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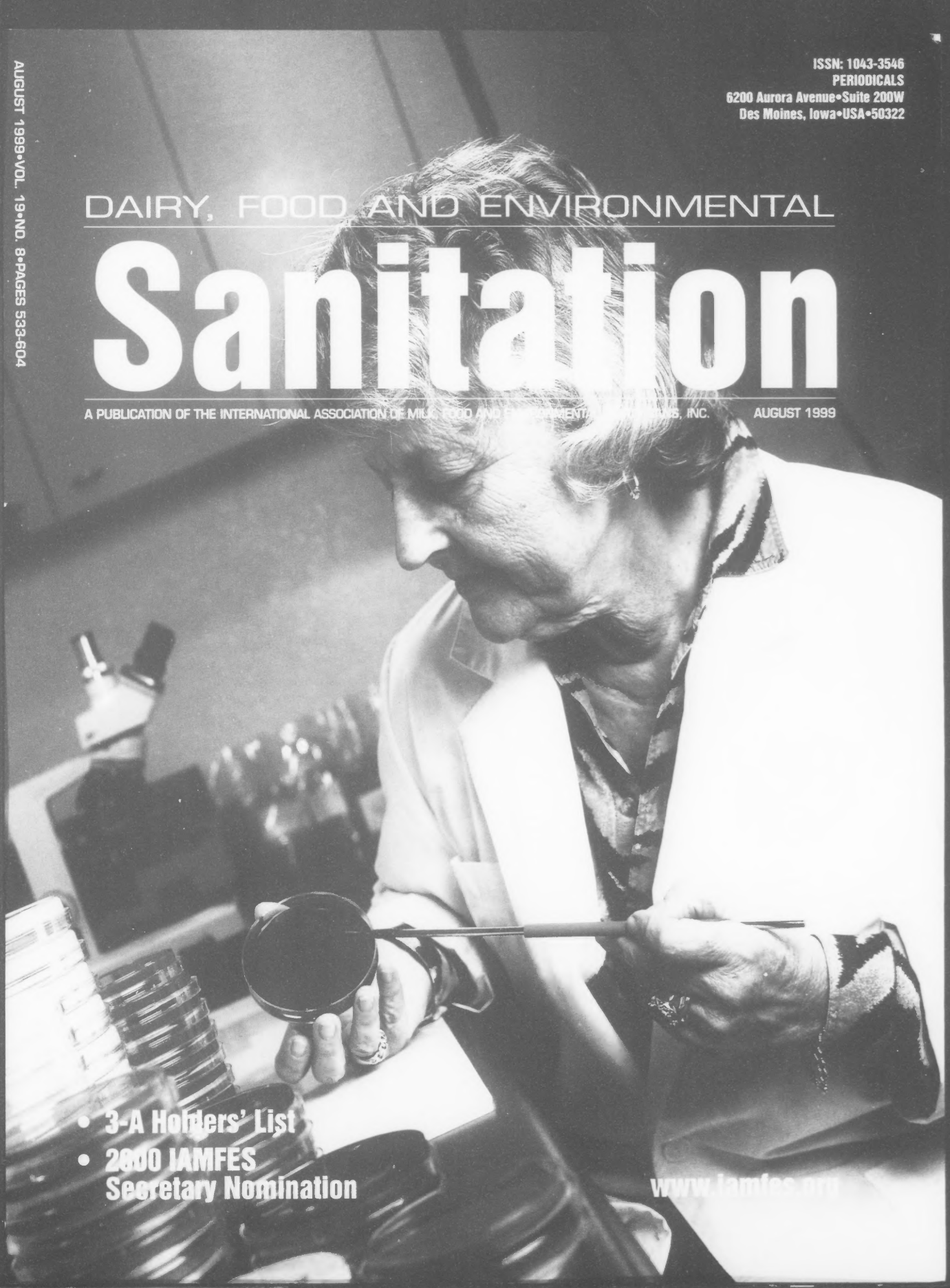
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

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



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Articles

Association News

Departments

Extras

INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.
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August 1-4

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Dearborn
Dearborn, Michigan

2000

August 6-9

Hilton Atlanta
and Towers
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2001

August 5-8

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2002

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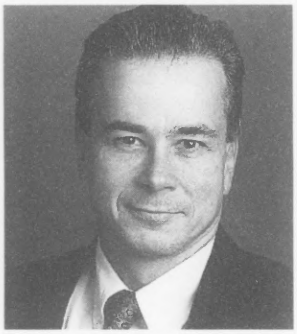
FROM YOUR PRESIDENT



By ROBERT E. BRACKETT
IAMFES President

"A look into IAMFES' future"

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.

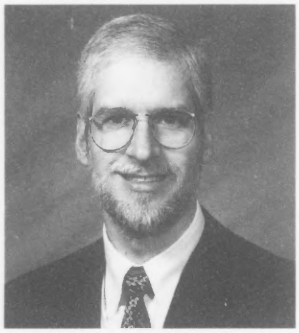
Specialization. The trend toward more specialization started several decades ago. The most obvious place it occurred was in professional services, such as medicine and law. However, this trend is also occurring in professional societies and having some profound effects. Professional associations such 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.

COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
IAMFES Executive Director

"Take time to look at the accomplishments of the Association"

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. In September, we began using a contractor who airlifts mail to countries 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 remake 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."

Dairy, Food and Environmental Sanitation, Vol. 19, No. 8, Pages 546-550

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 foodhandlers 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 Handwash 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 ($\alpha = 0.05$) 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 $\alpha^* = 1 - 1(1 - d)^k$ where κ=number of t-tests perfomed; α=standard alpha value, and α^*= 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 5.0×10^8 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 10^0) 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)*

$$R=75\left(\frac{\Sigma\chi_i}{n}\right)10^{D}$$

where: R = estimated number of bacteria,

75 = amount of stripping fluid dispersed into each sampling glove,

$\frac{\Sigma\chi_i}{n}$ = average of the duplicate agar plate counts, and D=Dilution level.

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

$R(1)\ O(1)_{BL}\ (1)_{BL}\ (1)_{BL}$
$R(2)\ O(2)_{BL}\ (2)_{BL}\ (2)_{BL}$
$R(3)\ O(3)_{BL}\ (3)_{BL}\ (3)_{BL}$

Post-Product Application Samples

$A(1)\ O(1)_1\ O(1)_3\ O(1)_7\ O(1)_{10}$
$A(2)\ O(2)_1\ O(2)_3\ O(2)_7\ O(2)_{10}$
$A(3)\ O(3)_1\ O(3)_3\ O(3)_7\ O(3)_{10}$

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

Prior to performing a statistical analysis, Exploratory Data Analysis should be performed on the data. Stem-Leaf Ordering, Letter Value displays, and Box Plots are generated to assure the data collected approximate the normal distribution *(20)*. If this is the case, a series of Student's *t* tests (adjusted for multiple comparisons) are conducted using the 0.05 level of significance for Type I (α) error.

We have determined that, when at least 18 subjects per product are used, the data variability or standard deviation (S) is ± 0.5 log. Using the equation *(12)*.

$$n \geq \frac{z\,S^2\,(z_{\alpha/2}+z_b)^2}{D^2}$$

where: n = sample size per product; S = known standard deviation of samples for $\log_{10}$ microbial populations; $z_{\alpha/d}$=alpha level at 0.05 = 1.96 for two-tail test; z_b = power of the statistic (80%) = 0.842; D = clinical difference of significance to be ruled out (20%). A 20% reduction from baseline of the control or reference product at a specific sampling time is considered adequate for detecting significance. Hence, 18 subjects are enough to ensure that Type I (α) error can be set at 0.05 and that Type II (β) error will not be excessive. Recall that Type I error is the probability of concluding the product is effective when it is not. This error, the more critical of the two, is controlled by setting α at the 0.05 level or less. Type II error (manufacturers' risk) is the probability of concluding that a product is not effective when it is. If any doubts exist as to maintaining the sampling variability at ± 0.5 log, increasing the number of subjects sampled, will be helpful.

SKIN IRRITATION

It is important to recognize the skin irritation potential of the product *(15)*. If it causes irritation to the hands, it simply will not be used. Detergents irritate the skin by damaging the stratum corneum so as to impair its "barrier" functions, usually by removing normal skin oils *(12)*. Additionally, they may be toxic to living epidermis and the dermis cells. Increased levels of cytokines, which are associated with skin allergies and irritation, have been observed in skin lymphatic fluids following skin exposure to sodium lauryl sulfate, an extremely common anionic detergent.

The most commonly observed irritation effects include (1) "soap-effect," in which the skin appears shiny and wrinkled; (2) "roughness," in which the skin looks and feels "rough," with fine scaling present; (3) redness; (4) swelling; and (5) cracks and fissures *(16)*. Usually, these effects appear in combination at different sites on the skin and at different degrees of severity.

Although visual scoring of hand irritation indices are simple and generally effective in providing important information concerning irritation potential, **transepidermal water loss** measurements are more accurate and precise for such evaluations. Transepidermal water loss instrumentation measures the barrier function of the stratum corneum, a main indicator of skin irritation *(16)*.

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, chaffing, 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 degerming 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.

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

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SUMMARY

Extensive efforts to control *Listeria monocytogenes* can reduce the frequency and level (CFU/g or cm^2) 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.

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)*.

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

Filling or packaging equipment
Conveyors
Solutions used in chilling food
Slicers, dicers, 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 *(5)*. The organism is found in a wide variety of foods, including meats, poultry, vegetables, dairy products, and fishery products *(4, 5)*, 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 *(1, 5, 8)*. 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 (6)*.

