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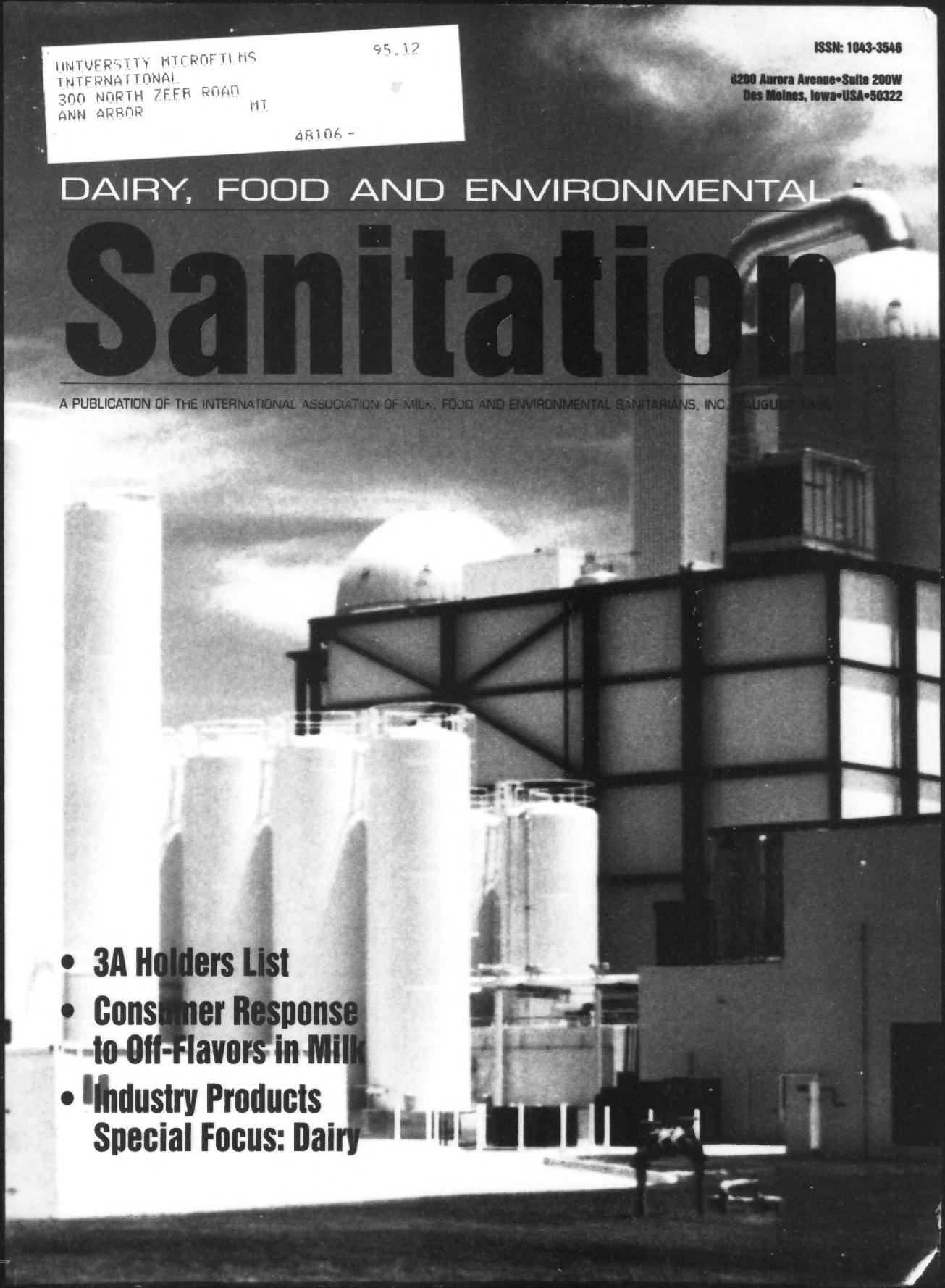
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. AUGUST 1995



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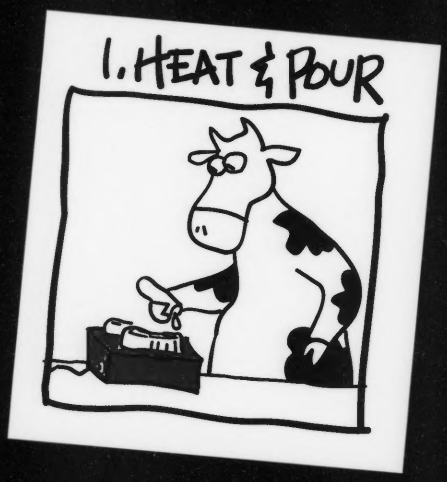

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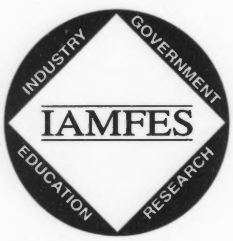

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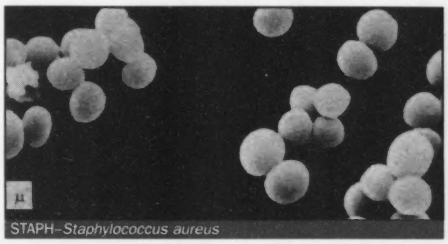
STAPH–*Staphylococcus aureus*


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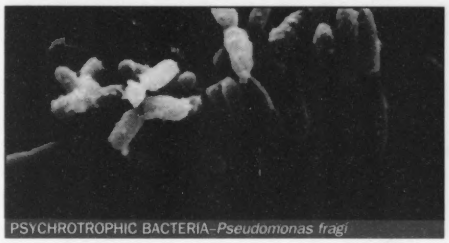
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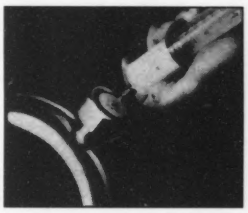

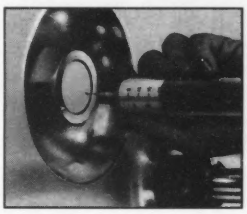

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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

"The mission of IAMFES is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."

Dairy, Food and Environmental Sanitation, Vol. 15, No. 8, Page 479

Letter to the Editor

Vibrio vulnificus infection associated with raw oyster consumption is a persistent seasonal problem. Florida has suffered this problem more than any other state, and no other food item in Florida has been associated with as many food poisoning deaths as raw summer oysters containing *Vibrio vulnificus* from the Gulf of Mexico *(1)*.

Representatives of the oyster industry and the Interstate Shellfish Sanitation Conference have proposed that the shelf life of oysters intended for raw consumption be limited to 14 days as a means to prevent infection with *Vibrio vulnificus*, and regulators in several Gulf Coast states have adopted or are considering this proposal *(3, 4)*. Unfortunately, data from Florida suggest that such action will have little or no effect on the incidence of illness or deaths from *Vibrio vulnificus*.

From 1981 through 1994, 96 cases of oyster-associated *Vibrio vulnificus* infection were reported to the Florida Department of Health and Rehabilitative Services. For 34 (35%) of those cases, both the date of consumption and the date of oyster harvest are documented by consumption history and information on recovered oyster tags. By the most conservative calculation (using the latest possible date of consumption and the earliest possible date of harvest when more than one possibility existed), the mean time from harvest to consumption was 5.6 days, with a range from zero to 18 days, and a median of 5 days. In only one case was the interval greater than 14 days. The harvest to consumption interval for the 19 fatal cases (mean 5.8 days, range 1-18 days, median 5 days) was essentially the same as for the non-fatal cases (mean 5.4 days, range 0-11 days, median 6 days). All but three of the 34 cases studied occurred during the months of April through October.

These data support earlier observations that *Vibrio vulnificus* is a highly seasonal contaminant of raw oysters *(1, 2)* and offer no support for a beneficial effect from a 14 day shelf life restriction. Future efforts to prevent *Vibrio vulnificus* infection from raw oysters should take full advantage of the information available from our tragic experience.

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4. Voisin, M. 1995. Personal communication. Gulf Oyster Industry Council. Feb. 1.

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State Health Office
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THOUGHTS

FROM THE PRESIDENT

By F. ANN DRAUGHON,
IAMFES President

"Change..."

Today, I am thinking about how things change. I don't particularly like change. I have worked with the same university and lived in the same house for the last 17 years. I've had the same car for seven years. I was married to a fine man for 16 years. I've had the same cat for the last 18 years and I plan to enjoy my children as long as possible. However, I came across a quotation the other day that meant a lot to me. Judity Viorst said, *"In the course of our life we leave and are left and let go of much that we love. Losing is the price we pay for living. It is also the source of much of our growth and gain."*

I began to think about how IAMFES has changed and grown in the last 24 years that I've been a member. The first change that comes to mind is that you have a female president for the first time in our history. That's a scary thought! Another major change that comes to mind is the evolution of our Program Advisory Committee. Not too long ago, the programs were completely organized by the IAMFES Board. We have just concluded our 82nd Annual Meeting of IAMFES and what a meeting it was! The educational content, breadth and professionalism of the program were superb. One of the big changes this year was that the symposia were proposed by huge numbers of IAMFES members, PDG's, committees and outside groups such as ILSI. More people were involved in the development of this year's program than ever before. Our hats are off to Bruce Langlois and the Program Advisory Committee (PAC) for developing, coordinating and organizing this year's great program. It has become an incredibly complex job with over 200 papers to coordinate. I think back with gratitude to the Board which had the foresight to initiate such a radical change in the Association and to Edmund Zottola who chaired the first PAC. Our annual meetings, exhibits and attendance continue to grow and have achieved recognition as THE BEST *"Food Protection"* Annual Meeting in the world. Another change that comes to mind was the reorganization of committees, professional development groups and task forces. This was a difficult change since our committees were near and dear to our heart and we were and are proud of them. As they have evolved, they are now more productive and involved in the Association than ever before. This is the direct result of the outstanding individuals who have chaired and served on the committees, PDG's and task forces. Our Association is on a sound financial base with the appropriate checks and balances needed in an association of this size.

Peoples and lands and associations which become stagnant and arid and unproductive eventually dry up and wither away. The individuals leading this Association have a responsibility to never let that happen to IAMFES and your past-presidents have protected, nurtured and cherished this Association. We owe a great debt of thanks to our immediate past-president, Dee Clingman and I wish to add my own personal appreciation and gratitude for his hard work. Dee was deeply involved and committed to the changes noted above and has led our Association smoothly on its path through these changes.

One thing about IAMFES that I never want to see changed is the feeling of closeness, family and friendship that is shared among the membership. The annual meeting is a time of education, intellectual stimulation and also a place to bring our families and recharge the emotional as well as the professional batteries that keep us going. As I do my best to lead your Association in the coming year, I ask that you let me know your concerns, your priorities and the things that you like best about IAMFES. It's YOUR Association and it's a place where YOU can make a difference. I challenge you to do so!

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On My MIND...

By STEVEN K. HALSTEAD, CAE
IAMFES Executive Manager

"The new year also ushers in a new era. Ann Draughon will be the first woman to be President of IAMFES."

"...is the start of a new year."

In many respects, the IAMFES Annual Meeting signals the start of a new year. A new president takes office and two new people become members of the Executive Board. Also, the end of this Annual Meeting puts into motion all the planning and preparation required for the next Annual Meeting.

With the start of any new year, we are faced with a decision: Should we look back on the year just past and reflect on its shortcomings and glories or should we look forward to the hopes and glories of the coming year? I choose a combination of both.

The past year was not only a difficult year, it was also a good year. Difficult in that we had a lot of learning to do. Good in that the staff was able to take a measure of their abilities and see what they were capable of doing. We started the year so far behind the eight ball that we could barely see it but by the end of the year we had *Dairy, Food and Environmental Sanitation* printed and ready to be mailed over a week ahead of schedule.

Just for a moment, step back in time with me and look at the beginning of last year. We inaugurated 1994 with several bold ideas to improve the *Journal of Food Protection*. We went from one Scientific Editor to two–the increasing numbers and complexity of the manuscripts we were receiving demanded that we do something. In addition to that, we moved the editing and much of the clerical work from the Scientific Editor's office to the Des Moines office. That probably would have been enough of a test and hopefully would have worked out the way we all wanted it to, but we really never got a chance to find out.

We had barely implemented the plan when budget limitations forced us to reduce our Des Moines staff by two people. Shortly thereafter, two other long time staff members left us. Suddenly we found ourselves facing a new publication process with a totally new staff. We also had an Annual Meeting coming up and only two people on staff who had ever so much as attended an Annual Meeting. Talk about stretching and growing! Talk about learning under fire! We did all that and more!

There were errors but we did the best we could and I was proud of the efforts put forth by my staff. The Executive Board and the journal management committees were very supportive and did everything they could to help. Charlie Felix and Cindy Bisset of the Foodservice and Packaging Institute came out and spent two days helping. Scientific Editors Lloyd Bullerman and Larry Beuchat each spent several days in the office helping, as did President Dee Clingman.

That support continues to this day and is the reason for our success. Without that support and assistance, we never would have found the inner strength and discipline needed to put forth those extra efforts. With this encouragement, we look forward to the new year.

