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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION, INC. AUGUST 2000

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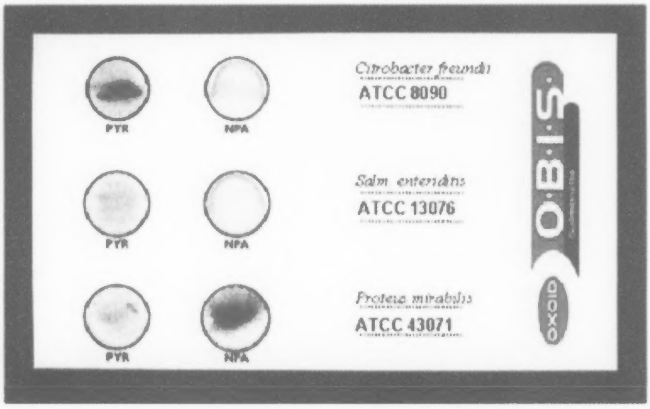

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Sanitation

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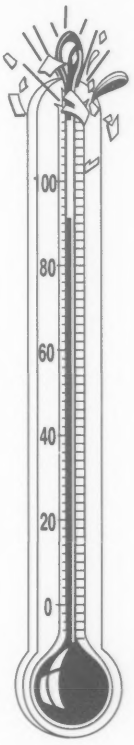

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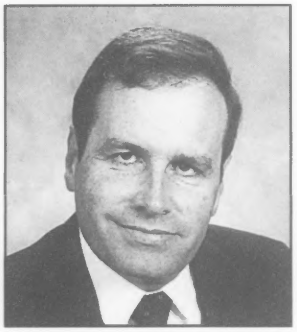


By JACK GUZEWICH
President

"Our organization has a bright future"

It is a cliché but it is hard to believe that a year has passed already. It has been a high point of my career to have served as President of the most important food safety professional organization in the world at a time when the importance of food safety is enjoying new recognition. After much discussion, our Members voted to change our name to the International Association for Food Protection by over 94%. Our stagnant Membership numbers have begun to grow. We are gaining new affiliates in North America (Mexico, Washington, D.C., and Quebec) and interest is being shown for even more affiliates in North America and in other continents. Our Journals continue to lead the way with cutting edge papers every month. Our Annual Meeting grows in prestige and attendance. We expect to break 1,200 in attendance this year and 1,300 is even possible! The quality of our staff in Des Moines assures that the organization is responsive to Member needs and that we operate like a first class professional organization. Our Journal Editors, Committee and Professional Development Group (PDG) chairpersons and Members continue to supply us with outstanding products, networking opportunities and outstanding Annual Meeting symposia. Last but not least, we are an organization made up of professionals whose membership in our organization demonstrates dedication to food safety and a desire to stay ahead of the curve in their constantly changing careers. Little wonder I am so proud to be a Member of IAFP, not to mention to be honored to have served as President.

Our organization has a bright future. A Student PDG is in the formative stages thanks to Scott Burnett from the University of Georgia and Kalmia Phelps from Virginia Tech. The student PDG will provide an influx of new young Members. We will be sponsoring a workshop on produce safety in Mexico in November of this year, our first such effort in that country. The World Health Organization (WHO) passed its first ever declaration setting up a more active food safety program and we have begun to explore how our organization could work toward official recognition from WHO as a non-governmental organization. We are working with the 3-A Symbol Council, FDA, USDA, IDFA, and IAFIS to develop a certification program for equipment bearing the 3-A symbol. The US Food and Drug Administration approached us with a request to hold a very important public meeting on their draft *Listeria monocytogenes* risk assessment in conjunction with our Annual Meeting. The National Advisory Committee on Microbiological Criteria for Foods will hold a meeting regarding the LM risk assessment immediately following our Annual Meeting. This is happening because so many of the nation's and world's experts on microbial food safety will be at our meeting anyway!

We also have a bright future due to our history. Earl Wright,

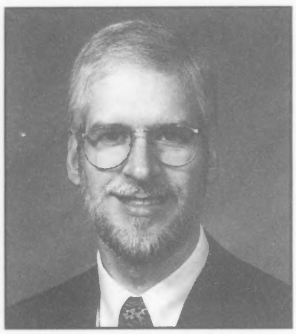
Harry Haverland, David Tharp, Didi Loynachan, Jackie Runyan, and Donna Bahun completed a history of our organization that will be handed out at the Annual Meeting and be published as a series of articles in *DFES* this fall. If you read this history or the other past Presidential Addresses that have been published in recent *DFES* issues you know how our roots are in milk safety and quality. Many of our past Members made significant contributions to the field of milk safety and quality and many of the concepts we use in the safety and quality of other foods originate in the milk safety and quality experience. With the strength of that history as our foundation and our mix of industry, academic and government Members, I have every confidence that the International Association for Food Protection will grow and evolve as the premier food safety organization in the world.

In closing I would like to thank some folks who have made this experience one I will never forget. First, I would like to thank the Executive Board members who I have had the privilege of serving with over the past four years, who have supported me and who have taught me a great deal: Ann Draughon, John Bruhn, Michael Brodsky, Lawrence Roth, Gale Prince, Beth Johnson, Bob Brackett, Jenny Scott, Jim Dickson, Anna Lammerding, and Randy Daggs. I would like to thank David Tharp, Lisa Hovey, Donna Bahun, Julie Cattanach, Lucia Collison, Bev Corron, Karla Jordan, Didi Loynachan, Beth Miller, Pam Wanninger, Tanya Wheeler, and Frank Zuehlke for their dedication to our organization and for their support. Finally, I would like to thank my wife, Judy, for her patience and support during my weekends away and many nights doing IAMFES/IAFP work. She has put up with a lot!

I look forward to my last year on the Executive Board as Past President and for the friendship of my fellow IAFP Members for many years to come.

COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
Executive Director

"We continue to evolve as an Association to meet the needs of our Members"

As we move closer to the end of the year 2000, we have completed a written history of the first 89 years of the Association. This document was available to Annual Meeting attendees and is available to Members. If you are interested in receiving a copy, fill out the coupon on page 634 for your complimentary Member copy. If you have a need for additional copies, you may also order them on the same page.

It has been said many times before, but in 1911, 35 "men" from Australia, Canada and the United States who were interested in improving the quality of milk, organized the International Association of Dairy and Milk Inspectors. This is the beginning of time for the present day, International Association for Food Protection.

As we look back over the history of the Association, it is apparent that we have made a significant impact on the safety of not only the milk supply, but also the food supply during the many years of our Association existence. In the early days, the emphasis was on creating methods to ensure safe milk. Many inspectors had no training or education to assist them in performing their duties. C.J. Steffen stated in the first Presidential Address, "I have known carpenters, locksmiths, ward politicians, plumbers and a cobbler to be appointed as dairy inspectors."

In his second Presidential Address, C.J. Steffen stated, "Practically all states and most cities have some form of dairy and milk inspection. In some instances inspection is by police power only, in others by means of elaborate milk laws and ordinances so far advanced for the city or state that they cannot be and are not enforced." Association Members worked long and hard to educate inspectors and they worked towards uniform milk-related ordinances and laws.

By the 1930s, society became more mobile and health concerns were no longer considered only a local matter. Health of people in one location was of concern to cities hundreds of miles away. Uniformity in protecting the food supply was needed and federal governments were seen as the solution. During the '30s the depression affected people's ability to buy food. Milk was an economical source of nutrition.

After the depression, equipment design proceeded rapidly. New forms of equipment were being installed, creating an additional public health concern. Pasteurization helped to relieve some of these concerns. Our Members were actively involved in moving towards a federal inspection program and in designing new equipment. Milk-borne epidemics became less frequent as pasteurization use increased.

The Association, now named International Association of Milk Sanitarians (1936), recognized a need to move away from the *Annual Reports* they published for the first 25 years. It was decided to publish the *Journal of Milk Technology* beginning in

1938. This journal was able to print more in-depth articles on the science of milk and would be more educational for Association Members. Research results would now be available to Members as the sharing of information moved to the next level.

At the 1946 Annual Meeting, food and restaurant sanitarians were included in our Membership and in 1947, the name was changed to International Association of Milk and Food Sanitarians. The journal name was likewise changed to *Journal of Milk and Food Technology*. At this point in time, you can see a shift in focus from only milk, to milk and food. For more than 50 years, our focus continues to follow this avenue! Now more Members share more information about safe food production and handling. Interaction between Members with varied backgrounds helps improve both the milk and food supply, thus having positive effects on the nation's health and the world's health.

Moving forward to present times, we just completed a name change for the Association as of January 1, 2000. Of course, we are now the International Association for Food Protection. Our 87th Annual Meeting recently concluded in Atlanta, Georgia again breaking attendance records as attendees were exposed to more than 300 scientific presentations to assist them in performing their duties. Just as the focus in 1911 was on the quality of milk and protecting the public's health, our 2000 Annual Meeting carried out the same focus with today's science.

We continue to evolve as an Association to meet the needs of our Members. The written history will provide a reference document for many years to come. It will provide new Members with an understanding of the evolution of the Association. It will provide long-time Members with memory jogging information about the Association whereby they can remember the impact they had on the safety of our food supply. We hope that you will have a better understanding of the rich history of YOUR Association and the positive impact we have had on public health and safe food over the life of the Association.

Dairy, Food and Environmental Sanitation, Vol. 20, No. 8, Pages 606-611

Trouble-shooting Sources and Causes of High Bacteria Counts in Raw Milk

S. C. Murphy and K. J. Boor*

SUMMARY

Measurement of bacterial numbers in raw milk is used to determine producer compliance with regulatory standards as well as with milk quality incentive programs. The Food and Drug Administration's Pasteurized Milk Ordinance requires that Class I milk not exceed 100,000 CFU/ml Standard Plate Count (SPC). Other bacteriological tests commonly used to supplement SPC analyses include the Preliminary Incubation Count (PIC), the Lab Pasteurization Count (LPC), and the Coliform Count. Results from these testing procedures can be used to help identify and eliminate sources of bacterial contamination in milk production systems. In this article, we review these bacteriological procedures and describe common sources and causes of high bacteria counts in raw milk.

This article has been peer reviewed by two professionals.

INTRODUCTION

Assurance of the quality of dairy products begins at the farm and ends in the hands of the consumer. The overall condition and cleanliness of a dairy farm is scrutinized by routine inspections. Raw milk quality is closely monitored to ensure processed product quality and safety. The Food and Drug Administration's Pasteurized Milk Ordinance (*18*) requires that Class I milk not exceed 100,000 CFU/ml Standard Plate Count (SPC) and 750,000 cells/ml Somatic Cell Count (SCC). In addition, raw milk must meet other quality standards, including freedom from drug residues, added water, sediment, contaminants, and other abnormalities. Depending on the purchaser of the milk, dairy farmers also may qualify for substantial monetary premiums by producing quality milk that meets standards far more demanding than regulatory requirements.

One quality measure used extensively in both regulatory and premium testing programs is estimation of bacterial numbers in a milk supply. In addition to the SPC, raw milk is often subjected to a number of other bacteriological tests that are used as indicators of milk production conditions. These tests may be included in determining eligibility for premium payments, or they may be used only as an added quality assurance tool. The bacteriological tests commonly used to supplement the SPC are the Preliminary Incubation Count (PIC), the Lab Pasteurization Count (LPC), and the Coliform Count (*14, 19*) The SPC provides an estimated count of total aerobic bacteria in a sample, and the PIC, LPC, and Coliform Count select for specific groups of bacteria that are associated with sub-optimal dairy production practices. Results of these testing procedures can be used to help identify and eliminate potential problems that may not be detected solely by SPC results. In this paper, below, we review these bacteriological procedures and describe common sources and causes of high bacteria counts in raw milk.

Standard plate count

The Standard Plate Count (SPC) of raw milk gives an indication of the total number of aerobic bacteria present in the milk at the time of pickup from the farm. Milk samples are plated in a semi-solid nutrient media or on Petrifilm™ (3M Company, St. Paul, MN) and then incubated for 48 hours at 32°C

(90°F) to encourage bacterial growth (*14*). Single bacteria (or clusters) grow to become visible colonies that are then counted. All plate counts are expressed as the number of colony forming units (CFU) per milliliter (ml).

Aseptically collected milk from clean, healthy cows typically has an SPC less than 1,000. Higher SPCs suggest that bacteria are entering the milk from a variety of possible sources. Although it is difficult to eliminate all sources of bacterial contamination, SPCs less than 5,000 are common, and counts less than 10,000 should be achievable by most farms. The most frequent cause of a high SPC is inadequate cleaning of the milking system. Milk residues on equipment surfaces provide nutrients for growth and multiplication of bacteria that contaminate the product during subsequent milkings. Other practices that can raise the bulk tank SPC are milking soiled cows, maintaining an unclean milking and housing environment, and failing to cool the milk rapidly to less than 4.4°C (40°F). Mastitic cows can also cause high SPCs.

Preliminary incubation count

Results from the Preliminary Incubation Count (PIC) can provide insight into sources of bacterial contaminants in milk production systems. This procedure involves holding the milk at 12.8°C (55°F) for 18 hours prior to plating (*14*). This step encourages reproduction of groups of bacteria that grow well at cool temperatures. Bacteria in the incubated sample are counted by the SPC procedure, as previously described, and are compared to the SPC of the unincubated sample to determine if a significant increase in bacterial numbers has occurred during the holding period. PICs are generally higher than SPCs. PICs that are more than 3-4 fold higher than SPCs are considered to indicate that the milk has not been protected from bacterial contamination.

High PICs are generally associated with inadequate cleaning and sanitizing of either the milking system or the cows. Bacteria considered to be natural flora of the cow (e.g., *Staphylococcus* spp.; *Streptococcus* spp.), including those that cause mastitis, are unlikely to grow significantly at the PI holding temperature. However, PICs equal to or only slightly higher than an already high SPC (e.g., > 50,000) may suggest that a high SPC is due to mastitis. Marginal cooling, i.e., holding of milk at over 4.4°C (40°F), or prolonged raw milk storage times can also result in unacceptable PIC levels, as these conditions may allow reproduction of some types of bacteria. Bacteria that grow well at refrigeration temperatures (psychrotrophic bacteria) are most frequently associated with high PICs.

Lab pasteurized count

Although most bacteria are destroyed by pasteurization, certain types are not. The Lab Pasteurized Count (LPC) estimates the number of bacteria that can survive the pasteurization process. Milk samples are heated to simulate batch pasteurization at 62.8°C (145°F) for 30 minutes (*19*). Bacteria that survive pasteurization (thermoduric bacteria) are enumerated using the SPC procedure. LPCs are generally much lower than SPCs. Lab Pasteurized Counts higher than 200 CFU/ml suggest that the milk was not properly protected from bacterial contamination. Bacteria considered the natural flora of the cow, as well as those associated with mastitis, are generally not thermoduric. High LPCs are generally associated with a chronic or persistent cleaning failure in some area of the system or with significant levels of milk contamination from soiled cows. Other common causes of high LPCs are old pipe-line gaskets, inflations and other rubber parts, milkstone deposits, and leaky pumps.

Coliform count

The Coliform Count procedure enumerates bacteria present in milk that are most commonly associated with manure or environmental contamination. Milk samples are plated on a selective bacterial media that encourages the growth of coliform bacteria while preventing the growth of others (*14*). Although coliforms are often used as indicators of fecal contamination, some strains commonly exist in the environment. Coliforms may enter the milk supply as a consequence of milking soiled cows or of dropping equipment into manure during milking. Generally, counts above 50 CFU/ml indicate poor milking hygiene. High coliform counts most often result from dirty equipment but also can result from milking cows with environmental coliform mastitis.

QUALITY STANDARDS — SPC, LPC, PIC AND COLIFORM COUNT

Raw milk bacterial regulatory standards and typical standards for dairy industry quality premiums are listed in Table 1. The bacterial tests actually included in a milk quality incentive program for producers, as well as the limits used, vary depending on the philosophy and requirements of a processor or cooperative. Generally, standards used to determine premium eligibility are based on values established for well-managed farms. Although no regulatory standards exist for some of the tests described in Table 1, standardized procedures for all of the analyses must be used to ensure accuracy of the results.

SOURCES AND CAUSES OF HIGH BACTERIA COUNTS IN RAW MILK

Milk is synthesized in specialized cells of the mammary gland and is virtually sterile when secreted into the alveoli of the udder (*22*). Beyond this stage of milk production, micro-

TABLE 1. Regulatory and hypothetical industry quality standards for raw milk bacterial counts (expressed as CFU/ml)

Testing Procedure	Quality Standard	Regulatory Standard
Standard Plate Caunt (SPC)	< 10,000	≤ 100,000
Laboratary Pasteurizatian Count (LPC)	< 200	Na standard
Preliminary Incubation Caunt (PIC)	< 3× the SPC ar < 50,000	Na standard
Coliform Count	< 50	California (< 750)

bial contamination generally occurs from three main sources: from within the udder, from the exterior of the udder, and from the surface of milk handling and storage equipment (*4*). The health and hygiene of the cow, the environment in which the cow is housed and milked, and the procedures used in cleaning and sanitizing the milking and storage equipment all influence microbial numbers in raw milk. Equally important are the temperature and length of storage time that may allow microbial contaminants to reproduce. All of these factors influence the total bacteria numbers (SPC) and the types of bacteria present in bulk raw milk.

Microbial contamination from within the udder

Raw milk as it leaves the udder of healthy cows normally contains very low numbers of microorganisms and generally will contain less than 1,000 total bacteria per ml (*12*). Although the teat cistern, teat canal, and teat apex may be colonized by a variety of microorganisms, microbial contamination from within the udder of healthy animals is not considered to contribute significantly to the total numbers of microorganisms in the bulk milk or to the potential increase in bacterial numbers during refrigerated storage. Natural flora of the cow generally will not influence LPCs, PICs or Coliform Counts.

Although a healthy udder should contribute very little to the total bacteria count of bulk milk, a cow with mastitis has the potential to shed large numbers of microorganisms into the milk supply. The influence of mastitis on the total bacteria count of bulk milk depends on the strain of infecting microorganism(s), the stage of infection, and the percentage of the herd infected. Infected cows have the potential to shed in excess of 10^7 bacteria per ml. If the milk from one cow with 10^7 bacteria per ml comprises 1% of the bulk tank milk, the total bulk tank count, disregarding other sources, would be 10^5 per ml (*4*).

Mastitis organisms that most frequently influence total bulk milk counts are *Streptococcus* spp., most notably *S. agalactiae* and *S. uberis* (*3, 4, 8, 11*), although other mastitis pathogens can influence the bulk tank count as well. Organisms associated with contagious mastitis, specifically *S. agalactiae* and *Staphylococcus aureus*, typically do not significantly increase in numbers on soiled milking equipment or under conditions of marginal or poor cooling; thus their presence in raw milk provides an indication of mastitis infections within the herd (*4, 8*). *Staphylococcus aureus* is not generally thought to be a frequent contributor to significant increases in total bulk tank counts (5), although *S. aureus* counts as high as 60,000/ml have been documented in bulk tank milk samples (*8*).

Organisms commonly associated with environmental mastitis (e.g., *S. uberis* and *S. dysgalactiae*) are found in the cow's environment and thus also may influence bulk milk bacteria counts through means other than masititis infections (*2, 23*), including by the milking of dirty cows or by the use of improperly cleaned equipment. Thus, an increase in SCC may provide supporting evidence that a mastitis bacterium may have caused an increase in bulk milk bacteria counts. In general, the presence of mastitis organisms does not influence LPCs or PICs. Cases of coliform mastitis may elevate coliform counts.

Microbial contamination from the exterior of the udder

The exterior of the cow's udder and teats can contribute microorganisms that are naturally associated with the skin of the animal as well as microorganisms derived from the environment in which the cow is housed and milked. In general, the direct influence of natural inhabitants as contaminants in the total bulk milk count is considered small, and most of these organisms do not grow competitively in milk. Of more importance is the contribution of microorganisms from teats soiled

TABLE 2. Sources of microbial contamination as predicted by results from standard plate count, laboratory pasteurization count, preliminary incubation count, and coliform count analyses

Procedure	Natural Flora	Mastitis	Dirty Cows	Dirty Equip.	Poor Cooling
SPC >10,000	Not likely	Possible	Possible	Possible	Possible
SPC >100,000	Not likely	Possible (rare)	Not likely	Possible (likely)	Possible (likely)
LPC >200-300	Not likely	Not likely	Possible	Possible (likely)	Not likely
PIC High vs. SPC	Not likely	Not likely	Possible	Possible (likely)	Possible (likely)
SPC High/ no increase in PIC	Not likely	Possible	Possible but not likely	Possible but not likely	Not likely but possible
Coliform Count High	Not likely	Possible (rare)	Possible	Possible	Not likely but possible

with manure, mud, feeds, or bedding.

Teats and udders of cows inevitably become soiled when animals are held in muddy barnyards or when cows are lying in stalls. Soiled bedding can harbor large numbers of microorganisms, with counts exceeding 10^8 to 10^{10} CFU per gram (*2, 4, 9, 23*). Organisms associated with soiled bedding materials include streptococci, staphylococci, spore-formers, coliforms, and other Gram-negative bacteria. As both thermoduric and psychrotrophic strains of bacteria are commonly found on soiled teat surfaces (*4*), contamination from the exterior of the udder can influence LPCs, PICs, and coliform counts.

The influence of dirty cows on total bacteria counts depends on the extent of soiling of the teat surface and on pre-milking udder preparation practices. For example, if one gram of teat soil containing 10^8 CFU of bacteria is allowed into the milk of one cow giving approximately 30 lb. (13,400 gm) of milk, the total bacteria count for that cow's milk, excluding other sources, would be in excess of 7,000 per ml. Milking heavily soiled cows could potentially result in bulk milk counts exceeding 10^4 per ml. Several studies have investigated pre-milking udder hygiene techniques in relation to the bacteria count of milk (*4, 6, 15, 17*). Generally, thorough cleaning of the teat with a sanitizing solution (spray, wet towel or dip) followed by thorough drying with a clean towel is effective in reducing the numbers of microorganisms in milk contributed from soiled teats. Coliform counts, which are generally associated with contamination with manure, barnyard mud, and used bedding, were relatively low in these studies, even for the untreated cows, suggesting that higher coliform counts in bulk milk are more likely to be caused by other factors (e.g., soiled equipment; coliform mastitis cases).