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 *(1, 2)*. 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 (2)*. 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.

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 *(7)* 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

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

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 harborages 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*

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

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 product.

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

Area	Frequency
Drains	Daily
Floors	Daily
Waste containers & storage	Daily
Walls	Weekly/monthly
Condensate drip pans	Weekly/monthly
HVAC	Weekly/monthly
Coolers	Weekly/monthly
Spiral freezers	Semi-annually

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 rooms 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.

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 a chronic 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 still 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, not 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 room 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 nonporous and easily cleaned, which experience indicates are better for *L. monocytogenes* control than other footwear, are necessary where footbaths are used.

ENVIRONMENTAL MONITORING PROGRAM TO VERIFY CONTROL

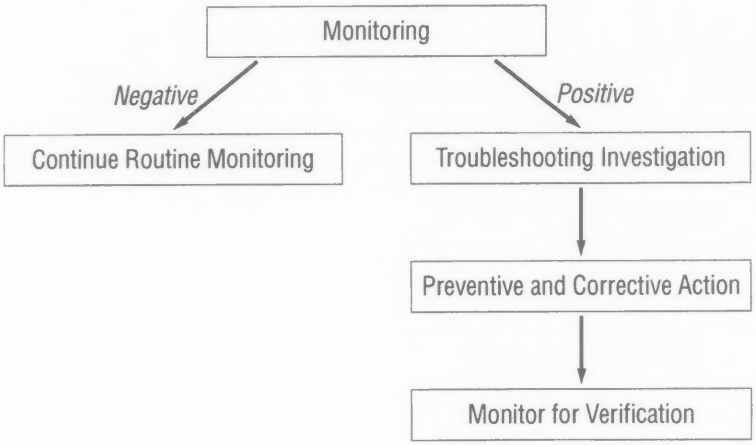
An environmental monitoring program is necessary to assess the need for additional pathogen control measures for products that may be recontaminated by *L. monocytogenes (8).* Industry experience has shown that an ongoing monitoring and control program that uses *Listeria* species (*Listeria* spp. or "generic *Listeria*") as an indicator of potential *L. monocytogenes* contamination reduces the possibility of finding not only *L. monocytogenes* in finished product, but other pathogens as well *(2).* Industry experience also shows that reentry of *Listeria* spp. into the production environment cannot be reliably prevented. Thus, ongoing monitoring to detect the organism in the environment is necessary. Each company should establish its own *L. monocytogenes* monitoring program considering the guidelines that follow. 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 *(8).* 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 *L. monocytogenes* 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

Figure 1. Non-product contact surface testing for indicators of *Listeria* contominotion



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:

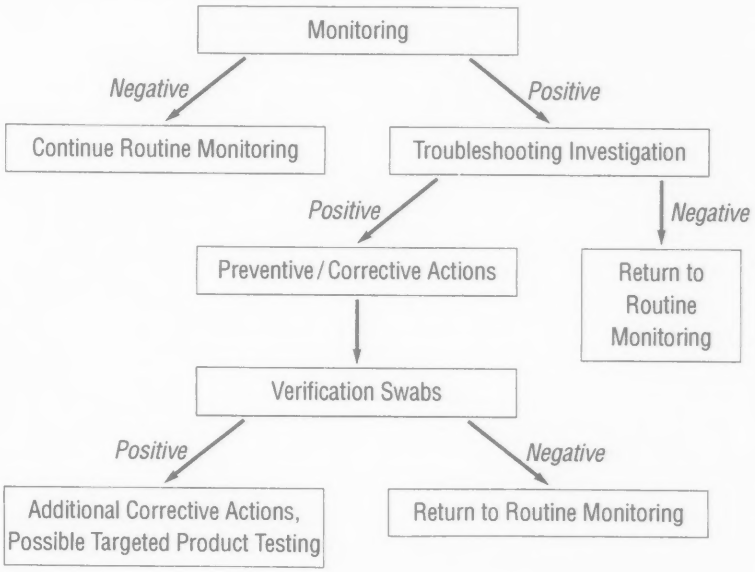
- Detection of *Listeria* spp. in an environmental monitoring sample does not necessarily indicate a microbiological control problem; it does indicate that additional investigation should be undertaken. Thus, a positive environmental monitoring sample does not mean that plants must shut down the line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



cific operation and the controls they have put into place, as well as any microbiological data available.

Plants should investigate to determine the reason(s) for all positives on food contact surfaces. Investigational sampling (which may be termed the troubleshooting or problem-solving mode for some plants) must be capable of identifying equipment that contains niches where *L. monocytogenes* has become established. Until these sites are located, it is not always possible to correct an ongoing problem.

Remedial actions should be taken for all food contact surface positives, based on a pre-determined plan of action, and the actions should be documented. Contamination of some product contact surfaces is of greater concern than others. Examples of remedial action include modifying cleaning and sanitizing procedures, re-design of equipment, improved GMPs, employee re-training, etc.

Plants should consider whether finding *Listeria*-like organisms on food contact surfaces should necessitate product testing.

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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Call for Nominations
2000 IAMFES Secretary

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:

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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.

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WEW Consulting
Salem

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Michael L. May
Quaker Maid Meats, Inc.
Shillington

Alan Sauter
Dietrich's Milk Products
Middlebury Center

Dike Ukuku
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

Melissa Tucker
H-E-B, San Antonio

WASHINGTON

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

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

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Diffchamb SA
Lyon

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Marjorie E. Jones
Marriott International
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Triarc Restaurant Group
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Miles Fostar
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

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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

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Amherst

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St. Paul

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Gary Cohen
Unisource
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Siobain M. Duffy
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SGS-US Testing Co.
Fairfield

Rebecca I. Montville
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North Brunswick

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Genevieve Johnson
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Margaret Venuto
Cornell Cooperative Extension
of Monroe County
Rochester

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Janeen M. Novotny
Carlton Packing Co.
Carlton

Wayne E. Weber
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Madison, Wisconsin

UpDates

Videojet Appoints Bryan M. Weber, Vice President Marketing

Videojet Systems International, Inc., has appointed Bryan M. Weber to the position of 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 on-going 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 his B.S. from the State University of New York at Buffalo.

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 Chicago.

Wargo received her bachelor'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 consultant whose areas of expertise include field operations supervision and evaluation, equipment appraisal, credit management, agricultural waste treatment and duel fuel/cogeneration systems for agribusiness. Mitchell majored in ag business at the College of the Sequoias (Visalia) and California State University Fresno and studied business at the University of Maryland.

Mitchell will head up EPTC's California Central Valley marketing 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 enactment of more stringent environmental legislation has targeted the overwhelming majority of regional farm operations, for which EPTC's closed-loop waste management 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. announced that Vicki Eakins, formerly Bell's marketing coordinator, 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 gained field experience as a technical representative for Canada, working with commercial, industrial, and swine and poultry accounts. Through her dealings with organizations, such as the American Institute of Baking, she further garnered technical knowledge 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, Massachusetts, 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 journalism and marketing from the University 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, redated, 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.

IAMFES NEWS

The Codex Alimentarius Commission Approves Guidelines for Organic Food

International guidelines for the production, processing, labelling 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 Somatotropine (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 prepackaged 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 bonemeal 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 undercooked 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 unannounced 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 sanitarian 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.

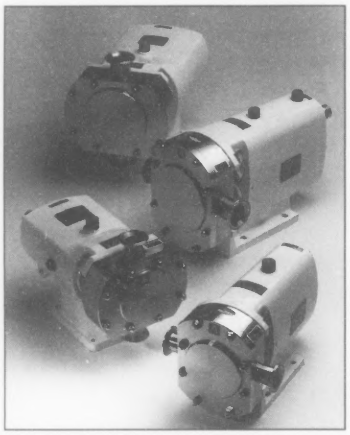
NSF International: The Public Health and Safety Company

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."

IndustryProducts



Alfa Laval Flaw, Inc.

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

Reader Service No. 289

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

Reader Service No. 290

Eka Chemicals Inc. Announces New ECF Technology for Water Treatment — First to Receive EPA Approval

The first sodium chlorate-based ClO_2 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 chlorite-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 chlorate 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

Reader Service No. 291

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

Reader Service No. 292

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 lines. 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 × 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

Reader Service No. 294

US Filter CT Series Carbon Purifiers Offer Efficient Contaminant Removal and Hot-Water-Sanitization Capabilities

United States Filter Corporation introduces the CT Series Carbon Purifiers. These systems efficiently remove chlorine, chloramine and many types of organic contaminants, ensuring the highest product quality for food and beverage, pharmaceutical and industrial applications. The purifiers have been specifically designed to meet food and beverage requirements, and provide conservative flow rates through the carbon media, while maximizing empty bed contact time.

CT Series Carbon Purifiers offer a number of standard features that sets them apart: Designed for hot-water sanitization and steam vapor stripping/sanitizing, with steam entry at top or bottom to facilitate removal of VOCs such as trihalomethanes; Advanced Johnson Screens internals for uniform distribution during draw-off and backwashing; Scavenger device for complete condensate removal during steaming; Choice of automated (PLC) or manual valves; and Fully automated operation, including normal flow, backwash and rinse to drain.