The new year also ushers in a new era. Ann Draughon will be the first woman to be President of IAMFES. But then, she was the first woman Secretary, the first woman Vice-president and the first woman President-elect. She handled each of those positions with talent and professionalism and I am confident she will do the same as President.

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Antibiotic Use in Animals and Transfer of Drug Resistance to Humans: Should We Stop Treating Animals with These Drugs?

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ABSTRACT

Antibiotics have played a critical role in animal production for the treatment and prevention of disease as well as increasing productivity. Although both animal and human medicine have benefited greatly from the use of these substances, the price that must be paid is an increase in the development of bacterial resistance. The role of therapeutic doses of antibiotics in humans and animals on the development of resistance is very clear. The effects of low levels of antibiotic residues in foods and the development and spread of resistance from animal to human bacteria as a result of antibiotic use in animals is uncertain; however, most researchers agree that it is negligible. To abolish the use of antibiotics in veterinary medicine is unreasonable. Instead, the resistance problem would be better solved by the more prudent use of antibiotics by farmers, veterinarians, and human physicians.

Antibiotics have been used in food-animal production for approximately 50 years. They are used for the treatment and prevention of disease, as well as for growth promotion. Developments in drug technology have been so dramatic over the years that today's intensive agricultural production techniques would not be possible without them.

Concerns over public health risks associated with the use of antibiotics in food-producing animals have been expressed by various parties over the years. Many concerns have centered around health hazards associated with the use of antibiotics in animals, as well as the potential for antibiotics to appear as residues in the food chain. Fears of allergenic, carcinogenic, and mutagenic reactions in consumers, as well as the development and spread of resistant bacteria from animals to humans, have been discussed in the literature *(2, 14, 17)*.

It has long been recognized that bacteria can develop resistance to an antibiotic. In 1946, only 5 years after the introduction of penicillin, doctors discovered staphylococci that were resistant to the drug *(1)*. Since then resistance has spread; however, developments in the drug industry have always managed to stay one step ahead of infectious agents. Recent reports in the media have discussed the re-emergence of many infectious diseases caused by new antibiotic-resistant bacteria *(1, 7)*. In these reports, farmers and veterinarians have unjustifiably been implicated as being a major cause of this problem due to the indiscriminate use of antibiotics in food-production animals over a period of many years.

Like all complicated and sensitive public health issues, much controversy has been generated on this topic, which has sometimes led to emotional and prejudiced conclusions. This is especially true when people lacking basic scientific knowledge or with other political agendas offer insights into the question. While not trying to underemphasize the importance of food safety, it is fair to attempt to best answer the question of transfer of drug-resistant bacteria between animals and humans by looking at several currently known facts on this issue and drawing the most reasonable conclusions from these.

Fact #1: Every pathogenic bacterium now has strains that resist at least one of the 100-plus antibiotics available in medicine (1, 14).

Bacterial resistance is classified as either constitutive or acquired. Constitutive resistance is seen in bacteria that are naturally resistant to various antibiotics because they lack the cellular mechanisms required for antibiotic action. Examples of this include the resistance of gram-positive bacteria to polymyxin B and the resistance of bacteria gram-negative to bacitracin and vancomycin.

Acquired bacterial resistance requires a change in the bacterial cell, brought about by chromosomal mutations or the transfer of genetic material to the cell. Chromosomal mutations tend to produce structural changes in the bacterial cell that lead to resistance, while transferable resistance provides genetic codes for enzymes that metabolize antibiotics. Mechanisms by which chromosomal mutations determine antibiotic resistance include changing target sites such as ribosomes (e.g., in the case of resistance to streptomycin and erythromycin), altering cell permeability (e.g., chloramphenicol, tetracyclines), increasing production of inactivating enzymes (eg.,ß-lactamases), and increasing the production of competitive metabolites (e.g., sulfonamides) *(14)*. Chromosomal mutations are generally a minor problem in antibiotic resistance as they are spontaneous and are uninfluenced by the presence of antibiotics. Quite often these bacteria may even be at a disadvantage compared to or in competition with the parent cell and can be removed from the population in the absence of an antibiotic *(1, 14)*. Genetic exchange, on the other hand, is of major importance in antibacterial drug resistance and almost always involves extrachromosomal or plasmid DNA in the presence of antibiotics selecting for resistant organisms. The plasmid DNA responsible for resistance can replicate within the cell and then spread to other cells by several different mechanisms of gene transfer, such as transduction in bacteriophages, or transformation, in which naked DNA is transferred from one cell to another, or conjugation, where genetic material is passed through a sex pilus joining the two cells. In addition, transposons have been found to play a significant role in the development of antibiotic resistance. Transposons are short sequences of DNA which may carry resistance genes that can transpose from plasmid to plasmid or from plasmid to chromosome. The rapid transfer of transposons between plasmids within a cell and between chromosomes and plasmids, in combination with interbacterial transfer, can result in the rapid transfer of antibiotic resistance within bacterial populations.

Undoubtedly, these mechanisms have caused the spread of antibiotic resistance over the years. For example, some bacterial strains of *Staphylococcus aureus* are now resistant to all known antibiotics except vancomycin; *Neisseria gonorrhoeae* strains are resistant to penicillins, tetracycline, and spectinomycin; and *Mycobacterium tuberculosis* strains are now resistant to aminoglycosides, isoniazid, ethambutol, pyrazinamide, and rifampin *(1)*. In some cases, by the time doctors find an antibiotic that works it can be to late. In 1992, 13,300 hospital patients in the United States died of infections that resisted every drug doctors tried *(1)*.

Fact #2: Drug-resistant microbes do not threaten us all equally.

The use of antimicrobial drugs results in antibiotic-resistant bacteria reaching the human population *(14, 16)*. Bacteria from animals may reach the human population by several different routes, such as fecal contamination of water, carcasses, and raw vegetables. High-risk individuals, such as slaughterhouse workers, food handlers, and farmers, have a higher complement of resistant *Escherichia coli* than the general population *(8)*. Corpet found that humans fed a sterile diet had lower numbers of tetracycline-, ampicillin-, and streptomycin-resistant bacilli in their fecal matter, and that raw vegetables and salads were most likely to carry large numbers of resistant bacteria. He suggests that immunocompromised patients be given an almost sterile diet *(5)*.

A healthy immune system protects against most bacterial invaders regardless of their susceptibility to drugs. Most bacteria are well adapted to growth in only one host and cause self-limiting infections, and very few are fatal. In addition, antibiotics by themselves are not solely responsible for the control of infectious disease; improved nutrition, water sanitation, pasteurization of milk, and vaccinations have also played a significant role in the battle against many infectious diseases, such as cholera, tuberculosis, typhoid, diphtheria, and tetanus. Antibiotic resistance becomes a major problem only when resistant bacteria develop in the immunocompromised, such as patients in hospitals and nursing homes *(5, 7, 10, 13, 14)*.

Fact #3: Most antibiotic resistance in human pathogens relates to the use of antimicrobial drugs in human and not veterinary medicine (9, 12, 14).

Since the mid-1980s, antibiotic sales have nearly doubled. Various studies have shown that 50 to 60% of all outpatient prescriptions are inappropriate, such as in the treatment of viral infections or the administration of antibiotics after the infecting bacteria have been defeated by the body's own immune system *(13)*. In addition, drug companies promote the use of their products by advertising them widely and supplying doctors with free samples, thereby making them feel duty-bound to provide patients with the latest technology *(7)*. Based on a comparison between people who had taken antibiotics and people who had not, Phelps inferred that for every 10% increase in usage, there is a 1% increase in resistance *(13)*.

It has been estimated that 30% of all patients fail to use antibiotics as prescribed and may stop taking medication after only a few days, when symptoms begin to disappear. This helps select more resistant bacteria, as most of the susceptible invading bacteria will have been killed, leaving only the resistant strains to flourish *(7)*. Some patients also save unused drugs to take later, or pass them around like vitamins.

Fact #4: Farm animals receive 30 times more antibiotics (mostly penicillins and tetracyclines) than people do (1).

Approximately 42% of all veterinary pharmaceuticals used worldwide are used as feed additives at low levels to help promote weight gain and feed efficiency. A further 18% of pharmaceuticals are used therapeutically

(11). It has been shown that within a short time of treating an animal with an antibiotic, the commensal *E. coli* population becomes resistant to that drug. This is mainly the result of selection of resistant organisms rather than transfer of resistance *(8)*. Continuous exposure to antibiotics is associated with the persistence of resistant organisms even after the drug is no longer administered. On the other hand, short-term therapy does not promote long-lasting resistance *(14)*.

Fact #5: The levels of antibiotics allowed in foods as residues are well below therapeutic doses, and the actual exposure to antibiotic residues is infrequent and always below the acceptable daily intake (ADI) for lifetime exposure (18).

In contrast to the well-documented negative effects of therapeutic doses of antibiotics, the effect of low concentrations of antibiotics ingested in contaminated foods on the resistance selection or composition of the human microbial flora is not well defined; however, most researchers agree that it is probably negligible *(6, 9)*.

Antibiotic residues have been found at very low levels in approximately 1% of animal products in the United States and Europe *(15)*. While it is not possible to say what levels of antibiotics present in meat, milk, or other products can be considered absolutely safe for the consumer, the maximum residue limit (MRL), or safe level, can be calculated by toxicological means, or a concept of zero tolerance may be accepted.

A zero-tolerance level is based on the lowest level of sensitivity of the analytical method. In recent years, however, improved analytical methods have made it possible to detect antibiotic and chemical residues at a fraction of a part per million (ppm) to a few parts per billion (ppb) or even parts per trillion (ppt). This means that today it is virtually impossible to administer a drug to an animal without being able to detect a level of residue, even after the required withdrawal time has been observed, so that any reference to zero tolerance is scientifically unsound and cannot be enforced by regulatory agencies *(2)*.

Fact #6: Currently there are several models for studying the microbiological effects of antibiotic residues in foods; however, all models have been criticized and are not ready to be used for risk-assessment purposes because the models cannot be extrapolated to address human public-health concerns.

Many models have been developed to look at the effects of low levels of antimicrobials on the intestinal microflora of humans and lab animals. However, these models have been limited in the study of resistance selection for the following reasons. They are complicated by the large background of resistant organisms. For instance, it has been estimated that 60% of people not taking antibiotics have intestinal microflora resistant to at least one antibiotic. They are subjected to large daily fluctuations in the number of resistant microorganisms and the lack of a validated animal model for assessing these effects. To date models of gnotobiotic rats inoculated with human gut flora would appear to be the most promising as far as replicating natural exposure conditions in humans *(6)*.

Researchers have also used indicator organisms in pure culture to determine the potential for the selection of resistant populations from a sensitive population. Appropriate indicator organisms include those that are very sensitive to a wide array of antibiotics and antimicrobials as well as being prone to resistance development that can be easily measured. Brady, White, and Katz *(3, 4)* looked for increases in the minimal inhibitory concentration (MIC) following exposure of the organism *Staphylococcus aureus* ATCC 9144 to various antibiotics alone and in various combinations at levels considered "safe" in milk and meat. They reasoned that this organism is much more sensitive than the normal intestinal flora and is, therefore, a good indicator of the resistance development potential of different levels of antibiotics.

Work with human volunteers has been very limited in scope for ethical reasons, such as only being able to use drugs that have been approved for use in humans, and because it is very expensive when compared to rodent models and requires large numbers of volunteers to be monitored over a long period of time *(6)*.

Fact #7: With current animal husbandry practices, the use of antimicrobial agents in veterinary medicine is as important as in the practice of human medicine. The removal of antibiotics from the animal-health industry would be both inhumane and an economic hardship for both producers and consumers (2).

Until 1972, world food production increased annually at a rate higher than the world population *(2)*. Since then, the world grain reserves have steadily declined due to factors such as adverse weather conditions, fuel and resource shortages, and socioeconomic instability. It is anticipated that by the year 2,000 the world may have to feed an additional 2 billion people, most of these in third-world countries *(2)*. With greater deficits in the production of cereal crops, animal production will need to become more efficient than it is now so that more cereal grains can be directed to the human diet. The role of drugs and chemicals in meeting these demands will be ever increasing. The return to organic food production would not be a solution, as it cannot provide the quantities of food to sustain the expanding world population. Booth asks, if organic procedures for the production of food as often proposed were instituted in the United States to replace the use of all drugs or chemicals, which 50 million or more people would want to be the ones to face starvation first *(2)*?

Today approximately 80% of all food-production animals receive medication for part or most of their lives and in the future, it is anticipated that nearly all animals produced in the United States for food will have received a chemotherapeutic agent of some type *(2)*.

The question of whether antibiotic-resistant bacteria derived from food animals is a significant source of human health problems is a difficult one to answer; however, it is clear that the use of antibiotics at therapeu-

tic levels in both humans and animals leads to the selection of resistance. Increasing the level of resistant bacteria in the general population would be highly undesirable since the transferable nature of resistance between microorganisms is known. Stopping all antibiotic treatments in food animals is not a reasonable solution to this problem; nevertheless, indiscriminate use of drugs should never be substituted for good management on the farm. The abuse of antibiotics in human medicine as well should not be overlooked when discussing this issue. The best defense is the development of policies that both protect the public and provide animal and human medicine with the tools and knowledge to provide safe and ethical treatments.

