</tr>
<tr>
<td>862 Delta Controls Corporation</td>
</tr>
<tr>
<td>585 Fortson Street</td>
</tr>
<tr>
<td>Shreveport, Louisiana 71107</td>
</tr>
<tr>
<td>586 Diversey Lever Equipment</td>
</tr>
<tr>
<td>151 Harvey West Boulevard</td>
</tr>
<tr>
<td>Santa Cruz, California 95060</td>
</tr>
<tr>
<td>866 Dovex S.S., Inc.</td>
</tr>
<tr>
<td>770 Tower Drive</td>
</tr>
<tr>
<td>Medina, Minnesota 55340</td>
</tr>
<tr>
<td>640 Dresser Industries</td>
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<tr>
<td>Instrument Division</td>
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<tr>
<td>250 East Main Street</td>
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<td>Stratford, Connecticut 06617</td>
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<td>663 Dresser Industries</td>
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<td>Instrument Division</td>
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<tr>
<td>210 Old Gate Lane</td>
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<tr>
<td>Milford, Connecticut 06460</td>
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<tr>
<td>405 Drexelbrook Engineering Co.</td>
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<tr>
<td>205 Keith Valley Road</td>
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<tr>
<td>Horsham, Pennsylvania 19044</td>
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<tr>
<td>861 Dwyer Instruments, Inc.</td>
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<tr>
<td>P.O. Box 373</td>
</tr>
<tr>
<td>Michigan City, Indiana 46360</td>
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<tr>
<td>977 Effecto, Inc.</td>
</tr>
<tr>
<td>A subsidiary of ifm electronic</td>
</tr>
<tr>
<td>805 Springdale Drive</td>
</tr>
<tr>
<td>Exton, Pennsylvania 19341</td>
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<tr>
<td>763 EG &amp; G Berthold Laboratorium Prof.</td>
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<tr>
<td>Berthold GmbH &amp; Co. KG Calmbacher Str. 22</td>
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<tr>
<td>D-7547 Bad Wildbad 1, Germany</td>
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<tr>
<td>(US Rep.: E.G &amp; G Berthold USA</td>
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<tr>
<td>100 Midland Road</td>
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<tr>
<td>Oak Ridge, Tennessee 37830</td>
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<tr>
<td>936 ENFM-USA, Inc.</td>
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<tr>
<td>11359 East Distribution Avenue</td>
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<tr>
<td>Jacksonville, Florida 32256</td>
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<tr>
<td>Company Name</td>
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<tr>
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<tr>
<td>Honeywell, Inc.</td>
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<tr>
<td>557</td>
</tr>
<tr>
<td>832</td>
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<tr>
<td>629</td>
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<td>906</td>
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<tr>
<td>1028 Finn and Company, Inc.</td>
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<td>1033 Finn and Company, Inc.</td>
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<tr>
<td>524 Flow Technology, Inc.</td>