US Filter, Lowell, MA

Reader Service No. 295

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 lows 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

Reader Service No. 296

BusinessExchange

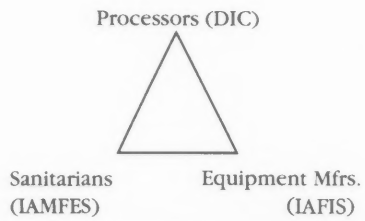
ADVERTISING INDEX

EMPLOYMENT OPPORTUNITIES

MARK OF COMPLIANCE

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**

Reader Service No. 225

Dairy, Food and Environmental Sanitation, Vol. 19, No. 8, Pages 577-597

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

2 APV Americas – Lake Mills (5/1/56)
100 South CP Avenue
Lake Mills, Wisconsin 53551

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

127 Paul Mueller Co. (6/29/60)
1600 W. Phelps Street
Springfield, Missouri 65801

440 Scherping Systems (2/28/85)
801 Kingsley Street
Winsted, Minnesota 55395

31 Walker Stainless Equipment Co., Inc. (10/4/56)
902 - 2nd Main Street
Elroy, Wisconsin 53929-0126

02-09 Pumps for Milk and Milk Products

975 Alfa Laval Pumps Ltd. (8/25/98)
Birch Road
Eastbourne, East Sussex
BN23 6PQ, England
(Not Available in the USA)

976 Alfa Laval Flow (8/25/98)
Birch Road
Eastbourne, East Sussex
BN23 6PQ, England
(Not Available in the USA)

63R APV Americas – Lake Mills (4/29/57)
100 South CP Avenue
Lake Mills, Wisconsin 53551

946 APV Americas – Lake Mills (11/25/97)
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799

568 Allweiler AG, Werk Bottrop (5/15/89)
Kirchhellener Ring 77-79
D-46244 Bottrop
Germany
(US Rep.: Shanley Pump and Equipment, Inc.
2525 South Clearbrook Drive
Arlington Heights, IL 60005)

793 Ampco Pumps Co. (9/14/94)
4000 W. Burnham Street
Milwaukee, Wisconsin 53215

212R Babson Brothers Company (2/20/70)
Dairy Systems Division
20903 West Gale Avenue
Galesville, Wisconsin 54630-0659

999 Blackmer/Mouvex (3/1/99)
1809 Century Ave., SW
Grand Rapids, Michigan 49509

923 Bombas Bornemann S.R.L. (5/16/97)
Armenia 2898 (1605)
Munro, Argentina
(US Rep.: Bornemann Pumps, Inc.
P.O. Box 1769
Matthews, North Carolina 28105)

205R Boumatic (5/22/69)
1919 S. Stoughton Road
P.O. Box 8050
Madison, Wisconsin 53716

739 CSF Inox S.P.A. (6/25/93)
Strada per Bibbiano
7 - Montecchio E. (RE)
Italy
(US Rep.: Sanchelima Intl.
1781-83 N.W. 93rd Avenue
Miami, Florida 33172)

709 Conexiones Inoxidables (1/18/93)
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)

820 Drum Industries, Inc. (3/17/95)
2501 Constant Comment Place
Louisville, Kentucky 40299

671 Flowtech Inc., – Teknoflow, Inc. (4/1/92)
1701 Spinks Drive
Marietta, Georgia 30067

466 Fluid Metering, Inc. (1/10/86)
5 Aerial Way, Suite 500
Syosset, New York 11791

828 Flux Pumps Corp. (4/13/95)
4430 Commerce Circle
Atlanta, Georgia 30336

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

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

325 Johnson Pumps (U.K.) Ltd. (12/19/79)
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)

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

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

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

997 Joh. Heinr. Bornemann GmbH (01/08/99)
Industriestrasse 2
D-31683
Obernkirchen, Germany

603 Johnson Pump (UK) Ltd. (8/16/90)
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)

604 Johnson Pump (UK), Ltd. (8/16/90)
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)

841 Johnson Pump (UK), Ltd. (8/18/95)
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)

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

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

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

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

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

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

241 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, WI 53115)

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

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

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

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

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

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

911 Sigma Equipment Corp. (3/20/97)
39 Westmoreland Avenue
White Plains, New York 10606

507 Sine Pump (7/21/87)
c/o Sundstrand Fluid Handling
14845 West 64th Street
Arvada, Colorado 80007

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

860 Sudmo North America, Inc. (11/28/95)
4786 Colt Road
Rockford, Illinois 61109

72R L.C. Thomsen Inc. (8/14/57)
1303-43rd Street
Kenosha, Wisconsin 53140

26R Tri-Clover, Inc. (9/29/56)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

1011 Tuchenhagen North America, Inc. (3/19/99)
9160 Branch Road
Columbia, Maryland 21045

899 Lederle GmbH Pumpen (12/31/96)
Und Maschinenfabrik
GewerbestraBe 53 D-79194
Gundelfingen, Germany
(US Rep.: Alto Systems Inc.
P.O. Box 60667
Houston, Texas 77205)

52R Viking Pump, Inc. (12/31/56)
A Unit of IDEXX Corporation
406 State Street, P.O. Box 8
Cedar Falls, Iowa 50613

29R Waukesha Cherry-Burrell (10/3/56)
611 Sugar Creek Road
Delavan, Wisconsin 53115

04-04 Homogenizers and Reciprocating Pumps

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

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

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

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

558 Niro Soavi S.p.A. (1/3/89)
43100 Parma (Italy)
VIA M. Da Erba Edoari, 29/A
(Distributed in the US by:
Niro Hudson, Inc.
1600 Country Road F
Hudson, Wisconsin 54016)

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

770 Tetra Pak Inc. (6/13/94)
101 Corporate Woods Parkway
Vernon Hills, Illinois 60061

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

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

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

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

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

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

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

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

653 Tremcar (10/10/91)
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. (9/28/56)
625 State Street
New Lisbon, Wisconsin 53950

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

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

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

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

435 Sermia International (11/27/84)
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. (8/25/77)
1303 43rd Street
Kenosha, Wisconsin 53140

1026 Pall Europe Ltd. (5/27/99)
Walton Road
Portsmouth, Hampshire, P06 1TD England

1024 ultrafilter, Inc. (5/11/99)
3560 Engineering Dr.
Norcross, Georgia 30092

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

11-05 Plate-type Heat Exchangers for Milk and Milk Products

880 AGC Engineering (6/7/96)
8869 SE 58th St. Avenue
Portland, Oregon 97206

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

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

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

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

718 Babson Bros. Co. (3/8/93)
Dairy Systems Div.
1400 West Gale Avenue
Galesville, Wisconsin 54630

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

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

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

468 GEA Ecoflex North America, Inc. (2/2/86)
7150 Distribution Drive
Louisville, Kentucky 40258-2528

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

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

912 Pladot Ein Harod (4/3/97)
Kibbutz Ein Harod Meuhad
18965 Israel
(US Rep.: Robert E. Turner
P.O. Box 4595
Gettysburg, Pennsylvania 17235-4595)

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

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

670 Flomax International, Ltd. (4/1/92)
2 Robert Street
P.O. Box 14537
Panmurie, Auckland
New Zealand
(US Rep.: Masport, Inc.
6140 McCormick Drive
Lincoln, Nebraska 68507)

1005 Schmidt Thermal Processing Ltd. (3/3/99)
P.O. Box 31-247
Milford, Auckland, New Zealand
(US Rep.: Westfalia Dairy Systems, Inc.
1862 Brummel Drive
Elk Grove Village, Illinois 60007

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

885 Tranter, Inc. Texas Division (7/11/96)
1900 Old Burk Highway
Wichita Falls, Texas 76304

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

12-05 Tubular Heat Exchangers for Milk and Milk Products

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

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

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

243 Babson Brothers Company (10/31/72)
Dairy Systems Division
20903 West Gale Avenue
Galesville, Wisconsin 54630-0659

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

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

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

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

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

217 Girton Manufacturing Co. (1/31/71)
P.O. Box 900
Millville, Pennsylvania 17846

711 Kusel Equipment Co. (2/24/93)
820 West Street
Watertown, Wisconsin 53094

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

96 C. E. Rogers Co. (3/31/64)
1895 Frontage Road, P.O. Box 118
Mora, Minnesota 55051

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

971 Hydro-Thermal Corporation (7/2/98)
400 Pilot Court
Wauseka, Illinois 53188

392 Stork Food & Dairy Systems, Inc. (6/9/83)
P.O. Box 1258
1024 Airport Parkway
Gainesville, Georgia 30503

614 Tetra Pak Processing Systems (5/2/91)
101 Corporate Woods Parkway
Vernon Hills, Illinois 60061

951 Thermaline, Inc. (1/30/98)
180 - 37th Street N.W.
Auburn, Washington 98001

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

13-09 Farm Milk Cooling and Holding Tanks

802 Refinox S.A. DE C.V. (11/10/94)
Ind. Torreon, Coah, Mexico
(US Rep.: James Read
M. E. Stainless
601 High Plain Drive
Bel Air, Maryland 21014)

49R Alfa Laval Agri, Inc. (12/5/56)
11100 North Congress Avenue
Kansas City, Missouri 64153

240 Babson Brothers Company (9/6/72)
Dairy Systems Division
P.O. Box 659
Galesville, Wisconsin 54630

4R Bou-matic, The Dairy Equipment (6/15/56)
Division of DEC, International
1919 S. Stoughton Road
Madison, Wisconsin 53708-8050

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

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

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

132 APV Americas (10/26/60)
182 Wales Avenue
Tonawanda, New York 14150

277 Contherm, Inc. (8/19/76)
P.O. Box 352, 111 Parker Street
Newburyport, Massachusetts 01950

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

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

273 Niro, Inc. (5/20/76)
Evaporator Division
9165 Rumsey Road
Columbia, Maryland 21045

107R C.E. Rogers Co. (7/31/58)
P.O. Box 118
1895 Frontage Road
Mora, Minnesota 55051