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Sensory Detection of and Consumer Response to Off-Flavors in Milk

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ABSTRACT

Off flavors in fluid milk are detrimental to milk quality. These off flavors may result from microbiological, compounds, biochemical and/or chemical activity or processing conditions. It is important that quality control personnel understand the cause of and sensory characteristics related to various off flavors. The impact of selected off flavors on consumer acceptability of fluid milk was determined. Fluid milk samples were evaluated by three untrained consumer panels (children in sixth grade, college-age students, and adults over 25 years of age) to determine acceptability of 2% milk from a retail market and milk with malty, feed, and light-oxidized off flavors. Milk samples with malty and feed off flavors were rated low. Oxidized off flavor, at the level tested, was less acceptable than "regular" milk, (i.e., milk with no off flavor) especially among college-age and adult consumers. Children rated acceptability of all milk samples low. College-age and adult consumers were more discriminating among milk samples with different off flavors. Of the samples, the regular milk was consistently scored the highest by all three panels. However, the average scores for all of the milk samples (including the regular milk) ranked no higher than "like slightly" on a nine-point hedonic scale, suggesting that the overall acceptability of milk should be a concern to the dairy industry.

Introduction

Over the past decade, the per capita consumption of milk has declined 6% *(1)*. One major reason for this trend includes the aging of America. As people grow older, they tend to reduce their milk consumption. The younger generations, especially children, remain the largest group of milk consumers *(1)*. Another reason for decreased consumption is an increased awareness of fat and cholesterol content of foods. This awareness has contributed to a continued decline in the consumption of whole milk but a substantial increase in the volume of low-fat and skim milk sold. Despite this trend toward the increased consumption of low-fat milk, research indicates that the taste of low-fat and skim milk has deterred some consumers from drinking milk altogether *(1)*. It is therefore extremely important that the dairy industry learn what is important to consumers regarding milk quality and what changes could be made to increase their milk consumption.

Although the quality of milk may be measured by analytical means such as microbiological or chemical analyses, the most important measure of milk quality is the human organoleptic response. Milk is constantly being tasted and assessed for quality because it is often consumed on a daily basis *(6)*. Any detectable defects or lapses in quality can result in loss of consumption and decreased sales, which the dairy industry cannot afford. Because consumers are more readily concerned with the flavor of milk than with any other analytical measure of its quality, dairy processors must be very concerned with the flavor of their product. The flavor of good quality milk is described as bland and pleasantly sweet, leaving only a clean, pleasing sensation after swallowing or expectorating *(6)*. Many different compounds contribute to this desirable flavor. Any imbalance of these compounds or addition of atypical compounds becomes readily apparent in the flavor of milk. Therefore, milk flavor quality is frequently described by the presence and intensity of off flavors. Milk quality is, therefore, directly related to any off flavors resulting from conditions that alter the balance of flavor compounds, such as microbiological activity, animal and/or nutrition-related conditions, biochemical and/or chemical reactions, and processing and/or storage conditions *(10)*. Table 1 provides brief sensory description and origins of some common off flavors and possible causes.

Table 1. Origin and description of common off flavors in milk[a]

Generol couse	Off flavar	Origin	Importont flovor compounds	Sensory description	Potentiol couses
Microbiologicol	Malty	*Streptococcus lactis* subsp. *maltigenes*	3-Methylbutanol from leucine	Burnt, caramel, Grape nuts®-like flovar	Impraper equipment sanitotion; delayed cooling of milk; storoge ot 10°C or above
	Acid	*Streptococcus lactis, S. cremoris, or Lactobacillus lactis*	Acetic, propionic, ond formic ocids, ocetoldehyde, ocetone, and diacetyl	Tingling/peeling sensation on tongue; feeling af cleanliness after expectoration	
	Fermented/fruity	*Pseudamanas fragi*	Ethylester, ethylbutyrote, eithylhexonaote	Odar similar ta either sauerkraut ar vinegor or to opples, pineopples, or ather fruit	Raw milk stored in bulk for extended time periods, old pasteurized milk
	Bitter/uncleon	Psychrotrophic bocterio	*n*-Pentonol, *n*-hexonol, acetaldehyde	Persistent bitter toste after expectaratian; unpleasant, musty, stole, spoiled, dirty	Temperature obuse resulting in microbiol grawth, certoin weeds, dirty utensils
Absorbed	Feed	Aromotic compounds in feed	*trons*-2-Hexonol, 3-hexonol, ocetone, 2-butanane, skatole, mercoptons, indole, trimethylomine	Aromotic ond pleosant, depending on type of feed used; includes gorlic ond onion	Feeding cows 1/2 to 3 h prior to milking
	Borny	Odor/toste tronsmitted to milk by caw inhaling oir ond volotile compounds	Voriaus oromotic campaunds	Odor of o poorly maintained barn; unpleosant, persistent ond uncleon oftertoste	Poor ventilotion, buildup af aramatic compounds in barn
	Cowy	Animol physiologicol molfunction	Ketone bodies in milk	Caws-breoth-like odor, unpleosant medicinol, chemicol oftertoste	Caws with ocetonemio or ketosis
Biochemicol/ chemical	Roncid	Hydrolysis of milk fot by lipase	Butyric, coproic, coprylic, capric, and lauric ocids	Soopy, bitter, uncleon, blue cheese-like oramo, strong, faul, lingering aftertaste	Homogenizotion of row milk; not pasteurizing milk immediately after homogenization; contaminatian af posteurized milk with row milk
	Light oxidized	Autooxidotion of lipids, breokdown of sulfur-contoining omina acids	2-Octenol, 2-nonenol, methianal	Burnt, feathery, tollowy, medicinal, chemical toste	Exposure af unprotected milk (plostic ond gloss contoiners) to UV rays from sunlight or fluorescent light
Pracessing	Caaked	Overheoted milk	Sulflhydryl compounds, hydragen sulfide	Sulfurous, rich, caramelized, scorched, sweet	Posteurization temperatures af 76-78 °C; increosed pasteurizotion times
	Foreign	Cantaminatian af milk with a foreign substance	Chemical sanitizers, detergents, insecticides, ointments, medicotions	May have an odar, odar/flavar nat assaciated with milk, depends on causative agent	Impraper use af chemicols, cleaners, medicotions resulting in contominotian
	Flot	Contominotion of milk with water	Woter	No odor; locks full flavar and sweetness	Adulterotion of milk with water; milk low in total solids content

[a] *(2, 4, 6, 8, 12, 13).*

Quality-control personnel within the processing facility must be able to accurately apply the best method of milk evaluation by sensory means to assess milk flavor *(5)*. Adequate training is necessary for quality-control personnel to detect and identify off flavors in milk and make informed decisions about final product quality. It is important that personnel understand the possible causes of each off-flavor so that preventive measures can be taken to reduce the risk of a flavor defect. In addition, if an off flavor does occur, this knowledge can be used to trace the defect to its origin and minimize or eliminate the cause of the defect completely *(5)*. However, consumer-based quality control works only if industry and consumers agree on the definitions of quality and undesirable characteristics *(13)*.

Unfortunately, most of the literature published about off flavors and most of the studies reported on milk quality are completed using trained panelists and dairy experts. Milk is commonly evaluated using the methods and terminology standardized by dairy products evaluation programs sponsored by the U.S. Department of Agriculture, American Dairy Science Association (ADSA), and Dairy, Food, and Industry Supply Association *(6)*. This means that descriptive terms used to describe off flavors are based on causes of the defects (e.g., rancid, fermented, oxidized). Such descriptions may include a variety of sensory attributes but are not specific to one characteristic *(11)*. Although this system was designed to predict the likelihood of consumer rejection depending on the degree of defect present, this generalization of terms may lead to discrepancies between consumers and trained panelists in the perception of off flavors. In fact, no attempt has been made to tie the scores given to milk samples to consumer acceptance of the products *(12)*. It has been suggested that dairy judges may be more conservative with scores because of prior knowledge of the shelf life and aging potentials of the product and that some defects may not be as objectionable to consumers as expected. It is important that trained personnel not become overcritical and begin looking for defects that are not a problem to consumers *(8)*.

Lawless and Claassen *(11)* determined that increasing levels of flavor defects resulted in lowered consumer acceptability scores, as expected. However, the rate of decline was not as severe as would be predicted from the ADSA-recommended scoring system *(11)*. In fact, milk samples with defect levels high enough to make the milk unsaleable in terms of dairy evaluation standards were scored no lower than 4.6 on a 15-point hedonic scale, corresponding to a rating slightly higher than "dislike very much." Other studies have demonstrated consumers' ability to discriminate among samples with light-oxidized off flavor. In studies by White and Bulthaus *(14)* and Bray et al. *(7)*, consumers were asked to complete a paired preference test. Of the 130 panelists tested in the first study, 63% chose the control milk over the light-oxidized sample and, of 2,000 panelists in the second study, 73.2% preferred the control milk sample. These results strongly indicate that consumers are able to detect this off flavor and that it has negative impact on perceived milk quality.

The consumer's perception of the sensory quality of milk is undeniably different from the perception of individuals within the dairy industry. However, there is relatively little information available to the dairy industry regarding consumer response to those sensory attributes considered "quality defects" by dairy experts, especially concerning the impact of the age of the consumer on milk acceptability and preference. Understanding consumer response can assist the dairy manufacturer in determining which sensory quality problems have the greatest impact on consumer satisfaction with fluid milk. This information will provide a basis for improving marketing and sales of fluid milk, especially to keep the younger generation consuming milk on a regular basis.

The primary objective of this experiment was to determine the impact of the flavor and odor characteristics of feed, malty, and oxidized milk on consumer perception of milk quality and acceptability. In addition, the information gathered from this experiment will be used to determine if different age groups (middle-school students, college-age adults, and older adults) view milk quality in relatively the same way.

MATERIALS AND METHODS

Preparation of samples

Milk samples were prepared to simulate three off flavors resulting from different conditions of milk handling. These off flavors included a malty off flavor to simulate a flavor resulting from microbiological activity, feed off flavor such as that caused by animal and/or nutrition-related conditions, and light-induced oxidation off flavor resulting from a chemical reaction. These flavors were simulated in fresh 2% milk purchased in one-half-gallon paperboard cartons from a local retail market. Untreated fresh milk served as the control product. Malty milk was prepared by soaking Grape Nuts® in 100 ml of milk for 20 minutes, straining the solution with cheese cloth, and adding the recovered solution (75 ml) to 425 ml of regular milk. The feed flavor was prepared by adding sterile alfalfa silage-based feed stock solution (0 to 10.5 ml) to 500 ml of milk. The feed stock solution was prepared by soaking 30 g alfalfa silage in 1000 ml and H_2O for 20 min., straining the solution to remove silage materials, and sterilizing the solution. The oxidized milk was prepared by storing 500 ml of milk in a glass jar placed in a Hussmann refrigeration unit at 36 to 42°F under two fluorescent Econ-o-watt lights (1100 to 1300 lux).

Determination of appropriate off-flavor intensity

Preliminary testing of the malty, feed, and oxidized off-flavors was completed using five members of the Virginia Tech dairy products evaluation team. Panelists were instructed to taste milk samples with increasing

amounts of the flavor defects, compare them to a reference sample, indicate if a difference was present, and describe any off flavor detected. Based on these responses, the preparation of samples was modified to provide an appropriate range of off flavor intensity. Stock solution of malty milk was added so the ratio of the weight of cereal to the final volume of milk ranged from 0 to 2.07%. Feed stock solutions were added to yield concentrations ranging from 0 to 1.77% feed stock solutions in milk. Oxidized milk was exposed to light for 10 min to 48 h.

Threshold testing was completed using an untrained panel of 24 faculty, students, and staff from the Food Science department at Virginia Tech. This testing was completed to determine the appropriate level of each off flavor in milk that was consistently perceptible to untrained evaluators. Threshold testing for each flavor was completed during separate sessions in the sensory laboratory in the Food Science and Technology building at Virginia Tech. Samples were presented under fluorescent lighting to panelists seated in individual booths.

During each session, eight series of triangle tests featuring eight increasing levels of one off flavor, each level with control samples, were presented to each panelist. Samples were coded with unique three-digit numbers and randomly arranged within each triangle test. All eight triangle tests were presented simultaneously. Panelists were asked to choose the sample within each triangle test that was different from the other two and to describe the flavor of that sample. Twenty milliliters of each sample at 4°C were served to the panelists in 1-oz. plastic cups. Panelists expectorated each sample after tasting it, rinsed their mouths with water between samples, and waited 20 s before tasting the next triangle set. The data was analyzed by determining the geometric mean percentage based on the lowest level correctly identified by each panelist in a sequentially correct series.