Influence of equipment cleaning and sanitizing procedures

Milking system cleanliness influences the total bulk milk bacteria count at least as much as any other factor (*16*). Milk residue left on equipment contact surfaces supports growth of a variety of microorganisms. Organisms considered to be natural inhabitants of the teat canal, apex, and skin generally do not grow significantly on soiled milk contact surfaces or during refrigerated storage of milk. Although organisms associated with contagious mastitis (e.g., *S. agalactiae*) generally do not reproduce well at refrigeration temperatures, some microbes associated with environmental mastitis (e.g., coliforms) may be able to grow to significant numbers. In general, environmental contaminants (i.e., from bedding, manure, feeds) are more likely to grow on soiled equipment surfaces than are organisms associated with mastitis infections. The farm water supply also can be a source of microorganisms (especially psychrotrophs) that can seed soiled equipment and/or the milk (*4*).

Cleaning and sanitizing procedures that leave residual soil on equipment can dramatically increase the numbers and influence the types of microbes that grow on milk contact surfaces. For example, heat resistant and/or thermoduric bacteria can persist in low numbers on equipment surfaces that are routinely cleaned with hot water. If

milk residue is also left behind (i.e., milk stone) these heat resistant organisms may reproduce and persist in the milking system. High numbers of thermoduric organisms are also associated with the use of old, cracked rubber parts. In general, conditions favorable for the reproduction of these organisms must persist for several days or weeks before these microbes can increase to numbers that significantly influence bulk tank counts (*21*). Thus, attention to detail in equipment maintenance and to cleaning and sanitizing procedures will help to control numbers of thermodurics in milking systems. The presence of thermoduric organisms is detected by increases in LPCs.

Ineffective cleaning, insufficient hot water temperatures, and/or the absence of sanitizers tends to select for faster growing, less heat-resistant organisms, principally Gram-negative rods (coliforms and Pseudomonads) and lactic streptococci. The presence of these organisms can result in high PICs and, in some cases, elevated LPCs. Effective use of chlorine or iodine sanitizers has been associated with reduced levels of psychrotrophic bacteria that cause high PICs (*10*). Psychrotrophic bacteria tend to be present in higher count milk and are often associated with occasional neglect of proper cleaning or sanitizing procedures (*16, 21*) and/or poorly cleaned refrigerated bulk tanks (*13, 20*).

Milk storage temperature and time

Milk storage at refrigeration temperatures will reduce the rate at which nearly all bacteria increase in numbers. Psychrotrophic microorganisms will continue to reproduce under refrigeration conditions, and the relative changes in bacterial numbers can dramatically affect the microbial ecology of the raw milk. To illustrate, although milk produced under near-ideal conditions may have an initial psychrotroph population of less than 10% of the total bulk tank count, psychrotrophic bacteria can become the dominant microflora after 2 to 3 days at 4.4°C (40°F) (*7*). The longer raw milk is held before processing (legally, up to 5 days), the greater the chance that psychrotrophs will increase in numbers during the storage period. Milk stored at the PMO legal limit of 7.2°C (45°F) will experience greater increases in bacterial numbers than the same milk held below 4.4°C (40°F).

When milk is held at temperatures above the legal limit of 7.2°C (45°F), bacteria other than psychrotrophs are able to grow rapidly and can become predominant in raw milk. Streptococci have historically been associated with poor cooling of milk, appearing as pairs or chains of cocci (spherical bacteria) on microscopic examination of milk smears (*1*). These bacteria will increase the acidity of milk. Certain strains are also responsible for a "malty defect" that is easily detected by its distinct odor. Storage temperatures greater than 15°C (60°F) tend to select for these types of contaminants (*7*). The types of bacteria that grow and become significant will depend on the initial microflora of the milk (*4*).

SUMMARY

As bacteria can enter milk production systems from multiple and various sources, determining the cause of high bacterial numbers is not always straightforward. High bacteria counts can result from a combination of factors (e.g., dirty equipment, cracked rubber hoses and inflations, mastitic cows, and marginal cooling). In addition to the SPC, a number of testing procedures may be used to evaluate the quality of raw milk, including the LPC, PIC and the coliform count. These tests generally select for bacteria that occur as contaminants that are not considered to be the natural flora of the cow. Table 2 describes the application of these bacterial tests for trouble-shooting sources of high bacterial counts in bulk tank milk.

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Hepatitis A Virus Control in Strawberry Products

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SUMMARY

Model experiments were performed to determine the effectiveness of certain processing steps against hepatitis A virus (HAV) that might be present on strawberries and in strawberry products. Washing experimentally contaminated strawberries with 2 ppm ClO_2 solution reduced measurable HAV levels by less than 70%. Heating a "4+1" strawberry concentrate at 72°C for 30 s reduced the measurable HAV level by 99.98%. If these findings were to be applied in a HACCP plan, the thermal process could well serve as a CCP_e (a process that eliminates the hazard). Designation of ClO_2 disinfection as a CCP_r (a process that reduces the hazard) depends on a subjective decision as to whether a 67% reduction is adequate and on the accuracy of measurement active ClO_2 levels in the wash water.

This article has been peer reviewed by two professionals.

INTRODUCTION

Hepatitis A ranked ninth, in terms of numbers of foodborne illnesses reported in the US, for the period 1993-1997, the most recent compilation issued by the Centers for Disease Control and Prevention (*9*). A more recent review from the CDC estimates that 4,170 foodborne cases of hepatitis A occur in the United States annually (*7*). In 1997, over 200 people, mainly school children, contracted hepatitis A from frozen strawberries distributed through the US Department of Agriculture School Lunch Program (*4*). The source or manner of contamination of the strawberries could not be determined. Considering that there had been two earlier frozen strawberry-associated outbreaks, which had claimed fewer victims (*2, 8*), this clearly was not a totally isolated event. The hepatitis A virus (HAV) infects only humans and is shed only in feces (*1*), so these outbreaks indicate that fecal contamination had occurred somehow. Until means of preventing such contamination are in place, the alternative prevention strategy is to try to identify Critical Control Points to deal with the problem during processing.

Model experiments were performed to determine the effectiveness of certain processing steps against (HAVs) that might be present on strawberries and in strawberry products. Experiments were done on a laboratory scale, because safety considerations do not permit taking the virus to commercial establishments or to growing sites. The study was done in three phases: (1) validating recovery methods for HAV in raw strawberries; (2) determining "removal" of HAV from strawberries by ClO_2 wash; and (3) evaluating a heat treatment of strawberry product for HAV inactivation. Unless stated otherwise, each experiment was performed just once.

MATERIALS AND METHODS

Recovery methods for HAV in raw strawberries

Strawberries purchased at a local grocery were allowed to ripen, and the green "caps" were carefully removed. By means of a sterile "scoopula," an incision was made near the cap scar to resemble a wound that might be made by a sharp thumbnail when the cap was removed in the field. This wound was inoculated with 0.1 ml of a suspension of HAV, strain HM-175 (provided by Dr. S. M. Lemon of the University of North Carolina), containing 10^4 plaque-forming units (PFU). The virus had been produced in our laboratory in the FRhK-4

TABLE 1. ClO_2 vs hepatitis A virus in/on experimentally contaminated strawberries, Runs 2 & 3

ClO_2 level (mg/l)	Contact time (s)	Neutralized immediately		Drained 5 min	
		Run 2	Run 3	Run 2	Run 3
0	0	650 (0%)[1]	520 (0%)	-	-
	30	600 (-8%)	450 (-14%)	-	-
2	15	670 (-0%)	300 (-42%)	550 (-15%)	290 (-44%)
	30	480 (-26%)	180 (-65%)	470 (-28%)	160 (-69%)
4	15	320 (-51%)	100 (-81%)	290 (-55%)	110 (-79%)
	30	170 (-74%)	120 (-77%)	160 (-75%)	100 (-81%)

[1]Plaque-forming units of surviving virus (% reduction from 0-time, 0-ppm control level)

fetal rhesus monkey (*Macaca mulatta*) kidney cell line (obtained from Dr. Theresa Cromeans, CDC, Atlanta); virus levels were measured by the plaque technique in this same cell line (*3*). Briefly, 10-fold dilutions of the sample in Dulbecco's phosphate-buffered saline plus 2% fetal bovine serum were inoculated into duplicate 25-cm^2 monolayer cell cultures in screw-cap plastic flasks from which the maintenance medium had been discarded. After 1 h of continuous rocking at 37°C, the cultures were overlaid with 10 ml of agar-solidified maintenance medium and incubated cell-side-up for 16 days at 37°C. The agar medium was dislodged with formalin solution, and the remaining cells were stained with crystal violet solution. Colorless areas, from which cells were absent as a result of localized virus infection, were recorded as plaques. A point estimate of the number of plaque-forming units per milliliter in the original sample was calculated as a weighted average of plaque numbers recorded from flasks that had fewer than 30.

The inoculated strawberry was placed in a Whirl-Pak No. B01318 (Nasco, Modesto, CA) bag with 10 ml of sterile, distilled deionized water and processed at "normal" speed in a Stomacher lab blender No. 80 (Seward Medical Ltd., Great Suffolk, UK) for 1 min. Filtered fluid from the bag was centrifuged at 2,000 × *g* for 20 min, and the supernatant fluid was concentrated by adsorption onto a 47-mm 1MDS filter, elution with 10 ml of urea arginine phosphate buffer (UAPB), precipitation with 0.2 ml of 1 M $MgCl_2$, and resuspension in 1 ml McIlvaine's buffer, pH 5 (*5*). HAV was quantified by the plaque technique in FRhK-4 cell cultures. Efficiency of recovery was determined for: (1) whole strawberry inoculated as described; (2) the top portion of a strawberry so inoculated; (3) the remainder (except top) of a strawberry so inoculated; and (4) the same volume of sterile, distilled deionized water, with no srawberry.

Removal of HAV from strawberries by ClO_2 wash

Strawberries commercially harvested for processing were inoculated with HAV in an experimental wound as already described. Berries were immersed in 100 ml of 0, 2, and 4 mg/l ClO_2 that had been generated by an apparatus lent to us by Shepard Brothers, La Habra, CA; levels of ClO_2 were measured according to their directions. The berries were removed after 15 or 30 s of immersion at room temperature, and one set was immediately immersed in 0.03 M $Na_2S_2O_3$ solution (*11*) to neutralize the ClO_2, whereas the remaining berries were drained for 5 min on a sterile sieve and then immersed in 0.03 M $Na_2S_2O_3$. This modeled washing at a processing facility, in which strawberries arriving at the plant were washed 5 min in 2 mg/l ClO_2 and drained 5 min on a wire conveyor before proceeding to further processing. Each sample comprised a single strawberry.

Experiments were also done with water containing 0, 2, and 4 mg/l ClO_2, to determine whether HAV that had been washed off the berries would be inactivated before it could be deposited on other berries. Water used in these experiments included Davis, CA, tap water (which is well water distributed without disinfection), water from a strawberry processing facility's supply, and water from the same facility after it had been used to wash straw-

TABLE 2. ClO_2 vs HAV in autoclaved Davis, CA, tap water — control (untreated) suspension had 7,600 PFU/ml

Exposure (min)	ClO_2 level (mg/l)	
	2	4
15	300 (-96%)[1]	55 (-99%)
30	230 (-97%)	35 (-99.5%)

[1]Plaque-forming units of surviving virus (% reduction from control level)

berries for 2 h (at which point it had a good deal of suspended material in it and was strongly colored with strawberry pigment). Water samples *(11)* with 0, 2, & 4 mg/l ClO_2 were inoculated with HAV at 10^4 PFU/ml; 1 ml samples were taken at 0, 15, and 30 min and assayed by the plaque technique.

Inactivation of HAV by heat treatment in strawberry product

Strawberry puree ("4+1"; 4 parts strawberries plus 1 part sugar by weight), provided by a processor, was inoculated (1 ml in 100 g) with HAV at an estimated final level of 10^4 PFU/g. The pH of the product as received was 3.8; this was adjusted with 1N citric acid or 1N sodium phosphate to 3, 3.5, and 4. The product was dispensed (0.1 ml/tube) into polypropylene microcentrifuge tubes No. 1405-0099 (Scientific Plastics) and placed in a ProGene thermal cycler No. 63740-6 (Techne [Cambridge] Ltd., Dukford, UK). Temperatures of 71.7°C and 90.6°C were tested; after the product had reached the specified temperature, tubes were removed at 0, 15, 30, and 60 s and chilled as rapidly as possible in ice water. The temperatures in the microcentrifuge tubes were monitored by a thermocouple in a tube with uninoculated product; it took 3 min to reach 71.7°C and 5 min to reach 90.6°C. Contents of five replicate tubes (a total of 0.5 ml) were pooled to provide a single sample and assayed by the plaque technique.

RESULTS

Recovery of HAV from strawberries

Compared with the "no strawberry" control, 80% of the HAV inoculated onto/into the whole strawberry was recovered in this preliminary trial. Because recovery from half berries was highly variable, these were not studied further. It was later observed that strawberries bought at retail did not really ripen to resemble the fruit picked for commercial processing.

Removal of HAV from berries by ClO_2

In Run 1, berries were sampled only after 30 s. Reduction of HAV at 2 mg/l ClO_2 was slight and may have resulted from removal of virus during draining. The reduction was probably not due to disinfection by ClO_2, which was substantially more effective at 4 mg/l than at 2 mg/l, (91% and 84% reductions, respectively).

In Runs 2 and 3, berries were sampled after 15 and 30 s and then after 5 min of draining (Table 1). Contact time, ClO_2 level, and draining all appeared to enhance HAV removal, but the greatest removals were only 75% and 81% in Run 2 and Run 3, respectively.

Inactivation of HAV by ClO_2 in water

The results indicated that ClO_2 had a significant antiviral effect against HAV inoculated on strawberries, but a significant amount of the virus was still infectious after the "disinfection" treatment. To determine the persistence of the virus in water, we first reacted HAV with ClO_2 in autoclaved Davis tap water, to give a baseline set of inactivation data (Table 2).

A similar experiment was done with water from the strawberry processing plant. Some of the water was freshly drawn (unused), whereas another sample was obtained after the water had been extensively reused to wash strawberries arriving from the field. ClO_2 for this experiment was generated by a more complex procedure than had been used in the other experiments (*6*), in the hope of obtaining more predictable levels of the disinfectant. The ClO_2 levels were measured in "demand-free" water, and equal quantities of ClO_2 were then added to the wash water samples. Inactivations at 2 mg/l were considerably less in this trial than in that involving Davis tap water (Table 3), but contact times in this experiment were 15 and 30 s, whereas times with the tap water were 15 and 30 min. It is also possible that the active level of ClO_2 was less than intended; this could not be measured directly.

Thermal inactivation of HAV in strawberry puree

The pH of the product appeared to exert very little effect on the heat inactivation of HAV (Table 4). It was reasonable to expect that no HAV infectivity would be detected in the 90.6°C samples, in that 60 seconds at 71.7°C had inactivated all the virus, and the higher-temperature samples had spent an additional 2 min reaching 90.6°C before timing of the process began. The starting

TABLE 3. Effect of ClO_2 on HAV in strawberry wash water

Wash water	Control	2 mg/l		4 mg/l	
		15 s	30 s	15 s	30 s
Unused	$1.3 \times 10^{4.1}$	1.1×10^4 (-15%)	1.0×10^3 (-82%)	4.5×10^2 (-96%)	1.7×10^2 (-99%)
Used	1.5×10^4	1.2×10^4 (-20%)	1.0×10^4 (-67%)	1.1×10^3 (-93%)	1.9×10^2 (-99%)

[1]Level of HAV, in plaque-forming units per milliliter (% reduction from control level)

TABLE 4. Recovery of hepatitis A virus after heating in "4+1" strawberry product, as plaque-forming units per gram

Temperature, °C	Time (s)	pH			
		3.0	3.5	3.8[1]	4.0
4	–			2.7×10^4	
71.7	15	39	33	41 (-99.8%)	40
	30	6	4	6 (-99.98%)	6
	60	ND[2]	ND	ND (>-99.996%)	ND
90.6	15	ND	ND	ND	ND
	30	ND	ND	ND	ND
	60	ND	ND	ND	ND

[1]Product as received (no pH modification)

[2]No plaque-forming units were detected

levels of HAV in these experiments were higher than would be expected in the event of accidental contamination of the product. If our laboratory model experiments are reasonably representative of this pasteurization process, there is a considerable margin of HAV safety in it.

DISCUSSION

On the basis of recorded outbreaks, hepatitis A is a hazard associated with frozen strawberry products. The risk (defined as probability of occurrence) is small but not negligible. Furthermore, how the strawberries became contaminated in previous outbreaks is undetermined, so preventing contamination is not yet a viable means of eliminating risk.

The present study was intended to evaluate certain processing steps as critical control points (CCPs) for strawberry products. It should be recognized that the HAV used was a

laboratory strain and that measurements by the plaque technique in cell culture are not the same as feeding the treated product to a consumer. It is also true that the laboratory bench is not a food processing facility. Nevertheless, the results presented are, we believe, the best that could be achieved in the face of the attendant technical and safety constraints. They are the best available bases for whatever decisions need to be made, and they are likely to remain so for quite some time.

Strawberries received at the plant are washed on arrival with water intended to contain 2 mg/l of ClO_2. This treatment significantly reduced the level of HAV, though never by more than 70%, in three experiments. We had difficulty in determining the level of ClO_2 accurately, and we assume that the same problem occurs at the processing plant.

ClO_2 at 2 ppm was more effective against HAV in Davis tap water than in the processing plant water during 15 and 30 min exposures (far longer than the contact times in strawberry processing). Its effectiveness was less with 15 and 30 s contact times in unused wash water from the plant, and even less in used wash water that contained considerable amounts of soil and strawberry juice. This shows that although ClO_2 can inactivate HAV with long contact times in clean water, it is less effective under what are supposed to be "real world" conditions.

The heat treatments applied to the "4+1" product she had little influence on the antiviral effect of the heat treatment.

If these findings were to be applied in the context of a HACCP plan, one would consider each of the modeled processes a potential critical control point. One definition of CCP (*10*) is "A point, step, or procedure at which control can be applied and a food safety hazard can be prevented, eliminated, or reduced to acceptable levels." As already stated, there is no known CCP for *preventing* the HAV hazard. The heat treatment can probably be regarded as a "CCP_e" (CCP that eliminates the hazard), but washing the incoming strawberries with 2 mg/l ClO_2 is at best a "CCP_r" (CCP that reduces the hazard). It is also important to note that temperature can be measured reliably, whereas measurement of ClO_2 levels is problematic, and accurate measurement is essential in the establishing of critical limits at a chosen CCP.

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ATP Bioluminescence: A Rapid Indicator for Environmental Hygiene and Microbial Quality of Meats

Jinru Chen

SUMMARY

To verify SSOPs and HACCP programs, detect generic *E. coli,* and monitor *Salmonella* in slaughterhouses and meat or poultry processing plants, real time on-line tests are needed. The ATP bioluminescence assay is a rapid method that uses firefly luciferase and its substrate, luciferin, to measure cellular ATP quantitatively. Because the level of ATP in a system reflects the number of metabolically active cells, the ATP assay can be used for rapid assessment of environmental hygiene, product quality, and HACCP management. Compared with traditional microbiological tests, the ATP bioluminescence assay has certain advantages and is suitable for real time on-line testing. Some of the limitations associated with the assay may be overcome through additional research.

ATP AND ATP BIOLUMINESCENCE

ATP is a nucleotide containing three basic subunits: adenine, ribose, and a triphosphate. The two-phosphanhydride bonds in the triphosphate part make ATP an energy-rich molecule. However, the energy associated with ATP cannot be stored; in water, ATP is converted, soon after its formation, to adenosine diphosphate (ADP) and adenosine monophosphate (AMP), with subsequent release of energy *(24)*.

One way to measure the level of ATP is by use of luciferase, an enzyme catalyzing light emission. The most extensively studied and commonly used luciferase is from *photinus pyralis*, a common firefly of North America *(8)*. The enzyme is a bisubunit protein with a molecular weight of 62 KDa *(8)*.

The firefly bioluminescence assay is an energy-consuming process in which, as in many biochemical reactions, ATP provides the energy. In addition to requiring ATP, firefly luciferase needs luciferin, molecular oxygen, and magnesium. In the initial step, an adenyl group is transferred from ATP to the carboxyl group of luciferin to form luciferyl adenylate, with elimination of inorganic pyrophosphate (Reaction 1). The luciferase-AMP complex subsequently reacts with molecular oxygen to yield light (Reaction 2) *(15)*. The peak emission of firefly bioluminescence is at 560nm, with emission wavelengths ranging from 560 to 630nm *(15)*.

Reaction 1:

$$E + LH_2 + ATP + Mg \Rightarrow E \cdot LH_2\text{-}AMP + ppi$$

Reaction 2:

$$E \cdot LH_2\text{-}AMP + O_2 \Rightarrow \text{Oxyluciferin} + CO_2 + AMP + \text{light}$$

E represents the enzyme, lu-

ciferase; LH_2 represents the luciferase substrate, luciferin.

ATP AS AN INDICATION OF MICROBIAL CONTAMINATION

Generated during cell metabolism, ATP is synthesized in cells and disappears within about 2 hours after cell death *(14)*. Therefore, the presence of cellular ATP is an indication of cell viability. In the firefly bioluminescence assay, the amount of ATP consumed is proportional to the amount of light generated *(13)*. Because the level of ATP in certain cells is fairly constant, i.e., 10^{-18} to 10^{-17} mole/bacterial cell *(25)*, the amount of light generated in the reaction is proportional to the number of metabolically active cells in the assay system.