299 Stork Food & Dairy Systems, Inc. (11/17/77)
P.O. Box 1258
1024 Airport Parkway
Gainesville, Georgia 30503

17-09 Formers, Fillers and Sealers of Single Service Containers for Fluid Milk and Fluid Milk Products

1031 ACMA USA, Inc. (6/18/99)
501 Southlake Boulevard
Richmond, Virginia 23236
(US Rep.: AUTOPROD Inc.
5355 115th Avenue North
Clearwater, Florida 33760)

939 BWI KP Aerofill (10/16/97)
807 West Kimberly Road
Davenport, Iowa 52808-3848

382 SIG Combibloc, Inc. (4/15/83)
4800 Roberts Road
Columbus, Ohio 43228

192 Evergreen Packaging (1/3/67)
2400-6th Street S.W., P.O. Box 3000
Cedar Rapids, Iowa 52406

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

1009 Federal Manufacturing Company (3/15/99)
201 West Walker Street
Milwaukee, Wisconsin 53204-0215

1029 FORMSEAL (6/18/99)
1 rue de l'Epee Royale
14700 FALAISE
France

619 Hassia Verpackungsmaschinen GmbH (2/22/91)
Heerweg 19
D-63691 Ranstadt
Germany
(US Rep.: Hassia USA, Inc.
1210 Campus Drive West
Morganville, New Jersey 07751)

735 Kvalitetsproduktion AB (6/11/93)
S-693 29 Degerfors, Sweden
(US Rep.: Flowtech, Inc.
1900 Lake Park Drive, Suite 345
Smyrna, Georgia 30080)

330 Milliken Packaging (8/26/80)
P.O. Box 736
White Stone, South Carolina 29353

442 Milliken Packaging (3/21/85)
P.O. Box 736
White Stone, South Carolina 29386

137 Elopak, Inc. (10/17/62)
30000 South Hill Road
New Hudson, Michigan 48165

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

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

1015 ProTherm Engineering Company (4/2/99)
3475 W. Shaw Avenue, Suite 106
Fresno, California 93711

281 Purity Packaging Corp. (11/8/77)
800 Kaderly Road
Columbus, Ohio 43228

967 RAPAK (6/18/98)
20939 Cabot Boulevard
Hayward, California 94545

1001 REMY Equipment (3/3/99)
50 Avenue des Fenots
28109 Dreux, France
(US Rep.: SIDEL, INC.
5600 Sun Court
Norcross, Georgia 30092

924 Robert Bosch GmbH (6/4/97)
P.O. Box 1127
D-71301
Waiblingen, Germany
(US Rep.: Robert Bosch Corporation
9890 Red Arrow Highway
Bridgman, Michigan 49106)

482 Serac, Inc. (8/25/86)
300 Westgate Drive
Carol Stream, Illinois 60188

681 Shikoku Kakoki Co., Ltd. (6/8/92)
No. 10-01 Nishinokawa
Tarohachisu, Kitajima-Cho
Itanogun, Tokushima, Japan
(US Rep.: Elopak, Inc.
30000 South Hill Road
New Hudson, Michigan 48165)

220 Tetra Rex, Inc. (4/24/71)
451 East Industrial Boulevard
Minneapolis, Minnesota 55413

1020 Tetra Rex, Inc. (4/21/99)
909 Asbury Drive
Buffalo Grove, Illinois 60089

351 Tetra Pak, Inc. (1/6/83)
3300 Airport Road
Denton, Texas 76207

694 IPFO International, Inc. (9/23/92)
275 Fountainebleau Boulevard, Suite 247
Miami, Florida 33172

19-04 Batch and Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amended

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

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

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

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

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

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

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

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

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

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

503 Ripley Stainless, Ltd. (5/1/87)
RR #3, Suite 41
Summerland, British Columbia V0H 1Z0
(Not available in the USA)

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

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

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

23-02 Equipment for Packaging Viscous Dairy Products

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

902 A.T.S. Engineering, Inc. (1/10/97)
7270 Torbram Road, Unit 23
Mississauga, Ontario
Canada L4T 3Y7
(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. (9/15/83)
5355 - 115th Avenue N
Clearwater, Florida 33760

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

965 BENHIL-GASTI Verpack (5/27/98)
ungsmaschinen GmbH
Jagenbergstrasse 1
D-41468 Neuss
Germany
(US Rep.: Autoprod, Inc.
5355 - 155th Avenue N
Clearwater, Florida 34620)

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

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

1030 FORMSEAL (6/18/99)
1 rue de l'Epee Royale
14700 Falaise, France
(US Rep.: Autoprod Inc.
5355 115th Avenue North
Clearwater, Florida 33760)

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

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

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

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

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

679 Consolidated Biscuit Co. (6/1/92)
312 Rader Road
McComb, Ohio 45858

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

760 Jordan Manufacturing, Inc. (2/23/94)
1688 County Road 192
Crossville, Alabama 35962

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

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

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

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

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

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

24-02 Non-coil Type Batch Pasteurizers

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

187 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Avenue
St. Cloud, Minnesota 56302

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

1025 Pladot Ein Harod (5/25/99)
Kibbutz Ein Harod
Meuhad 18965 Israel
(US Rep.: Robert E. Turner
P.O. Box 4595
Gettysburg, Pennsylvania 17235-4595)

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

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

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

188 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Avenue
St. Cloud, Minnesota 56301

725 Inox-Tech, Inc. (4/14/93)
6705 Route 132
Ville Ste-Catherine
Quebec, Canada J0L 1E0
(US Rep.: Michael Ripka, Pres.
Bionex
12615 E. Meridian Avenue
Payallup, Washington 98373)

710 Lee Industries, Inc. (2/10/93)
P.O. Box 687
514 West Pine Street
Phillipsburg, Pennsylvania 16866

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

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

448 Scherping Systems (8/1/85)
801 Kingsley Street
Winsted, Minnesota 55395

520 Stainless Fabrication, Inc. (12/8/87)
4455 W. Kearney
Springfield, Missouri 65803

837 Viatec Process Incorporated (7/10/95)
500 Reed Street
Belding Michigan 48809

202 Walker Stainless Equip. Co., Inc. (9/24/68)
625 State Street, P.O. Box 202
New Lisbon, Wisconsin 53950-0202

26-03 Sifters for Dry Milk and Dry Milk Products

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

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

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

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

656 Separator Engineering, Ltd. (11/4/91)
810 Ellingham Street
Pointe Clair, Quebec, Canada H9R 3S4
(US Rep.: Kason Corp.
1301 E. Linden Avenue
Linden, New Jersey 07036)

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

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

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

935 Bossar S.A. (8/8/97)
Poligono Industrial Roca
C/. San Marti s/n.
08100 Martorelles
(Barcelona)
Spain
(US Rep.: Hayssen Manufacturing Co.
225 Spartangreen Blvd.
Duncan, South Carolina 29334)

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

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

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

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

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

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

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

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

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

28-03 Flow Meters for Milk and Milk Products

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

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

253 Badger Meter, Inc. (1/2/74)
4545 W. Brown Deer Road
P.O. Box 23099
Milwaukee, Wisconsin 53223

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

956 Blancett Fluid Flow Meters (3/19/98)
100 E. Felix Street South, Suite 190
Fort Worth, Texas 76115-3548

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

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

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

950 Delta M Corp. (1/19/98)
1003 Larsen Drive
Oak Ridge, Tennessee 37830

692 Endress & Hauser Flowtec AG (9/14/92)
Kägenstrasse 7
CH - 4153 Reinach, Switzerland
(US Rep.: Endress & Hauser, Inc.
2350 Endress Place
Greenwood, Indiana 46143)

226 Bailey Fischer & Porter Co. (12/9/71)
125 E. County Line Road
Warminster, Pennsylvania 18974

477 Flowdata, Inc. (7/31/86)
1817 Firman Drive
Richardson, Texas 75081-1826

506 Flow Technology, Inc. (6/17/87)
4250 East Broadway Road
Phoenix, Arizona 85040

224 The Foxboro Company (11/16/71)
33 Commercial Street
Foxboro, Massachusetts 02035

717 Gemu Valves, Inc. (3/4/93)
3800 Camp Creek Parkway
Ste. 102, Bldg. 2400
Atlanta, Georgia 30331

649 Geo Technology Corporation (10/2/91)
12312 E. 60th Street
Tulsa, Oklahoma 74146

1035 GRUPPO ISOIL S.p.A. (6/28/99)
Via F.lli Gracchi 27
20092 Cinsello Balsamo
Milano Italy
(US Rep.: Liquid Controls, LLC
105 Albrecht Drive
Lake Bluff, Illinois 60044-2242)