Evaluation of Milk Quality

Based on the geometric means, milk with the three off flavors and regular milk were evaluated for acceptability on a nine-point hedonic scale by three different untrained consumer panels of 30 undergraduate students ages 18 to 23, 17 middle-school students ages 10 to 13, and 25 Food Science faculty, staff, and graduate students ages 25 to 60.

Milk samples for evaluation of consumer acceptability were prepared with specific proportions as follows. Malty milk was prepared by soaking 4.44 g of malted cereal in 100 ml of milk for 20 min, straining the liquid through cheesecloth, and adding the recovered liquid (90 ml) to 510 ml of regular milk. The ratio of the weight of the dry cereal to the final volume of milk used was 0.74%. The feed flavor milk was prepared by adding 6.24 ml of alfalfa silage-based feed stock solution to 600 ml of milk so that the resulting liquid contained 1.04% feed. The oxidized milk was prepared by storing 600 ml of milk in a glass jar and placing it in a Hussmann refrigeration unit at 34 to 38°F under two fluorescent Econ-o-watt lights for 2 h, 40 min.

Testing for consumer acceptability of milk flavor for the college-age and the older adult panels were completed in the sensory laboratory in the Food Science and Technology building at Virginia Tech. The test for the school-age (sixth grade) panel was completed in a local middle-school classroom. In each test, four samples of milk, including the control and samples of milk exhibiting each off flavor, were included.

Samples were coded with three-digit numbers and presented simultaneously and in random order to each panelist. Panelists were asked to rate the acceptability of each milk sample on a 9-point hedonic scale ranging from "dislike very much" (score = 1) to "like very much" (score = 9).

Responses from the hedonic scales were analyzed using a two-way analysis of variance (ANOVA MiniTab, Version 10, MiniTab, Inc., State College, PA) to determine if there were significant differences ($P < .05$) in the preferences for the different milk samples and/or if there were significant differences in preference among the three age groups. Fisher's least significance difference (LSD) was used to determine differences between pairs of samples.

RESULTS AND DISCUSSION

Off flavors in milk must be present at a level that is perceptible before the impact on acceptability of the product can be determined. Threshold testing was used to determine appropriate levels of off flavors for subsequent testing for acceptability. For the calculation of the geometric means of the feed and malty samples, responses from 16 and 17 panelists out of 24 were used, respectively. These panelists, representing a majority of the panelists for each test, were at some point able to correctly and consistently identify the sample with the off-flavor. The resulting threshold levels found for the feed and malty milk were 1.04% feed stock solution and 0.74% malted cereal solution. However, only 9 of 24 panelists could be used for the geometric mean calculation of the oxidized milk; thirteen panelists never picked the correct sample sequentially by the seventh triangle test. Although the threshold level was calculated to be 2 h, 40 min exposure to light, this series of samples was well below the detection level for the oxidation off flavor for many of the panelists. Due to the increased incidences of this off flavor, it is likely that consumers have become conditioned to the off flavor *(3)* and therefore are less discriminating among different levels.

Significant differences ($P < 0.0001$) in the preference for all milk samples as a group were found among the three different age groups. The middle-school students rated the four milk samples significantly lower in acceptability than did the college-age and adult consumers. The adult group gave higher ratings for all milk samples compared with the other populations.

In addition, when all responses were pooled ($N = 67$), significant differences ($P < 0.0001$) were found among preferences for the four milk samples. Significant differences in mean hedonic scores were found between the malty and oxidized, malty and control milk, and feed and control milk samples. No significant differences were found between the mean scores for malty and feed milk (3.8 and 4.5, respectively) or between the mean scores for oxidized and regular milk (5.1 and 5.8, respectively). However, when using the responses from the college age and adult consumers only, significant differences were found among all samples except the oxidized and feed samples. The college age and adult panels were much more discriminating between samples of milk than the middle-school panelists, who rated all of the samples significantly lower, but did not discriminate between the samples (i.e., no samples were found to be significantly different) (Table 2). The only difference ($P < 0.0001$) in acceptability by gender was for light-oxidized milk; males rated the acceptability of this milk higher (means score = 6.0) than females (mean score = 4.6) did.

The acceptability of the malty and feed samples was low, with mean hedonic scores generally corresponding to a rating of "dislike slightly" on the hedonic scale. No significant differences were found between the scores of oxidized and "regular" samples of milk, which corresponded to ratings of "neither like nor dislike" and "like slightly" on the hedonic scale.

It is apparent that the impact of the oxidized milk is minimal compared to that of the feed and malty off flavors. Because 68% of the panelists in this experiment regularly consume milk bought in plastic jugs (Figure 1), it is likely that most of these consumers drink milk which may have an oxidation flavor. Therefore, they may be accustomed to the off flavor. In addition, it is likely that differences between the regular milk and the oxidized samples would have been found if samples of 12 to 48 h of light exposure had been used *(9, 11, 14)*.

Table 2. Mean acceptability scores[a] for malty, feed, oxidized, and regular milk samples as rated separately by the sixth grade, college, and adult panels of consumers (n = 17, 30, 25, respectively).

Off Flavor	6th Graders	College Students	Adults
Malty	3.6[a]	3.8[a]	4.1[a]
Feed	3.9[a]	4.3[ab]	5.2[ab]
Oxidized	4.2[a]	5.2[bc]	5.6[ab]
Regular	4.2[a]	6.3[c]	6.3[b]

[a]Based on a 9-point hedonic scale: 1 = dislike extremely, 5 = neither like nor dislike, and 9 = like extremely.

[b]Means in a column followed by different letters are significantly different $P < 0.05$.

The malty and feed off flavors have a more serious impact than the oxidation off flavor on milk quality and acceptance, based on low hedonic scores. Trained quality-control personnel should concentrate their efforts on preventing these flavor defects. Overall, the scores for the milk samples were low, covering a range from 3.6 (slightly lower than "dislike slightly") to 6.4 (slightly higher than "like slightly") on the hedonic scale. This strongly suggests that manufacturers must evaluate the overall quality of their milk and pursue even higher standards in order to increase milk consumption. Surprisingly, in light of the relatively low acceptability scores, 55% of the college-age and adult panelists responded that flavor did not influence their purchasing habits, and 65% of sixth graders responded that they did not express opinions about milk flavor to a parent or guardian.

The most noticeable trend in consumer demographics was the extreme preference for plastic packaging by all three panels (Figure 1). Only three of college-age and adult panelists who expressed a preference preferred the paperboard packaging. This suggests that a majority of the panelists accept the flavor of milk with some degree of a light-oxidized off flavor as normal. In addition, there was a noticeably higher frequency of milk consumption by the middle-school panelists (all drank milk at least once a day) than by the other two panels (Figure 2). This suggests that this group is a major portion of milk consumers. The dairy industry should focus much of its attention on increasing children's perception of milk quality to keep them drinking milk as they grow up. In addition, a majority of the panelists preferred 2% and lower milk-fat content (Figure 3).

CONCLUSIONS

From the results of this experiment, it is evident that although the children were much more critical of all milk flavors, the college-age and adult participants were more discriminating between samples. It is also evident that the malty and feed off flavors had a substantial impact by deceased consumer acceptance of milk, suggesting that the dairy industry must take precautions to maintain a high- quality milk product from its origin at the farm through the point of sale to the consumer to prevent occurrence of these flavor problems. However, the oxidized off flavor, at the level tested, was found to have a much lower impact on consumer acceptance, suggesting that low degrees of this defect may not be a serious concern. The low acceptance scores of all the tested milk products also suggests that milk manufacturers must pursue higher quality of its products if it is to maintain the current market of milk consumers, especially children, who consume milk the most frequently, and who will eventually be the next generation of consumers.

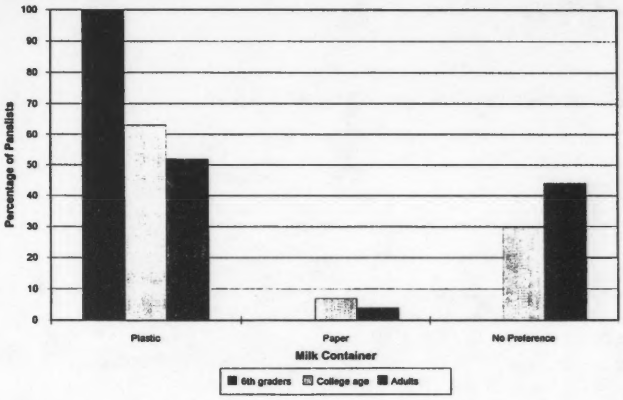

Figure 1. The percentage of panelists from the sixth grade, college, and adult panels (n = 17, 30, 25, respectively) preferring/consuming milk in plastic or paper packaging, or having no preference

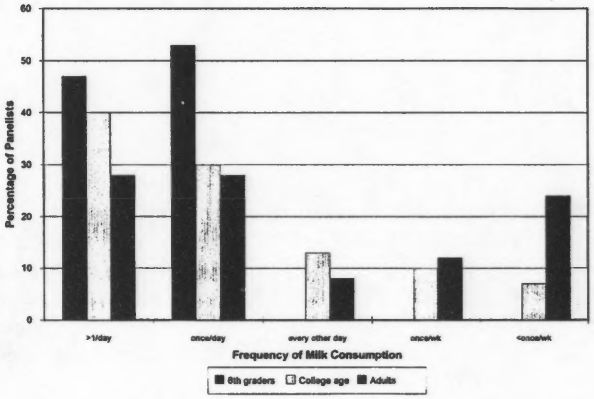

Figure 2. The percentage of panelists from the sixth grade, college, and adult panel (n = 17, 30, 25, respectively) consuming milk more than once per day, once per day, every other day, once per week or less than once per week

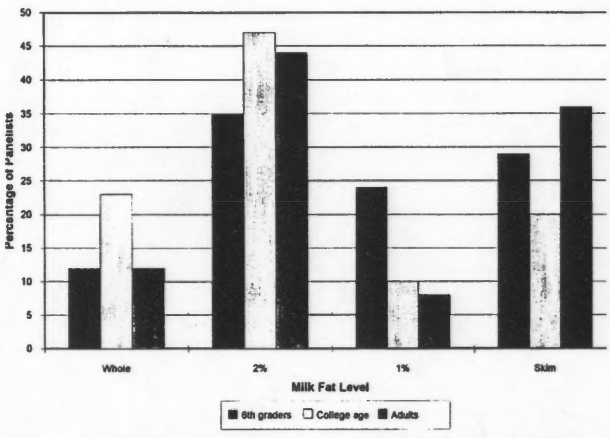

Figure 3. The percentage of panelists from the sixth grade, college, and adult panels (n = 17, 30, 25, respectively) who consume whole, 2%, 1%, or skim milk on a regular basis.

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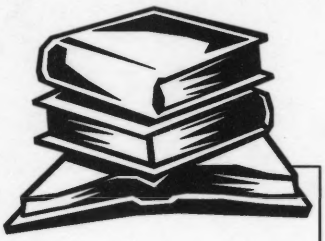
Dairy, Food and Environmental Sanitation, Vol. 15, No. 8, Page 494

Book reviewed by: Purnendu C. Vasavada, University of Wisconsin-River Falls, River Falls, Wisconsin

Book Review



"Principles of Cereal Science and Technology"
(2nd edition)

R. C. Hoseny
American Association of Cereal Chemists
3340 Pilot Knob Road, St. Paul, MN 55121

This is an expanded and improved version of the first edition of the book. Three new chapters: *Rheology of Doughs and Batters, Glass Transition and Its Role in Cereals,* and *Feeds* have been added. Also, in this edition, information on the gluten proteins is discussed in a separate chapter.

In 18 chapters, the book covers fundamental aspects of structure and chemistry of major cereal grains, processing of cereal commodities and manufacturing of pasta, noodles and snack foods. The first four chapters, *Structure of Cereals*, *Starch*, *Proteins of Cereals*, and *Minor Constituents of Cereals*, provide basic information about structures and chemical condiments of major cereal grains and their association with properties of ingredients derived from cereals. Chapters five to nine describe primary and secondary processing of cereal, including storage, milling, malting and brewing. Chapter 10 and 11 are the new chapters designed to include rapidly advancing areas of cereal science viz rheology, gluten proteins and glass transitions. The rest of the chapters, except for the final chapter on feeds, are designed to discuss manufacturing of yeast leavened products, soft wheat products, pasta and noodles and snack foods. The final chapter in the book is on feeds designed to give preliminary information on feed manufacturing.

As in the previous edition, the main objective of this book is to provide a basic text book. Although additional references have been listed in the "suggested reading" section at the end of the chapter, this is not a good reference work, "nor is it" intended to be! The book is perhaps, the only textbook available for undergraduate course in cereal science and technology, and is recommended as such.

Also, it would be useful to students of food science & technology and food industry professionals as a general reference on the subject of cereal science.

Read any good books lately?

If you have recently read or heard about an interesting and informative book relative to food science or safety, and would like to recommend it for review, please contact: Editor, *Dairy, Food and Environmental Sanitation,* 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2838; telephone (515) 276-3344 or (800) 369-6337; fax (515) 276-8655.

Proposed Warning Labels for Iron-Containing Products; FDA Report on Consumer Research; Availability

Agency: Food and Drug Administration, HHS.