The ATP bioluminescence assay was developed in the 1960s for use in studies seeking life in outer space *(5)*. The technique was later adapted for detecting microorganisms in food *(18)*. Currently, ATP bioluminescence is widely used for the rapid assessment of processing conditions and microbial contamination of food. It has also found applications in monitoring environmental hygiene and critical control points (CCPs) in Hazard Analysis and Critical Control Points (HACCP) management.

The ATP bioluminescence assay involves four basic steps: sample collection by swabbing contaminated surfaces or rinsing samples; separation of microbial cells from foodstuff by use of filtration or centrifugation; extraction of microbial ATP with detergents; and light measurement by use of the luciferase-luciferin complex and a luminometer. The luciferase-luciferin complex and the other reagents needed for the assay are commercially available, and some of the systems have been evaluated *(7)*. Information on commercial ATP hygiene monitoring systems has been reviewed by Griffiths *(13)* and more recently by Chen *(6)*.

ASSAY TIME, DETECTION LIMIT, AND PORTABILITY

In contrast to traditional monitoring methods, the ATP bioluminescence assay is rapid, and test results can be obtained in minutes *(1, 3, 19, 20)*. This speed makes the ATP assay highly desirable for on-line monitoring. Making the assay more practical for use by the food industry, many portable models of luminometers that allow the assay to be performed conveniently on site are available.

The minimum numbers of cells detectable by the ATP bioluminescence assay are between 10^3 and 10^4 CFU/ml *(4, 22, 23)*. Although the test is relatively sensitive, this detection level may be insufficient when lower numbers of cells must be detected *(11)*. To reach the goal of a lower detection limit, researchers in the United Kingdom have modified the ATP bioluminescence assay by targeting cellular adenylate kinase and ADP instead of measuring the level of ATP directly *(21)*. Adenylate kinase, an enzyme present in virtually all living cells, catalyzes the following equilibrium reaction:

$$ATP + AMP \leftrightarrows 2ADP$$

By introducing purified ADP into the assay system, the reaction is driven in the direction of additional ATP generation. The enhanced level of ATP is then detected by the firefly bioluminescence assay. This modified ATP assay was reported to have a minimum detection level of 10^2 CFU/ml *(21, 22)*.

MEAT-RELATED APPLICATIONS

Hygiene monitoring

Under the regulations on pathogen reduction and HACCP systems, established by the Food Safety and Inspection Service (FSIS) *(10)*, all plants in the United States that process meat and poultry are required to establish plant-specific Sanitation Standard Operating Procedures (SSOPs). Strictly speaking, the development and implementation of plant-specific or process-specific SSOPs and HACCP are only the preliminary steps. To verify the adequacy and effectiveness of the programs, direct observation or testing is required. Routinely, on-line monitoring is done through measurement of physical or chemical parameters such as temperature and time of treatment or product pH *(13)*. Although these parameters can give an indication of operating conditions and product quality, they do not indicate the level of microbial contamination. To obtain valid information, microbiological tests are sometimes needed. However, standard microbiological methods may not be suitable because of the time required for test results to become available.

The ATP bioluminescence assay has been proven to be a useful tool for monitoring environmental hygiene. When it was used to evaluate the effectiveness of cleaning and sanitizing of meat slicers, a strong correlation was observed between results achieved by use of the ATP bioluminescence assay and results with conventional swabbing techniques *(17)*. The ATP assay gave a better indication of cleanliness because it was capable of detecting meat residues on slicers that had not been cleaned properly. The ATP bioluminescence assay was also compared with plate counts in evaluating the possible transfer of *E. coli* O157:H7 from contaminated ground beef to grinding equipment *(9)*, the inactivation of bacterial cells during cleaning and sanitizing treatments *(9)*, and the effectiveness of disinfection of cutting boards in a microwave oven *(16)*. There was about 30% disagreement between the ATP assay and standard plate counts *(13)*, usually caused by the presence of food residues on examined areas or nonvegetative microbial cells and/or injured microorganisms in tested samples *(13)*.

Product quality

ATP bioluminescence has been used in assessing microbial quality of animal carcasses, including poultry, pork, and beef. Microorganisms were washed off meat surfaces with a rinsing fluid *(2)*. Somatic cells in

the rinsing waters were lysed with a detergent. The lysate was filtered twice, first through a rough filter to remove animal tissues and then through a fine membrane that retained microbial cells. Microbial ATP was subsequently extracted and measured. The assay took 15 min and could detect 10^3 CFU/g of poultry meat. The ATP assay developed by Siragusa et al. *(19, 20)* detected microbial ATP specifically. A 500-cm^2 area of beef or 50-cm^2 area of pork carcasses, respectively, were swabbed with a sponge that was ATP free and moistened with somatic-cell lysing agent. After the nonmicrobial ATP was extracted and removed, the microbial ATP was isolated and assayed. The procedure, which was completed in 5 min, had a detection level of 10^2-10^3 CFU/cm^2 of carcasses. Smaller areas of beef carcasses (5 cm^2) were sampled by Bautista et al. *(3)*. Microbial cells were separated from the rinsing fluid by filtration. The ATP from 10^4 CFU/cm^2 was detected with this procedure.

HACCP

Monitoring and record keeping are two important steps in HACCP management, which provides information on whether potential hazards are under control and whether corrective actions are necessary. The ATP bioluminescence assay has been evaluated as a rapid test for monitoring CCPs in poultry processing plants *(3)*. Samples were collected from various CCPs in poultry processing plants by swabbing chicken carcasses. ATP extracted from the chicken rinsing waters was assayed by use of the luciferase-luciferin complex. The test took 2 min to complete. ATP levels on chicken carcasses increased after evisceration but decreased to low levels after the pre-chill and chill treatments. The microbial quality of poultry processing waters was also monitored by the ATP bioluminescence assay. A 15-min procedure developed by Griffiths' group in Canada has provided an on-line monitoring test that allows water usage in poultry processing plants to be minimized *(1)*.

Pathogen detection

A regulation of the FSIS requires slaughterhouses and meat or poultry processing plants to test for generic *E. coli*, monitor *Salmonella*, and maintain detailed records of safety inspection *(10)*. Most official protocols for detecting foodborne pathogens are based on standard microbiological methods, for which relatively long times are required. Sometimes products are already on the shelf when test results become available. The speed of ATP assays can circumvent this possibility. Unfortunately, the low specificity of the assay prevents it from being used directly as a rapid method to detect specific pathogens in food. However, combined with techniques such as immunomagnetic separation or bacteriophage lysis, ATP bioluminescence assays can be used for detecting specific pathogens such as *E. coli* and/or *Salmonella* spp.

LIMITATIONS

The major drawback of ATP bioluminescence is its sensitivity to various environmental factors. Because it uses an enzyme, the ATP assay is sensitive to pH and temperature. Industry cleaners or sanitizers can either enhance or quench the bioluminescence signal, causing false positive or false negative results *(26)*. Commercial sanitizers containing lactic acid, trisodium phosphate, hydrogen peroxide, or trichlosan have been shown to affect light measurement negatively when the sanitizers come into contact with the ATP assay reagents *(12)*. False positive results can also be caused by ATP of nonmicrobial sources. However, this problem can be overcome by using different extractants in a two-step lysis to extract ATP selectively from either microbial or somatic cells *(13)*. Somatic ATP is extracted first and subsequently removed by a filter device; the ATP from the microbial cells retained in the device is subsequently extracted and assayed *(19, 20)*.

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Diversifed Foods & Seas., Metairie

Maryland

Barbara S. Bennett
I.M.I.C., Brookeville

Mark W. LaVorgna
Perdue Farms, Inc., Salisbury

Massachusetts

Caroline E. Cronin
BJ's Wholesale Club, Bellingham

Henry Morgan
Shaw's Supermarkets, Inc.
East Bridgewater

Michigan

Teresa J. Breckt
MI Dept. of Agriculture, Shepherd

Amy B. Brown
MI Dept. of Agriculture, Belding

Diane Miller
Cherry Central, Inc., Traverse City

J. D. Park
MI Dept. of Agriculture, Lansing

Anna Marie Rodriguez
Earthgrains, Grand Rapids

Minnesota

Mary O'Flaherty
Experior Assessments, St. Paul

Sharon Stewart
Univ. of Minnesota-Crookston
Crookston

Jeffrey Varcoe
University of Minnesota, St. Paul

C. Zook
University of Minnesota, St. Paul

Missouri

Lesly J. Forsberg
Kansas City Health Dept.
Kansas City

Michael C. Hershley
Kansas City Health Dept.
Kansas City

Chuck Jolley
Sosland Publishing, Kansas City

Nebraska

Mauricio Castelo
USDA-ARS-MARC, Clay Center

Divya Jaroni
University of Nebraska-Lincoln
Lincoln

Jason E. Mann
University of Nebraska-Lincoln
Lincoln

Marcos X. Sanchez
University of Nebraska-Lincoln
Lincoln

Jayne E. Stratton
University of Nebraska-Lincoln
Lincoln

New Jersey

Michael E. Hollander
Hollander Horizon, Princeton

New York

Gregory P. Fingar
Patco Management, Liverpool

Pennsylvania

David N. Calvin
H. J. Heinz Co., Pittsburgh

Oscar J. Clouthier
Better Baked Foods, Inc.
Northeast

Bob Colvin
Silliker Laboratories Group
Sinking Spring

Tennessee

Hanna L. Potter
Gate Gourmet, Germantown

Willie Taylor
Univ. of Tennessee, Knoxville

Texas

Amanda Ballard
Dairy Farmers of America,
Sulphur Springs

Elizabeth Duffy
Texas A & M Univ., College Station

New Sustaining Members

Trevor R. Hopkins
Applied Research Institute
Newtown, CT

Siri Mathiesen
Genpoint AS
Oslo, Norway

UpDates

Copesan Announces Two New Strategic Account Managers

Copesan is pleased to announce that Steve Romero and Bernie Cox have been appointed to the positions of strategic account managers. In this role, Steve assumes responsibility for the West Coast, based in San Antonio, TX and Bernie assumes responsibility for the Midwest, based in St. Louis, MO. Steve is an AIB certified quality control sanitarian and has been in the pest management industry for ten years. Bernie is licensed and state certified in Maryland, Texas, Florida, Alabama, and Mississippi and offers 21 years of experience in the pest management industry.

Quality Chekd Dairies, Inc. Hires Steve Drabek as Director of Education and Training

Quality Chekd Dairies, Inc. has hired Steve Drabek as director of education and training. Drabek will replace Ed Cotner, who has served as director for seven years. Cotner, a 19-year veteran of Quality Chekd, will retire in March 2001.

As director of education and training, Drabek will develop and implement programs to ensure Quality Chekd Dairies continue to meet consumer needs.

Drabek also will be responsible for conducting Quality Chekd's "COW TECH" training institute, a premier dairy training program in the United States, offering Quality Chekd dairy management and their employees more than 100 classes each year.

Drabek began his career with Borden, and later joined Hillside Dairy in sales and marketing. In 1994 Drabek became director of distribution for Borden/Meadow Gold where he managed and restructured the entire distribution system for 66 centers covering 21 states. Drabek, a native of Columbus, OH, is a graduate of Ohio State University.

Bell Laboratories, Inc. Adds Corporate Recruiter-Trainer to Sales Team

Bell Laboratories has recently added the position of corporate recruiter and sales trainer to its sales team. Based out of Bell's headquarters in Madison, WI, Jamie Root has taken on this post, where he facilitates hiring and preparing new technical sales representatives for the field.

Previously based out of Atlanta, GA, Root worked for more than six years as a Bell technical sales representative for the Southeast. Bell has recently assigned two representatives instead of one to cover Root's former Southeast territory.

With his seasoned sales experience and technical knowledge, Root is well-qualified for his new position. "I have all the product knowledge," said Root. "And I know how to grow the business by selling and by building relationships with distributors and end-users," he added.

Root holds a bachelor's degree in marketing from University of Wisconsin at Eau Claire. He is a native of Argyle, WI.

Chr. Hansen Introduces Shannon Neuens

Chr. Hansen is pleased to introduce Shannon Neuens as the newest member of our team of dairy professionals. Shannon is the product manager for specialty products, and will be responsible for antibiotic test kits sales and service. Shannon will also assist in the market development of other specialty product lines.

Shannon has a M.S. in business administration from Cardinal Stritch University, Milwaukee, WI. Shannon has been a valued employee of Chr. Hansen for over five years, with his latest assignment as the special projects scientist. Shannon developed new culture concepts and systems for the North American Cheese and Grade A businesses.

Hueck Foils Announces Organizational Changes to Accomodate Market Growth

Hueck Foils President, George Thibeault, Jr., has added two new staff members and promoted two key executives in response to market growth.

Larry Snyder has been appointed director of manufacturing, and will assume responsibility for the production and operations at the Hueck Foils manufacturing facility in Columbia, SC. Snyder previously held managerial positions in production and development at Rexham Corporation.

Rosalyn White has been promoted to the position of quality assurance manager, and will be

responsible for production quality at the Hueck Foils manufacturing facility in Columbia, SC. White, previously responsible for quality control systems, joined Hueck Foils in 1997 at the initial start-up of the plant.

Mary Haigney has been promoted to the position of healthcare sales representative, Northeast Region. Haigney, an employee since the start up of US sales operations in 1990, most recently was responsible for customer service and logistics.

Paul Mangano has been appointed as healthcare sales executive, Eastern Region. Mangano, most recently employed by QPS, Virginia, offers extensive knowledge and industry background in the pharmaceutical and healthcare markets. He will be responsible for key accounts within the healthcare industry.

Carlisle Sanitary Maintenance Products Announces New Product Manager

Carlisle Sanitary Maintenance Products, a division of Carlisle FoodService Products, has announced Christine Marten as new product manager.

Marten brings to Carlisle Sanitary Maintenance Products 13 years experience in marketing, sales, and management in the floor covering industry. In her new position, Marten will be implementing the global marketing plan for Carlisle Sanitary Maintenance Products.

Marten has a bachelor's degree in marketing from University of Wisconsin.

Alfa Laval Flow Inc. Names New Materials Manager

Dan Ouimet, of Milwaukee, WI has accepted the position of materials manager at Alfa Laval Flow Inc.

Dan brings over 12 years of purchasing experience and product management to his new role. His responsibilities include managing the planning, material control and purchasing functions.

3-A Symbol Council Defines Recertification Program

The 3-A Sanitary Standards Symbol Administrative Council, in response to inquiries from equipment manufacturers, dairy processor-users of equipment and sanitarians has defined the process for granting Council authorization to apply the 3-A Symbol on re-built equipment.

Modified or re-built dairy equipment bearing the 3-A Symbol may not meet 3-A Sanitary Standards. If this equipment has been modified or re-built, the 3-A Symbol Council has no means of determining if all provisions of 3-A Standards have been met. Therefore, purchasers of used, modified or re-built equipment can only be assured that such standards have been complied with if the seller provides verification from the 3-A Symbol Council that an authorization has been granted to use the 3-A Symbol for the individual piece of equipment. Such authorization will be granted to the re-seller upon successful application for authorization to the 3-A Symbol Council. In the application, it must be demonstrated that the equipment has been modified, re-built or remanufactured to meet the applicable 3-A Standards. An application must be made for each piece of equipment covered, stating both model and serial numbers. If the requirements are not met, the 3-A Symbol is invalid and shall be removed from the equipment.

Further information about the 3-A Sanitary Standards Symbol Administrative Council and its programs that authorize use of the 3-A Symbol on equipment meeting 3-A Standards is available from the 3-A Sanitary Standards Symbol Administrative Council, 1500 Second Avenue S.E., Suite 209, Cedar Rapids, IA 52403; Phone: 319.286.9221; Fax: 319.286.9290; E-mail: aaasansb@ia.net, or visit the Council's Web site: zeus.ia.net/~aaasansb.

INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

NEWS

Surveillance of Infection with *Salmonella typhi* in Europe and the United States

In Europe, the main risk factor for infection with *Salmonella typhi* is travel, particularly to the Indian subcontinent. Similarly, while the levels of resistance to the antibiotics of choice (ciprofloxacin and third generation cephalosporins) are low, resistance can and does occur. Surveillance of salmonellosis, including antimicrobial resistance testing, is needed to monitor the evolution of antimicrobial resistance, and to provide clinicians, public health physicians, and policymakers with up-to-date information. The Enternet international *Salmonella* database for 1999, which includes data from all 15 countries of the European Union plus Switzerland, Australia and the Czech Republic, contains records of 127 to 278 human cases of salmonellosis, 461 (0.36%) of whom were infected with *Salmonella typhi*. Travel details were recorded for 198 of these cases – Indian subcontinent 114 cases (58%), Papua New Guinea 17 (9%), Indonesia 14 (7%) and Tunisia 13 (7%), other countries six cases or fewer. The results of antimicrobial resistance testing are available for 62 of the 461 cases. Eleven cases were resistant to four or fewer antimicrobials, one resistant to five, three to six, and two to seven. Fourteen were designated as fully sensitive, although nine of these were tested against six antimicrobials rather than the range of 11 monitored by Enternet. The remaining 31 isolates gave intermediate results to at least one of the antimicrobials tested.

Although the risk of acquiring typhoid fever in the United States and other developed countries remains low, drug resistance among *Salmonella typhi* is increasing. A cross sectional laboratory-based surveillance study reported in JAMA estimated the incidence of infections with antimicrobial-resistant *S. typhi* and identified risk factors for infection. The results suggest that ciprofloxacin and ceftriaxone are appropriate empirical treatment for suspected typhoid fever, but resistance may be anticipated. Continued monitoring of antimicrobial resistance among *S. typhi* strains will help determine vaccination and treatment policies. *S. typhi* isolates and epidemiological information from 293 people with symptomatic typhoid fever were submitted to US public health departments and laboratories from 1 June 1996 to 31 May 1997. Altogether, 228 patients were admitted to hospital for a mean duration of seven days, and two died. In the six weeks before becoming ill, 216 had travelled to India, Pakistan, Bangladesh, or Haiti. Fifty-three patients had acquired typhoid fever in the US. Seventy-four isolates of *S. typhi* were found to be resistant to one or more antimicrobial agents, 51 showed multi-drug resistance to ampicillin, chloramphenicol, and trimethoprimsulphisoxazole. Although the number of reported cases of typhoid fever in the US has remained fairly stable for 20 years the sources of infection and patterns of antimicrobial resistance have changed. The proportion of cases attributed to exposure on the Indian subcontinent increased from 25% in 1985 to

57% in the study reported. From 1985 to 1989, 0.6% of US strains were reportedly multi-drug resistant, compared with 17% in the study reported. Foreign-born US residents returning to their country of origin and children were identified as the two groups in need of vaccination. The high incidence of infection among travellers to the Indian subcontinent along with the increasing resistance in the strains that they acquire there indicate their particular need of vaccination before travel.

Outbreaks of VTEC O157 Infection Linked to Consumption of Unpasteurized Milk

Two recent outbreaks of Verocytotoxin producing *Escherichia coli* (VTEC) O157 infection in England provide further evidence of the hazard to human health posed by consumption of unpasteurized milk. One also shows how easily VTEC O157 may spread among small children. Guidelines for the control of VTEC O157 infection were published recently. Four people in northwest England became ill between 20 April and 13 May 2000 in the first outbreak, which was detected in late April. Three of the cases were adults who had drunk unpasteurized milk sold by a local farm. The fourth, a child, was not known to have done so, but unpasteurized milk from the same farm was consumed in the household. This case also had other risk factors including contact with pet animals that visited the farm. The outbreak strain was confirmed by the PHLS Laboratory of Enteric Pathogens (LEP) as *E. coli* O157 phage type (PT) 21/28 Verocytotoxin type (VT) 2 resistant to ampicillin, streptomycin, and sulphonamides. Pulsed field gel electrophoresis (PFGE) showed that all the human isolates were indistinguishable from each other and from strains of PT21/28 VT2 from the primary milk filter leading into the bulked milk tank. *E. coli* O157 PT21/28 VT2 with the same resistance type as the human and milk filter isolates was obtained from 64 of the 127 cattle sampled on the farm. The farmer immediately stopped selling unpasteurized milk voluntarily. A pasteurization order is currently in place. The second outbreak of two cases, was reported from southwest England in mid-May. The index case, a 5-year old child who was admitted to the hospital with haemolytic uraemic syndrome, had drunk unpasteurized milk on the family farm. The second case (who had diarrhea) was in the same class at school and the two are known to have held hands with each other. LEP confirmed the presence of *E. coli* O157 phage type 2 VT2 in the clinical specimens, a sample of raw milk, and isolates from dairy cattle on the farm. The strains were indistinguishable by PFGE. The PHLS is aware of four further outbreaks of VTEC O157 infection since April this year, and a recent outbreak affected a scout camp in Scotland.

USDA Launches Food Thermometer Education Campaign

The US Department of Agriculture (USDA) launched a national consumer education campaign to promote the use of food thermometers in the home. The campaign features a cartoon thermometer called Thermy that proclaims "It's Safe to Bite When the Temperature is Right."

"Consumers should use a food thermometer when cooking meat, poultry, and egg dishes," said Agriculture Secretary Dan Glickman. "Using a food thermometer is the best way to ensure that food has reached a temperature high enough to destroy harmful bacteria."

Most people think they know when food is done by trusting their experience or the color of meat. This can be misleading. One out of four hamburgers turns brown in the middle before it has reached a safe internal temperature, according to recent USDA research.

The new public education campaign includes a televised public service announcement and informational materials for consumers, educators, and health professionals. A number of grocery chains around the country including, Giant Food Inc. of Maryland, Tops, BI-LO, Stop and Shop, Giant Food Stores of Pennsylvania, Wegmans, Schnuck Markets, Spartan Foods, Big Y, Supervalu, Richfoods, Farm Fresh, Albertsons, Kings Super Markets, and the thermometer industry are also participating in this public effort.