661 Alfa Laval Flow, Inc. (11/21/91)
G & H Division
8201 - 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909

630 Halliburton Services (5/28/91)
Drawer 1431
Duncan, Oklahoma 73536-0346

574 Aaliant (10/12/89)
150 Venture Boulevard
P.O. Box 4585
Spartanburg, South Carolina 29305

512 Hoffer Flow Controls, Inc. (8/17/87)
107 Kitty Hawk Lane
Elizabeth City, North Carolina 27909-4585

744 Honeywell IAC (11/16/93)
1100 Virgina Drive
Fort Washington, Pennsylvania 19034

733 Honeywell, Inc. (5/18/93)
1100 Virginia Drive
Fort Washington, Pennsylvania 19034-3260

265 Flow Automation (3/10/75)
9303 Sam Houston Parkway South
Houston, Texas 77099-5298

535 FMC Invalco, Inc. (7/12/88)
(An FMC Corporation Subsidiary)
P.O. Box 1183
Hutchinson, Kansas 67504

764 Yokogawa Industrial Automation America Inc. (4/22/94)
4 Dart Road
Newnan, Georgia 30265-1040

840 KOBOLD Instr. Inc. (7/17/95)
1801 Parkway View Drive
Pittsburgh, Pennsylvania 15205

871 KOBOLD Instr. Inc. (3/28/96)
1801 Parkway View Drive
Pittsburgh, Pennsylvania 15205

529 KROHNE, Inc. (5/18/88)
7 Dearborn Road
Peabody, Massachusetts 01960

972 Liquid Controls, LLC (7/21/98)
105 Albrecht Drive
Lake Bluff, Illinois 60044-2242

1034 Liquid Controls, LLC (6/28/98)
105 Albrecht Drive
Lake Bluff, Illinois 60044-2242

778 Magnetrol Intl., Inc. (7/27/94)
5300 Belmont Road
Downers Grove, Illinois 60515

378 Micro Motion, Inc. (2/16/83)
7070 Winchester Circle
Boulder, Colorado 80301

932 Nitto Seiko Co., Ltd. (7/31/97)
623 Japan, 30
Nobu-Cho
Ayabe Kyoto
(US Rep.: Endress & Hauser Flowtec AG
Division USA
2350 Endress Place
P.O. Box 246-1
Greenwood, Indiana 46142)

938 norax, Inc. (10/16/97)
10728 S. 92nd Street
Franklin, Wisconsin 53132

1019 Pacific Flow Controls (4/20/99)
170-F Alamo Plaza, Suite 177
Alamo, California 94507

729 Peek Measurement, Ltd. (4/14/93)
Kings Worthy, Winchester
Hampshire, England S023 7QA
(US Rep.: Peek Measurement
10335 Landsbury, Ste. 300
Houston, Texas 77099-3407)

490 Rosemount, Inc. (1/8/87)
12001 Technology Drive
Eden Prairie, Minnesota 55344

585 Solartron (12/7/89)
11321 Richmond Avenue
Houston, Texas 77082-2615

587 Schlumberger Ind., Measurement Div. (12/18/89)
1310 Emerald Road
Greenwood, South Carolina 29646

550 Sparling Instruments Co., Inc. (10/26/88)
4097 N. Temple City Boulevard
P.O. Box 5988
El Monte, California 91731

715 Thermal Instrument Co. (2/25/93)
217 Sterner Mill Road
Trevose, Pennsylvania 19053

1021 Toshiba Corporation (4/27/99)
1, Toshiba-Cho
Fuchu-Shi, Tokyo 183 Japan

803 Turck, Inc. (11/18/94)
3000 Campus Drive
Plymouth, Minnesota 55441-2656

29-01 Air Eliminators for Milk and Fluid Milk Products

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

662 Alfa Laval FLow, Inc. (11/21/91)
G & H Division
8201 - 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909

436 Scherping Systems (11/27/84)
801 Kingsley Street
Winsted, Minnesota 55395

30-01 Farm Milk Storage Tanks

421 Paul Mueller Co. (4/17/84)
P.O. Box 828
Springfield, Missouri 65801

31-02 Scraped Surface Heat Exchangers

290 APV Americas - Lake Mills (6/15/77)
100 South CP Avenue
Lake Mills, Wisconsin 53551

323 Waukesha Cherry-Burrell (7/26/79)
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

274 Alfa Laval Thermal, Inc. (6/25/76)
111 Parker Street
Newburyport, Massachusetts 01950

496 FMC Corp.
Fran Rica Systems (2/23/87)
P.O. Box 30127
Stockton, California 95213-0127

361 N.V. Terlet (7/12/82)
P.O. Box 62
7200 AB Zutphen
Netherlands
(US Agent Manning & Lewis-NJ)

964 Schroder GmbH & Co. KG (5/27/98)
Falkenstr. 51-57
D-23564, Lubeck
Germany
(US Rep.: Schroder N.A. Corp.
12780 Westlinks Drive
Fort Myers, Florida 33913)

32-02 Uninsulated Tanks for Milk and Milk Products

397 APV Americas - Lake Mills (6/21/83)
100 South CP Avenue
Lake Mills, Wisconsin 53551

268 DCI, Inc. (11/21/75)
600 No. 54th Avenue, P.O. Box 1227
St. Cloud, Minnesota 56301

708 Lee Industries, Inc. (1/12/93)
P.O. Box 688
Phillipsburg, Pennsylvania 16866

844 Paul Mueller Co. (8/24/95)
1600 West Phelps Street
Springfield, Missouri 65801

354 C.E. Rogers Co. (3/3/82)
1895 Frontage Road, P.O. Box 118
Mora, Minnesota 55051

683 SANIFAB (7/9/92)
A Division of A&B Process Systems Corp.
P.O. Box 86
Stratford, Wisconsin 54484

441 Scherping Systems (3/1/85)
801 Kingsley Street
Winsted, Minnesota 55395

852 Viatec, Inc. (10/18/95)
1220 State Street
Hastings, Michigan 49058

339 Walker Stainless Equip. Co., Inc. (6/2/81)
625 State Street
New Lisbon, Wisconsin 53950

33-01 Polished Metal Tubing for Dairy Products

310 Allegheny Bradford Corp. (7/19/78)
P.O. Box 200 Route 219 South
Bradford, Pennsylvania 16701

812 A.T.I. s.r.l. (1/26/95)
Viale Resegone 7
22036 Erba (Como)
Italy
(US Rep.: Norca Corporation
185 Great Neck Road
Great Neck, New York 11022)

413 Azco, Inc. (12/8/83)
P.O. Box 567
Appleton, Wisconsin 54912

736 Kvalitetsproduktion AB (6/11/93)
S-693 29 Degerfors, Sweden
(US Rep.: Flowtech, Inc.
1900 Lake Park Drive, Ste. 345
Smyrna, Georgia 30080)

308 Rath Manufacturing Co., Inc. (6/20/78)
2505 Foster Avenue
Janesville, Wisconsin 53545

368 Rodger Industries Inc. (10/7/82)
P.O. Box 186, R.R. 1
Blenheim, Ontario
Canada N0P 1A0
(Not available in the USA)

776 TGPRO (7/18/94)
Bangkok, Thailand
(US Rep.: Kurt Orban Partners
Kurt Orban
450 Kings Road
Brisbane, California 94005)

775 Trent Tube (7/18/94)
P.O. Box 77
East Troy, Wisconsin 53120

331 United Industries, Inc. (10/23/80)
1546 Henry Avenue
Beloit, Wisconsin 53511

34-02 Portable Bins

916 Custom Metalcraft, Inc. (4/17/97)
2332 East Division
P.O. Box 10587 GS
Springfield, Missouri 65808

647 Thomas Conveyor Company (9/18/91)
Tote System Division
P.O. Box 2916
Fort Worth, Texas 76113-2916

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 (2/7/84)
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. (4/9/97)
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)
Reeweg 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.
Plattsville, Ontario, Canada N0J IS0

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 (8/25/77)
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 Stoelting, 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. (4/12/83)
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. (11/5/96)
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 Tri-Clover, 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 (9/18/90)
611 Sugar Creek Road
Delavan, Wisconsin 53115

44-02 Air Hydraulically or Mechanically Driven Diaphragm Pumps

958 American LEWA, Inc. (4/15/98)
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

833 Wilden Pump & Engr. Co. (6/22/95)
22069 Van Buren Street
Grand Terrace, California 92313-5651

805 Tri-Clover (11/18/94)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

45-00 Cross Flow Membrane Modules

807 CeraMem Separations (11/30/94)
20 Clematis Avenue
Waltham, Massachusetts 02154

786 North Carolina SRT, Inc. (9/24/94)
221 James Jackson Avenue
Cary, North Carolina 27513

46-01 Refractometers and Optical Sensors

981 AW Company (9/16/98)
8809 Industrial Drive
Franksville, Wisconsin 53126-9337

785 Bran & Lubbe, Inc. (9/2/94)
1025 Busch Parkway
Buffalo Grove, Illinois 60089

955 Brimrose Corp. of America (3/17/98)
5020 Campbell Boulevard
Baltimore, Maryland 21236-4968

859 The Electron Machine Corp. (11/4/95)
15820 CR 450 West
P.O. Box 2345
Umatilla, Florida 32784

800 Epsilon Industrial Inc. (10/24/94)
2215 Grand Avenue Parkway
Austin, Texas 78728

783 James C. Camp (9/2/94)
dba Advantec Process Systems
95 Wyngate Drive
Newnan, Georgia 30265

940 K-Patents OY (10/23/97)
P.O. Box 77
Fin-01511
Vantaa, Finland
(US Rep.: K-Patents, Inc.
1804 Centre Pointe Circle, Suite 106
Naperville, Illinois 60563)

697 Liquid Solids Control, Inc. (10/21/92)
P.O. Box 259
Farm Street
Upton, Massachusetts 01568

751 Maselli Measurements, Inc. (1/20/94)
Via Baganza, 43100
Parma, Italy
(US Rep.: Maselli Measurements, Inc.
P.O. Box 7571
Stockton, California 95267)

921 optek-Danulat Inc. (4/30/97)
279 South 17th Avenue, Suite 10
West Bend, Wisconsin 53095