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<tr>
<td>459 Endress + Hauser, Inc.</td>
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<tr>
<td>876 Fisher-Rosemount</td>
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<tr>
<td>598 FMC Invalco, Inc.</td>
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<td>963 GLI International, Inc.</td>
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<td>984 Garner Industries</td>
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<td>592 Claude S. Gordon Co.</td>
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<tr>
<td>668 GP: 50 New York, Ltd.</td>
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<tr>
<td>653 Griffith Industrial Products Company</td>
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<tr>
<td>749 Haenni Cie &amp; AG</td>
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<tr>
<td>651 HEINRICH KUBLER AG</td>
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<tr>
<td>794 Honeywell, Inc.</td>
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<tr>
<td>627</td>
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<table>
<thead>
<tr>
<th>1002</th>
<th>MILLTRONICS LTD.</th>
<th>(3/3/99)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nikkelstrand 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NL 4832 AB Breda, The Netherlands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(US Rep.: MILLTRONICS, INC. 709 E. Stadium Drive</td>
<td></td>
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<tr>
<td></td>
<td>Arlington, Texas 76011</td>
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<table>
<thead>
<tr>
<th>588</th>
<th>Minco Products, Inc.</th>
<th>(12/20/89)</th>
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<tbody>
<tr>
<td></td>
<td>7300 Commerce Lane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minneapolis, Minnesota 55432</td>
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<thead>
<tr>
<th>863</th>
<th>Nelson-Jameson</th>
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<tr>
<td></td>
<td>2400 East 5th Street, P.O. Box 647</td>
<td></td>
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<tr>
<td></td>
<td>Marshallfield, Wisconsin 54449</td>
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<thead>
<tr>
<th>597</th>
<th>NUOVA FIMA S.p.A.</th>
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<tbody>
<tr>
<td></td>
<td>Via C. Battisti 59</td>
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<tr>
<td></td>
<td>28045 - INVORIO (NO) Italy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(US Rep.: MDI Industrial Sales LTD. 9868 - 33rd Avenue Alberta, Canada T6N 1C6)</td>
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<tr>
<td></td>
<td>(Not available in the USA)</td>
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<thead>
<tr>
<th>966</th>
<th>ODEN Corporation</th>
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<tbody>
<tr>
<td></td>
<td>255 Great Arrow Avenue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buffalo, New York 14207</td>
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<table>
<thead>
<tr>
<th>909</th>
<th>OHMART/VEGA Corporation</th>
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<tbody>
<tr>
<td></td>
<td>4241 Allendorf Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cincinnati, Ohio 45209-9961</td>
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</table>