ConAgra Refrigerated Prepared Foods Shares Food Safety Knowledge with Industry

As the food industry continues to improve its food safety practices to combat foodborne pathogens such as *Listeria monocytogenes*, sharing best practices between companies is proving to be an effective strategy. Industry leader ConAgra Refrigerated Prepared Foods (CRPF) recently hosted 87 representatives from other meat and food processing firms for a day-and-a-half work-shop on controlling *Listeria* in the plant environment. The workshop comes on the heels of a call by President Clinton for meat processors to conduct environmental and end-product testing for *Listeria*, and an industry survey that shows 90 percent of the industry already does so voluntarily.

"As an industry leader, we believe it is our responsibility to share our expertise with other companies. If we can help the entire industry do a better job in this area, we all benefit," said Tim Harris, president and chief operating officer, CRPF. "We have a moral obligation to provide the

safest possible food to the consumer. Beyond that, it is a prerequisite to doing business. We can't begin to think about profits until we are making safe products." Keith Brickey, vice president for quality assurance for the company said, "We began addressing *Listeria* in the plant environment in late 1980s. Our policy is to share what we learn with the USDA, other companies and consumer groups. In the process and at workshops such as this, we also learn from the experiences of others."

Speakers included Don DeLozier from the USDA's Food Safety Inspection Service (FSIS) who commented on additional proposed regulations for *Listeria* control. A proposed regulatory directive, currently in draft form, likely would expand the ready-to-eat product categories subject to sampling for pathogens and clarify the agency's role in sampling programs. Dr. Bruce Tompkin, CRPF vice president for product safety, provided a review of listeriosis trends and current research on the organism. According to the Centers for Disease Control data, the listeriosis incidence rate has declined in the US since the late 1980s and essentially has been flat for the last five years at about five cases per million people. University research is showing that not all strains of *Listeria monocytogenes* are equally pathogenic, with different strains causing illness in animals than in humans, for instance.

Dr. Tompkin outlined recommended strategies for controlling *Listeria* in the processing plant: Prevent establishment of the organism in niches or other sites that could lead to product contamination. Implement an environmental sampling program that can assess in a timely manner whether the plant environment is under control. Respond to any suspicious sampling results as rapidly and effectively as possible. Verify that the problem has been corrected. Provide regular, short- and longer-term assessments, such as weekly and quarterly reports, to identify chronic problem areas and trends.

Other CRPF quality assurance experts shared microbiological sample collection and testing techniques, effective cleaning methods for equipment, and equipment design tips to facilitate cleaning and preventing bacteria build-up. Hands-on problem-solving information came from Quality Assurance managers from four CRPF processing plants who shared their best practices for *Listeria* control in equipment sanitation and plant construction.

This is the second *Listeria* workshop offered for the industry by CRPF. In addition, all quality assurance personnel at the company's processing plants have received additional training to share the most current techniques for *Listeria* control.

National Seafood Industry Survey Report on HACCP Implementation Completed

Seventy-seven percent of the nearly 750 companies that responded to a recent survey of the US seafood industry reported that they would not have been able to comply with the US Food and Drug Administration's (FDA) new Seafood HACCP regulation without the in-depth training courses that were conducted across the country. This finding is part of a 65-page report on the costs, benefits and impacts of HACCP on the seafood industry compiled by New York Sea Grant Specialist Ken Gall with funding support from the National Seafood HACCP Alliance. The intent of the national survey was to document the time, effort, and resources that the seafood industry devoted to implementing the FDA HACCP regulation. It was also meant to identify potential changes or problems in the process as well as to plan for additional training activities that might be needed. Survey questionnaires were distributed to approximately 5,000 seafood businesses in November 1999 that had completed an Alliance training course. A total of 744 seafood businesses from 43 states and three territories responded to the survey. Over half of these firms were small businesses with fewer than 10 employees. Almost sixty percent were seafood wholesalers or distributors and 35 percent were seafood processors.

Eighty-eight percent of the responding firms indicated that employees from the firm developed their own HACCP plan, which averaged 68.7 hours to complete with a range from 0.5 to 1,200 hours. The report also documents the costs of HACCP implementation and the investments that seafood firms made in time, equipment and infrastructure to meet the requirements of the new regulation. Total costs averaged approximately $17,500 per firm for the smallest firms and over $93,000 for the largest firms in the first year. The report indicates that the overall impact of these expenditures was 7 to 10 times greater for the smallest firms as compared to the largest when reported costs were evaluated as a percentage of annual sales. The seafood industry identified cost as the major disadvantage to the HACCP system. Benefits included: better understanding and confidence in the safety of their products; improved employee cooperation; improvements in quality management; and greater efficiency in overall operations.

Florida Residents First to Try New Product — Irradiated Fresh Ground Beef Now Available at Retailers

Food Technology Service, Inc. (FTSI) and Colorado Boxed Beef Company (CBBC) announced that Florida consumers will be the first to try irradiated fresh ground beef, now available at independent retail grocers throughout Florida.

"We want to offer consumers the safest meat available, fresh or frozen," said Steve Saterbo, CBBC's senior vice president. "And because more than 80% of customers buy fresh ground beef, not frozen, it only makes sense to roll out the fresh product first."

The fresh irradiated ground beef is being sold under Colorado's New Generation label in 1- and 1.5-pound packages. The packaging will carry the international symbol for irradiation – the radura – green flower inside a broken circle, which is increasingly becoming recognized as a symbol for food safety.

Irradiation is a process similar to pasteurization which uses ionizing energy to eliminate bacteria in food, such as *E. coli*, *Listeria* and *Salmonella*. Each year, more than 76 million foodborne illnesses are reported, resulting in 5,000 deaths. "Irradiation has proven to eliminate foodborne pathogens and prevent foodborne illness. Now consumers have the option of purchasing irradiated products and putting the safest food available on their family's table," said Dr. Richard Hunter, Heath Officer, Florida Department of Public Health.

Six Florida-based retail supermarkets will begin offering consumers irradiated fresh ground beef. In the near future, according to Ellis, several national retail chains located in the east will begin stocking the New Generation brand. The commissary at the Naval Air Station in Orlando is also offering their consumers the choice of irradiated ground beef. "Consumers use irradiated products everyday and may not even realize it," according to Ellis. "Medical disposable supplies, cotton balls, contact solution, and feminine hygiene products are just a few of the products that are currently irradiated." Now, with the recent USDA approval of irradiated red meat, consumers can also have their fresh ground beef irradiated for an extra measure of safety.

Food Technology Service was the first dedicated commercial food irradiator in the nation and currently irradiates the food eaten in space by NASA astronauts. In addition, Food Technology Service conducts ongoing testing and irradiation for major meat and poultry processors.

Salmonella Infection from Terrarium in Sweden

When a family in southern Sweden moved their house in February 2000, they used an empty terrarium, usually occupied by two pythons, to keep their one-year old son out of the way of the removal men. A few days later the child developed gastroenteritis, as did his 17 year old uncle, who had reassembled the terrarium after the move. Neither of them developed invasive disease or had to be admitted to hospital. Fecal specimens from both yielded *Salmonella* subspecies 1. The rest of the family remained well. The snakes had been bought a few years earlier from a local pet shop. In 1997 three cases of *Salmonella* subspecies 1 infection were linked to snakes from the same shop. Snakes, lizards, and turtles have become an important source of human salmonellosis in recent years. Over 13% of cases of salmonellosis acquired in Sweden in 1996 (80 cases) were linked to such reptiles. The number of cases has decreased since then, thanks to recommendations provided to the public and pet shop owners by the agriculture ministry and the Swedish Institute for Infectious Disease Control, which were also taken up by the media. In 1999, 43 people were infected – 22 people by turtles, 12 by snakes, and nine by lizards. Most of the cases were children. The problem of reptile – associated salmonellosis has been recorded in Eurosurveillance Weekly before and the occurrence of invasive, sometimes fatal, cases in children has prompted the Centers for Disease Control and Prevention (CDC) to issue guidelines for its prevention.

FDA Advises Consumers about Fresh Produce Safety

The Food and Drug Administration (FDA) is advising consumers to be aware of safe handling and preparation practices for fresh fruits and vegetables. The Centers for Disease Control and Prevention (CDC) has reported that the occurrence of foodborne disease increases during the summer months for all foods, including fresh produce.

Foodborne illness can cause serious and sometimes fatal infections in young children, frail or elderly people, and others with weakened immune systems. Healthy persons with foodborne illness can experience fever, diarrhea, nausea, vomiting and abdominal pain.

Following are some steps that consumers can take to reduce the risk of foodborne illness from fresh produce:

- At the store, purchase produce that is not bruised or damaged. If buying fresh-

cut produce, be sure it is refrigerated or surrounded by ice.

- At home, chill and refrigerate foods. After purchase, put produce that needs refrigeration away promptly. (Fresh whole produce such as bananas and potatoes do not need refrigeration.) Fresh produce should be refrigerated within two hours of peeling or cutting. Leftover cut produce should be discarded if left at room temperature for more than two hours.
- Wash hands often. Hands should be washed with hot soapy water before and after handling fresh produce, or raw meat, poultry, or seafood, as well as after using the bathroom, changing diapers, or handling pets.
- Wash all fresh fruits and vegetables with cool tap water immediately before eating. Don't use soap or detergents. Scrub firm produce, such as melons and cucumbers, with a clean produce brush. Cut away any bruised or damaged areas before eating.
- Wash surfaces often. Cutting boards, dishes, utensils, and counter tops should be washed with hot soapy water and sanitized after coming in contact with fresh produce, or raw meat, poultry, or seafood. Sanitize after use with a solution of 1 teaspoon of chlorine bleach in 1 quart of water.
- Don't cross contaminate. Use clean cutting boards and utensils when handling fresh produce. If possible, use one clean cutting board for fresh produce and a separate one for raw meat, poultry, and seafood. During food preparation, wash cutting boards, utensils or dishes that have come into contact with fresh produce, raw meat, poultry, or seafood. Do not consume ice that has come in contact with fresh produce or other raw products.
- Use a cooler with ice or use ice gel packs when transporting or storing perishable food outdoors, including cut fresh fruits and vegetables. Following these steps will help reduce the risk of foodborne illness from fresh produce.

Congratulations

In June of 2000, the International Association for Food Protection was a supporter of the IFT-FMD Student/Professional Reception at the Institute of Food Technologists Annual Meeting in Dallas, Texas.

We are pleased to announce the following as the winner of our complimentary one-year Membership to IAFP.

Fatma Tesim Ekinci
Clemson University
Clemson, SC

We hope this new Member finds IAFP Membership rewarding.

The Membership Directory is available at

www.foodprotection.org

Members Only!!!

To access the Membership Directory, click on the "Member Directory" button on the IAFP home page and input your Member ID and password (your last name). The Directory is searchable by first or last name, company, city, state/province or country and any combination of the above categories. To send a colleague a message, just click on their E-mail address.

Go explore this new Member benefit!

Promega Corporation

GMO Screening Kit Provides Extra Reliability and Economy with Multiplex Nested PCR System

The Biosmart Allin1.0 GMO screening system resolves problems of false negative results due to PCR failure and inhibition with a multiplex nested PCR assay. PCR protocols provide the most reliable means for detecting the presence of genetically modified (GMO) material in many types of foods. However, the variability encountered in different food matrices may result in misleading results with some screening protocols due to unamplifiable DNA or PCR failure caused by the presence of inhibitors. The Allin 1.0 35S screening kit: Eliminates false negative results due to PCR failure with the use of internal controls; detects PCR failure by using corn and soy primers which demonstrate PCR success; and saves up to 45% over individual assays with simultaneous reactions.

The multiplex nested PCR Allin 1.0 screening assay simultaneousy detects the presence of the 35S promoter as well as zein (maize) and lectin (soya). A specific zein or lectin band confirms that PCR was successful and that the sample contains maize or soya. In addition, this screening kit provides internal controls, which improve accuracy by detecting PCR failures resulting from inhibitors. Color-coded tubes enable the user to keep materials organized and prevent errors caused by mix-ups.

This new system improves economy since three analyses take place simultaneously. Labor costs are saved as well as materials such as *taq* polymerase, pipette-tips and agarose. In addition, thermocyclers are used more efficiently allowing for a greater number of samples to be processed. Users may save up to 45 percent compared to individual analyses.

Promega Corp., Madison, WI

Reader Service No. 287

Stemi DV4 Stereomicroscope from Carl Zeiss

Carl Zeiss introduces a new Stemi DV 4 (Double Lens Vario with zoom factor of 4) high-performance, low-cost zoom stereomicroscope. The Stemi DV 4 with zoom factor of 4 is compact and extremely easy to use. Its excellent optics combined with a patented zoom system ensures brilliant, razor-sharp, high-contrast images throughout the 8× to 32× zoom range.

It comes equipped with transmitted and reflected light illumination. The unique, Model C Stand can use both illumination techniques individually, or combined at the touch of a button. Another button continuously controls brightness and intensity in either technique. This simplicity of handling will be appreciated in the laboratory and classroom, or by users in industrial assembly, testing and quality inspection departments.

The well-planned accessory interfaces make the Stemi DV 4 a basic unit for a highly expandable modular stereomicroscope system with its comprehensive range of stands, mounting brackets, stages and illuminators. This modular approach allows for a variety of configurations and applications.

Carl Zeiss, Inc., Thornwood, NY

Reader Service No. 288

Micromass Introduces MicrobeLynx™ System for Rapid Bacterial Identification

Micromass has introduced the MicrobeLynx™ System for rapid identification of intact bacteria.

The ability to rapidly identify bacterial contamination in products such as processed foods, toothpaste, cosmetics and drinking water – is crucial for consumer confidence. In an age when "food scares" hit the headlines with increasing regularity, today's microbiologists need new tools and technologies to stay ahead.

Micromass has leveraged its networked M@LDI™ mass analyzer

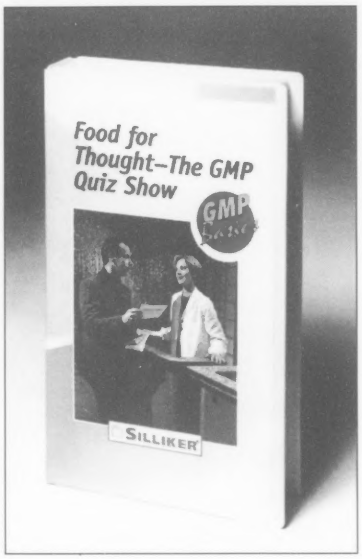
with novel MicrobeLynx™ bioinformatics technology to provide microbiologists with a powerful analytical system for the rapid speciation and typing of microorganisms. This automated bacterial "mass-fingerprinting" approach offers greater sensitivity, selectivity and speed of analysis compared with classical identification methods in medical microbiology, the food, water, pharmaceutical and biotechnology industries.

This method applies proven biopolymer mass spectrometry techniques (MALDI-TOF MS) to the analysis of intact bacteria. Thus allowing the unique population of macromolecules expressed on the surface of bacteria to be rapidly sampled and characterized by molecular weight. The resulting mass spectrum provides a unique fingerprint for the species tested. Bacterial mass-fingerprints of unknowns can be reliably matched in seconds against a database of quality controlled reference spectra... delivering a powerful new tool for real-time detection and subtyping of bacteria.

The MicrobeLynx™ System is exceptionally sensitive – requiring only a single small colony from primary culture for unambiguous identification. In addition, the System is highly selective and can readily discriminate between genetic transformants, antibiotic sensitive/resistant strains (e.g. MSSA and MRSA), strains with different plasmid profiles (e.g. *Bacillus anthracis),* vegetative, mother and spore cells of bacilli and can identify conventionally problematic microorganisms (e.g. *Porphyromonas* spp.*).* Offering exceptional speed and ease of use – characteristic bacterial mass-fingerprints are obtained in seconds with minimal operator training, minimizing per sample cost.

Micromass UK Limited, Manchester, England

Reader Service No. 289



Silliker Laboratories Group, Inc.

New Silliker Video Serves "Food For Thought"

Food For Thought – The GMP Quiz Show, the new employee training video from Silliker Laboratories, reviews GMP principles as three food plant workers compete on a fictional television quiz show.

From the first question to the final bonus round, the video covers a variety of GMP principles, including employee practices, proper work attire, cross-contamination, employee traffic patterns, microbial growth niches, temperature danger zones and more. Used alone or in conjunction wih other GMP training materials, the video is a cost-effective tool to train new hires or sharpen the knowledge of veteran workers.

As the contestants jockey to answer questions, trainees can join in the engaging battle of wits and identify real-life GMP violations Employees can test their knowledge through a reproducible quiz contained in the video's free training guide that corresponds to a special review section at the conclusion of the video.

"Food For Thought – The GMP Quiz Show" is the fourth installment in Silliker Laboratories' popular GMP training series.

Silliker Laboratories Group, Inc., Homewood, IL

Reader Service No. 290

Parallux™ System Receives AOAC-RI Approval

The Parallux system has received the Performance Tested Methods Certification from the AOAC Research Institute for six new antibiotic residue tests for milk. This new technology offers milk processors a faster, more automated way to screen for antibiotic residues with unprecedented speed and accuracy.

The following six assays have been approved: Parallux™ Beta Lactam Assay; Parallux™ Pen*/Ceph 2X Assay; Parallux™ Cillins Assay; Parallux™ Cephapirin Assay; Parallux™ Cetiofur Assay; and Parallux™ Cloxacillin Assay.

These assays demonstrate the power and flexibility of the Parallux™ system to meet both milk industry and FDA requirements. The Parallux™ Beta Lactam Assay is the only rapid residue test that can detect all six Beta Lactam antibiotic residues at the US-FDA tolerance/safe levels in one test.

Moreover, Parallux™ allows detection closer to the US-FDA tolerance/safe levels. This will provide milk processors a means to better protect milk supplies without having to reject milk that is deemed safe for human consumption. The system can also determine which drug or drug family is in the milk, assisting in traceback of positive samples.

Please note: The Parallux™ system is in the process of FDA and NCIMS approval and currently may not be used for NCIMS Appendix N official screening in the United States.

IDEXX Laboratories, Inc., Westbrook, ME

Reader Service No. 291

Detection of Microbial Genes with Sequence Capture — PCR Method

Magnetic capture of sequence specific DNA will improve the sensitivity of PCR methods for the detection of bacterial or viral DNA in clinical samples. A 10-to 100-fold increase in sensitivity has been demonstrated using Dynabeads® M-280 Streptavidin to capture oligonucleotides prior to PCR. Dynabeads® M-280 Streptavidin are superparamagnetic microspheres with streptavidin molecules bound to their surface.

Briefly, biotinylated capture oligonucleotides are added to crude extracts of tissues or cells. After hybridization between the target sequence and the capture fragment, Dynabeads® M-280 Streptavidin is added for magnetic separation. The hybridized fragment binds to the Dynabeads® M-280 Streptavidin and is isolated by placing the sample in a magnetic tube holder (Dynal® MPC). Subsequently, all irrelevant DNA and potential PCR inhibitors can be removed from the sample prior to PCR amplification. The method has been shown to detect as little as one genome of Mycobacterial bacterial DNA in 750mg of total DNA (Manglapan, G., et al. JCM, May 1996).

Dynabeads® Products can also be used to isolate microorganisms from samples. ImmunoMagnetic Separation (IMS) can be used to rapidly concentrate target organisms prior to lysis and hybridization and to enrich the target organism in the small volumes usually required for PCR analysis. Dynabeads® Products can be easily coated with antibodies specific to your target organism. Dynabeads® Products are also available precoated with antibodies to *Salmonella, Listeria,* and *E. coli* O157.

Dynal, Inc., Lake Success, NY

Reader Service No. 292

Improvements in BBL™ Sterile Pack Prepared Plated Media Raise the Industry Standard of Sterility Assurance

BD Biosciences has raised the sterility assurance level of its widely used BBL™ Sterile Pack Prepared Plated Media to an all-new industry high. Heralded nearly twenty years ago as the first media designed specifically for environmental sampling in critical environments, BBL Sterile Pack Prepared Plated Media now bring another first to the industry. Until now, the industry standard for irradiated medium was the validated Sterility Assurance Level (SAL) of 10^{-3}. BBL Sterile Pack Prepared Plated Media now raise the sterility standard to 10^{-5} in all patented RODAC (Replicate Organism Detection and Counting) plates and settling dishes.

What elevates the new sterility claim to this higher level is our unique, gamma-irradiated packaging system. The superior integrity of the BBL Sterile Pack Plated Media packaging system provides the protection needed by the media to achieve the claim of the improved level of sterility assurance. First, an outer wrap is removed from the plates before they pass into the critical environment. The second inner wrap is removed in the critical environment. The outer and inner wrap, of Tyvek™/Polyethylene construction, create the required bacterial barrier while maintaining the desired breathability. An additional sterile rolled bag is provided for transportating the plates out of the critical environment to the laboratory.

The BBL Sterile Pack Plated Media line is validated sterile using AAMI guidelines. Gamma radiation exposure is based on a probability model for inactivation of microbial populations. This provides a higher level of assurance against false positives and greatly reduces the risk of introducing contaminants into the critical environment.

BD Biosciences, Sparks, MD

Reader Service No. 293

New System Provides Ultrasonic Power at Record Levels

An entirely new kind of ultrasonic power source has been introduced, with unprecedented power and performance from a commercial system. The UTS-6000 ultrasonic system from Etrema Products can deliver 6000 Watts; continuously and at full power.

This new technology for ultrasonic power was developed as a result of an Advanced Technology Program (ATP) cooperative agreement funded jointly by Etrema Products and the National Institute of Science and Technology (NIST). Officials at NIST believe higher power ultrasonic sources resulting from this program will lead to a significant increase in ultrasonic industries and jobs. The ATP program enabled Etrema to complete development of the technology, and provide the resulting products at competitive prices.