Action: Notice.

Summary: The Food and Drug Administration (FDA) is announcing the availability of a report entitled "Consumer Research on Proposed Warning Labels for Iron-Containing Products," which describes the results of research conducted by the agency to evaluate consumer understanding of the proposed warning labels for iron-containing products. FDA is inviting comments on the findings in this report.

Dates: Written comments by July 24, 1995.

Addresses: Submit written comments and requests for single copies of "Consumer Research on Proposed Warning Labels for Iron-Containing Products" to the Dockets Management Branch (HFA-305), Food and Drug Administration, rm. 1-23, 12420 Parklawn Dr., Rockville, MD 20857. Comments and requests should be identified with the docket number found in brackets in the heading of this document. Send two self-addressed adhesive labels to assist that office in processing your requests. After the comment period shown above, copies of the document will be available at cost from the Freedom of Information Staff (HFI-35), Food and Drug Administration, rm. 12A-16, 5600 Fishers Lane, Rockville, MD 20857. "Consumer Research on Proposed Warning Labels for Iron-Containing Products" and received comments are available for public examination in the Dockets Management Branch between 9 a.m. and 4 p.m., Monday through Friday.

For Further Information Contact: Raymond E. Schucker, Center for Food Safety and Applied Nutrition (HFS-725), Food and Drug Administration, 200 C St. SW., Washington, DC 20204, 202-205-5657.

Supplementary Information: In the Federal Register of October 6, 1994 (59 FR 51030), FDA issued a proposal ("the initial proposal") on actions that it tentatively concluded were necessary to stop the recent epidemic of pediatric poisonings from over consumption of iron-containing products. In the Federal Register of February 16, 1995 (60 FR 8989), the agency issued a supplementary proposal to clarify changes in its legal authority with the passage of the Dietary Supplement Health and Education Act (Pub. L. 103 - 417).

In the initial proposal, FDA announced that it may conduct focus group research to evaluate consumer understanding of the proposed warning messages and to ensure that the messages are not misleading. FDA has conducted this research. Consumers provided feedback as to their understanding of the proposed warnings and the degree to which the specific wording of the messages was believable, relevant, confusing, or irritating. Additional warning messages were created as a result of public comment on the proposed rule, and these messages were also evaluated in the focus groups.

FDA stated in the initial proposal that it would make a report of the results of this research available for public comment before it issued the final regulations. The research report is now available for public comment.

Dated: May 18, 1995. David A. Kessler, Commissioner of Food and Drugs. {FR Doc. 95-12605 Filed 5-22-95; 8:45 a.m.}

New Monographs and Revisions of Certain Food Chemicals Codex Monographs; Opportunity for Public Comment

FDA is announcing an opportunity for public comment on pending changes to certain Food Chemicals Codex specification monographs from the third edition and its four supplements. One new monograph and additions, revisions, and corrections to current monographs for certain substances used as food ingredients are being prepared by the National Academy of Sciences/Institute of Medicine (NAS/IOM) Committee on Food Chemicals Codex (the committee). This material will be published in the fourth edition of the Food Chemicals Codex, which is scheduled for release in March 1996. When the committee completes its review of the comments, it will incorporate any changes that it makes in response to comments in monographs published in supplements to the fourth edition.

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UpDates

Elgin Dairy Foods Appoints Hartline as Marketing Associate

Elgin Dairy Foods, Inc., the Chicago-based manufacturer of dairy and non-dairy mixes, toppings and other food products and ingredients, has appointed Susan Hartline, Marketing Associate, a new post. The appointment was announced by Jim Gignac, Elgin's Manager of Marketing and Sales.

Hartline, a native of Kalamazoo, MI, holds a bachelor's degree in journalism with a concentration in advertising from the University of Wisconsin at Madison. She also studied Spanish at Universidad Complutense in Madrid, Spain.

Elgin makes a wide range of soft serve, shake and ice cream mixes, dairy and non-dairy whipped toppings, sour cream and creamers. It also produces proprietary mixes and ingredient formulations used by the foodservice and food processing industries. The company has the capacity to produce more than 300,000 gallons of dairy products weekly.

Stavropoulos Appointed Head of Flavorite Operations

John Garner, President, Flavorite Laboratories, Inc., announces the appointment of Mike Stavropoulos as Vice-President of Operations for the Memphis-based manufacturer and marketer of flavors, seasonings, and ingredients. In his new role, Stavropoulos oversees Flavorite's Manufacturing Operations, Material Services, and Human Resources.

Stavropoulos joined Flavorite in 1992 as Director of Human Resources. Since October, he has served as Interim Director of Operations. Prior to coming to Flavorite, Stavropoulos was with Goldsmith's Department Stores for 14 years working in operations and human resources.

Stavropoulos received his B.S. from the University of Memphis, Memphis, TN and also has earned his certification as a Senior Professional in Human Resources. He is a member of the Society for Human Resource Management.

Educational Foundation Names Michael L. Moon, FMP National Account Sales Manager, Commercial Market

The Educational Foundation of the National Restaurant Association announces that Michael L. Moon, FMP has been named National Account Sales Manager, Commercial Market.

Moon joined The Educational Foundation in 1994 and has served as Account Executive and National Account Manager. In his new position, he will oversee The Educational Foundation's sales of educational and training products and services in the commercial foodservice market, which includes restaurant chains operating as U.S. based corporations.

Prior to The Educational Foundation, Moon was the owner and President of Made In The USA Deli Corp., a full-service deli concept operating in Chicago. He also served as Assistant Food and Beverage Director for the Hyatt Regency Hotel, and Sales Manager for Sheriden Hotels, both in Scottsdale, AZ. Moon received his bachelor of science degree in political science from Arizona State University in 1988.

The Educational Foundation at the National Restaurant Association, a nonprofit organization based in Chicago, is dedicated to enhancing the professionalism of the foodservice industry through education and training. The Foundation develops and offers training products and services in areas including food safety, responsible alcohol service, safety and security, foodservice management, and profitability.

Ross Appointed IRB Coordinator

Julie A. Ross has been appointed to the position of IRB Coordinator for Affiliated Research Centers, Inc. (ARC), a clinical research organization.

As IRB Coordinator, Ross is responsible for establishing and managing appropriate systems for efficient and streamlined IRB filings, reviewing study documents, and becoming familiar with the test article, study design, and research plan. Using that information, Ross drafts patient consent forms for ARC's 34 investigational sites.

Ross also prepares, completes, and sends submissions to the IRB, and approved regulatory document packages to clients and investigators notifying each of IRB approval for ARC's 34 investigational sites.

In addition, Ross maintains a database tracking system of IRB approvals, renewals, and reports. She assists investigators in preparing renewal applications and annual reports, and maintains up-to-date central files on each affiliated site. Ross maintains project files and prepares weekly project status reports for each project detailing the current status for each participating investigator.

Other responsibilities include participating in training sessions for affiliated study coordinators, developing and maintaining standard operational policies and procedures, and preparing patient recruitment advertising to be used at each site.

Ross earned a degree in nuclear medicine technology. Prior to her appointment, she was Program Director for the School of Nuclear Medicine Technology, and Education Director for the School of Diagnostic Ultrasound. In 1990, she was appointed to the clinical faculty at both the University of Wisconsin, and Alverno College, Milwaukee, Wisconsin.

BISSC Elects 1995 Officers

Sigismondo De Tora, Nabisco Biscuit Co., East Hanover, N.J., remains as Chairman of the Baking Industry Sanitation Standards Committee (BISSC) after being re-elected to a third one-year term. De Tora is an active BISSC member having previously served on the organization's Design Handbook Committee and the Marketing and Promotion Committee. He has more than 15 years of baking industry experience with a background in process design and development as well as project management. He is also a long-time member of the American Institute of Chemical Engineers.

Don Jordan, director of project engineering of Campbell Taggart, St. Louis, MO., was elected Vice Chairman of BISSC. Jordan, a BISSC member for the past two years, served as chairman of the Standards Review Committee. He has more than 12 years of baking industry experience and is also a member of the American Society of Bakery Engineers (ASBE).

Don Jordan Appointed as BISSC Vice Chairman

Don Jordan, director of project engineering of Campbell Taggart, St. Louis, Mo., has been appointed vice chairman of BISSC. The announcement came during the BISSC Annual Meeting, March 4 in Chicago.

Jordan, a BISSC member for the past two years, served as chairman of the Standards Review Committee. He has more than 12 years of baking industry experience and is a member of the American Society of Bakery Engineers (ASBE).

Jordan started with Campbell Taggart in 1983 as a project engineer and was promoted to senior engineer in 1985 and manager of capital budgets and control in 1992. In January of 1994 he became director of project engineering.

Jordan succeeds Frank Goley, former vice president of engineering, Campbell Taggart, Inc., Dallas, who served as vice chairman and chairman for the past several years.

Sigismondo De Tora, Nabisco Biscuit Co., remains chairman of BISSC, being re-elected to serve a third one-year term.

Microbiologist Urges Vigilance Against *E. coli* Bacteria

Recent outbreaks of illness and death due to deadly *E. coli* bacteria underscore that organism's ability to invade the food supply and the need for vigilance by everyone from the farm to the dinner table, according to a South Dakota State University microbiologist.

"We have to know that every link in the food processing chain has a role to play," said David Henning, an associate professor in SDSU's dairy science and microbiology departments. "Not all the responsibility for stopping this organism rests with the farmer or anyone else."

Henning outlined the dangers of *E. coli* serotype O157:H7, the most dangerous form of the organism, in comments prepared for the annual joint Midwest meeting of the American Society of Animal Science and the American Dairy Science Association in Des Moines, April 10-12. (Weather-related travel concerns prevents Henning from delivering his remarks at the meeting.)

Henning said the bacterium is difficult to detect in live cattle because they don't get sick from it like humans do. Recent research, including tests at the USDA's National Animal Disease Center in Ames, failed to reveal any clinical symptoms in cattle infested with the *E. coli* bacteria, he said.

Also, research in Georgia and South Dakota show that cattle with *E. coli* O157:H7 bacteria in their digestive tract may have no evidence of this bacterium when retested at a later date. Likewise cattle without the organisms may have them when retested. "It appears to be a fleeting or cyclical occurrence for livestock to have this bacterium," Henning said. "That makes it difficult to track."

Fortunately, researchers are making more progress in tracking down the source of contamination

when outbreaks of *E. coli* poisoning do occur. "We've developed new methods and we're getting very good at zeroing in on the source of the outbreaks so we can help the people affected," Henning said.

The organism contaminates food through fecal material from the intestinal tract that may contaminate milk at the farm or meat during slaughter. The danger is greatest in raw milk that hasn't been pasteurized and in ground beef products where the organism is mixed throughout the meat by the grinding process. Henning noted that *E. coli* is able to survive acid washes and other processing techniques designed to kill harmful bacteria. That makes consumer vigilance especially important.

Henning said consumers should not drink raw milk and should cook meat until there is no pink in the middle and juices run clear. "A big danger at this time of the year is people who carry meat out to a barbecue on a plate, cook it and carry it back inside on the same plate. There is a great danger for cross contamination," he said.

He noted that the U.S. Department of Agriculture estimates there may be up to 20,000 cases of *E. coli*-related food poisoning each year. Those with mild cases experience symptoms similar to stomach flu including intestinal cramps, vomiting and diarrhea. However, about 10 percent of the cases can develop into serious health problems requiring hospitalization. About 1 percent of all cases are fatal. The economic cost to the United States is estimated to be between $216 million and $580 million.

"The outbreaks of *E. coli* food poisoning have helped us refocus our food safety research," Henning said. "Until recently there was a great deal of concern about residues of herbicides, colorings and other factors in foods. These outbreaks have put the focus on where the real food safety dangers are."

Contact: David Henning, South Dakota State University, (605) 688-5477; Tom Jirik, Iowa State University, Agricultural Information, (515) 294-0705

Outbreaks of *E. coli* O157:H7 Heightened Public Awareness of Foodborne Illness

Recent outbreaks of *E. coli* O157:H7 have heightened public awareness of foodborne illness in the United States. These outbreaks have reinforced the importance of educating consumers and training food workers. As a result, over the past two years, many educational initiatives have been directed at the proper cooking of ground meat.

We know that deficiencies in hygiene and food preparation practices can result in food-borne illness. One recent case, summarized below, highlights the need to also focus attention on proper cleaning and sanitization.

During the summer of 1994, an outbreak of *E. coli* O157:H7 occurred that was associated with contamination of multiple foods in a retail food market following introduction of *E. coli* O157:H7, possibly on course ground beef that was subsequently reground in-

store. Cross-contamination to other ground meats and food items, particularly delicatessen products, occurred over several days.

Inspection of the food market revealed several important deficiencies; knives and cutting benches were used for beef, chicken, and pork without cleaning and sanitizing between species; each meat grinder was used to grind a range of beef, pork, turkey, and lamb products; and the grinders were washed only once a week with soap and water without a sanitation step. (The 1993 FDA Food Code provides recommendations on how often multi-use utensils and meat grinding equipment should be washed and sanitized.)