<table>
<thead>
<tr>
<th>983</th>
<th>OHMART/VEGA Corporation</th>
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<tbody>
<tr>
<td></td>
<td>4241 Allendorf Drive</td>
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<tr>
<td></td>
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<table>
<thead>
<tr>
<th>523</th>
<th>Paper Machine Components, Inc.</th>
<th>(1/3/88)</th>
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<tbody>
<tr>
<td></td>
<td>Miry Brook Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Danbury, Connecticut 06810</td>
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<table>
<thead>
<tr>
<th>554</th>
<th>Par Sonics, Inc.</th>
<th>(11/30/88)</th>
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<tbody>
<tr>
<td></td>
<td>R.D. #1 - Box 505</td>
<td></td>
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<tr>
<td></td>
<td>Centre Hall, Pennsylvania 16828</td>
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<table>
<thead>
<tr>
<th>563</th>
<th>PI Components Corp.</th>
<th>(2/13/89)</th>
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<tbody>
<tr>
<td></td>
<td>1951 Highway 290W</td>
<td></td>
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<tr>
<td></td>
<td>Bremhan, Texas 77833</td>
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<table>
<thead>
<tr>
<th>644</th>
<th>Princo Instruments, Inc.</th>
<th>(8/22/91)</th>
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<tbody>
<tr>
<td></td>
<td>1020 Industrial Highway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southampton, Pennsylvania 18966-4095</td>
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<thead>
<tr>
<th>815</th>
<th>ProMag FM LTD</th>
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<tbody>
<tr>
<td></td>
<td>11552 Merchant Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baton Rouge, Louisiana 70809</td>
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<table>
<thead>
<tr>
<th>1000</th>
<th>pro/M/t/c., Inc.</th>
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<tr>
<td></td>
<td>1201 Braddock Ave., Suite 2</td>
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<td></td>
<td>Pittsburgh, Pennsylvania 15218</td>
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<thead>
<tr>
<th>487</th>
<th>Pyromation, Incorporated</th>
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<tbody>
<tr>
<td></td>
<td>5211 Industrial Road</td>
<td></td>
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<tr>
<td></td>
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<tr>
<th>367</th>
<th>RDF Corporation</th>
<th>(10/2/82)</th>
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<tbody>
<tr>
<td></td>
<td>23 Elm Avenue</td>
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<tr>
<th>982</th>
<th>Reotemp Instrument Corporation</th>
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<tr>
<td></td>
<td>11568 Sorrento Valley Road, Suite 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>San Diego, California 92121-1313</td>
<td></td>
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<table>
<thead>
<tr>
<th>495</th>
<th>Rosemount Analytical, Inc.</th>
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<tbody>
<tr>
<td></td>
<td>Unioloc Division</td>
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<tr>
<td></td>
<td>2400 Barranca Parkway</td>
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<td></td>
<td>Irvine, California 92606</td>
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<table>
<thead>
<tr>
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<tr>
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<td></td>
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<tr>
<td></td>
<td>Saddle Rock, New Jersey 07663</td>
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<table>
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<tr>
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<tr>
<td></td>
<td>12001 Technology Drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eden Prairie, Minnesota 55344</td>
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<table>
<thead>
<tr>
<th>732</th>
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<th>(5/18/93)</th>
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<tbody>
<tr>
<td></td>
<td>7620 DiSalle Boulevard</td>
<td></td>
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<tr>
<td></td>
<td>Fort Wayne, Indiana 46825</td>
<td></td>
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<table>
<thead>
<tr>
<th>784</th>
<th>Sensotec, Inc.</th>
<th>(9/2/94)</th>
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<tr>
<td></td>
<td>2080 Arlington Lane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbus, Ohio 43228-4112</td>
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<table>
<thead>
<tr>
<th>515</th>
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<th>(9/14/87)</th>
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<tbody>
<tr>
<td></td>
<td>159 Swanson Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boxborough, Massachusetts 01719</td>
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<table>
<thead>
<tr>
<th>583</th>
<th>S. J. Controls, Inc.</th>
<th>(11/11/89)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2248 Obispo Avenue #203</td>
<td></td>
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<tr>
<td></td>
<td>Long Beach, California 90806</td>
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<tr>
<th>873</th>
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<tr>
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<td>410</td>
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<td>779</td>
<td>Wahl Instruments, Inc.</td>
<td>234 Weaverville Highway, Asherville, North Carolina 28804</td>
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<td>707 Jeffrey Way, Round Rock, Texas 78664</td>
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<td>WEISS Instruments, Inc.</td>
<td>85 Bell Street, West Babylon, New York 11704</td>
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<td>Weksler Instruments Corporation</td>
<td>250 E. Main Street, Stratford, Connecticut 06497</td>
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<td>WIKA Instrument Corp.</td>
<td>1000 Wiegand Boulevard, Lawrenceville, Georgia 30243</td>
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<td>Winter’s Thermogauges, Ltd.</td>
<td>121 Railside Road, Toronto, Ontario, Canada M3A 1R2</td>
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<td>Winter’s Thermogauges, Ltd.</td>
<td>121 Railside Road, Toronto, Ontario, Canada M3A 1R2</td>
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The Following Firms Have Not Renewed Their 3-A Symbol Authorization and Effective June 30, 1999 are No Longer Authorized to Display the 3-A Symbol