The heart of Etrema's system is a shape change metal, which converts electrical energy to acoustic energy. Etrema's systems use state-of-the-art technologies that allow more of the electrical energy to be converted to acoustic power and delivered to the work. And, the shape change metal does not degrade with use, allowing unsurpassed reliability. The UTS-6000 system includes a state-of-the-art refrigeration system that permits continuous full power operation in industrial conditions.

Etrema Products Inc., Ames, IA

Reader Service No. 294

Dairy, Food and Environmental Sanitation, Vol. 20, No. 8, Pages 635-652

Holders of 3-A Symbol Council Authorization as of June 30, 2000

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
100 South CP Avenue
Lake Mills, WI 53551-1799

117 DCI Inc.
P.O. Box 1227
600 North 54th Ave.
St. Cloud, MN 56302

127 Paul Mueller Co.
P.O. Box 828
1600 West Phelps
Springfield, MO 65801

440 Scherping Systems
801 Kingsley St.
Winsted, MN 55395

02-09 Centrifugal and Positive Rotary Pumps for Milk and Milk Products

26 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

29 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

52 Viking Pump Inc.
P.O. Box 8
406 State Street
Cedar Falls, IA 50613-0008

63 APV Americas- Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

65 Alfa Laval Flow Inc., G&H
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

72 L.C. Thomsen Inc.
1303 - 43rd Street
Kenosha, WI 53140

145 ITT Jabsco
1485 Dale Way
Costa Mesa, CA 92628-2158

148 Monyo Ind Prod
Div. of Robbins & Myers
1895 West Jefferson Street
Springfield, OH 45501

205 Bou-Matic
P.O. Box 8050
1919 S Stoughton Road
Madison, WI 53716-8050

212 Westfalia Surge Technologies, Inc.
20903 West Gale Avenue
Galesville, WI 54630-0659

241 WCB de Mexico, S.A. de C.V.
Alfredo B. Nobel #39
Fracc. Ind. Puente de Vigas
Tlalnepantla. Edo de Mexico 54070 Mexico

306 Fristam Pumps
P.O. Box 620065
2410 Parview Road
Middleton, WI 53562

314 Len E. Ivarson
3100 W. Green Tree Road
Milwaukee, WI 53209

325 Johnson Pumps (UK) Ltd.
Highfield Ind Estates
Edison Road
Eastbourne, E.Sussex BN23 6PT UK

400 Netzsch Inc.
119 Pickering Way
Exton, PA 19341

466 Fluid Metering Inc.
5 Aerial Way, Suite 500
Syosset, NY 11791

502 Inoxpa, S.A.
Carrer dels Telers
Banyoles 54-17820 Spain
U.S. Rep: Jensen Fittings Corp.
North Tonawanda, NY

507 Sine Pumps
Sundstrand Fluid Hndlg.
14845 West 64th Street
Arvada, CO 80004

567 Stainless Products
P.O. Box 169
1649 - 72nd Ave.
Somers, WI 53171

568 Shanley Pump & Equipment
2525 So. Clearbrook Drive
Arlington, IL 60005

595 seepex, Inc.
511 Speedway Drive
Enon, OH 45323

603 Johnson Pumps (UK) Ltd.
Highfield Ind Est
Edison Road
Eastbourne, E. Sussex BN236PT UK

604 Johnson Pumps (UK) Ltd.
Highfield Ind. Estate
Edison Road
Eastbourne, E. Sussex BN23 6PT UK

654 Mono Pumps/Dresser Div.
P.O. Box 14
Martin St., Audenshaw
Manchester M34 5DQ UK

671 FLOWTECH DIV
Teknoflow, Inc.
1701 Spinks Drive
Marietta, GA 30067-8925

673 Alfa Laval Flow, Inc.
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

678 Shanley Pump & Equipment
2525 So. Clearbrook Dr.
Arlington, IL 60005

701 Pierre Guerin SA
179 Grand Rue
BP.12
Mauze 79210 France

709 Conexiones Inox. (CIPSA)
Vicente Guerrero 211
Xicotepec de Juarez Edo
Puebla, Mexico

739 CSF Inox SpA
Strada per Bibbiano, 7
42027 Montecchia Italy

793 Ampco Pumps Inc.
4424 W. Mitchell Street
Milwaukee, WI 53214

810 O.M.A.C. S.R.L Pompe
Via G. Falcone 8
1-42048 Rubiera Italy

820 Syltone Industries LLC
2501 Constant Comment Pl
Louisville, KY 40299

827 PACKO INOX NV
Diksmuide Branch
Cardijnlaan 10
B8600 Diksmuide Belgium

828 Flux Pumps Corporation
4330 Commerce Circle
Atlanta, GA 30336

841 Johnson Pumps (UK)
Highfield Ind Est
Edison Road
Eastbourne, East Sussex BN236PT UK

899 Lederle GmbH, Pumpen-und
Gewerbestrasse 53
D-79194 Germany
U.S. Rep: Alto Systems, Inc.
P.O. Box 60667
Houston TX

911 Sigma Equipment Corporation
39 Westmoreland Avenue
White Plains, NY 10606

923 Bornemann Pumps, Inc.
P.O. Box 1769
Matthews, NC 28105

934 Pladot Ein Harod
Kibbutz Ein Harod
Meuhad - 18965 Israel

946 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

975 Alfa Laval Flow
Birch Road
Eastbourne, East Sussex BN 23 6PQ UK

996 Johnson Pump (UK) Ltd.
Highland Industrial Estate
Edison Road
Eastbourne, East Sussex BN236PT UK

997 Joh. Heinr.Bornemann GmbH
Industriestr 2
Obernkirchen D-31683 Germany

999 BLACKMER/MOUVEX
1809 Century Avenue S.W.
Grand Rapids, MI 49509

1004 Q-Pumps s.a.de c.v.
Acceso A # 108
Fracc. Ind. Jurica
76130 Queretaro Mexico

1011 Tuchenhagen North America, Inc.
9160 Red Branch Road
Columbia, MD 21045

04-04 Homogenizers and Reciprocating Pumps

75 APV Gaulin
500 Research Drive
Wilmington, MA 01887

87 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

247 Bran & Luebbe
1025 Busch Pkwy.
Buffalo Grove, IL 60089

390 American Lewa Inc.
132 Hopping Brk Road
Holliston, MA 01746

558 Niro Soavi S.p.A.
Via M
Da Erba Edoari 29/A
43100 Parma Italy

657 Microfluidics International Corp.
P.O. Box 9101
30 Ossipee Road
Newton, MA 02164-9101

770 Tetra Pak, Inc.
101 Corporate Woods Pkwy.
Vernon Hills, IL 60061

847 Stork Food & Dairy Systems, Inc.
P.O. Box 1258
1024 Airport Pkwy.
Gainesville, GA 30503

1045 Sonic Corporation
1 Research Drive
Stratford, CT 06615

05-14 Stainless Steel Automotive Milk and Milk Product Transportation Tanks for Bulk Delivery

25 Walker Stainless Equip
P.O. Box 202
625 State St.
New Lisbon, WI 53950-0202

40 Hills Stainless Steel
P.O. Box 987
505 W Koehn St.
Luverne, MN 56156

70 Brenner Transp.
P.O. Box 670
450 Arlington Ave.
Fond du Lac, WI 54936-0670

85 Polar Tank Trailer
12810 County Road 17
Holdingford, MN 56340-9773

379 Brenner Tank Mauston Inc.
N3760 Hwy 12 & 16
Mauston, WI 53948

437 West Mark
P.O. Box 100
2704 Railroad Ave.
Ceres, CA 95307

513 Nova Fabricating
P.O. Box 231
404 County Road 50
Avon, MN 56310

653 TREMCAR
I Tougas Street
Iberville, Quebec J2X 2P7 Canada

756 Beall Trailers of CA
1301 South Avenue
Turlock, CA 95380-5108

943 LBT Stainless, Inc.
Route 5, Box 480
Manning, SC 29102

10-03 Milk and Milk Products Filters Using Single Service Filter Media

35 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

296 L.C. Thomsen Inc.
1303-43rd Street
Kenosha, WI 53140

435 Sermia Intl.
771 Blvd. Industriel
Blainville, Quebec J7C 3V4 Canada

593 Filtration Systems
10304 NW 50th St.
Sunrise, FL 33351

1024 ultrafilter, Inc.
3560 Engineering Drive
Norcross, GA 30092

1026 Pall Europe Ltd.
Walton Road
Portsmouth, Hampshire P.O.6 1TD UK

1046 Zander Filter Systems, Inc.
5201-D Brook Hollow Pkwy.
Norcross, GA 30071

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

14 Chester Jensen Co.
P.O. Box 908
5th & Tilghman Streets
Chester, PA 19016

17 Tetra Pak Processing
101 Corporate Woods Pkwy.
Vernon Hills, IL 60061

20 APV Americas
P.O. Box 1718
1200 W. Ash Street
Goldsboro, NC 27533-1718

30 Waukesha Cherry-Burrell
Process Equip Div.
P.O. Box 35600
Louisville, KY 40232-5600

120 Alfa Laval Agri Inc.
11100 N Congress Ave.
Kansas City, MO 64153-1296

279 The Schlueter Co.
P.O. Box 548
3410 Bell Street
Janesville, WI 53547-0548

365 APV Heat Exchangers A/S
P.O. Box 823
8 Platinvej
DK-6000 Kolding
Denmark

414 Paul Mueller Co.
P.O. Box 828
1600 W. Phelps St.
Springfield, MO 65801-0828

468 GEA Ecoflex North America, Inc.
7150 Distribution Drive
Louisville, KY 40258-2528

610 Universal Dairy Equip, Inc.
11100 N. Congress Ave.
Kansas City, MO 64153-1296

622 ITT Standard
175 Standard Pkwy.
Cheektowaga, NY 14227

650 API Schmidt-Bretten, Inc.
2777 Walden Avenue
Buffalo, NY 14225

658 Thermaline Inc.
180 - 37th Street NW
Auburn, WA 98001

670 Flomax International LTD
c/o Massport Inc.
6140 McCormick Dr.
Lincoln, NE 68507-3296

718 Westfalia-Surge Technologies, Inc.
20903 West Gale Ave.
Galesville, WI 54630

791 The Coburn Company Inc.
Box 147
Whitewater, WI 53190

880 AGC Engineering
8969 SE 58th Avenue
Portland, OR 97206

885 TRANTER PHE, INC.
1900 Old Burk Hwy
Wichita Falls, TX 76306

912 Pladot Ein Harod
Kibbutz Ein Harod
Meuhad 18965 Israel

1005 Westfalia-Surge Technologies, Inc.
20903 W. Gale Avenue
Galesville, WI 54630

1071 I.E.C. Engineering Ltd.
111 Madison Avenue
Cresskill, NJ 07626

12-05 Tubular Heat Exchangers for Milk and Milk Products

96 C.E. Rogers Co.
P.O. Box 118
1895 Frontage Road
Mora, MN 55051

103 Chester-Jensen
P.O. Box 908
Chester, PA 19016

217 Girton Mfg Co.
P.O. Box 900
Main Street
Millville, PA 17846

238 Paul Mueller Co.
P.O. Box 828
1600 West Phelps
Springfield, MO 65801

248 Allegheny Bradford
P.O. Box 200
Route 219 South
Bradford, PA 16701

298 Feldmeier Equipment
P.O. Box 474
Syracuse, NY 13211

392 Stork Food & Dairy Systems, Inc.
P.O. Box 1258
1024 Airport Pkwy.
Gainesville, GA 30503

438 APV Americas Engineered Systems
395 Fillmore Ave.
Tonawanda, NY 14150

532 Scherping Systems
P.O. Box 10
801 Kingsley St.
Winsted, MN 55395

605 Waukesha Cherry-Burrell
P.O. Box 35600
Louisville, KY 40232-5600

614 Tetra Pak Processing
101 Corporate Woods Pkwy.
Vernon Hills, IL 60061

632 Yula Corp.
330 Bryant Ave.
Bronx, NY 10474

712 Enerquip Inc.
P.O. Box 467
611 North Road
Medford, WI 54451

886 API-Ketema Heat Transfer Tech.
2300 W Marshall Drive
Grand Prairie, TX 75051

889 FMC-FranRica Systems
P.O. Box 30127
Stockton, CA 95213-0127

951 Thermaline, Inc.
180 37th Street N.W.
Auburn, WA 98001

971 Hydro-Thermal Corp.
400 Pilot Court
Waukesha, WI 53188

1055 APV Nordic Engineered Systems
Pasteursvej
8600 Silkeborg DK-8600 Denmark

1058 Peterson Custom Stainless, Inc.
1100 Industrial Drive
Watertown, WI 53094

13-09 Farm Milk Cooling and Holding Tanks

4 Dairy Equip Co.
P.O. Box 8050
1919 S Stoughton Road
Madison, WI 53708-8050

12 Paul Mueller Co.
P.O. Box 828
1600 W. Phelps St.
Springfield, MO 65801

49 Alfa Laval Agri Inc.
11100 N Congress Ave.
Kansas City, MO 64153-1296

240 Westfalia Surge, LLC
Dairy Equipment Division
20903 W. Gale Avenue
Galesville, WI 54630-0659

611 Universal Dairy Eqpt, Inc.
11100 N. Congress Ave.
Kansas City, MO 64153-1296

802 BIDESA
Adolfo Aymes 153
Ciudad Ind. De Coahuila Mexico
U.S. Rep: James Reed
601 High Plain Dr.
Bel Air,CA 21024

16-05 Milk and Milk Products Evaporators and Vacuum Pans

107 C.E. Rogers Co.
P.O. Box 118
1895 Frontage Road
Mora, MN 55051

132 APV Americas
395 Fillmore Avenue
Tonawanda, NY 14150-0366

186 Marriott Walker Corp.
925 E. Maple Road
Birmingham, MI 48009

273 Niro, Inc. Evaporator Division
9165 Rumsey Road
Columbia, MD 21045

277 Alfa Laval Thermal Inc.
111 Parker Street
Newburyport, MA 01950

299 Stork Food & Dairy Systems, Inc.
P.O. Box 1258
1024 Airport Pkwy.
Gainesville, GA 30503

500 Dedert Corp.
20000 Governors Dr.
Olympia Fields, IL 60461

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

137 Elopak Inc.
30000 South Hill Road
New Hudson, MI 48165

192 Evergreen Pkg. Equip
P.O. Box 3000
2400-6th St. SW
Cedar Rapids, IA 52406-3004

220 Tetra Rex Inc.
451 E. Industrial Blvd.
Minneapolis, MN 55413-2930

281 Purity Packaging
P.O. Box 727
Glen Falls, NY 12801-0727

330 Milliken Pkg Co.
P.O. Box 736
White Stone, SC 29386

351 Tetra Pak, Inc.
3300 Airport Road
Denton, TX 76207

382 SIG COMBIBLOC, Inc.
4800 Roberts Road
Columbus, OH 43228-9699

442 Milliken Pkg Co.
P.O. Box 736
White Stone, SC 29386

482 SERAC, Inc.
300 Westgate Dr.
Carol Stream, IL 60188

488 BWI Holmatic
1750 Corporate Dr., Suite 700
Norcross, GA 30093

619 Hassia, USA, Inc.
1210 Campus Drive West
Morganville, NJ 07751

681 Shikoku Kakoki Co. Ltd.
10-1 Nishinokawa
Tarohachisu, Itano-Gun, 771-02 Japan
U.S. Rep: Elopak, Inc.
3000 South Hill Road
New Hudson, MI 48165

694 F.D.O. Inc.
3434 Eglinton Ave. E., #712
Scarborough-Toro. Ontario M1J 2J1 33172 Canada

735 Kvalitetsproduktion AB
P.O. Box 900
S-693 29 Sweden
U.S. Rep: Flowtech, Inc.
1900 Lake Park Drive, Suite 345
Smyrna, GA 30080

924 Robert Bosch Corporation
P.O. Box 1127
Waiblingen D-71301Germany
U.S. Rep: Robert Bosch Corporation
9890 Red Aroow Highway
Bridgman, MI 49106

939 Packaging Technologies
807 West Kimberly Road
Davenport, IA 52808-3848

941 Oden Corporation
255 Great Arrow Avenue
Buffalo, NY 14207-3024

967 RAPAK
2801 Faber Street
Union City, CA 94587

989 PACK LINE, Ltd.
4, Hapatish Street
Industrial Zone 58815
Israel

1001 Remy Equipment
Avenue de la patrouille de France
Octeville-sur-Mer BP 627
76059 Le Havre France
U.S. Rep: SIDEL Inc.
5600 Sun Ct.
Norcross, GA 30092

1009 Federal Manufacturing Co.
201 West Walker St.
Milwaukee, WI 53204-0215

1015 ProTherm Engineering Co.
3475 W. Shaw Ave., Suite 106
Fresno, CA 93711

1020 Tetra Rex Inc.
909 Asbury Drive
Buffalo Grove, IL 60089-4525

1029 Formseal
1 rue de l'Epee Royale
14700 Falaise France

1031 ACMA USA, Inc.
501 Southlake Blvd.
Richmond, VA 23236

1052 Glopak, Inc.
4755 Blvd. Des Grandes Prairies
St. Leonard, Quebec H1R 1A6 Israel

1064 FMC Europe N.V.
Breedstraat 3
2700 Belgium
U.S. Rep: FMC Foodtech
2300 Ind. Ave.
Madera, CA

1073 I.E.C. Engineering Ltd.
111 Madison Avenue
Cresskill, NJ 07626

18-03 Multiple Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces

1041 Superior Seals Ltd.
Woolsbridge Ind. Park
Three-Legged Cross
Wimborne Dorset BH21 6SR UK

1056 Newman Sanitary Gasket Co.
P.O. Box 222
Lebanon, OH 45036

1063 Titan Industries
P.O. Box 1007
11121 Garfield Avenue
South Gate, CA 90280

19-05 Batch and Continuous Freezers for Ice Cream, Ices and Similarly Frozen Dairy Foods

146 Waukesha Cherry-Burrell
P.O. Box 35600
100 So. CP Avenue
Louisville, KY 40232-5600

286 Tetra Pak Hoyer Inc.
753 Geneva Parkway
P.O. Box 0280
Lake Geneva, WI 53147

355 Emery Thompson Machine
& Supply Company
1349 Inwood Avenue
Bronx, NY 10452

903 Coldelite Corporation of America
3760 Industrial Drive
Winston-Salem, NC 27105

1076 MITO 27 s.r.l.
Via della Solidarieta, 2/1
40056 Italy

20-20 Multiple Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment

1053 Victrex USA Inc.
601 Willowbrook Lane
West Chester, PA 19382

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

154 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551

155 Paul Mueller Co.
P.O. Box 828
1600 W Phelps St.
Springfield, MO 65801-0828

160 DCI Inc.
P.O. Box 1227
600 N 54th Ave.
St. Cloud, MN 56302

165 Walker Stainless Equip.
P.O. Box 202
625 State Street
New Lisbon, WI 53950-0202

312 Feldmeier Equipment
P.O. Box 474
6800 Town Line Road
Syracuse, NY 13211

439 JV Northwest Inc.
390 S. Redwood Street
Canby, OR 97013

479 Scherping Systems
P.O. Box 10
801 Kingsley Street
Winsted, MN 55395

503 Ripley Stainless (1997) Ltd.
RR # 3 Site 41, Comp. 10
Summerland, British V0H 1Z0 Canada

675 Stainless Fabrication
P.O. Box 1127
4455 W. Kearney
Springfield, MO 65801-1127

23-02 Equipment for Packaging Viscous Dairy Products

174 Waukesha Cherry-Burrell Ice Cream
267 Livingston Street
Northvale, NJ 07647

222 Sweetheart Cup Company
10100 Reisterstown Road
Owings Mills, MD 21117

343 Tetra Pak Hoyer, Inc.
P.O. Box 280
753 Geneva Parkway
Lake Geneva, WI 53147

366 AutoProd, Inc.
5355-115th Ave. N
Clearwater, FL 34620

447 GEI International, Inc.
700 Pennsylvania Drive
Exton, PA 19341-0439

537 Osgood Industries
601 Burbank Road
Oldsmar, FL 34677

635 Interbake Foods
2245 Tomlynn Street
Richmond, VA 23294

666 Rapidpak Inc.
P.O. Box 9015
Appleton, WI 54911-9015

674 Hayssen Mfg
225 Spartangreen Blvd.
Duncan, SC 29334

679 Consolidated Biscuit Co.
312 Rader Road
McComb, OH 45858

740 Raque Food Systems
P.O. Box 99594
11002 Decimal Dr.
Louisville, KY 40269

760 Jordan Manufacturing
1688 County Road 192
Crossville, AL 35962

853 Elmar Industrial
P.O. Box 245
Buffalo, NY 14043-0245

868 Cryovac North America
P.O. Box 464
Duncan, SC 29334-0464

870 Machinery Engineering & Technology
P.O. Box 2656
2626 E. Delavan Drive
Janesville, WI 53546

891 World Cup LLC
1535 S. Highway 39
LaPorte, IN 46350

902 A.T.S. Engineering, Inc.
7270 Torbram Road, Unit #23
Mississauga, Ontario L4T 3Y7 Canada

942 Oden Corporation
255 Great Arrow Avenue
Buffalo, NY 14207-3024

965 BENHIL-GASTI Verpack GmbH
Jagenbergstrasse 1
D-41468 Neuss Germany
U.S. Rep: Autoprod, Inc.
5355 115th Avenue
Clearwater, FL 33760