Based on the findings of this outbreak and those of other outbreaks over the past two years, we are asking state and local inspection agencies to join with us in placing an increased emphasis on urging retailers and food service establishment operators to provide training to their workers on proper management of health hazards. One way of achieving this goal is to help operators, who need it, find training programs and education materials.

Previously, there was no central location where one could find out what training programs and education materials were available. To address this deficiency, FDA and USDA have recently established the USDA/FDA Foodborne Illness Education Information Center.

The Information Center, which is located at the National Agricultural Library in Beltsville Maryland, is a central repository of foodborne illness training programs and education materials. The training and education database is available at no cost to food officials at all levels of government and to individual food operators that could benefit from this service. The following is a description of The Information Center and how to use it.

USDA/FDA Foodborne Illness Education Information Center

The USDA/FDA Foodborne Illness Education Information Center has compiled a database of consumer and food worker educational materials developed by universities; private industry; and local, state, and federal agencies. This includes computer software, training materials for the management and workers of retail food markets, food service establishments and institutions, educational research and more.

Reports of the database are free and are available via the Internet or by connecting to the ALF Bulletin Board at (301) 504-6510.

To access the database via the Internet, telnet to your favorite gopher, chose "All other gophers" then "Gopher servers in the USA," then "Maryland," then "Food and Nutrition Information Center, USDA." From the menu displayed, look under USDA/FDA Foodborne Illness Education Information Center. The direct gopher address is (fnic.esuda.gov).

The Center can also be accessed electronically through the FDA World Wide Web server (http://vm.cfsan.fda.gov/index.html), or through the NAL electronic bulletin board ALF, and through PENpage International Food and Nutrition Database (IFAN). Floppy disk copies of the database may be obtained from the center.

For more information about the database, contact Cindy Roberts, Information Specialist, at:

USDA/FDA Foodborne Illness Education Information Center
c/o Food and Nutrition Information Center
National Agricultural Library/USDA
Beltsville, MD 20705-2351
Telephone (301) 504-5719; Fax (301) 504-6409
INTERNET ADDRESS: croberts@nalusda.gov

Restaurant Leaders Call for Industry and Public Participation in National Food Safety Education Month

The Educational Foundation of the National Restaurant Association, the primary source of education, training and career development for the food service industry, announces that September 1995 has been designated National Food Safety Education Month, and has called for participation by all segments of the food service industry, as well as by the public.

George D. Rice, FMP chairman of The Educational Foundation and GDR Enterprises, Inc., Tampa, made the announcement in May at the 76th Annual National Restaurant Association Restaurant, Hotel-Motel Show, along with Ralph Brennan, FMP, president of the National Restaurant Association and co-owner of Mr. B's/Bacco, New Orleans; and John Farquharson, FMP, vice chairman of The Educational Foundation and executive vice president, Global Food and Support Services, ARAMARK Corporation, Philadelphia.

Rice said the goal of National Food Safety Education Month is to make food safety training accessible to as many people as possible, and to build public awareness and understanding of the food service industry's commitment to serving safe food.

"Food service operators train employees year-round on food safety. But when the nation's youth heads back to school in September, education is the top-of-mind, making it timely to stress industry education as well," said Rice. "We hope that this extra 'homework' will help the industry earn high marks from customers."

Brennan added that the industry's emphasis on food safety training has made the food served in our nation's restaurants safer

than ever before. "We are continually working to enhance safe food handling practices throughout the food service industry."

Farquharson, whose organization is one of the nation's largest food service companies serving millions of people each day, points out that food safety is equally important at home, where authorities agree that food borne illness often goes undetected and almost always unreported. "During National Food Safety Education Month, our industry, as experts in safe food handling and preparation, will also help the public learn safe food handling practices for their homes. For everyone employed in the food service industry, the public education campaign also will reinforce important food safety training they receive in the workplace."

Rice challenged all segments of the food service industry to mark National Food Safety Education Month by providing or promoting training and by participating in the Industry Council on Food Safety. Formed by the leadership of the National Restaurant Association and The Educational Foundation, the Industry Council is a coalition of food service operators, suppliers and associations committed to addressing food safety through training. Operator participants receive door decals to demonstrate their food safety commitment to customers.

The Educational Foundation of the National Restaurant Association, a nonprofit organization based in Chicago, is dedicated to enhancing the professionalism of the food service industry through education and training.

For more information about National Food Safety Education Month or the Industry Council on Food Safety, contact The Educational Foundation, Telephone (800) 456-0116.

Buchanan Gives Fourth Frazier Memorial Lecture

Dr. Robert L. Buchanan of the Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, D.C. gave the fourth Frazier Memorial Lecture at the University of Wisconsin-Madison on May 17, 1995. Dr. Buchanan's lecture, "Dealing with Uncertainty: The Future of Food Microbiology," was given in conjunction with the annual meeting of the Food Research Institute.

In his lecture, Buchanan stressed the need to rediscover the role of mathematics in food microbiology. He indicated food microbiologists are forced to deal with uncertainty by such forces as international trade, food production costs, development of multiple barrier foods, various technological breakthroughs, and public health concerns. Buchanan also emphasized that food microbiologists must become more involved in doing risk assessment, especially as it relates to international trade.

The Frazier Memorial Lecture was established in 1992 to commemorate the life and career of the late Dr. William C. Frazier, a pioneering professor of food and dairy microbiology at the University-Wisconsin. Earlier Frazier Memorial lecturers include Drs. Douglas Archer, Richard Gilbert and Mitchell Cohen. The lectureship is administered jointly by the Departments of Food Science, Bacteriology, and Food Microbiology and Toxicology at the University of Wisconsin-Madison.

FDA Announces Food Safety Pilot

The Food and Drug Administration today announced that seven major food companies have joined the agency in a pilot program to test on a broad scale, a system of preventive controls designed to enhance food safety.

Under this approach, called Hazard Analysis and Critical Control Points, or HACCP, companies analyze their manufacturing processes to determine the "critical control points" where problems are most likely to occur and where preventive measures need to be focused. For example, controlled heating time and temperature in the cooking process ensure that harmful bacteria are destroyed.

"Building safety into the food manufacturing process is the idea behind HACCP," said FDA Commissioner David A. Kessler, M.D. "It simply makes sense to design safety into the process, rather than rely on inspections and sampling to identify unsafe products after they have been made."

The companies that volunteered to take part in the pilot program and the products involved represent a wide range of foods and manufacturing processes. They include:

- Alto Dairy, Wapun, Wisc.–hard cheese
- Campbell Soup Company, Camden, NJ–refrigerated salad dressing
- Campbell-Taggart, Inc., St. Louis, MO–pan breads
- Con Agra, Omaha, NE–flour
- Ocean Spray Cranberries, Lakeville-Middleboro, MA–pasteurized juice

• Pillsbury, Minneapolis, MN–bakery products

• Hans Kissle Foods, Wilmington, MA–quiche. The Massachusetts Department of Health is participating in the pilot in cooperation with Hans Kissle Foods.

Food companies' participation in this pilot will help FDA determine whether HACCP is practical for the food industry. Individual firms will have the opportunity to work with FDA to determine how best to apply HACCP to their particular plant of regulatory policies that would minimize burden while guarding against food safety hazards.

In Jan. 1994, FDA proposed a mandatory HACCP system for the seafood industry.

On Aug. 4, 1994, FDA solicited public comments on how HACCP systems might affect various other segments of the food industry, and also invited manufacturers to volunteer for this pilot. Additional firms will be announced as they are chosen.

FDA is one of eight Public Health Service agencies in HHS.

Cargill Salt Receives Superior Ratings from American Institute of Baking

The American Institute of Baking (AIB) Food Safety Audit Program recently awarded its Superior rating to the Cargill Foods–Salt Products plant in Hutchinson, KS, making it the final of Cargill's food-grade salt facilities to capture a superior rating under the AIB's Consolidated Standards For Food Safety. With the addition of the Hutchinson plant, all four of Cargill's food-grade salt facilities currently hold superior AIB ratings.

"This milestone for us in the food industry included exceptionally high scores for the Hutchinson plant and reflects Cargill's thorough commitment to its own formal Hazard Analysis Critical Control Points (HACCP) Program," said Skip Niman, director of quality administration for Cargill Salt.

A superior AIB rating demonstrates exceptional performance in all facets of food safety. For customers and consumers, a superior rating ensures consistent delivery of food-grade products. Cargill's food-grade salt facilities that currently hold superior AIB ratings are in Hutchinson, KS; Newark, CA; Breaux Bridge, LA, and Watkins Glen, NY.

"AIB ratings are significant because most food-industry professionals are familiar with the stringent evaluation criteria, and when they hear a high score it says to them, 'there's a company that's really progressive and is working to meet its customers' needs,'" said Niman. "It gives a customer peace of mind knowing its suppliers are rated highly by an organization like the AIB," he added.

The concern for food safety has become a focal point for the entire food-processing industry. According to Bill Pursley, AIB vice president for food safety, "The market is concerned about providing quality, safe products to its customers. Companies that are being proactive and taking the initiative to improve food safety for their products will achieve greater results in the marketplace."

Cargill's HACCP Program

Cargill Salt follows the HACCP program to guide its food safety effort, because HACCP was designed specifically for food processing. As part of its Food Safety Program, the AIB evaluates HACCP programs and provides suggestions for improvement.

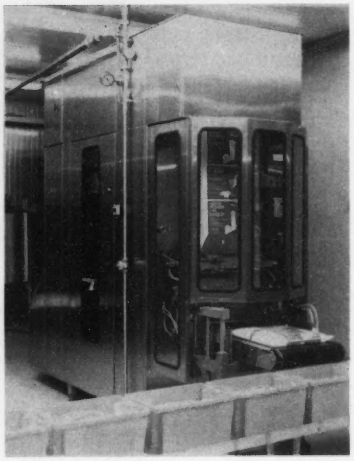
As an ingredient supplier to the food-processing industry, Cargill Salt wanted to improve production control on behalf of its customers, and so developed a formal HACCP program in 1992. HACCP identifies the critical control points in the production, processing, and transportation phases of food processing where risk of contamination is most likely. This gives food processors more control over their production process and products, and reduces risks to customers and consumers.

Cargill's HACCP program includes spohisticated technology to detect the most minute source of contamination, and is supported by annual employee training on the systems and procedures that drive its food safety efforts.

"Food safety has become much more precise," said Niman. "We've seen a growth in ways to control contamination, such as stronger magnets and finer screens. There also has been a tightening of requirements. What was acceptable 20 years ago, would not be acceptable today," he added.

Companies that operate a HACCP program must develop written procedures and technical support to control, monitor and prevent hazards such as bacteria, dirt or other foreign objects, from entering food products at these points. HACCP was originally developed by Pillsbury, the National Aeronautics Space Administration (NASA) and the Army Natick research center for the manned space program in the 1960s.

Industry**Products**



Glopak

New Bag-In-Box Packaging Machines from Finland

Suppliers of products suitable for bag-in-box packaging can cut costs by investing in a new Finnish machine that utilizes rolls of recyclable and inexpensive packaging films, cutting production costs dramatically. These new FP-in-box machines have been developed and manufactured by Elecster Co. of Toijala in Finland, who say capital pay-back times as short as three months, plus on-going savings, can be achieved.

Unlike other bag-in-box systems which use ready-made bags, FP-in-box uses roll stock material to form, fill and seal 5- to 20-litre bags automatically at up to 5000 to 6000 litres an hour. Already the company has won orders worldwide from dairies and milk-based product suppliers, as well as soft drink makers, alcohol distilleries and sections of the chemical industry.

The new machines form the pouches from heat-sealable mono- or multi-layer films or laminates; the film is folded around the metering tube before the inner surfaces are fused together at the edge by vertical heat sealing, thus forming a vertical hose of film. The horizontal sealer forms the bottom seam of the pouch, simultaneously cutting and forming the upper seam of the previous pouch.

The flow meter fills the pouch and the weight of product carries it to the pouch receiver which activates the horizontal sealer. The filled and sealed pouch is finally fed into its cardboard box or plastic crate. The whole process is controlled by a programmable logic control (PLC). The operation panel controls sealing times, temperatures or metering quantity, or switches to pre-set programs.

Three versions of the FP-in-box offer flow meter filling; powered film unwinding; date-stamping; film-guard; production counter; PLC; and interphase to dairy CIP system.

For more than 30 years Elecster Co. has been a supplier of integrated solutions to the packaging industry. In addition to being a specialist in the field of complete UHT plants, including tubular-type sterilizer and aseptic filling machines, the company produces 2-5 layer pre-sterilized films and complete film production lines.

Glopak Inc., Ontario, CAN

Reader Service No. 320

Chr. Hansen Introduces New CC Cultures

Chr. Hansen, Inc. of Milwaukee, Wisconsin introduces a new line of fast-acting mesophilic homofermentative cultures for cottage cheese. Reduced make times for cottage cheese, when using the new CC Cultures, are averaging between thirty to sixty minutes.