### 02-09 Pumps for Milk and Milk Products
- 684 P.C.M. Pompes
- 888 Seeberger GmbH
- 609 Tuthill Corporation

### 05-14 Stainless Steel Automotive Milk and Milk Product Transportation Tanks for Bulk Delivery and/or Farm Pick-Up Service
- 623 Walker Stainless

### 12-05 Tubular Heat Exchangers for Milk and Milk Products
- 824 DASI Industries
- 616 ITT Standard

### 28-03 Flow Meters for Milk and Milk Products
- 755 Liquid Controls

### 33-01 Polished Metal Tubing for Dairy Products
- 289 Tri Clover

### 63-01 Sanitary Fittings for Milk and Milk Products
- 528 Dayco Products

### 74-00 Sensors and Sensor Fittings and Connections Used on Fluid Milk & Milk Products Equipment
- 865 APV Heat Transfer Technologies
Continued from page 604

salads and other pre-cut produce items. Why? We need to remember that fresh produce products need to have these spoilage organisms present. Spoiled food has traditionally not been eaten, which has provided some protection from disease. The spoilage organisms not only render the food inedible but also provide competitive inhibition for any pathogens that might have been present. Historically, these organisms provided the safety margin for fresh produce so that unsafe foods were not consumed. There has also been interest in identifying indicator organisms for fresh produce. Presence of generic coliforms is not a good indication of the practices used in the production of a pre-cut salad or other produce products. Most contaminants are present at such low incidence rates, that sampling programs that would provide statistically valid information would be cost prohibitive and certainly would not provide a meaningful reduction of risk. The National Advisory Committee on Microbiological Criteria for Foods in its review of produce safety did indicate that the use of total plate count as a means to identify if the process is under control was an appropriate protocol. There is no agreement on what, if any, testing criteria would be appropriate for finished product.

Pre-packaged, pre-cut salads have not been implicated in a foodborne illness outbreak, which is probably due to a number of factors. The same practices that enable these products to appear fresh and inviting serve to prevent the product from becoming unsafe. The industry has a long history of training and providing technical assistance to the less informed members of the community. The industry is interested in having laboratories educated and informed about the facts regarding fruit and vegetable safety.

We all need to remember that the benefit of eating a diet high in fruits and vegetables outweighs the risk of foodborne illness. The consumer and the media are in need of sound science and reasonable information from the scientific community; these are confusing times, we don’t need to contribute to the confusion.
SEPTEMBER

• 1, Management of Dairy Food Safety, University of Wisconsin-Madison, Madison, WI. This workshop will address why we keep plants clean, how we keep plants clean, and what to do if a sanitation problem occurs in your plant, including recall programs and legal ramifications. For additional information, contact Mary Thompson, Wisconsin Center for Dairy Research, 1605 Linden Dr., Babcock Hall, Room 241, Madison, WI 53706; Phone: 608.262.2217; Fax: 608.262.1578; Web site: www.cdr.wisc.edu.

• 9-10, 36th Annual Marschall Cheese Seminar, Santa Clara Convention Center. Co-sponsored by the California Dairy Research Foundation (CDRF) and Rhodia Inc. For more information, contact Jo Ann Sterenberg at 219.264.2557.


• 13-15, A Basic Concept for Food Protection Conference, Arlington, TX, sponsored by the Food Processors Institute. For further information, contact The Food Processors Institute, 1350 I Street, N.W., Suite 300, Washington, D.C. 20005-3305; Phone: 202.393.0890; Fax: 202.639.5941.

• 13-17, Food Micro 99, Veldhoven - The Netherlands, co-sponsored by IAMFES. Food Micro 99 is primarily for individuals working in food microbiological research and those who are studying food microbiology as well as for professionals responsible for the production of (safe) food and authorities involved in safe food regulation. For additional information, contact Dr. Leon Gorris, Unilever Research Laboratory, Vlaardingen, Postbus 114, 3130 AC Vlaardingen, The Netherlands, Phone: 31 10 4605709; Fax: 31 10 4605188; E-mail: leon.gorris@unilever.com.

• 14, International Seminar on Organic Dairy Products, in association with the 83rd IDF Annual Sessions, Athens, Greece. For additional information, contact National Dairy Committee of Greece, Iera Odos 75-118 55 Athens, Greece; Phone: 30 1 5294651; Fax: 30 1 5294616.

• 14-18, 83rd IDF Annual Sessions, Divani Caravel Hotel, Athens, Greece. For additional information, contact National Dairy Committee of Greece, Iera Odos 75-118 55 Athens, Greece; Phone: 30 1 5294651; Fax: 30 1 5294616.

• 15-16, VDIA 78th Annual Fall Conference, at the Hampton Inn and Conference Center in Colchester, VT. Co-sponsored by the VT Dairy Industry Association and the VT Feed Dealers Association. For further information, contact Diane Bothfeld at 802.524.6581.