990 PACK LINE, Ltd.
4, Hapatish Street
Industrial Zone 58815 Israel

1030 Formseal
1 rue de l'Epee Royale
14700 Falaise France

1066 Research & Development Pkgng. Corp.
KEY-PAK Machines
1221 Highway 22
Lebanon, NJ 08833

1074 I.E.C. Engineering Ltd.
111 Madison Avenue
Cresskill, NJ 07626

24-02 Non-Coil Type Batch Pasteurizers for Milk and Milk Products

158 APV Americas-Lake Mills
100 South CP Ave.
Lake Mills, WI 53551-1799

166 Paul Mueller Co.
P.O. Box 828
1600 W Phelps St.
Springfield, MO 65801

187 DCI Inc.
P.O. Box 1227
St. Cloud, MN 56302-1227

402 Coldelite Corporation of America
3760 Industrial Drive
Winston-Salem, NC 27105

878 Walker Stainless Equip
P.O. Box 202
625 State St.
New Lisbon, WI 53950-0202

1025 Pladot Ein Harod
Kibbutz Ein Harod
Meuhad 18965 Israel

1072 I.E.C. Engineering Ltd.
111 Madison Avenue
Cresskill, NJ 07626

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

159 APV Americas-Lake Mills
100 South CP Ave.
Lake Mills, WI 53551-1799

167 Paul Mueller Co.
P.O. Box 828
1600 W Phelps St.
Springfield, MO 65801

188 DCI Inc.
P.O. Box 1227
St. Cloud, MN 56302-1227

202 Walker Stainless
P.O. Box 202
625 State St.
New Lisbon, WI 53950-0202

448 Scherping Systems Inc.
801 Kingstree St.
Winsted, MN 55395

520 Stainless Fabrication
P.O. Box 1127
4455 W. Kearney
Springfield, MO 65801-1127

687 A&B Process Systems
P.O. Box 86
201 S. Wisconsin Avenue
Stratford, WI 54484

710 Lee Industries, Inc.
P.O. Box 687
514 W Pine St.
Phillipsburg, PA 16866

725 Inox-Tech Inc.
6705 Route 132
Ville, Quebec J0L 1E0 Canada

837 Viatec, Incorporated
202 South Broadway
Hastings, MI 49058

26-03 Sifters for Dry Milk and Dry Milk Products

172 SWECO
Div. of Emerson Elec Co.
7120 Buffington Road
Florence, KY 41042

185 Rotex Inc.
1230 Knowlton St.
Cincinnati, OH 45223-1845

363 Kason Corp.
67-71 East Willow Street
Millburn, NJ 07041

430 Midwestern Industries
P.O. Box 810
Massillon, OH 44648-0810

656 Separator Engineering Ltd.
810 Ellingham St.
Pointe Claire PQ Quebec H9R 3S4 Canada

752 Andritz Inc.
35 Sherman St.
Muncy, PA 17756

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

353 All-Fill Inc.
P.O. Box 652-C
418 Creamery Way
Exton, PA 19341

409 GEI International, Inc.
700 Pennsylvania Drive
Exton, PA 19341-0439

497 Triangle Pkg Machinery
6655 W Diversey Ave.
Chicago, IL 60707

618 Yamato Scale Co., Ltd.
5-22 Saemba-cho,
Akashi
Hyogo 673-8688 29334 Japan

625 Ishida Co. Ltd.
44-Sanno-Cho, Shogoin
Sakyo-Ku,
606 Kyoto Japan

831 Custom Equipment Design
P.O. Box 4807
1057 Highway 80 East
Monroe, LA 71203

905 Pacmac, Inc.
P.O. Box 360
1611 Armstrong Ave.
Fayetteville, AR 72702-0360

922 Heat & Control, Inc.
21121 Cabot Blvd.
Hayward, CA 94545-1132

998 SIG Pack EAGLE Corp.
2107 Livingston St.
Oakland, CA 94606

1039 BOSSAR USA, Inc.
1145 Commerce Blvd. N.
Sarasota, FL 34243

1062 Multipond America, Inc.
2666 N. Packerland Dr.
Green Bay, WI 54303-4856

1068 MATCON USA, INC.
233 North Delsea Drive
Sewell, NJ 08080

28-03 Flow Meters for Milk and Milk Products

224 The Foxboro Co.
NO1-3B
33 Commercial St.
Foxboro, MA 02035-2099

226 ABB Automation Inc.
Instrumentation Division
125 E. County Line Road
Warminster, PA 18974-4995

253 Badger Meter Inc.
P.O. Box 245036
4545 W. Brown Deer Road
Milwaukee, WI 53224-9356

265 Flow Automation
9303 Sam Houston Pkwy. S.
Houston, TX 77099-5298

270 ABB Instrumentation Inc.
125 East County Line Road
Warminster, PA 18974

272 Accurate Metering Systems
1651 Wilkening Road
Schaumburg, IL 60173

359 Rosemount, Inc.
12001 Technology Drive
Eden Prairie, MN 55344

378 Micro Motion
7070 Winchester Circle
Boulder, CO 80301

477 Flowdata, Inc.
1817 Firman Drive
Richardson, TX 75081-1826

490 Rosemount Inc.
12001 Technology Dr.
Eden Prairie, MN 55344

506 Flow Technology, Inc.
4250 E. Broadway Road
Phoenix, AZ 85040

512 Hoffer Flow Controls
107 Kitty Hawk Lane
Elizabeth City, NC 27909

529 Krohne, Inc.
7 Dearborn Road
Peabody, MA 01960

535 FMC Invalco
2825 West Washington St.
Stephenville, TX 76401

550 Sparling Instruments
4097 N Temple Cty Blvd.
El Monte, CA 91731

574 Venture Measurement LLC
150 Venture Blvd.
Spartanburg, SC 29306

585 Solartron, Inc.
19408 Park Row, Suite 320
Houston, TX 77084

587 Schlumberger Industries
1310 Emerald Road
Greenwood, SC 29646

649 GEO Technology Corp.
12312 E. 60th Street
Tulsa, Ok 74146

660 Danfoss A/S
DK - 6430
Nordborg Denmark

661 Alfa Laval Flow Inc.
G&H Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

692 Endress & Hauser
Flowtec AG
Kagenstrasse 7
Ch-4123 Reinach
Switzerland

715 Thermal Instrument Co.
217 Sterner Mill Road
Trevose, PA 19053

717 Gemu Valves Inc.
Suite 110, Bldg. 2600
3800 Camp Creek Pkwy.
Atlanta, GA 30331

729 ONIX Measurement
London Road, Kings Worthy
Winchester Hampshire S023 7QA UK

733 Honeywell Inc.
1100 Virginia Drive
Fort Washington, PA 19034-3260

744 Honeywell IAC
Industrial Contrls Div.
1100 Virginia Dr.
Ft. Washington, PA 19034

764 Yokogawa Corporation of America
2 Dart Road
Newnan, GA 30265-1040

778 Magnetrol Intern
5300 Belmont Road
Downers Grove, IL 60515

803 TURCK Inc.
5000 Fernbrook Lane
North Plymouth, MN 55446

840 KOBOLD Instruments
1801 Parkway View Dr.
Pittsburgh, PA 15205

884 ABB Automation Products GmbH
Dransfel Strasse
Gottingen 37079 Germany
ABB Automation Inc.
Instrumentation Division
125 East County Line Road
Warminster, PA 18974

938 norax Inc.
10728 South 92nd Street
Franklin, WI 53132

950 DELTA M Corp.
1003 Larsen Drive
Oak Ridge, TN 37830

956 Blancett Fluid Flow Meters
100 E. Felix Street So., Suite 190
Fort Worth, TX 76115-3548

972 Liquid Controls, LLC
105 Albrecht Drive
Lake Bluff, IL 60044-2242

979 Metron Technology
2005 10th Street
Boulder, CO 80302

1019 Pacific Flow Controls-ASA Magmeters
3000 Danville Blvd. #177
Alamo, CA 94507

1021 Toshiba Int. Corp.
1, Toshiba-cho
Fuchu-shi
Tokyo 183 Japan
Toshiba Int. Corporation
13131 West Little York Road
Houston, TX 77041

1034 Liquid Controls, LLC
105 Albrecht Drive
Lake Bluff, IL 60044-2242

1035 ISOIL INDUSTRIA S.p.A.
Via F.lli Gracchi 27
20092 CINISELLO BALSAMO
MILANO Italy

1065 PMC-Global Industries, Inc.
P.O. Box 4781
2500 Steven Road
Odessa, TX 79760

1075 Advanced Flow Technology Co.
P.O. Box 906
2700 Interstate Drive
Lakeland, FL 33802

1077 Sponsler Co., Inc.
2363 Sandifer Boulevard
Westminster, SC 29693

29-01 Air Eliminators for Milk and Milk Byproducts

340 Accurate Metering
1651 Wilkening Road
Schaumburg, IL 60173

436 Scherping Systems
801 Kingsley St.
Winsted, MN 55395

662 Alfa Laval Flow Inc.
G&H Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

1057 Krebs Engineers
5505 West Gillette Road
Tucson, AZ 85743

30-01 Farm Milk Storage Tanks

421 Paul Mueller Co.
P.O. Box 828
1600 W Phelps St.
Springfield, MO 65801

31-02 Scraped Surface Heat Exchangers

274 Alfa Laval Thermal Inc.
111 Parker St.
Newburyport, MA 01950

290 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, WI 53551

323 Waukesha Cherry-Burrell
P.O. Box 35600
Louisville, KY 40232-5600

361 Terlet N.V.
P.O. Box 62
7200 AB Zutphen Netherlands
U.S. Rep: Manning & Lewis Eng.
New Jersey

496 FMC Corp./FranRica Sys
P.O. Box 30127
2807 S Highway 99
Stockton, CA 95213-0127

964 Schroder NA Corp.
4745 S. Mendenhall Road
Memphis, TN 38141

32-02 Scraped Surface Heat Exchangers

268 DCI, Inc.
P.O. Box 1227
600 North 54th Ave.
St. Cloud, MN 56302-1227

339 Walker Stainless Equip.
P.O. Box 202
625 State St.
New Lisbon, WI 53950-0202

354 C.E. Rogers Co.
P.O. Box 118
1895 Frontage Road
Mora, MN 55051

397 APV Americas - Lake Mills
100 South CP Avenue
Lake Mills, WI 53551

441 Scherping Systems
801 Kingsley St.
Winsted, MN 55395

683 A&B Process Systems
P.O. Box 86
201 S. Wisconsin Ave.
Stratford, WI 54484

708 Lee Industries Inc.
514 West Pine St., P.O. Box 688
Phillipsburg, PA 16866

844 Paul Mueller Co.
1600 West Phelps St.
Springfield, MO 65801

852 Viatec Incorporated
1220 W. State Street
Hastings, MI 49058

33-01 Polished Metal Tubing for Milk and Milk Products

308 Rath Mfg Co., Inc.
2505 Foster Ave.
Janesville, WI 53545

310 Allegheny Bradford
P.O. Box 200
Bradford, PA 16701

331 United Industries
1546 Henry Avenue
Beloit, WI 53511

368 Rodger Industries
P.O. Box 186/ RR #1
Blenheim ON N0P 1A0 Canada

413 AZCO Inc.
P.O. Box 567
2150 Holly Road
Appleton, WI 54912

3736 Kvalitetsproduktion AB
P.O. Box 900
S-693 29 Sweden
U.S. Rep: Flowtech, Inc.
1900 Lake Park Drive, Suite 345
Smyrna, GA 30080

775 Trent Tube
2015 Energy Drive
P.O. Box 77
East Troy, WI 53120

776 Kurt Orban Partners
450 Kings Road
Brisbane, CA 94005

812 Norca Corporation
185 Great Neck Road
Great Neck, NY 11022

1044 SYNCRO VAC, INC.
803 Ames Avenue
Milpitas, CA 95035

34-02 Portable Bins for Dry Milk and Milk Products

647 Thomas Conveyor Co.
Tote System Division
P.O. Box 2916
Fort Worth, TX 76113-2916

916 Custom Metalcraft, Inc.
P.O. Box 10587 GS
2332 E. Division
Springfield, MO 65808

35-00 Continuous Blenders

417 Waukesha Cherry-Burrell
P.O. Box 35600
Louisville, KY 40232-5600

527 Arde BarInc.o Inc.
500 Walnut St.
Norwood, NJ 07648

590 Chemineer Inc.
125 Flagship Dr.
N. Andover, MA 01845

642 Mondomix B.V.
Reeweg 13, P.O. Box 98
1394 ZH Netherlands
U.S. Rep: Mondomix-USA Branch
1900 Tyler Road, Unit 400
St. Charles, IL 60174

680 Quadro Engineering Inc.
613 Colby Drive
Waterloo Ontario N2V 1A1 Canada

724 Silverson Machines
P.O. Box 589
355 Chestnut St.
E. Longmeadow, MA 01028

766 Semi-Bulk Systems
159 Cassens Court
Fenton, MO 63026-2543

825 GEI International, Inc.
700 Pennsylvania Dr.
Exton, PA 19341

869 Admix Inc.
234 Abby Road
Manchester, NH 03103-3332

914 International Mixing Technologies
Avenue de la Gironde
59640 Dunkerque France
U.S. Rep: IMT/USA
10140 Caminito Volar
San Diego, CA 92126

1027 Polar Process Inc.
P.O. Box 190
Plattsville Ontario NOJ 1SO Canada

1050 ADMIX, Inc.
234 Abby Road
Manchester, NH 03103

1069 Bran+Luebbe, Inc.
1025 Busch Parkway
Buffalo Grove, IL 60089-4516

36-00 Colloid Mills

293 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115-1337

608 Kinematica Inc.
260 Northland Blvd., Suite 335
Cincinnati, OH 45246-3502

808 Boston Shearpump Inc.
33 Brighton Street
Belmont, MA 02478

846 IKA Works Inc.
2635 North Chase Pkwy. SE
Wilmington, NC 28405-7499

38-00 Cottage Cheese Vats

385 Stoelting Inc.
502 Hwy 67
Kiel, WI 53042-1600

541 Kusel Equip.
P.O. Box 87
Watertown, WI 53094

39-00 Pneumatic Conveyors for Dry Milk and Dry Milk Products

1042 Wm. W. Meyer & Sons, Inc.
8261 Elmwood Avenue
Skokie, IL 60077

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

381 Marriott Walker Corp.
925 E. Maple Road
Birmingham, MI 48009

456 C.E. Rogers Co.
P.O. Box 118
1895 Frontage Road
Mora, MN 55051

41-01 Bag Collectors for Dry Milk and Dry Milk Products

631 Flexicon Corp.
P.O. Box 5269
1375 Strykers Road
Philipsburg, NJ 08865

894 Spiroflow Systems, Inc.
2806 Gray Fox Road
Monroe, NC 28110

42-01 In-Line Strainers for Milk and milk Products

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

655 Tri-Clover
P.O. Box 1413
Kenosha, WI 53141-1413

855 Flowtech
Div. of Teknoflow, Inc.
1701 Spinks Drive SE
Marietta, GA 30067-8925

1023 ultrafilter, Inc.
3560 Engineering Drive
Norcross, GA 30092

44-02 Air, Hydraulically, or Mechanically Driven Diaphragm Pumps for Milk and Milk Products

713 Warren Rupp Inc.
P.O. Box 1568
(800 N Main St.)
Mansfield, OH 44901-1568

805 Tri-Clover, Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

833 Wilden Pump & Engineering
22069 Van Buren Street
Grand Terrace, CA 92313-5651

958 LEWA Herbert Ott GmbH & Co.
Ulmerstrasse 10
71229 Leonberg Germany
U.S. Rep: American LEWA, Inc.
132 Hopping Brook Road
Holliston, MA 01746-1499

1012 VERSA-MATIC PUMP
6017 Enterprise Drive
Export, PA 15632-8969

45-01 Crossflow Membrane Modules

786 North Carolina SRT Inc.
221 James Jackson Ave.
Cary, NC 27513

807 Corning Incorporated
HP-CB-03-01
Corning, NY 14831

813 Coors Tek
1100 Commerce Park Dr.
Oak Ridge, TN 37830

1067 Filtration Engineering Co., Inc.
12255 Ensign Avenue
Champlin, MN 55316

46-02 Refractometers and Energy-Absorbing Optical Sensors for Milk and Milk Products

697 Liquid Solids Control
P.O. Box 259
Farm Street
Upton, MA 01568

742 Reflectronics, Inc.
3009 Montavesta Road
Lexington, KY 40502

750 PT Papertech Inc.
301-2609 Westview Drive
North Vancouver BC V7N 4M2 Canada

751 Maselli Misure S.p.A.
c/o Maselli Meas.
P.O. Box 7571
Stockton, CA 95267

767 Foss NIRSystems, Inc.
12101 Tech Road
Silver Spring, MD 20904

783 J. Campdba Advantec Proc Sys
95 Wyngate Dr.
Newnan, GA 30265

785 Bran & Luebbe
1025 Busch Pkwy.
Buffalo Grove, IL 60089-4516

800 Epsilon Industrial Inc.
2215 Grand Avenue Parkway
Austin, TX 78728

859 Electron Machine Corp.
P.O. Box 2349
15824 CR 450 West
Umatilla, FL 32784

919 Foss NIRSystems, Inc.
12101 Tech Road
Silver Spring, MD 20904

921 optek-Danulat, Inc.
279 So. 17th Ave., Suite #10
West Bend, WI 53095

940 K-Patents OY
P.O. Box 77
Fin-01511 Vantaa Finland

955 Brimrose Corp. of America
5020 Campbell Blvd.
Baltimore, MD 21236-4968

981 AW Company
8809 Industrial Drive
Franksville, WI 53126-9337

47-00 Centrifigul and Positive Rotary Pumps for Pumping Cleaning and Sanitizing Solutions

897 Ampco Pumps Co.
4424 W. Mitchell Street
Milwaukee, WI 53214

50-00 Level Sensing Devices for Dry Milk and Dry Milk Products

705 Venture Measurement LLC
150 Venture Blvd.
Spartanburg, SC 29306

51-01 Plug-Type Valves for Milk and Milk Products

239 LUMACO
9-11 East Broadway
Hackensack, NJ 07601

357 Tanaco Products
3860 Loomis Trail Road
Blaine, WA 98230

759 VNE Corporation
1149 Barberry Dr.
Janesville, WI 53545

761 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

772 Alfa Laval Flow Inc.
G&H Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

777 Tech Controls Enterp
3725 N. Murray Road
Otis Orchard, WA 99027

780 L.C. Thomsen, Inc.
1303-43rd St.
Kenosha, WI 53140

781 Robert-James Sales, Inc.
699 Hertel Ave. Suite 260
Buffalo, NY 14207

787 Cipriani Inc.
23195 LaCadena Dr., Suite 103
Laguna Hills, CA 92653

788 WCB de Mexico, S.A. de C.V.
Alfredo B. Nobel #39
Fracc. Ind.Puente de Vigas
Tlalnepantla Edo de Mexico 54070 Mexico

790 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

52-02 Plastic Plug-Type Valves for Milk and Milk Products

577 Ralet Defay
66, Blvd. Polnc.are
1070 Brussels
Belgium

907 L'A'UFER International AG
Finkenweg 2
D-88709
Germany

53-01 Compression-Type Valves for Milk and Milk Products

34 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

149 Q-Controls
93 Utility Court
Rohnert Park, CA 94928

245 Westfalia Surge Technologies, Inc.
20903 W. Gale Ave.
Galesville, WI 54630

376 Defontaine of America, Inc.
16720 W. Victor Road
New Berlin, WI 53151

443 Badger Meter
P.O. Box 581390
6116 E. 15th St.
Tulsa, OK 74158-1002

467 Tuchenhagen North America
9160 Red Branch Road
Columbia, MD 21045

483 On-Line Instrumentation
P.O. Box 541
Route 376
Hopewell Junc, NY 12533

484 APV Americas-Lake Mills
100 South CP Ave.
Lake Mills, WI 53551-1799

530 Alfa Laval Flow Inc.
G&H Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

538 Cipriani Inc.
Suite #103
23195 LaCadena Road
Laguna Hills, CA 92653

542 L.C. Thomsen, Inc.
1303-43rd Street
Kenosha, WI 53140

551 WCB de Mexico, S.A. de C.V.
Alfredo B. Nobel #39
Fracc. Ind. Pte. Vigas, Tlalnepantla
54070 Edo. MX. 54070

555 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

561 Vacu-Purg Inc.
P.O. Box 272
214 West Main
Fredericksburg, IA 50630

570 LUMACO
9-11 East Broadway
Hackensack, NJ 07601

584 Valvinox Inc.
650 -1 Rue
Iberville Quebec J2X 3B8 Canada

607 FLOWSERVE Corp.
1300 Parkway View Drive
Pittsburgh, PA 15205-1410

652 Pierre Guerin Technologies
179 Grand Rue
BP.12
MAUZE 79210 France

686 Bardiani Valvole S.p.A.
Via G. Di Vittorio 30/B
Fornovo Taro 43045 Italy

716 Conexiones Inox (CIPSA)
Vicente Guerrero 211
Xicotepec de Edo Puebla Mexico
U.S. Rep: Ben Dolphin Consulting
4735 Lansing Drive
N. Olmstead, OH 44070

730 APV Americas-Lake Mills
100 South CP Ave.
Lake Mills, WI 53551-1799

748 Richards Industries
3170 Wasson Road
Cincinnati, OH 45209-2381

762 Stainless Products
P.O. Box 169
1649 - 72nd Ave.
Somers, WI 53171-0169

796 VNE Corporation
P.O. Box 1698
1149 Barberry Drive
Janesville, WI 53547

804 Sudmo North America
6918 Forest Hills Road
Rockford, IL 61111

806 Steri Technologies Inc.
857 Lincoln Ave.
Bohemia, NY 11716

823 Sudmo-North Ameica
6918 Forest Hills Road
Rockford, IL 61111

881 Lucas & Associates
642 Alvarado St., No. 306
San Francisco, CA 94114-3256

883 Keystone/Tyco Flow Control
12-14 Kaimiro St., Pukete Ind.
Pukete
Hamilton, New Zealand
U.S. Rep: Keystone Valve USA, Inc.
Houston, TX