767 Foss NIR Systems, Inc. (6/6/94)
12101 Tech Road
Silver Spring, Maryland 20904

750 PT Papertech, Inc. (1/20/94)
#301 - 2609 Westview Drive
North Vancouver
B. C. Canada V7N 4M2
(US Rep.: BD Services Corporation
300 North Commercial Street
Bellingham, Washington 98227)

919 Foss NIR Systems, Inc. (4/24/97)
12101 Tech Road
Silver Spring, Maryland 20904

742 Reflectronics, Inc. (9/15/93)
3009 Montavesta Road
Lexington, Kentucky 40502

47-00 Pumps for Cleaning & Sanitizing Solutions

897 Ampco Pumps Company (12/10/96)
4000 West Burnham Street
Milwaukee, Wisconsin 53215

50-00 Level Sensing Devices

705 Bindicator Company (12/29/92)
1915 Dove Street
Port Huron, Michigan 48060

51-00 (Formerly 08-17R) Plug-Type Valves

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

772 Alfa Laval Flow, Inc. (6/10/57)
G & H Division
8201 - 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909

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

239 LUMACO (6/3/72)
9-11 East Broadway
Hackensack, New Jersey 07601

788 Puriti, S.A. De C. V. (9/12/72)
Alfredo Nobel No. 39
Fracc. Ind. Pte. de Vigas
Tlalnepantha, Mexico
(US Rep.: Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115)

781 Robert James Sales, Inc. (8/31/94)
699 Hertel Avenue, Suite 260
Buffalo, New York 14207

357 Tanaco Products (4/15/82)
3860 Loomis Trail Road
Blaine, Washington 98230

777 Tech Control Ent. (8/2/85)
3725 N. Murray Road
Otis Orchard, Washington 99027

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

759 VNE Corporation (3/16/78)
1149 Barberry Drive
Janesville, Wisconsin 53545

761 Waukesha Cherry-Burrell (12/17/57)
611 Sugar Creek Road
Delavan, Wisconsin 53115

52-01 (Formerly 08-17H) Thermoplastic Plug Type Valves

907 LAUFER International AG (2/25/97)
Finkenweg 2
D-88709
Meersburg, Germany
(US Rep.: M. G. Newell Corporation
115 N. 20th Street
Tampa, Florida 33605)

577 Ralet-Defay (11/2/89)
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 (10/22/86)
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799

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

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

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

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

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

686 Bardiani Valvole S.R.L. (8/3/92)
Via G. Vittorio, 30/B
43045 Fornovo (PR) Italy
(US Rep.: Sanchelima Int.
1763 Northwest 93rd Avenue
Miami, Florida 33172)

1010 Candigra/CIA, S.A. (3/16/99)
c/Telers, 54-Aptdo 174
17820 Banyoles, Spain
(Not available in the USA)

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

716 Conexiones Inoxidables (3/4/93)
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. (1/25/83)
16720 W. Victor Road
New Berlin, Wisconsin 53151

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

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

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

881 MTS Milchtechnik AG (6/14/96)
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. (10/15/86)
Rt. 376, P.O. Box 541
Hopewell Junction, New York 12533

652 Pierre Guerin SA (10/4/91)
BP.12 - 79210
Mauze-Sur-Le-Mignon
France
(Not Available in the USA)

551 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Fracc. Ind. Puente de Vigas
Tlalnepantla, Mexico
(US Rep.: Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, Wisconsin 53115)

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

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

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

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

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

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

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

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

954 Taylor Valve Technology (2/25/98)
8300 S.W. 8th Street
Oklahoma City, Oklahoma 73128

542 L.C. Thomsen, Inc. (8/31/88)
1303-43rd Street
Kenosha, Wisconsin 53140

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

55-01 Boot Seal Valves for Milk & Milk Products

821 Keofitt A/S (3/17/95)
Snaremosvej 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. (10/15/56)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

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

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

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

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

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

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

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

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

835 Alfa Laval Flow, Inc. (6/22/95)
G & H Division
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

1014 Check-All Valve Manufacturing Co. (3/31/99)
1800 Fuller Road
Des Moines, Iowa 50265

968 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)

834 Stanfos, Inc. (6/22/95)
3908 - 69th Avenue
Edmonton, Alberta
Canada T6B 2V2
(US Rep.: Andron Stainless Corporation
8901 Farrow Road, Suite 101
Columbia, South Carolina 29203)

857 Steel & O'Brien, Mfg. Co. (10/30/95)
12850 Route 39
Sardinia, New York 14134

689 VNE Corporation (8/17/92)
1149 Barberry Drive
Janesville, Wisconsin 53547

908 Waukesha Cherry-Burrell (4/25/97)
611 Sugar Creek Road
Delavan, Wisconsin 53115

59-00 (Formerly 08-17D) Automatic Positive Displacement Sampler

291 Accurate Metering Systems Inc. (6/22/77)
1650 Wilkening Court
Schaumburg, Illinois 60173

284 Bristol Equipment Co. (11/18/76)
210 Beaver Street
P.O. Box 696
Yorkville, Illinois 60560-0696

60-00 (Formerly 08-17G) Rupture Discs

407 Continental Disc Corp. (10/14/83)
3160 W. Heartland Drive
Liberty, Missouri 64068

854 Fike Metal Prod. (10/17/95)
Div. Fike Corp.
704 South 10th Street
Blue Springs, Missouri 64015

892 Oklahoma Safety Equipment Company (10/11/96)
(OSECO)
1701 West Tacoma
Broken Arrow, Oklahoma 74012

61-00 (Formerly 08-17I) Steam Injected Heaters

728 APV Americas (4/14/93)
Heat Transfer Division
395 Fillmore Avenue
Tonawanda, New York 14150

811 Hydro-Thermal Corporation (1/1/95)
400 Pilot Court
Waukesha, Wisconsin 53188

991 Komax Systems, Inc. (11/30/98)
508 East E Street
Wilmington, California 90744

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

874 Q-Jet DSI, Inc. (4/2/96)
704 Powell Lane, P.O. Box 350
Lewiston, New York 14092-0350

62-01 (Formerly 08-17L) Hose Assemblies

795 Able Hose & Rubber, Inc. (9/14/94)
2307 E. Hennepin Avenue
Minneapolis, Minnesota 55413

774 The Briggs Co. (7/18/94)
3 Bellecor Drive
New Castle, Delaware 19720

758 Crouch Supply Co. (2/22/94)
P.O. Box 163829
902 S. Jennings
Ft. Worth, Texas 76161

721 Dixon Valve & Coupling Co. (3/23/93)
800 High Street
Chestertown, Maryland 21620-1196

913 JGB Enterprises, Inc. (4/9/97)
115 Metropolitan Drive
Liverpool, New York 13088

757 Nelson-Jameson, Inc. (2/21/94)
P.O. Box 647
2400 East 5th Street
Marshfield, Wisconsin 54449

727 Nalge Process Technologies Group (4/14/93)
924 Marcon Boulevard
Allentown, Pennsylvania 18103

799 R/W Connection (10/21/94)
936 Links Avenue
Landisville, Pennsylvania 17538

698 Sanitary Couplers, Inc. (10/23/^2)
275 South Pioneer Boulevard
Springsboro, Ohio 45066

700 Titan Industries, Inc. (10/23/92)
P.O. Box 1007
11121 Garfield Avenue
South Gate, California 90280-7590

63-02 (Formerly 08-17R) Sanitary Fittings

1018 Advance Fittings Corporation (4/13/99)
218 West Centralia Street
Elkhorn, Wisconsin 53121

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

79R APV Americas – Lake Mills (11/23/57)
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799

682 Andron Stainless, Ltd. (6/30/92)
6170 Tomken Road
Mississauga, Ontario
Canada L5T 1X7
(US Rep.: Andron Stainless Corp.
8901 Farrow Road, #101
Columbia, South Carolina 29223)

349 APN, Inc. (12/15/81)
921 Industry Road
Caledonia, Minnesota 55921

900 APV Americas – Lake Mills (12/31/96)
100 South CP Avenue
Lake Mills, Wisconsin 53551-1799

948 ARMATURENWERK (1/2/98)
HOTENSLEBEN GmbH
SchulstraBe 5-6
39393 Holenslebon
Germany
(US Rep.: VNE Corporation
1149 Barberry Drive
Janesville, Wisconsin 53547)

1016 Becker, Inc. (4/5/99)
P.O. Box 1258
6705 14th Avenue
Kenosha, Wisconsin 53140

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

688 Swagelok (8/4/92)
29500 Solon Road
Solon, Ohio 44139-3492

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

960 C S E Chiang Sung (4/24/98)
Enterprise Co., Ltd.
No. 65 Sheng Kung 1st Road
Pei Tou Industrial Park
Changhua, Taiwan ROC
(US Rep.: Kurt Orban Partners
450 Kings Road
Brisbane, California 94005)

949 CANDIGRA y CIA, S.A. (1/2/98)
C/. Telers, 54-Aptdo. 174
17820 Banyoles
Spain
(Not Available in the USA)

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

962 CIVACON (4/30/98)
416 E. Alondra Boulevard
Gardena, California 90248

696 Conexiones Inoxidables (10/1/92)
de Puebla S. A. de C. V.
Vicente Guerrero No. 112
Xicotepec de Juarez
Edo. Puebla, Mexico
(US Rep.: Ben Dolphin Consulting
4735 Lansing Drive
North Olmsted, Ohio 44070)