The new CC Cultures are available in convenient DVS, or direct vat set form. Chr. Hansen developed the CC Culture line for their rapid growth and bacteriophage resistance properties, which allow for extended periods of continuous use. The CC Culture line includes five super-concentrated, high activity cultures, all of which contain selected strains of *Lactococcus cremoris* and *Lactococcus lactis*. The CC Cultures are Kosher approved, excluding Passover.

Chr. Hansen is a leading developer and producer of cultures, enzymes, flavors and coloring agents for the food, dairy and agricultural industries. Chr. Hansen, established in 1874, has offices in 24 locations worldwide, including U.S., Canada, Mexico, England, Ireland, France, Denmark and Australia.

Chr. Hansen, Milwaukee, WI

Reader Service No. 321

Solar Barn™ Housing Promotes Animal Health

Farmers are reporting improved livestock health when they are raised and housed in Solar Barns™ Respiratory problems seem to decline and young animal survival rates are up. One Vermont dairy farmer, using this type of structure to raise calves, remarked, "Between last Thanksgiving, when we put this barn up, and this May we've raised 90 calves without a single loss. We would have lost five to eight if we still raised them in hutches." Others are finding faster growth rates in young animals.

The explanation for this greater well being seems to be in the twin benefits of natural sunlight and improved ventilation. Almost all living organisms seem to respond to sun light. Livestock animals, after all, were not "designed" to live indoors. The salutary effect of fresh air is well documented. Perhaps another important factor is that workers enjoy being in the Solar Barn™ and consequently spend more time caring for the animals.

The Solar Barn™ is a greenhouse-like structure with a galvanized steel frame and a translucent roof. This type of roofing material allows the sun to shine through, creating a light, dry, airy atmosphere inside. During the warmer months a shade cover is used to keep the Solar Barn™ cool. Little electrical lighting is normally needed.

Most Solar Barns™ are self-ventilating, requiring no fans. As the sun shines through the roof, the inside air is heated and naturally rises from the floor of the building. Since there is no "ceiling" in the structure, this convection current of warmed moist air has space to circulate to the end walls of the barn where open space allows air exchange. They can be equipped with roll-up sides to facilitate ventilation during warmer months.

Solar Barns™ are available in two styles and many sizes. The Multi-arch style provides plenty of width for dairy free stall barns.

Solar Barn™, Richmond, VT

Reader Service No. 322

New Steam Injection Heaters for 3A Applications from Hydro-Thermal Provide Self Draining, Efficient and Stable Operation

New direct steam injection heaters approved for 3A sanitary applications are now available from Hydro-Thermal Corporation.

The new heaters provide precise temperature control and smooth, stable operation where heating of water or liquid mixtures is needed in a sanitary environment. They are designed for processing and other manufacturing operations in food, pharmaceutical and biotechnological facilities.

They are the only direct steam injection heaters that are self draining from multiple orientations; this minimizes the chance of water collection which might facilitate bacteria growth which could add contamination to the process. The heaters' turbulent mixing and internal modulation of steam provide smooth, stable operation and eliminate plugging and fouling associated with other types of heating devices.

Each unit is sealed for external wash down and can be assembled or disassembled with no special tools within minutes for internal cleaning.

The heaters' advantages include quick heating with no warmup time needed and 100% thermal efficiency since both latent and sensible heat of the steam is used.

The units easily fit into existing process piping. Available in three different sizes, one model is designed for a 1" connection, another for a 1.5" connection and a third for a 2.5" connection.

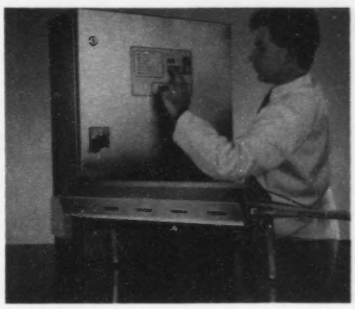
The 3A heaters can handle flow rates up to 150 gallons a minute and steam flow rates up to 13,000 lbs./hr. with maximum temperature rise of 250°F. The heaters provide precise temperature control to ± 1/2°F (1/4°C).

Hydro-Thermal provides a full money-back guarantee if the heater doesn't perform to the user's requirements.

Hydro-Thermal Corporation makes a complete line of direct steam injection heating products for paper, chemical, food and pharmaceutical processing as well as other applications where liquids or slurries are heated.

Hydro-Thermal Corporation, Waukesha, WI

Reader Service No. 324



Aquionics

Non-Chemical Disinfection for Food and Dairy Industries

Aquionics Inc. displayed single lamp, high intensity ultraviolet systems for disinfection of fluids, air and packaging at the 1995 IAMFES show in Pittsburgh, PA. The ultra-violet systems provide a non-chemical, non-heat exchange method for killing bacteria, yeast, mold and viruses commonly found in food processing environments.

Featured were newly designed lamps and systems which provide

more economical water disinfection with minimal maintenance and operating costs. Units are suitable for carbon filtered water, chilled or heated water, incoming plant water, brines and transport waters.

Also at the show was a new compact surface disinfection system ideal for packaging applications such as yogurt and cottage cheese cups and paperboard containers. The air systems designed to treat moving air flows in duct work to culture and filling rooms provide total environmental control.

Aquionics, Erlanger, KY

Reader Service No. 323

Delco

Delco's Versa 4300E Pressure Washer Cuts Big Clean-Ups Down to Size

Delco's versatile **VERSA 4300E Industrial Duty Hot High Pressure Washer** cuts clean-up time down to size. Blast away dirt, grease, and grime from farm equipment, truck and car fleets, and a variety of other surfaces with a combination of hot water and high pressure.

Delco's **VERSA 4300E** comes with a 7½ hp, 230 volt, three phase motor. The dual v-belt pulleys provide smooth power transfer to the ceramic plunger pump. The all wetted stainless and brass parts give years of trouble free service. Working pressure of the **VERSA 4300E** is 3,000 psi at 4.0 gpm.

Included with the **VERSA 4300E** are an automatic unloader that protects the pump when the trigger is closed and a vacuum switch that provides protection from low water flow. The **VERSA 4300E** also has a heavy duty schedule 80 heating coil for long life and a high limit temperature switch that controls water temperature.

Designed with the user in mind, Delco's **VERSA 4300E** is simple and safe to operate. Additional features include 10" stud tread pneumatic tires; adjustable chemical dilution valve allowing operator control of desired chemical usage to type of cleaning desired; and a 40" wand with insulated grip.

Delco, St. Louis, MO

Reader Service No. 325

Flex-Valve 9500 Series Enclosed Type Pinch Valves with Elastomer Sleeves that Meet FDA Requirements

The Flex-Valve 9500 Series enclosed type pinch valve from Flexible Valve Corporation features a full, round elastomeric sleeve that spans the entire length of the valve and is available in polymers that meet FDA requirements. Durable Van Stone flanges are integral with the sleeve body. Ideal for food and pharmaceutical processing applications, the 9500 Series valves are used extensively for handling liquids, granules pastes, and other difficult to control flows.

The Flex-Valve 9500 Series is a simple on/off valve that is easy to assemble and cost-effective to operate. For flow control or shut off, the rubber sleeve is pinched by injecting air or hydraulic pressure directly between the casing and the rubber sleeve. When the valve is in the open position, the contour of the rubber sleeve assures unobstructed flow without dead spots or cavities.

Flexible Valve Corporation, Hackensack, NJ

Reader Service No. 326

Premium Quality Rubber Hose for Sanitary Product Transfer

Sani-Tech Inc., a Nalge company, is now manufacturing Grey, FDA rubber hose for sanitary product transfer applications. This hose is a premium quality hose designed for suction and/or discharge, can handle a wide variety of products and will not impart taste or odor to the media being transported.

Manufactured with a white FDA grade EPDM synthetic rubber contact surface, reinforced by two polyester spirals and dual helix 316 SS wire, then covered with Grey EPDM rubber (crush resistant version also available). The Grey FDA hose can accommodate any style fitting for your connective requirements. Sani-Tech's Grey FDA hose is the ideal choice for food, beverage, dairy, cosmetic, CIP pharmaceutical and chemical transfer applications.

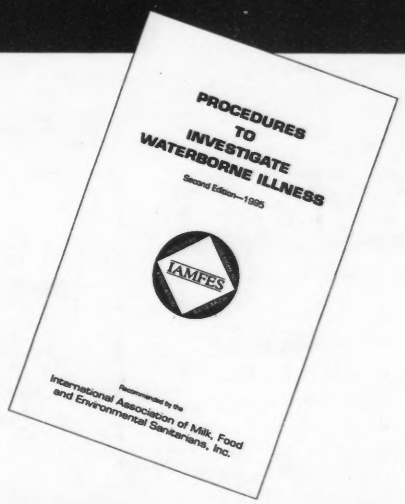
Sizes are available 1/2" through 6" in diameter and can handle temperatures ranging from -40 to +300° F. Sani-Tech's GFDA hose conforms to FDA, USDA, 3A and the construction criteria of the Grade A pasteurized milk ordinance.

Sani-Tech Inc., Lafayette, NJ

Reader Service No. 327

Coming Soon...

For the first time since 1979 the IAMFES booklet, *Procedures to Investigate Waterborne Illness*, has been revised and will be available to you late this summer.



Keep watching for updates in future issues of *Dairy, Food and Environmental Sanitation*!

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Reader Service No. 349

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Prefer Northeast Area
(But Would be Willing to Relocate)

Please contact
Howard Malberg
914-794-8264

BusinessExchange

Services/Products

WhereToFindIt

Dairy, Food and Environmental Sanitation, Vol. 15, No. 8, Pages 510-526

Holders of 3-A Symbol Council Authorization on February 1995

Questions or statements concerning any of the holder's authorizations listed below, or the equipment fabricated, should be addressed to: Administrative Officer, 3-A Symbol Council, 3020 Bluff Rd., Columbia, SC 29209; Phone (803) 783-9258; Fax (803) 783-9265.

01-07 Storage Tanks for Milk and Milk Products

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

28 Cherry-Burrell Corporation (10/3/56)
(A United Dominion Company)
575 E. Mill St.
Little Falls, New York 13365

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

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

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

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

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

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

02-08 Pumps for Milk and Milk Products

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

830 APV Fluid Handling (5/5/95)
100 South CP Avenue
Lake Mills, Wisconsin 53551

636 Abel Pumps Corporation (7/10/91)
79 North Industrial Park
511 North Avenue
Sewickley, Pennsylvania 15143-2339
(Mfr: Abel Pumps, Buchen, Germany)

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

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

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

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

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

709 Conexiones Inoxidables (1/18/93)
de Puebla S.A. de C.V.
Vicente Guerrero No. 211
Xicotepec de Juarez
Edo, Puebla, Mexico
(U.S. Rep: Ben Dolphin Consulting,
4735 Lansing Drive
North Olmsted, Ohio 44070)

820 Drum Industries, Inc. (3/17/95)
2501 Constant Comment Place
Louisville, Kentucky 40299
(Mfg. by: Alfa Laval Pumps, LTD
Easbourne East Sussex
England BN 23 6PQ)

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

671 Flowtech, Inc. (4/1/92)
1900 Lake Park Drive
Smyrna, Georgia 30080

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

828 Flux Pumps Corp. (4/13/95)
4430 Commerce Circle
Atlanta, Georgia 30336
(Mfg. by: Flux Geraete GmbH
Talweg 12
D75433 Maulbronn
Germany)

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

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

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

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

502 Inoxpa, s.a. (9/16/92)
C/. Telers, 54
17820 Banyoles
Gerona, Spain

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

603 Johnson Pumps (U.K.) Ltd. (8/16/90)
Highfield Industrial Estate
Edison Road, Eastbourne
East Sussex, England BN23 6PT
(U. S. Rep: Johnson Pump of America
4825 Scott St.
Schiller Park, Illinois 60176)

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

792 KSB. Inc. (9/14/94)
4415 Sarellen Road
Richmond, VA 23231
(Mfg. by: KSB AK Tiengesellschaft
Frankenthal, Germany

673 Alfa Laval Pumps, Inc. (4/16/92)
9201 Wilmot Road
Kenosha, Wisconsin 53141-1426

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

400 Netzsch Incorporated (8/15/83)
119 Pickering Way
Exton, Pennsylvania 19341-1393

810 O.M.A.C. SRL Pompe (1/2/95)
Via G. Bernini 4, I-42043
Rubiera (RE) Italy
(U.S. Rep.: Sanchelima International Inc.
1783 N.W. 93rd Avenue
Miami, Florida 33172

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

684 PCM.POMPES (7/9/92)
17 Rue Ernest Laval
B. P. 35 - 92173 Vanves Cedex, France
(U.S. Rep: Alfa Laval Pumps, Inc.
9201 Wilmot Road
Kenosha, Wisconsin 53141-1426)

701 Pierre Guerin SA (10/27/92)
BP. 12 - 79210
Mauze-Sur-Le-Mignon
France
(U.S. Rep: Alfa Technical Group, Inc.
601 Thompson Road N.
Syracuse, New York)

241 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico
(U.S. Rep: Top Line Corporation)

148R Moyno Industrial Products (4/22/64)
A Division of Robbins & Myers, Inc.
1895 W. Jefferson St.
Springfield, Ohio 45501-0960