944 Samson Controls,Inc.
4111 Cedar Blvd.
Baytown, TX 77520

952 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

954 Taylor Valve Technology, Inc.
8300 SW 8th Street
Oklahoma City, OK 73128

978 Relco Unisystems Corp.
P.O. Box 1689
Willmar, MN 56201

1008 Univalve S.A.
Z.A. du Mittelfeld 1
rue Alfred Kastler-F
67300 France

1010 CANDIGRA y CIA
c/telers, 54
Aptdo 174
17820 Banyoles Spain

1038 AERRE INOX s.r.l.
Via delle Arti 26
26010 FIESCO(CR) Italy
U.S. Rep: CMG Industries, Inc.
Laguna Hills, CA

1043 HOVAP
Professor Zernikestrasse 8
Sneek 8606 JV Netherlands
TYCO Valves & Controls
1467 Elmwood Avenue
Cranston, RI 02910

54-02 Diaphragm-Type Valves for Milk and Milk Products

203 ITT Engrd Valves
P.O. Box 6164
33 Centerville Road
Lancaster, PA 17603-2064

494 Tri-Clover, Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

514 H.D. Baumann Inc.
35 Mirona Road
Portsmouth, NH 03801-5317

565 APV Americas-Lake Mills
100 South CP Ave.
Lake Mills, WI 53551-1799

615 ASEPCO, Inc.
1101 San Antonio Road, Suite 301
Mountain View, CA 94043

617 Defontaine of America, Inc.
16720 W Victor Road
New Berlin, WI 53151

637 Gemu Valves, Inc.
3800 Camp Creek Pkwy, Bldg. 2600, Suite 110
Atlanta, GA 30331

745 Cashco Inc.
P.O. Box 6
Hwy. 140 West
Ellsworth, KS 67439-0006

814 Burkert Contromatic Corp.
2602 McGaw Avenue
Irvine, CA 92714

856 Flowtech
Div. of Teknoflow, Inc.
1701 Spinks Drive SE
Marietta, GA 30067-8925

877 APV America-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

953 Burkert Contromatic Corp.
2602 McGaw Avenue
Irvine, CA 92614

980 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

55-01 Boot Seal-Type Valves for Milk and Milk Products

821 Keofitt a/s
Snaremosevej 27
DK-7000 Denmark
Keofitt c/o R.,B.,V.,N., & R.
1000 N. Water St.
Milwaukee, WI

56-00 Inlet and Outlet Leak-Protector Plug-Type Valves for Milk and Milk Products

34 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

57-01 Tank Outlet Valves for Milk and Milk Products

534 LUMACO
9-11 East Broadway
Hackensack, NJ 07601

643 Paul Mueller Co.
1600 W. Phelps Street
Springfield, MO 65801

58-00 Vacuum Breakers and Check Valves for Milk and Milk Products

689 VNE Corporation
1149 Barberry Drive
Janesville, WI 53545

691 Defontaine of America, Inc.
16720 W Victor Road
New Berlin, WI 53151

834 Stanfos Inc.
3908-69th Avenue
Edmonton, Alberta T6B 2V2 Canada

Andron Stainless Corp.
Suite 101, 8901 Farrow Road
Columbia, SC 29203

835 Alfa Laval Flow Inc.
G&H Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

843 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

857 Steel & O'Brien Mfg Inc.
12850 Route 39
Sardinia, NY 14134

908 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

968 MarketNet
2241 Quebec Avenue South
Saint Louis Park, MN 55426

986 Bradford Cast Metals
P.O. Box 33
Elm Grove, WI 53122

995 DURABLA Fluid Technology
140 Sheree Blvd.
Exton, PA 19341-0566

1014 Check-All Valve Mfg. Co.
P.O. Box 835
Des Moines, IA 50304

59-00 Automatic Positive Displacement Samplers for Milk and Milk Products

284 Bristol Equipment Co.
P.O. Box 696
210 Beaver Street
Yorkville, IL 60560-0696

291 Accurate Metering Systems
1651 Wilkening Road
Schaumburg, IL 60173

1037 AERRE INOX s.r.l.
Via delle Arti 26
26010 FIESCO Italy
CMG Industries
Laguna Hills, CA

60-00 Rupture Discs for Milk and Milk Products

407 Continental Disc
3160 Heartland Dr.
Liberty, MO 64068-3850

854 Fike Metal Products
Div. Fike Corp.
704 South 10th Street
Blue Springs, MO 64015

892 OSECO
1701 West Tacoma
Broken Arrow, OK 74012

61-00 Steam Injection Heaters for Milk and Milk Products

560 Pick Heaters Inc.
P.O. Box 516
730 Indiana Ave.
West Bend, WI 53095

728 APV Americas -
Heat Transfer Division
395 Fillmore Ave.
Tonowanda, NY 14150

811 Hydro-Thermal Inc.
400 Pilot Court
Waukesha, WI 53188

874 Q-Jet DSI, Inc.
P.O. Box 748
303 State Street
North Haven, CT 06473

991 Komax Systems, Inc.
508 East "E" Street
Wilmington, CA 90744

62-01 Hose Assemblies for Milk and Milk Products

698 Sanitary Couplers Inc.
275 South Pioneer Blvd.
Springboro, OH 45066

700 Titan Industries Inc.
11121 Garfield Avenue
South Gate, CA 90280

721 Dixon Valve & Coupling
800 High St.
Chestertown, MD 21620

727 Saint-Gobain Performance Plastics
460 Milltown Road
Bridgewater, NJ 08807

757 Nelson-Jameson Inc.
P.O. Box 647
2400 E. 5th St.
Marshfield, WI 54449

758 Crouch Supply Co.
P.O. Box 163829
902 S. Jennings
Ft Worth, TX 76161

774 The Briggs Co.
3 Bellecor Drive
New Castle, DE 19720

795 Able Hose & Rubber Inc.
2307 E. Hennepin Ave.
Minneapolis, MN 55413

799 R/W Connection
936 Links Ave.
Landisville, PA 17538

1003 Dixson Valve and Coupling Company
800 High Street
Chestertown, MD 21620-1196

63-02 Sanitary Fittings for Milk and Milk Products

31 Walker Stainless Equip.
P.O. Box 202
625 State Street
New Lisbon, WI 53950-0202

34 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

67 Alfa Laval Flow Inc., G&H Div.
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

73 L.C. Thomsen Inc.
1303-43rd Street
Kenosha, WI 53140

79 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

82 Waukesha Cherry-Burrell
611 Sugar Creek Road
Delavan, WI 53115

200 Paul Mueller Company
P.O. Box 828
1600 West Phelps Street
Springfield, MO 65801

242 WCB de Mexico, S.A. de C.V.
Alfredo B. Nobel #39
Fracc. Ind. Pte. Vigas,
Tlalnepantla Edo de Mexico 54070 Mexico

304 VNE Corporation
1149 Barberry Dr.
Janesville, WI 53545

334 Stainless Products, Inc.
P.O. Box 169
1649 - 72nd Ave.
Somers, WI 53171-0169

349 A.P.N. Inc.
921 Industry Road
Caledonia, MN 55921

380 Allegheny Bradford Corp.
P.O. Box 200
Bradford, PA 16701

389 Lee Industries
P.O. Box 688
514 W Pine St.
Philipsburg, PA 16866

391 Stork Food & Dairy Systems, Inc.
P.O. Box 1258
1024 Airport Pkwy.
Gainesville, GA 30503

424 Robert-James Sales,Inc.
699 Hertel Ave. Ste 260
Buffalo, NY 14207

449 Tech Control Enterprise Co.
3725 N. Murray Road
Otis Orchard, WA 99027

454 Jensen Fittings Corp.
107-11 Goundry St.
N. Tonawanda, NY 14120-5998

621 Bradford Castmetals, Inc.
P.O. Box 33
Elm Grove, WI 53122

645 Cipriani Inc.
23195 LaCadena Dr. #103
Laguna Hills, CA 92653

677 Excel-A-Tec Inc.
W 140 N5958 Lilly Road
Menomonee Falls, WI 53051

682 Andron Stainless Ltd.
6170 Tomken Road
Mississauga Ontario L5T 1X7 Canada
U.S. Rep: Andron Stainless Corp.
8901 Farrow Road, #101
Columbia, SC 29203

688 Swagelok
29500 Solon Road
Solon, OH 44139

696 Conexiones Inox. (CIPSA)
Vicente Guerrero 211
Ciudad Xicotepec Edo Puebla Mexico

699 Rodger Industries
P.O. Box 186
Blenheim Ontario NOP 1A0 Canada

703 Parker Hannifin Corp.
UHP Products Division
1005 A Cleaner Way
Huntsville, AL 35805

707 Valvinox Inc.
SGRM Div.
650-1st St.
Iberville Quebec J2X 3B8 Canada

726 Norton Performance Plastics
460 Milltown Road
Bridgewater, NJ 18103

741 Steel & O'Brien Mfg
12850 Route 39
Sardinia, NY 14134

773 VNE Corporation
P.O. Box 1698
Janesville, WI 53547

838 Quality Management Inc. (QMI)
426 Hayward Avenue North
St. Paul, MN 55128

900 APV Americas-Lake Mills
100 South CP Avenue
Lake Mills, WI 53551-1799

917 Irving Polishing & Mfg Co., Inc.
5704 46th Street
Kenosha, WI 53144-1899

925 Hassia USA, Inc.
1210 Campus Drive West
Morganville, NJ 07751

933 King Lai International Co., LTD
No.10 6th East St.
Youth Industrial Zone
Tachia,Taichung Taiwan ROC

947 FLOW MECA, INC.
19400 Stevens Creek Bld., Suite 200
Cupertino, CA 95014

948 VNE Corporation
1149 Barberry Drive
Janesville, WI 53547

949 CANDIGRA y CIA
C/. Telers,54-Aptdo.174
Banyoles Spain

960 Kurt Orban Partners
450 Kings Road
Brisbane, CA 94005

962 CIVACON
416 East Alondra Blvd.
Gardena, CA 90248

969 MarketNet
2241 Quebec Avenue South
Saint Louis Park, MN 55426

985 Bradford Cast Metals
P.O. Box 33
Elm Grove, WI 53122

987 Trident Stainless Mfg. Ltd.
4635 Burgoyne St.
Units 17-18
Mississauga Ontario L4W 1V9 Canada

992 Taitech Precision Industries
2000 North Ivar Avenue
Los Angeles, CA 90068

1006 Westfalia-Surge Technologies, Inc.
20903 W. Gale Avenue
Galesville, WI 54630

1007 Westfalia -Surge Technologies, Inc.
20903 W. Gale Avenue
Galesville, WI 54630

1016 Becker, Inc.
P.O. Box 1258
6705 14th Ave.
Kenosha, WI 53140

1017 United Pacific Distributors
1040 Wallace Place
City of Industry, CA 91748

1018 Advance Fittings Corp.
P.O. Box 678
218 West Centralia Street
Elkhorn, WI 53121

1036 AERRE INOX s.r.l.
Via delle Arti 26
26010 FIESCO Italy
CMG Industries, Inc.
Laguna Hills, CA

1054 Hyjoin, Ltd.
28 Clifton Hill
London NW8 0QG UK

1059 Sani-Fit, Inc.
54 Carolina Street
Springville, NY 14141

1060 Thai-German Products Pb.Co.Ltd.
170/25-28 Ocean Tower1, 10 Flr.
Ratchadaphiseak Road, Klongtoey
Bangkok 10110 THAILAND
U.S. Rep: Norce Industrial LLC
Great Neck, NY 11022

1080 J. Chen Business Company, Ltd.
No.7 Lane 135 Sec. 2
Shi-Tzuen St.
Sunhlin City, Taipei, Taiwan
ROC

64-00 Pressure Reducing and Back Pressure Regulating Valves for Milk and Milk Products

753 Alfa Laval Flow Inc.
Sanitary Flow Division
P.O. Box 581909
Pleasant Prairie, WI 53158-0909

769 Richards Industries
Valve Group
3170 Wasson Road
Cincinnati, OH 45209-2381

782 CASHCO
P.O. Box 6
Ellsworth, KS 67439-0006

65-00 Sight and/or Light Windows and Sight Indicators in Contact with Milk and Milk Products

818 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

845 L.J. Star Incorporated
P.O. Box 1116
2201 Pinnacle Parkway
Twinsburg, OH 44087

849 Jacoby TarBox Division of
The Clark Reliance Corp.
16633 Foltz Ind Pkwy.
Strongsville, OH 44136

867 J.M. Canty, Inc.
6100 Donner Road
Lockport, NY 14096

929 SHAE Industries
P.O. Box 1268
Healdsburg, CA 95448

970 MarketNet
2241 Quebec Avenue South
Saint Louis Park, MN 55426

974 Steel & O'Brien Mfg., Inc.
12850 Route 39
Sardinia, NY 14134

994 Taitech Precision Industries
2000 North Ivar Ave.
Los Angeles, CA 900681

68-00 Ball-Type Valves for Milk and Milk Products

898 Fluid Transfer
Div. of Lee Ind., Inc.
514 W Pine Street
Philipsburg, PA 16866

931 LUMACO
9-11 East Broadway
Hackensack, NJ 07601

1022 Bradford Castmetals, Inc.
P.O. Box 33
Elm Grove, WI 53122

1032 BowIswitch USA, INC.
6580 Valley Center Drive, Box 6
Radford, VA 24141

1048 IBCC Industries, Inc.
3200 S. 3rd Street
Milwaukee, WI 53207

73-00 Shear Mixers, Mixers, and Agitators

901 Admix, Inc.
234 Abby Road
Manchester, NH 03103

957 Admix, Inc.
234 Abby Road
Manchester, NH 03103-3332

74-00 Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products

32 ABB Instrumentation, Inc.
P.O. Box 20550
1175 John St.
Rochester, NY 14602-0550

206 The Foxboro Company
NO2-1B
33 Commercial St.
Foxboro, MA 02035-2099

285 K Systems Corp.
Tank Mate Division
4931 Butterfield Road
Hillside, IL 60162

315 Burns Engineering
10201 Bren Road East
Minnetonka, MN 55343

318 Anderson Instruments
156 Auriesville Road
Fultonville, NY 12072

328 Rosemount Inc.,
Mail Stop PK04
8200 Market Blvd.
Chanhassen, MN 55317-1126

367 RdF Corporation
P.O. Box 490
23 Elm Avenue
Hudson, NH 03051-0490

396 King Engineering
P.O. Box 1228
Ann Arbor, MI 48106

405 Drexelbrook Engrng
205 Keith Valley Road
Horsham, PA 19044

410 Viatran Corp.
300 Industrial Drive
Grand Island, NY 14072

420 Stork Food & Dairy Systems, Inc.
1024 Airport Pkwy., P.O. Box 1258
Gainesville, GA 30503

428 Ari Industries
381 Ari Court
Addison, IL 60101

444 Tuchenhagen N America
9160 Red Branch Road
Columbia, MD 21045

459 Endress + Hauser GmbH + Co.
2350 Endress Place, P.O. Box 246
Greenwood, IN 46143

487 Pyromation Inc.
5211 Industrial Road
Fort Wayne, IN 46825-5152

495 Rosemount Analytical, Inc.
2400 Barranca Pkwy.
Irvine, CA 92606

501 Lumenite Control Technology
2331 North 17th Ave.
Franklin Park, IL 60131

515 Setra Systems Inc.
159 Swanson Road
Boxborough, MA 01719

522 Weed Instrument Co.
P.O. Box 300
707 Jeffrey Way
Round Rock, TX 78680

523 Paper Machine Comp
Miry Brook Road
Danbury, CT 06810

524 Flow Technology, Inc.
4250 E. Broadway
Phoenix, AZ 85040

525 Caldwell Systems Corp.
600 S. Sunset, Unit D
Longmont, CO 80501

554 Par-Sonics Inc.
R.D. #1 Box 505
Centre Hall, PA 16828

557 Honeywell, Inc.
1100 Virginia Dr.
Ft. Washington, PA 19034

563 P I Components
1951 Hwy 290W
Brenham, TX 77833

569 Weiss Instruments
905 Waverly Avenue
Holtsville, NY 11742

572 ITT Conoflow
P.O. Box 768
Route 78
St. George, SC 29477

576 AMETEK
Test/Calibration Inst. Div.
8600 Somerset Dr.
Largo, FL 34643

583 S.J. Controls
2248 Obispo Ave.
Long Beach, CA 90806

586 DiverseyLever Equipment
2841 Mission Street
Santa Cruz, CA 95060-2142

588 Minco Products
7300 Commerce Lane
Minneapolis, MN 55432-3177

596 Magnetrol Intl.
5300 Belmont Road
Downers Grove, IL 60515

597 Nuova Fima S.p.A.
Via C. Battisti 59
28045- INVORIO Italy
U.S. Rep: MDI Industrial Sales
9868-33 Ave.
Alberta, Canada T6N

598 FMC Invalco Inc.
2825 W. Washington
Stephenville, TX 76401

600 Weksler Instruments
Dresser Industries
250 E. Main Street
Stratford, CT 06497

620 Larad Equipment
18 Menfi Way
Hopedale, MA 01747

627 Milltronics
P.O. Box 4225
1954 Technology Drive
Peterborough Ontario K9J 7B1 Canada
U.S. Rep: Milltronics, Inc.
709 E. Stadium Dr.
Arlington, TX 76001

629 ISE of Texas Inc.
907 Bay Star Blvd.
Webster, TX 77598-1531

633 Griffith Ind. Products
P.O. Box 111
Pearl Avenue
Putnam, CT 06260

640 Dresser Industries
250 E. Main St.
Stratford, CT 06497

641 Tempress A/S
P.O. Box 2090
Nordlandsvej 64-66
Risskov DK8240 Denmark

644 Princo Instruments
1020 Industrial Highway
Southampton, PA 18966-4095

646 WIKA Instruments Corp.
1000 Wiegand Blvd.
Lawrenceville, GA 30243-5868

651 Granzow Inc.
2300 Crownpoint Exec Dr.
Charlotte, NC 28227

659 Venture Measurement LLC
150 Venture Blvd.
Spartanburg, SC 29306

663 Dresser Equipment Group
Instrument Division
210 Old Gate Lane
Milford, CT 06460

668 GP:50 New York LTD
P.O. Box 1150
2770 Long Road
Grand Island, NY 14072

672 Computer Instruments
1000 Shames Drive
Westbury, NY 11590

685 Winters Thermogauges
121 Railside Road
Toronto Ontario M3A 1B2 Canada

706 Venture Measurement LLC
150 Venture Blvd.
Spartanburg, SC 29306

732 SensorTec Inc.
7620 DiSalle Blvd.
Fort Wayne, IN 46825

738 ABB Automation, Inc.
Instrumentation Division
125 East County Line Road
Warminster, PA 18974

747 Alloy Engr Co. Inc.
P.O. Box 4036
304 Seaview Ave.
Bridgeport, CT 06607-0036

749 Haenni Instruments AG
Bernstrasse 59
CH-3303 Switzerland
U.S. Rep: Haenni Instruments Inc.
1107 Wright Avenue
Gretna, LA 70056

763 PerkinElmer Instruments, Inc.
801 S. Illinois Ave.
Oak Ridge, TN 37831-0895

765 Tri-Clover Inc.
P.O. Box 1413
Kenosha, WI 53141-1413

768 MTS Sensors Div.
3001 Sheldon Dr.
Cary, NC 27513

779 Wahl Instruments Inc.
234 Weaverville Hwy.
Asheville, NC 28804

784 Sensotec, Inc.
2080 Arlingate Lane
Columbus, OH 43228-4112

794 Honeywell, Inc.
PA62/212
1100 Virginia Drive
Fort Washington, PA 19034

798 Kay-Ray/Sensall Inc.
1400 Business Center Dr., Ste.100
Mount Prospect, IL 60056

815 ProMag Ltd.
11552 Merchant Drive
Baton Rouge, LA 70809

822 Ametek
820 Pennsylvania Blvd.
Feasterville, PA 19053

829 DCT Instruments/Sensotec, Inc.
2080 Arlingate Lane
Columbus, OH 43228-4112

832 H O Trerice Co.
12950 W Eight Mile Road
Oak Park, MI 48237-3288

842 Klay Instruments B.V
Nijverheidsweg 5
P.O. Box 13
NL 7991 CZ Netherlands
U.S. Rep: HiTech Technologies Inc.
Yardley, PA 19067-7706

850 Chicago Stainless Equip.
1280 S.W. 34th Street
Palm City, FL 34990-3308

861 Dwyer Instruments Inc.
P.O. Box 373
Michigan City, IN 46361-0373

862 Delta Controls Corp.
585 Fortson Street
Shreveport, LA 71107

863 Nelson-Jameson
P.O. Box 647
2400 East Fifth Street
Marshfield, WI 54449

866 Dovex S.S. Inc.
770 Tower Drive
Medina, MN 55340

872 Brookfield Eng. Lab Inc.
11 Commerce Boulevard
Middleboro, MA 02346

873 Smar Equipamentos Industriasis, Ltd.
Av. Dr. Antonio Furlan Jr., 1028
Sertaozinho-SP 14160.000 Brazil

875 SOR Inc.
14685 West 105th Street
Lenexa, KS 66215

876 Rosemount Inc.
8200 Market Blvd., Mail Stop PK04
Chanhassen, MN 55317-1126

879 Zurich Acessorio Ind Ltda
Rua Serra da Predade, 183
Sao Paulo-SP 03131-080 Brazil

893 Kistler-Morse Corp.
19021 - 120th Ave. N.E.
Bothell, WA 98011-9511

896 ABB Instrumentation
2175 Lockheed Way
Carson City, NV 89706

906 Mettler-Toledo
Process Analytical, Inc.
261 Ballardvale Street
Wilmington, MA 01887

909 Ohmart/VEGA
4241 Allendorf Drive
Cincinnati, OH 45209-9961

910 CEMCO Manufacturing, Inc.
1120 North Peoria
Tulsa, OK 74106-4904

930 Kamstrup A/S, Process Division
Jacob Knudsens Vej 12
DK-8230 Abyhoj Denmark

936 ENFM-USA, Inc.
11339 East Distribution Avenue
Jacksonville, FL 32256

945 Kemotron, Inc.
1090 Northcase Parkway, Suite 200 S.
Marietta, GA 30067

961 KDG Instruments
Crompton Way
Crawley, W. Sussex RH102YZ UK

963 GLI International, Inc.
9020 West Dean Road
Milwaukee, WI 53224

966 ODEN CORPORATION
255 Great Arrow Avenue
Buffalo, NY 14207-3024

977 efector, Inc.
A subsidiary of ifm electronic
805 Springdale Drive
Exton, PA 19341

982 Reotemp Instr.-Corp.
11568 Sorrento Valley Road, Suite 10
San Diego, CA 92121-1313

983 OHMART/VEGA Corp.
4241 Allendorf Drive
Cincinnati, OH 45209

984 Garner Industries
4200 North 48th Street
Lincoln, NE 68504

1000 pro/M/tec, Inc.
1201 Braddock Ave., Suite 2
Pittsburgh, PA 15218

1002 Milltronics
Nikkelstraad 10
NL4823 AB
Breda Netherlands

1013 Rheology Services, Inc.
160 Market St., Suite 7
Saddle Brook, NJ 07663

1028 SAN-TRAN.COM, INC.
7524 W. 98th Place
Bridgeview, IL 60455

1033 SAN-TRAN.COM, INC.
7524 W. 98th Place
Bridgeview, IL 60455

1047 Viatran Corporation
300 Industrial Drive
Grand Island, NY 14072

1051 Endress+Hauser Conducta
Dieselstrasse 24
D-70839 Germany

1061 Maselli Measurements, Inc.
7746 Lorraine Avenue
Stockton, CA 95210

1070 Pondus Instruments AB
Box 178
S-162 12
Vallingby Sweden
U.S. Rep: ABB Instrumentation

75-00 Belt-Type Feeders

1078 Brabender Technologie Inc.
6500 Kestrel Road
Mississauga Ontario L5T 1Z6 Canada

78-00 Spray Devices to Remain in Place

988 Holdren Brothers, Inc.
301 Runkle Street, P.O. Box 459
West Liberty, OH 43357

993 Lechler, Inc.
445 Kautz Road
St. Charles, IL 60174-5301

1040 Spraying Systems Co.
P.O. Box 7900
Wheaton, IL 60189-7900

81-00 Auger-Type Feeders

1049 Tetra Pak Hoyer
753 Geneva Parkway, P.O. Box 280
Lake Geneva, WI 53147

1079 Brabender Technologies Inc.
6500 Kestrel Road
Mississauga Ontario L5T 1Z6 Canada

ComingEvents

SEPTEMBER

·10-12, The International Exposition for Food Processors® (IEFP) 2001, Sands Expo & Convention Center, Las Vegas, NV. For additional information, contact Nancy Janssen or Cheryl Clark at 703.684.1080; 800.331.8816 (US and Canada only); fax: 703.548.6563; Web site: info@fpmsa.org.