• 16-18, Lead Auditor Training Seminar, Embassy Suites, St. Louis, MO. For further information, contact Christine VerPlank or Shelia Brewer, ASI Food Safety Consultants, 7625 Page Blvd., St. Louis, MO 63133; Phone: 800.477.0778; Fax: 314.727.2563.

• 19-24, The International Institute of Refrigeration (IIIR) 20th International Congress of Refrigeration, Sydney, Australia. For further information, contact ICR99 Secretariat, 52 Rosslyn St., West Melbourne Vic 3003 Australia; Phone: 61 3 9328 2399; Fax: 61 3 9328 4116; Web site: www.airah.org.au/ICR99.

• 22, New York State Association of Milk and Food Sanitarians Affiliate Meeting, at the Rochester Marriott Throughway Hotel in Rochester, NY. For further information, contact Janene Lucia at 607.255.2892.

• 22-24, Washington Milk and Food Sanitarians Association Affiliate Meeting, West Coast Wenatchee Center Hotel in Wenatchee, WA. For further information, contact William Brewer at 206.363.5411; E-mail: billbrewer1@juno.com.

• 23-24, Wisconsin Association of Milk and Food Sanitarians Affiliate Meeting. For further information, contact Randy Daggs at 608.266.9376.

OCTOBER

• 4-8, Aseptic Better Process Control Certification School and Aseptic Symposium, North Carolina State University, Raleigh, NC. For further information, contact Ms. Lisa Gordon at 919.515.2956; Fax: 919.515.7124; E-mail: lisa_gordon@ncsu.edu.

• 6-7, Associated Illinois Milk, Food & Environmental Sanitarians Annual Meeting at Pere Marquette Hotel in Peoria, IL. For additional information, contact Lee Dressel at 618.654.3438.

• 6-7, Iowa Association of Milk, Food and Environmental Sanitarians, Inc., Affiliate Meeting. For further information, contact Monica Streicher at 319.933.5209.

• 28-31, Worldwide Food Expo '99, McCormick Place, Chicago, IL. Register today and see new products, make new contacts, and get the information you need to
operate faster. For additional information, contact Worldwide Food Expo '99, 2751 Prosperity Ave., Suite 100, Fairfax, VA 22031 or Phone 703.645.9302; Fax: 703.876.2637; Web site: www.worldwidefood.com.

NOVEMBER

- 1-3, Pasteurizer Operators Workshop, endorsed by International Dairy Foods Association at the Nittany Lion and Borland Laboratory, University Park, PA. The program includes hands-on activities, discussions and lectures on regulations, cleaning and sanitation, pasteurization, milk flavor, and other operational procedures in milk plants. For more information, Phone: 814.865.8301; Fax: 814.865.7050; Web site: www.cas.psu.edu.

- 8-9, The International Fresh-cut Produce Association (IFPA) Hosts 7th Annual Technical Seminar, Holiday Inn Old Town Select in Alexandria, VA. This event will focus on “Global Food Safety Issues,” and their impact on the fresh-cut produce sector. For more information, contact Justina Brewer at 703.299.6282.

- 10-12, FAMFES Annual Retreat, held at the Florida Leadership Training Center, Haines City, FL. For further information, contact Bill Thornhill at 914.298.7748.

- 21-23, International Conference on Processed Food for 21st Century, Jadavpur University, Calcutta India. For additional information, please contact Dr. Pratap Chakraborty, Head of the Department and Convener, Jadavpur University, Dept. Food Technol. Biochem. Eng., Calcutta 700032; Fax: 91 33 472 5822 or 473 4266; E-mail: juftbe@cal2.vsnl.net.in.