1003 Dixson Valve and Coupling Company (3/3/99)
800 High Street
Chestertown, Maryland 21620-1196

677 EXCEL-A-TEC, Inc. (5/8/92)
N93 W14635 Whittaker Way
Menomonee Falls, Wisconsin 53051

973 Fastest, Inc. (7/21/98)
2315 Hampden Avenue
St. Paul, Minnesota 55114

947 FLOWMECA (12/22/97)
47 rue du Bois Chaland
LISSES
91029 Evry Cedex
France
(US Rep.: FLOWMECA, Inc.
19400 Stevens Creek Boulevard, Suite 200
Cuppertino, California 95014)

838 Food & Dairy Quality Mgmt. Inc. (QMI) (7/10/95)
245 E. 6th Street, Suite 416
St. Paul, Minnesota 55101

67R Alfa Laval Flow, Inc. (6/10/57)
G & H Division
8201 - 104th Street, P.O. Box 581909
Pleasant Prairie, Wisconsin 53158-0909

925 Hassia Verpackungsmachinen (6/5/97)
GmbH
Heerweg 19
D-63691
Ranstadt, Germany
(US Rep.: Hassia USA, Inc.
1210 Campus Drive West
Morganville, New Jersey 07751)

773 Herrli AG (7/15/94)
3210 Kerzers
Switzerland
(US Rep.: VNE Corp.
P.O. Box 1698
Janesville, Wisconsin 53547)

917 Irving Polishing & Mfg., Co., Inc. (4/17/97)
5704 46th Street
Kenosha, Wisconsin 53144-1899

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

933 King Lai International Co., Ltd. (7/31/97)
No. 10, The 6th Street
Youth Industrial Zone
Tachia, Taichung
Taiwan ROC
(Not available in the USA)

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

703 Parker Hannifin Corp. (11/6/92)
UHP Products Division
1005 A Cleaner Way
Huntsville, Alabama 35805

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

726 Nalge Process Technologies Group (4/14/93)
924 Marcon Boulevard
Allentown, Pennsylvania 18103

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
Mississuaga, Ontario
L4W 1V9 Canada
(US Rep.: Steve Byskosh
500 Berwick Court
Schaumburg, 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
Ellsworth, 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.
16633 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
121 W. North Street
Healdsburg, California 95448

845 L. J. Star Inc. (9/7/95)
P.O. Box 1116
2201 Pinnacle Parkway
Twinsburg, Ohio 44807

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

68-00 Ball-Type Valves

1032 Bowlswitch USA, Inc. (6/18/99)
6580 Valley Center Drive
Radford, Virginia 24141

1022 Bradford Castmetals, Inc. (5/6/99)
P.O. Box 33
Elm Grove, Wisconsin 53122

898 Fluid Transfer (12/12/96)
Division of Lee Ind., Inc.
514 W. Pine Street
Philipsburg, Pennsylvania 16866

931 LUMACO (7/18/97)
9-11 East Broadway
Hackensack, New Jersey 07601

73-00 Shear Mixers, Mixers and Agitators

901 Admix, Inc. (1/2/97)
234 Abby Road
Manchester, New Hampshire 03103-3332

957 Admix, Inc. (3/24/98)
234 Abby Road
Manchester, New Hampshire 03103-3332

74-00 Sensors and Sensor Fittings and Connections

32 ABB Instrumentation, Inc. (10/4/56)
125 E. County Line Road
Warminster, Pennsylvania 18974

738 ABB Instrumentation, Inc. (6/25/93)
125 E. County Line Road
Warminster, Pennsylvania 18974

747 Alloy Engineering Co., Inc. (1/11/94)
304 Seaview Avenue
Bridgeport, Connecticut 06607

576 Ametek Test and Calibration (10/13/89)
Instruments Division
8600 Somerset Drive
Largo, Florida 34643

822 Ametek/US Gauge Division (3/17/95)
PMT Products
820 Pennsylvania Boulevard
Feasterville, Pennsylvania 19053

318 Anderson Instrument Co., Inc. (4/9/79)
156 Auriesville Road
Fultonville, New York 12072

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

659 Bindicator Company (11/20/91)
1915 Dove Street
Port Huron, Michigan 48060

706 Bindicator Company (12/29/92)
1915 Dove Street
Port Huron, Michigan 48060

926 BOURDON - SEDEME S.A. (6/18/97)
125, rue de la Marre
B.P. 214 41103
Vendome Cedex
France
(US Rep.: Rawson & Co., Inc.
P.O. Box 924288
Houston, Texas 77292-4288)

872 Brookfield Eng. Lab, Inc. (3/28/96)
11 Commerce Boulevard
Middleboro, Massachusetts 02346

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

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

525 Caldwell Systems Corporation (3/4/88)
600 S. Sunset, Unit D
Longmont, Colorado 80501

910 CEMCO Mfg., Inc. (3/7/97)
1120 North Peoria
Tulsa, Oklahoma 74106-4904

850 Chicago Stainless Equip. (9/28/95)
1280 S.W. 34th Street
Palm City, Florida 34990-3308

672 Computer Instruments Corp. (4/3/92)
1000 Shames Drive
Westbury, New York 11590

829 DCT Instruments/Sensotec, Inc. (4/13/95)
2080 Arlingate Lane
Columbus, Ohio 43228-4112

862 Delta Controls Corporation (11/30/95)
585 Fortson Street
Shreveport, Louisiana 71107

586 Diversey Lever Equipment (12/14/89)
151 Harvey West Boulevard
Santa Cruz, California 95060

866 Dovex S.S., Inc. (1/29/96)
770 Tower Drive
Medina, Minnesota 55340

640 Dresser Industries (7/16/91)
Instrument Division
250 East Main Street
Stratford, Connecticut 06497

663 Dresser Industries (12/4/91)
Instrument Division
210 Old Gate Lane
Milford, Connecticut 06460

405 Drexelbrook Engineering Co. (9/27/83)
205 Keith Valley Road
Horsham, Pennsylvania 19044

861 Dwyer Instruments, Inc. (11/28/95)
P.O. Box 373
Michigan City, Indiana 46360

977 Efector, Inc. (8/31/98)
A subsidiary of ifm electronic
805 Springdale Drive
Exton, Pennsylvania 19341

763 EG & G Berthold Laboritorium Prof. (4/21/94)
Berthold GmbH & Co. KGCalmbacher Str. 22
D-7547 Bad Wildbad 1, Germany
(US Rep.: E G & G Berthold USA
100 Midland Road
Oak Ridge, Tennessee 37830)

936 ENFM-USA, Inc. (8/28/97)
11339 East Distribution Avenue
Jacksonville, Florida 32256

1028 Finn and Company, Inc. (6/21/99)
7524 W. 98th Place
Bridgeview, Illinois 60455

1033 Finn and Company, Inc. (6/21/99)
7524 W. 98th Place
Bridgeview, Illinois 60455

524 Flow Technology, Inc. (1/14/88)
4250 E. Broadway Road
Phoenix, Arizona 85040

459 Endress + Hauser, Inc. (10/17/85)
2350 Endress Place
Greenwood, Indiana 46142

876 Fisher-Rosemount Singapore (5/14/96)
Private Limited
1 Pandan Cresent
Singapore 0512
Republic of Singapore
(US Rep.: Rosemount, Inc.
12001 Technology Drive
Eden Prairie, Minnesota 55344)

598 FMC Invalco, Inc., (3/22/90)
A FMC Corp. Subsidiary
2825 W. Washington
Stephenville, Texas 76401

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

963 GLI International, Inc. (5/4/98)
9020 West Dean Road
Milwaukee, Wisconsin 53224

984 Garner Industries (10/20/98)
4200 North 48th Street
Lincoln, Nebraska 68504

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

668 GP: 50 New York, Ltd. (3/30/92)
2770 Long Road
P.O. Box 1150
Grand Island, New York 14072

633 Griffith Industrial Products Company (6/21/91)
P.O. Box 111
Putnam, Connecticut 06260

749 Haenni Cie & AG (1/17/94)
CH-3303
Jegenstorf, Switzerland
(US Rep.: Haenni Instruments, inc.
1107 Wright Avenue
Gretna, Louisiana 70056)

651 HEINRICH KUBLER AG (10/3/91)
CH-6341 Baar
Switzerland
(US Rep.: Granzow, Inc.
2300 Crown Point Executive Drive
Charlotte, North Carolina 28227)

794 Honeywell, Inc. (9/14/94)
1100 Virginia Drive
Fort Washington, Pennsylvania 19034

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

832 H.O. Trerice Co. (5/12/95)
12950 W. Eight Mile Road
Oak Park, Michigan 48237-3288

629 ISE-Magtech (5/20/91)
907 Bay Star
Webster, Texas 77598-1531

572 ITT Conoflow (9/25/89)
P.O. Box 768, Rt. 78
St. George, South Carolina 29477

961 KDG Instruments (4/24/98)
Crompton Way
Crawley, W. Sussex
RH102YZ, England
(Not available in the USA)

798 Kay-Ray/Sensall, Inc. (10/14/94)
1400 Business Center Drive
Mount Prospect, Illinois 60056

930 Kamstrup A/S (7/18/97)
Process Division
Jacob Knudsens Vej 12
DK-8230 Aabyhoj
Denmark
(Not available in the USA)

945 Kemotron, Inc. (11/25/97)
1090 Northchase Parkway, Suite 200 South
Marietta, Georgia 30067

842 Klay Instruments B.V. (8/18/95)
Nijverheidsweg 5
NL 7991 CZ Dwingeloo
The Netherlands
(Not available in the USA)

396 King Engineering Corp. (6/13/83)
P.O. Box 1228
Ann Arbor, Michigan 48106

893 Kistler-Morse Corporation (10/31/96)
19021-120th Avenue N.E.
Bothell, Washington 98011-9511

285 K Systems Corp. (Tank Mate Division) (12/7/76)
4391 Butterfield Road
Hillside, Illinois 60162

620 Larad Equipment (2/25/91)
213 Airport Drive Extension
Hopedale, Massachusetts 01747

501 Lumenite Control Technology Inc. (4/27/87)
2331 N. 17th Avenue
Franklin Park, Illinois 60131

596 Magnetrol International (3/20/90)
5300 Belmont Road
Downers Grove, Illinois 60515

768 MTS Systems Corporation (6/6/94)
Sensors Division
3001 Sheldon Drive
Cary, North Carolina 27513

906 Mettler-Toledo Process (2/14/97)
Analytical, Inc.
261 Ballardvale Street
Wilmington, Massachusetts 01887

627 Milltronics, LTD. (4/12/91)
P.O. Box 4225
Peterborough, Ontario
Canada K9J 7B1
(US Rep.: Milltronics, Inc.
709 E. Stadium Drive
Arlington, Texas 76011)