·12-13, Upper Midwest Dairy Industry Association Annual Meeting, Holiday Inn, St. Cloud, MN. For additional information, contact Paul Nierman at 612.785.0484.

·12-13, Food Plant Sanitation Workshop, Chicago, IL. For additional information, contact AIB, 1213 Bakers Way, P.O. Box 3999, Manhattan, KS 66505-3999; phone: 785.537.4750; fax: 785.537.1493.

·12-14, Wyoming Environmental Health Association Annual Meeting, Little America Hotel, Cheyenne, WY. For additional information, contact Nola Evans at 307.745.4591.

·12-16, The National Society for Healthcare Foodservice Man-agement 2000 Conference, at the Registry Resort, Naples, FL. For further information, contact Sheila Crowley at 202.546.7236; fax: 202.547.6348.

·14-15, Microbiological Concerns in Food Plant Sanitation and Hygiene, Huntington Beach,CA. This course is designed for individuals responsible for implementing and monitoring sanitation programs. For further information, contact Silliker Laboratories Group, Inc., at 800.829.7879; Web site: www.Silliker.com.

·19-21, New York State Assn. of Milk & Food Sanitarians, Sheraton Inn, Syracuse, NY. For additional information, contact Janene Lucia at 607.255.2892.

·19-21, Washington Assn. for Food Protection Annual Meeting, WestCoast Wenatchee Center Hotel, Wenatchee, WA. For more information, contact Bill Brewer at 206.363.5411.

·23-27, Plasticulture 2000, Hershey Lodge and Convention Center, Hershey, PA. See active field demonstrations of machinery, crops grown in plasticulture systems and special tours. For more information, contact The American Society for Plasticulture at 814.238.7045.

·24-27, InterMopro 2000, InterCool 2000, and InterMeat 2000, Düsseldorf, Germany. For further information, contact Messe Düsseldorf North America, 150 N. Michigan Ave., Suite 2920, Chicago, IL 60601; phone: 312.781.5180; fax: 312.781.5188; Web site: www.mdna.com.

·25-27, Indiana Environmental Health Association, Inc. Fall Educational Conference, Radisson, Evansville, IN. Contact Helene Uhlman at 219.853.6358 or Bob Schmidt at 812.349.2542.

·27-28, Wisconsin Milk & Food Sanitarians Association Meeting, Regency Suites, Green Bay, WI. For further information, contact Randy Daggs at 608.266.9376.

·29-Oct. 2, 2nd Biennial 5-A Day International Symposium, Washington Monarch Hotel, Washington, D.C. Public health professionals and produce industry leaders interested in implementing or strengthening community-based public/private partnerships to improve health in their own countries should attend this conference. For more information, contact National Cancer Institute at 301.496.8520; E-mail: Margaret_Farrell@nih.gov; or Produce for Better Health Foundation at 302.235.2329, ext. 32; E-mail: mneilan@5aday.com.

OCTOBER

·2-3, International Fresh-cut Produce Association (IFPA) 8th Annual Technical Seminar, "Biotechnology: Friend or Foe?" Monterey Marriott, Monterey, CA. For further information, contact Stephanie Grunenfelder at 703.299.6282.

·4-5, Iowa Assn. of Milk, Food & Environmental Sanitarians, Inc., Best Western Starlight Hotel, Ames, IA. For additional information, contact Monica Streicher at 319.933.4521, ext. 222.

·5-6, Alberta Assn. of Milk, Food & Environmental Sanitarians Meeting, Bernard Schnell Hall, University of Alberta in Edmonton, Alberta, Canada. For additional information, contact Bonnie Jensen at 780.495.2188.

·9-11, Eighth International Symposium on Animal, Agricultural and Food Processing Wastes (ISAAFPW), Marriott Conference Center, Des Moines, IA. Co-sponsored by IAFP. For additional information, phone Brenda West at 800.371.2723.

·11-12, Associated Illinois Milk, Food & Environmental Sanitarians, Stoney Creek Inn, East Peoria, IL. For additional information, contact Tom Gruetzmacher at 815.395.8797.

·11-13, Second NSF International Conference on Food Safety: Preventing Foodborne Illness through Science and Education. The conference will be held in Savannah, GA at the Hyatt Regency. Co-sponsored by IAFP and other organizations. For additional information, contact Wendy Raeder at 734.827.6888; fax: 734.827.7114/6831; E-mail: raeder@nsf.org.

·12-13, HACCP Workshop, Industry, CA. For additional information, contact AIB, 1213 Bakers

Way, P.O. Box 3999, Manhattan, KS 66505-3999; phone: 785.537.4750; fax: 785.537.1493.

·**23-25, The 2000 New Mexico Environmental Health Conference,** Albuquerque Convention Center, Albuquerque, NM. For additional information, contact Tom Duker, P.O. Box 27176, Albuquerque, NM 87125-7176; phone: 505.924.3667; fax: 505.924.3684; E-mail: tduker@mercury.bernco.gov.

·**24-25, Michigan Environmental Health Association's (MEHA) Annual Food Protection Conference,** Amway Grand Hotel, Grand Rapids, MI. For additional information, contact Diane L. Forys, Food Protection Conference Chairperson, (MEHA) at 810.987.5306 or fax: 810.985.2150.

·**31, North Dakota Environmental Health Association Annual Conference,** Grand Forks Holiday Inn, Grand Forks, ND. For additional information, contact Debra Larson at 701.328.1292.

NOVEMBER

·**8-10, International Life Sciences Institute (ILSI) Europe 2nd International Symposium on Food Packaging—Ensuring the Safety and Quality of Foods,** Vienna, Austria. For more information, contact ILSI Europe, Avenue E. Mounier, 83-Box 6-B, 1200 Brussels, Belgium, or phone: 32.2.771.00.14; fax: 32.2.762.00.44; E-mail: Packaging.Sympo@ilsieurope.be.

·**8-10, Servsafe® for the Retail and Food Service Sector,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.836.1246; fax: 519.821.1281; E-mail: gftc@uoguelph.ca.

·**12, IAFP Workshop, Latin American Workshop on Safety of Exported Produce,** Guadalajara Mission Carlton Hotel, Guadalajara, Mexico. Watch our Web site at www.foodprotection.org for more information.

·**12-16, American Public Health Association's 128th Annual Meeting,** Boston, MA. For more information, phone: 202.777.2470; fax: 202.777.2531; E-mail: ashell.alston@apha.org.

·**13-16, Pacific Congress on Milk Quality and Mastitis Control,** Nagano, Japan. Co-sponsored by IAFP. For additional information, contact Secretariat for PC2000, Philpot and Associates International, P.O. Box 120, Homer, LA 71040; phone: 318.927.2388; fax: 318.927.3133; E-mail: philpot@homerla.com.

·**16-17, Alabama Association for Food Protection Annual Meeting.** For additional information, contact Patricia Lindsey at 256.734.0243.

·**15-17, IFT's International Food Safety and Quality Conference and Expo,** Orange County Convention Center, Orlando, FL. For additional information, call 312.782.8424.

·**21-23, Second National On-Farm Food Safety and Quality Assurance Conference,** Novotel Launceston, Tasmania. For more information, contact Tasmanian Quality Assured Inc., P.O. Box 193, Launceston 7250, Tasmania; phone: 03.6331.6377; fax: 03.6331.4344; E-mail: tqainc@microtech.com.au.

·**30, HACCP: An Executive Summary,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.821.1246; fax: 519.836.1281; E-mail: gftc@uoguelph.ca.

DECEMBER

·**4-5, Food Safety Objectives: Public Health, HACCP and Science Conference,** Georgetown University, Washington, D.C. For further information, contact Phillipa Orme, FSO 2000 Conference Secretariat, 12 Church St., West Hanney, Wantage, Oxon OX12 OLN, UK; Phone 44.01235.868811. Fax: 44.01235.868811; E-mail: p.orme@dial.pipex.com.

·**4-6, InterBev 2000,** Morial Convention Center, New Orleans, LA. For more information call Joe Nemchek at 203.840.5949.

·**13-14, HACCP IV: Train the Trainer,** Guelph, Ontario, Canada. For more details, contact Marlene Inglis, Guelph Food Technology Centre at 519.821.1246; fax: 519.836.1281; E-mail: gftc@uoguelph.ca.

ADVERTISING INDEX

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Silliker Laboratories, the global leader in food microbiology and chemistry testing, education and consulting, has an opening for a Corporate Director of Microbiology. Responsibilities include; providing technical direction to all Silliker microbiology personnel, coordinating corporate efforts related to quality systems, managing projects within the area of expertise and providing consulting services to clients as needed. Applicants must have an advanced degree (Ph.D. preferred) in Microbiology or Food Science with a strong emphasis in microbiology and a minimum of five years of food testing industry experience. Professional level written and oral communication skills are required. Position is located in Chicago Heights, IL.

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Sr. Research Associate Food Safety/Microbiology

The Food Safety/Microbiology Department of Campbell Soup has an opening for a Sr. Research Associate. The successful candidate will possess strong oral/written communication skills; the ability to design experiments and correctly interpret data/findings, and the ability to work independently while managing multiple projects/priorities. Candidate must have a Masters in Food Microbiology or Food Science with 2+ years laboratory experience. General knowledge of microbial risk and testing requirements for food products is beneficial. Work experience in a food processing lab, QA or operations is a plus. Travel expectancy is 10-15%.

Contact: Suzanne Tortorelli; E-mail: suzanne_tortorelli@campbellsoup.com; Fax: 856-968-2888.

Welch's, the world's leading marketer of Concord grape and other fruit-based products, has immediate openings for a Quality Specialist and a Senior Quality Specialist at our Technology Center in Billerica, Massachusetts.

QUALITY SPECIALIST

Responsible for quality systems, sanitation and process capability audits of potential and existing co-packers, licensees and suppliers with a major focus in the fresh fruit business. Develops and issues quality specifications and procedures. Provides Corporate Quality technical oversight and support of co-packers, licensees and supplies. BS required (MS or Ph.D. preferred) in Microbiology, Food Science, Chemistry or related science with 2+ years of related work experience. Strong technical competence along with demonstrated ability to champion quality policies, objectives and initiatives within a focuses area of responsibility are required. Travel is estimated at 50-75%. This position is located at our Technology Center in Billerica, Massachusetts. (TECHNOLOGY CENTER)

SENIOR QUALITY SPECIALIST

Responsible for technical oversight of various business and operations functions. Develop and implement Quality policies and procedures across the corporation. Provides leadership in executing quality system improvements throughout the organization. Recommends strategic technical direction to management. BS required (MS or Ph.D. preferred) in Microbiology, Food Science, Chemistry, Engineering or related science with 6+ years of experience in Corporate and Plant Quality management. Demonstrated technical ability along with solid project management and leadership skills required. This position is located at our Technology Center in Billerica, Massachusetts.

Cargill, Inc.
Food Safety Microbiologist
R9900-056

Cargill is a global leader in the processing and distribution of agriculture-based renewable resources and an emerging leader in the conversion of these resources to new products. Cargill seeks to create long term value by developing, commercializing, and expanding a variety of technology-based specialty food, feed and industrial chemical businesses. Our Corporate Food Safety Department seeks a Food Safety Microbiologist to design and conduct laboratory experiments, maintain laboratory under GLP conditions and conduct GLP audits, as well as record, organize and report data. Additional responsibilities include conducting literature reviews and developing position papers. Position accountabilities include 15% travel. The position is located in suburban Minneapolis, MN.

Eligible candidates must have an MS degree in microbiology or related discipline with 2+ years food laboratory experience. The successful candidate must be resourceful in conducting experiments, able to provide recommendations and have demonstrated the ability to apply food microbiology principles. Specialized knowledge in microbiological testing procedures and good laboratory practices are a must. Strong written and verbal communication and teamwork skills are required.

If you would like to be part of a company that is raising the standard of living worldwide, consider Cargill. Please submit resume online by visiting our resume builder at www.cargill.com/jobs/index. MUST specify R9900-056 in the area titled "Job Number." The Internet is the preferred method for receiving resumes. If this is not an option for you, please forward resume to: PO Box 5697, MS#10, Attn: JTS, Minneapolis, MN 55440-5697.

Equal Opportunity Employer.

Director of the University's Center for Animal Health and Food Safety

The College of Veterinary Medicine, University of Minnesota is seeking an outstanding individual to fill the position of Director of the University's Center for Animal Health and Food Safety. This will be a 12-month, 100% time, annually renewable administrative appointment. The individual will also hold a faculty appointment in one of the academic departments of the College, rank and appointment type dependent on qualifications and experience consistent with collegiate and University policy. The Center has been newly created based on substantial continuing funding from the State of Minnesota and is dedicated to improving the safety of food from animals. The successful candidate will have the challenge of assembling a team of people (existing and new faculty with the college and greater university and collaborators from the private and government sectors) who will have a significant impact on safety and wholesomeness of food from animals. The Director will have budget authority for the Center with the advice of an advisory committee and will report to the Dean of the College.

Candidates must have the following qualifications: DVM, VMD, or equivalent foreign veterinary degree or other advanced degree relating to food safety and public health (i.e. MPH, PhD, MD) is required. Candidates must qualify for Assistant, Associate, or Full Professor rank within one of the academic departments of the College of Veterinary Medicine. Excellent communication skills along with abilities and enthusiasm for developing and implementing public communication programs. Leadership skills and demonstrated experience in managing multi-faceted programs. The position requires an aptitude for building an atmosphere of teamwork among a group of individually accomplished, highly motivated people. Clear vision of the importance of food safety throughout the total food chain, the contributions that a university can make in assuring the quality of animal food, and the potential role for the veterinary profession relative to food safety in food animal production. National and/or international stature in food safety programs development, research, education, and/or implementation. Demonstrated understanding of the complex mix of constituencies and market forces at play in implementing food safety at an industry-wide level. Preference given to candidates with a combination of medical and research training and/or experience in administration, program development, budget control, and program leadership.

Salary, rank and appointment type dependent upon qualifications and experience.

Applicants must submit a cover letter outlining qualifications and vision for the position, a curriculum vitae, names, addresses, and phone numbers of three professional references. Applications will be reviewed beginning September 1, 2000 and continuing until the position is filled. Please send application materials to: *Dr. John Fetrow, Search Committee Chair, College of Veterinary Medicine, University of Minnesota, 1365 Gortner Ave., St. Paul, MN 55108. Inquiries are encouarged by contacting Dr. Fetrow at*: fetro001@te.umn.edu, *612-625-3776.*

The University of Minnesota is an equal opportunity educator and employer.

FOOD PROTECTION PROGRAM MANAGER
Boise, Idaho

Want a great lifestyle? Boise is in the heart of the Pacific Northwest. It's a growing community with friendly folks, great amenities and easy access to world class whitewater rafting, skiing, fishing, hunting, camping, snowmobiling and other outdoor activities.

Boise is the headquarters for eight major international corporations. Great schools, roads, clean air and water, safe communities, parks, reasonable cost housing and numerous job opportunities.

Idaho has some of the most diverse geography in the country, from desert sand dunes to fertile farm land to alpine lakes and granite peaks.

Position: Manage Idaho's Food Protection Program; develop and implement food protection regulations, guidelines, and strategies for food safety and sanitation; manage statewide compliance audits, budget and contracts.

Desirable Background: Related bachelor's degree or relevant upper division college courses or professional seminars on food safety and at least five years food safety related management experience.

Salary: $45,000 - $50,000 per year depending on experience.

For Information & Application Contact:
Send a resume and cover letter to: Russell Duke, Idaho Division of Health, 450 West State Street, Boise, Idaho 83720; Fax: (208) 334-6581; Ph: (208) 334-0606 or e-mail: **duker@idhw.state.id.us**

Application Deadline: Immediate consideration and position open until filled.

IDAHO DEPARTMENT OF HEALTH AND WELFARE
EEO/AA

International Association for Food Protection

6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2863, USA
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- ❒ D1030 Cold Hard Facts
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- ❒ D1140 Pasteurizer – Operation
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ENVIRONMENTAL

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- ❒ E3030 Air Pollution: Indoor
- ❒ E3040 Asbestos Awareness
- ❒ E3055 Effective Handwashing–Preventing Cross-Contamination in the Food Service Industry
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- ❒ E3140 Putting Aside Pesticides
- ❒ E3150 Radon
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THOUGHTS on Today's Food Safety...

Why the Concern about Food Allergies?

Steve L. Taylor, Ph.D.
University of Nebraska
Food Allergy Research & Resource Program

Undeclared food allergens have become a major source of food recalls in recent years. Suppliers and co-packers now continually face allergen audits and the need to divulge the sources of many ingredients. Sanitation companies are being asked for advice on how to remove residues of allergenic foods from processing equipment.

Why have these concerns arisen? Food allergies afflict 2.0 to 2.5% of American consumers, and, the number of consumers with food allergies appears to be rising. True food allergies are abnormal responses of the immune system, especially the production of allergen-specific IgE antibodies, to naturally occurring proteins in certain foods that most individuals can eat safely. On a worldwide basis, eight foods or food groups (the so-called Big Eight: milk, eggs, fish, crustacea, peanuts, soybeans, tree nuts, and wheat) account for more than 90% of all food allergies. But virtually any food can trigger allergic reactions in at least rare cases.

IgE-mediated food allergies can cause severe reactions in a few of the affected individuals with an estimated 25,000 emergency room visits and 100 to 200 deaths in the United States each year. Severe reactions are usually the result of inadvertent ingestion of a reasonably large amount of the offending food, but the most sensitive individuals can react to invisible, trace amounts of the offending food. While the minimum amount needed to elicit an objective reaction in the most sensitive individuals remains unknown, levels as low as 1 to 2 mg have elicited reactions in controlled clinical trials.

An avoidance diet is the only effective method for preventing allergic reactions to foods. Food-allergic consumers rely heavily on the ingredient statements of packaged food products. While many allergic reactions, especially the severe reactions, occur in foodservice situations, consumer complaints demonstrate that packaged foods do occasionally cause allergic reactions due to the presence of undeclared allergens. Until recently, undeclared residues of allergenic foods could not be detected in other foods. Now, ELISAs are available for the specific and sensitive detection of peanut, egg, casein, and almond residues, and provide companies with the tools needed to assess the effectiveness of allergen control strategies. However, the increased concern over food allergens has also led to a proliferation of precautionary labeling, e.g., "may contain peanuts." Since allergic consumers often dislike precautionary labeling, it should be used judiciously and in situations where allergen control strategies cannot effectively prevent the occasional presence of undeclared residues of allergenic foods.

International Association for Food Protection

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The leading food safety conference
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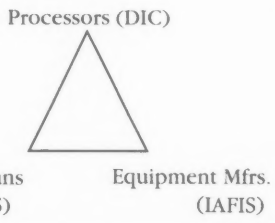
MARK OF COMPLIANCE

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

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Cedar Rapids, IA 52403

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