Reader Service Card

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<td>&quot;Developing HACCP Plans — A Five-Part Series (as published in DFES)</td>
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<td>&quot;Surveillance of Foodborne Disease — A Four-Part Series (as published in JFP)</td>
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<td>&quot;Annual Meeting Abstract Book Supplement (year requested _____)</td>
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<td>Complete Set 3-A Dairy &amp; Egg Standards</td>
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<td>Five-year Update Service on 3-A Dairy &amp; Egg Standards (new and revised standards only)</td>
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E-mail: iamfes@iamfes.org; Web site: www.iamfes.org

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<td>$140.00</td>
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<td>JFP and DFES</td>
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<td>Journal of Food Protection</td>
<td>$42.50</td>
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DO NOT USE THIS FORM FOR RENEWALS
Questions regarding produce safety have been raised in the technical community as well as in the popular press. The IAMFES Annual Meeting has a session titled “Fruits and Vegetables: Are They Safe Enough?” Compare this to the National Cancer Institute’s “Five-a-Day” message to increase our consumption of fruits and vegetables and you can understand that there is some confusion among consumers.

The general term “produce” has been used to refer to a category of products, which is really a very broad group of food items. Unlike meat, which is predominately muscle tissue, produce can be any part of a plant, stem, root, fruit, leaf, bud, etc. and it can even be a fungus. The differences in physiology and chemical composition are striking and this makes it almost impossible to generalize about produce. Technology has enabled us to have fresh produce available on a year-round basis and in various convenient forms. Product risk assessments must take into account the unique combinations of composition and physical characteristics as well as growing and harvesting practices, packing, cooling and storage conditions. Add minimal processing and modified atmosphere packaging and it becomes obvious that there is no such thing as “produce”.

There have been stories in the media on the risks of various products, some justified and others not. An especially troubling group of stories was the eighteen-month attack on the pre-cut salad industry by television stations around the country. This relatively new category of products has been at retail for just about ten years. The media stories typically involved the reporter buying a number of packages of pre-cut salads at the grocery store, taking them to a laboratory for analysis and then doing a story on the “scary” things that were found in the salad. The problem was actually compounded by the laboratories themselves. As we all know not all laboratories are experienced in all types of analysis. Some of the reporters took the products to medical testing laboratories with no experience in food analysis and data interpretation. Imagine what a medical lab would think about total plate counts of $10^4$ or $10^5$. Other samples were taken to laboratories experienced in traditional processed food products that also misinterpreted the results of their tests. Processed products usually have a kill step, and the presence of high levels of total plate count and indicator organisms, such as coliforms is evidence that there was a breakdown of the process. The breakdown could be in the actual process itself or post-process recontamination resulting from exposure to unprocessed product, poor employee hygiene or a facility problem. This is not necessarily the case for fresh produce. The organisms typically found on produce such as Enterobacter spp. and Klebsiella spp. show up as coliforms in the general screening tests used at these laboratories, but their presence does not indicate fecal contamination and therefore an increased risk of illness.

Lack of context can be responsible for some rather inflammatory comments. One example that took place during this period was the on-camera statement by a laboratory scientist confronted with data showing several thousand generic coliforms per gram in pre-packaged salad. The scientists said that “one would be better off eating raw ground beef than consuming this product.” Not only was this statement completely untrue, it was, in fact, dangerous. If someone had taken them up on this and eaten raw ground beef and become ill, who would be responsible? The need for education of laboratory personnel regarding these types of products was addressed by the International Fresh-cut Produce Association (IFPA) who sent out over 300 fact sheets about fresh produce products to laboratories around the country. The three largest pre-cut salad companies worked together to generate information to be shared about this type of product. They reviewed the situation with prominent academic experts who confirmed that this was a “non-issue”. They held press briefings and developed a media kit for use in responding to reporters’ inquiries regarding this issue. My real concern about this is the time and money spent on this effort could have been used to identify real areas of risk. It was a drain of scientific effort.

Now there have been suggestions that standard levels of microorganisms be set for pre-packaged...
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