1002 MILLTRONICS LTD. (3/3/99)
Nikkelstrand 10
NL4832 AB Breda, The Netherlands
(US Rep.: MILLTRONICS, INC.
709 E. Stadium Drive
Arlington, Texas 76011)

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

863 Nelson-Jameson (1/11/96)
2400 East 5th Street, P.O. Box 647
Marshfield, Wisconsin 54449

597 NUOVA FIMA S.p.A. (3/20/90)
Via C. Battisti 59
28045 - INVORIO (NO) Italy
(US Rep.: MDI Industrial Sales LTD.
9868 - 33rd Avenue
Alberta, Canada T6N 1C6)
(Not available in the USA)

966 ODEN Corporation (5/27/98)
255 Great Arrow Avenue
Buffalo, New York 14207

909 OHMART/VEGA Corporation (3/4/97)
4241 Allendorf Drive
Cincinnati, Ohio 45209-9961

983 OHMART/VEGA Corporation (10/10/98)
4241 Allendorf Drive
Cincinnati, Ohio 45209

523 Paper Machine Components, Inc. (1/3/88)
Miry Brook Road
Danbury, Connecticut 06810

554 Par Sonics, Inc. (11/30/88)
R.D. #1 - Box 505
Centre Hall, Pennsylvania 16828

563 PI Components Corp. (2/13/89)
1951 Highway 290W
Brenham, Texas 77833

644 Princo Instruments, Inc. (8/22/91)
1020 Industrial Highway
Southampton, Pennsylvania 18966-4095

815 ProMag PM LTD (2/24/95)
11552 Merchant Drive
Baton Rouge, Louisiana 70809

1000 pro/M/tec., Inc. (3/3/99)
1201 Braddock Ave., Suite 2
Pittsburgh, Pennsylvania 15218

487 Pyromation, Incorporated (12/16/86)
5211 Industrial Road
Fort Wayne, Indiana 46825-5152

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

982 Reotemp Instrument Corporation (10/08/98)
11568 Sorrento Valley Road, Suite 10
San Diego, California 92121-1313

495 Rosemount Analytical, Inc. (2/13/87)
Uniloc Division
2400 Barranca Parkway
Irvine, California 92606

1013 Rheology Services, Inc. (3/30/99)
160 Market Street, Suite 7
Saddle Rock, New Jrsey 07663

328 Rosemount, Inc. (5/22/80)
12001 Technology Drive
Eden Prairie, Minnesota 55344

732 SensorTec, Inc. (5/18/93)
7620 DiSalle Boulevard
Fort Wayne, Indiana 46825

784 Sensotec, Inc. (9/2/94)
2080 Arlington Lane
Columbus, Ohio 43228-4112

515 Setra Systems, Inc. (9/14/87)
159 Swanson Road
Boxborough, Massachusetts 01719

583 S. J. Controls, Inc. (11/11/89)
2248 Obispo Avenue #203
Long Beach, California 90806

873 Smar Equipamentos (4/2/96)
Industriasis Ltda.
7240 Brittmoore, Suite 118
Houston, Texas 77041

875 SOR (4/15/96)
14685 W. 105th Street
Lenexa, Kansas 66215-5964

420 Stork Food & Dairy Systems, Inc. (4/17/84)
P.O. Box 1258
1024 Airport Parkway
Gainesville, Georgia 30503

896 TBI-Bailey Controls Company (12/3/96)
2175 Lockheed Way
Carson City, Nevada 89706

641 Tempress A/S (7/16/91)
Nordlandsvej 64-66
DK-8240 Risskor, Denmark
(Not available in the USA)

690 Texas Thermowell, Inc. (8/25/92)
P.O. Box 1535
Hwy. 96 North
Silsbee, Texas 77656

765 Tri-Clover, Inc. (4/27/94)
P.O. Box 1413
Kenosha, Wisconsin 53141-1413

444 Tuchenhagen North America, Inc. (6/17/85)
9160 Red Branch Road
Columbia, Maryland 21045
196 Western Avenue
Fond du Lac, Wisconsin 54936-1458

754 Valmet Automation (7/2/95)
30 Thomas Drive
Westbrook, Maine 04092

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

779 Wahl Instruments, Inc. (8/10/94)
234 Weaverville Highway
Asherville, North Carolina 28804

522 Weed Instrument Company, Inc. (12/28/87)
707 Jeffrey Way
Round Rock, Texas 78664

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

600 Weksler Instruments Corporation (4/27/90)
250 E. Main Street
Stratford, Connecticut 06497

646 WIKA Instrument Corp. (9/10/91)
1000 Wiegand Boulevard
Lawrenceville, Georgia 30243

685 Winter's Thermogauges, Ltd. (8/3/92)
121 Railside Road
Toronto, Ontario
Canada M3A 1B2
(US Rep.: Winter's Thermogauges, Inc.
6020/3 N. Bailey Avenue
Buffalo, New York 14226)

879 Zurich Industria E (6/3/96)
Comercio LTDA
R. Serra da Piedade, 183
Sao Paulo - SP - Brazil 03131-080
(Not available in the USA)

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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

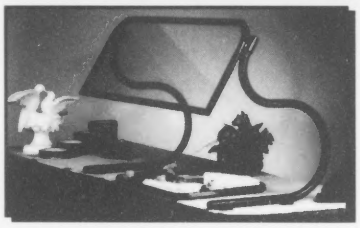
865 APV Heat Transfer Technologies

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.



ComingEvents

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.

·**12-15, Food Quality '99 Conference and Expo,** San Francisco Marriott, San Francisco, CA. For additional information, visit www.foodquality.com or phone: 215.860.7800, ext. 10.

·**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 Laboratorium 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, lera 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, lera 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 (IIR) 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 319.933.4521.

·**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.

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Des Moines, Iowa 50322-2863, USA
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E-mail: iamfes@iamfes.org; Web site: www.iamfes.org

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- ❒ D1180 10 Points to Dairy Quality
- ❒ D1010 The Bulk Milk Hauler: Protocol & Procedures
- ❒ D1020 Causes of Milkfat Test Variations & Depressions
- ❒ D1030 Cold Hard Facts
- ❒ D1040 Ether Extraction Method for Determination of Raw Milk
- ❒ D1050 The Farm Bulk Milk Hauler
- ❒ D1060 Frozen Dairy Products
- ❒ D1070 The Gerber Butterfat Test
- ❒ D1080 High-Temperature, Short-Time Pasteurizer
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1110 Milk Plant Sanitation: Chemical Solution
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1130 Pasteurizer - Design and Regulation
- ❒ D1140 Pasteurizer - Operation
- ❒ D1150 Processing Fluid Milk

ENVIRONMENTAL

- ❒ E3010 The ABCs of Clean – A Hand-washing & Cleanliness Program for Early Childhood Programs
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- ❒ E3030 Air Pollution: Indoor
- ❒ E3040 Ashestos Awareness
- ❒ E3050 Down in the Dumps
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- ❒ F2060 Food Safe - Series I (4 Videos)
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- ❒ F2090 Food Safety: An Educational Video for Institutional Food-Service Workers
- ❒ F2120 Food Safety: For Goodness Sake, Keep Food Safe
- ❒ F2110 Food Safety is No Mystery
- ❒ F2130 Food Safety: You Make the Difference
- ❒ F2140 GMP: Basics – Employee Hygiene Practices
- ❒ F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
- ❒ F2160 GMP: Sources & Control of Contamination during Processing
- ❒ F2165 HACCP and Its Application to the Food Industry
- ❒ F2180 HACCP: Safe Food Handling Techniques
- ❒ F2170 The Heart of HACCP
- ❒ F2175 Inspecting For Food Safety-Kentucky's Food Code
- ❒ F2190 Is What You Order What You Get? Seafood Integrity
- ❒ F2210 Northern Delight - From Canada to the World
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- ❒ F2280 Principles of Warehouse Sanitation
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- ❒ M4050 Personal Hygiene & Sanitation for Food Processing Employees
- ❒ M4060 Psychiatric Aspects of Product Tampering
- ❒ M4070 Tampering: The Issue Examined

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6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA
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E-mail: iamfes@iamfes.org; Web site: www.iamfes.org

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THOUGHTS on Today's Food Safety...

Understanding Produce Safety

Nancy E. Nagle, Ph.D.
Nagle Resources
Pleasanton, California

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 predominantly 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 plates 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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