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

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

568 Shanley Pump & Equipment, Inc. (5/15/89)
2525 S. Clearbrook Dr.
Arlington Heights, Illinois 60005
(Mfg. by Allweiler, West Germany)

678 Shanley Pump & Equipment, Inc. (5/11/92)
2525 S. Clearbrook Dr.
Arlington Heights, Illinois 60005
(Mfg. by Allweiler, West Germany)

507 Sine Pump (7/21/87)
c/o Sundstrand Fluid Handling
14845 West 64th St.
Arvada, Colorado, 80004

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

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

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

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

52R Viking Pump, Inc. (12/31/56)
A Unit of IDEXX Corporation
406 State St., P.O. Box 8
Cedar Falls, Iowa 50613
(Manufactured by: Johnson Pump
Highfield Ind. Estate, Edison Road
Eastbourne, E. Sussex
UK BN 23 6PT)

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

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

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

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

309 APV Homogenizer, Div., Rannie Prod. (7/19/78)
(Formerly APV Rannie, Inc.)
445 Etna Street, Suite 57
St. Paul, Minnesota 55106

722 APV Rannie AS (3/23/93)
Roholmsvej 8, DK-2620
Albertslund, Denmark
(U.S. Rep: APV Crepco, Inc.
100 South CP Avenue
Lake Mills, Wisconsin 53551)

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

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

486 Fowler Products Company (11/18/86)
150 Collins Industrial Blvd.
P.O. Box 80268
Athens, Georgia 30608-0268

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

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

770 Tetra Pak Processing Systems (6/13/94)
8400 Lakeview Parkway, Ste. 500
Pleasant Prairie, Wisconsin 53158
(Manufactured by: Tetra Pak-Stainless Equipment AB
Lund, Sweden)

714 Union Homogenizer (2/25/93)
4600 W. Dickman Road
Battle Creek, Michigan 49015

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

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

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

756 Beall Trailers of California (2/21/94)
9801 Moffat Blvd.
Manteca, California 95336

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

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

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

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

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

653 Tremcar (10/10/91)
1, Tougas Street
Iberville, Quebec, Canada J2X 2P7
(U. S. Rep: Bay State Tr. & Tr.
527 Winthrop
Rehobeth, Massachusetts 02769)

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

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

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

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

32 ABB Kent-Taylor, Inc. (10/4/56)
(Formerly Taylor Instruments)
P.O. Box 20550
Rochester, New York 14602-0550

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

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

321 Anderson Instrument Co., Inc. (6/14/79)
156 Auriesville Road
Fultonville, New York 12072

586 Diversey Equipment Tech. (12/14/89)
151 Harvey West Blvd.
Santa Cruz, California 95060

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

763 EG & G Berthold Laboritorium Prof. (4/21/94)
Berthold GmbH & Co. KGCalmbacher Str. 22
D-7547 Bad Wildbad 1, Germany
(U.S. Representative:Berthold Systems, Inc.
101 Corporation Drive
Aliquippa, Pennsylvania 15001-4863)

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

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

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

794 Leeds and Northrup Co. (9/14/94)
351 Sumneytown Pike
P. O. Box 2000
North Wales, Pennsylvania 19454

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

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

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

495 Rosemount Analytical Division (2/13/87)
2400 Barranca Pkwy.
Irvine, California 92714

826 Rosemount, Inc. (4/6/95)
12001 Technology Drive
Eden Prairie, Minnesota 55344

732 SensorTec, Inc. (5/18/93)
16335-7 Lima Road
Huntertown, Indiana 46748

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

32 ABB Kent-Taylor (10/4/56)
1175 John Street
P. O. Box 20550
Rochester, New York 14602-0550

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

444 Tuchenhagen North America (6/17/85)
8949 Deerbrook Trail
Milwaukee, Wisconsin 53223

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

779 Wahl Inst., Inc. (8/10/94)
5750 Hannum Ave.
Culver City, California 90231

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

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

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

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

704 Pall Trinity Micro Corp. (11/6/92)
3643 State Route 281
Cortland, New York 13045-0930

720 R-P Products (3/19/93)
Box 388, 407 Jefferson Street
Three Rivers, Michigan 49093

435 Sermia International (11/27/84)
740-212 Boul. Industrial
Blainville, Quebec
Canada J7C 3V4
(U.S. Rep: United Dairy
Machinery Corp.
301 Meyer Road
Buffalo, New York 14224)

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

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

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

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

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

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

17 Tetra Pak Processing (7/28/82)
8400 Lake View Parkway
Pleasant Prairie, Wisconsin 53158

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

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

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

791 The Coburn Co., Inc. (9/14/94)
834 E. Milwaukee St., Box 147
Whitewater, Wisconsin 53190
(Mfg. by: Elmega S./L.
Apartado De Cerros, 1
Camino Vrejo De Mourelle, S/N
15840 (Santa Comba) La Coruna
Spain

468 Niro, Inc. Evaporator Division (2/2/86)
9165 Rumsey Road
Columbia, Maryland 21045-1991

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

15 Kusel Equipment Co. (8/15/56)
820 West St., P.O. Box 87
Watertown, Wisconsin 53094

360 Laffranchi Wholesale Co. (7/12/82)
P.O. Box 1273
Ferndale, California 95536

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

491 On-Line Instrumention (1/12/94)
P.O. Box 541
Route 376
Hopewell Junction

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

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

670 Skellerup Engineering, Ltd. (4/1/92)
2 Robert Street
P.O. Box 11-020
Ellerslie, Auckland 5
New Zealand
(U.S. Rep: Masport, Inc.
6140 McCormick Drive
Lincoln, Nebraska 68507)

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

610 Universal Dairy Equipment (12/13/90)
Auckland, New Zealand
11100 N. Congress Avenue
Kansas City, Missouri 64153
(Mgr. Skellerup Engineering,
Ellersie, Auckland 5,
New Zealand)

12-05 Tubular Heat Exchangers for Milk and Milk Products

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

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

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

734 The Diversified-Berdell Group, Inc. (5/19/93)
1710 Flushing Ave.
Ridgewood, New York 11385

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

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

824 DASI Industries, Inc. (3/17/95)
1414 - 5th Ave. SE
Decatur, Alabama 35601
(Mfg. by: Sacome Incapsa
30001 Murcia
Spain)

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

712 Enerquip, Inc. (2/24/93)
611 North Road
P.O. Box 368
Medford, Wisconsin 54451

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

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

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

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

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

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

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

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

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

614 Tetra Pak Processing Systems (12/27/90)
P.O. Box 179
8400 Lake View Parkway, Suite 500
Pleasant Prairie, Wisconsin 53158
(Mfg. by Tetra Pak Stainless Equipment AB,
P.O. Box 64
Bruggaregatan 23, S-221 00
Lund, Sweden)

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

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

13-09 Farm Milk Cooling and Holding Tanks

802 Agroequcpos Heker, S.A. (11/10/94)
De C.V.
Ind. Torreon, Coah, MEXICO
(U.S. Rep: James Read
M. E. Stainless
601 High Plain Dr.
Bel Air, Maryland 21014)

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

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

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

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

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

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

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

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

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

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

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

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

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

639 Niro-Sterner, Inc. (7/10/91)
421-6th Street South
Winsted, Minnesota 55395

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

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

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

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

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

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

619 Hassia Verpackungsmaschinen GmbH (2/22/91)
63691 Ranstadt 1/Hessen Germany
(Hassia U.S.A., Inc. 39 Plymouth St.
Fairfield, New York 07007)

473 International Paper Company (6/12/86)
Extended Shelf-Life Division
4020 Stirrup Creek Drive, Bldg. B200
Durham, North Carolina 27703

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

731 LIEDER-Maschinenbau Gmbh & Co. KG (5/18/93)
Postfach 1252/Im Laab 3
3033 Schwarmstedt, Germany

743 Liqui-Box Corporation (11/16/93)
6950 Worthington-Galena Road
Worthington, Ohio 43085

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

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

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

281 Purity Packaging Corp. (11/8/76)
800 Kaderly Road
Columbus, Ohio 43228

723 James River Corporation (3/26/93)
One Better Way Road
Milford, Ohio 45150
(Mfg. by Thimonnier, France)

746 Septipack, Inc. (1/11/94)
2313 Benson Mill Rd.
Sparks, Maryland 21152
(Mfg. by Remy Equipment, Druex, France)

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

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

351 Tetra Pak, Inc. (1/7/82)
909 Asbury Drive
Buffalo Grove, Illinois 60089
(Mfg. by A. B. Tetra, Italy)

220 Tetra Rex Packaging Systems (4/24/71)
(formerly TetraPak/EquipUS)
909 Asbury Drive
Buffalo Grove, Illinois 60090

694 Time Pack, Inc. (9/23/92)
26 Starfish Drive
Vero Beach, Florida 32960
(Mfg. by: Time Pack
GmbH, Weissensburg
Germany)

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

141 APV Crepaco, Inc. (4/15/63)
100 South CP Ave.
Lake Mills, Wisconsin 53551

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

286 Tetra Laval Food Hoyer, Inc. (12/8/76)
7711 95th St., P. O. Box 0902
Pleasant Prairie, Wisconsin 53158-0902 (12/8/76)
(Mfg. by O. G. Hoyer A/S, Denmark)

465 Leon's Frozen Custard (12/17/85)
3131 S. 27th Street
Milwaukee, Wisconsin 53151

573 Processing Machinery & Supply Co. (9/28/89)
1108 Frankford Ave.
Philadelphia, Pennsylvania 19125
(Mfg. by PMS Italiana, Italy)

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

22-04 Silo-type Storage Tanks for Milk and Milk Products

154 APV Crepaco, Inc. (2/10/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

168 Cherry-Burrell Corp. (6/16/65)
(A Unit of AMCA Int'l, Inc.)
575 E. Mill Street
Little Falls, New York 13365

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

181 Damrow Co. (5/18/66)
(Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

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

439 JV Northwest, Inc. (1/22/85)
28120 S.W. Boberg Rd.
Wisonville, Oregon 97070

702 Paul Krohnert Manufacturing, Ltd. (11/6/92)
P.O. Box 126
811 Steeles Avenue
Milton, Ontario, Canada L9T 2Y3
(Not available in the U.S.A.)

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

503 Ripley Stainless, Ltd. (5/1/87)
RR #3, Site 41
Summerland, British Columbia V0H 1Z0
(Not available in U.S.A.)

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

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

165 Walker Stainless Equipment Co., Inc. (4/26/65)
Elroy, Wisconsin 53929

23-02 Equipment for Packaging Frozen Desserts, Cottage Cheese and Similar Milk Products

174 APV Crepaco, Inc. (9/28/65)
Filling & Wrapping Systems Div.
100 South CP Avenue
Lake Mills, Wisconsin 53551

209 Doboy Packaging Machinery Incorp. (7/23/69)
869 S. Knowles Ave.
New Richmond, Wisconsin 54017

674 Hayssen Manufacturing (4/20/92)
5300 Highway 42 North
P.O. Box 571
Sheboygan, Wisconsin 53082-0571

447 Mateer-Burt Co., Inc. (7/22/85)
434 Devon Park Drive
Wayne, Pennsylvania 19087

343 Tetra Laval Food Hoyer, Inc. (7/6/81)
7711 95th St., P. O. Box 0902
Pleasant Prairie, Wisconsin 53158-0902
(Mfg. by: Alfa Hoyer, Denmark)

679 Ice Cream Novelties (6/1/92)
Division of Popsicle Inc., Ltd.
5305 Harvester Road
P.O. Box 610
Burlington, Ontario, Canada L7R 3Y5
(U.S. Rep:Sunshine Biscuits
100 Woodbridge Center Drive
Woodbridge, New Jersey 07095-1196)

635 Interbake Dairy Ingredients Div. (7/10/91)
2220 Edward Holland Drive
Suite 301
Richmond, Virginia 23230

760 Jordan Manufacturing, Inc. (2/23/94)
Rt. 1, Box 42 A 1
Crossville, Alabama 35962

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

666 Rapidpak (3/5/92)
1725 West 8th Street
Appleton, Wisconsin 54911

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

222 Sweetheart Packaging (11/15/71)
(Formerly Fort Howard Pkg. Corp.)
10100 Reistertown Road
Owing Mills, Maryland 21117

24-02 Non-coil Type Batch Pasteurizers

158 APV Crepaco, Inc. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

161 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

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

819 JayBee Precision, Inc. (3/17/95)
Kirk Pasture Road, P.O. Box 231
Bristol, New Hampshire 03222-0231

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

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

159 APV Crepaco, Inc. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

162 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

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

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

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

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

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

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

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

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

26-03 Sifters for Dry Milk and Dry Milk Products

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

634 Great Western Mfg. Co. (7/10/91)
2017 South Fourth Street
P.O. Box 149
Leavenworth, Kansas 66048

363 Kason Corp. (7/28/82)
1301 East Linden Ave.
Linden, New Jersey 07036

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

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

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

172 Sweco, Inc. (9/1/65)
7120 Buffington Rd.
Florence, Kentucky 41042

27-02 Equipment for Packaging Dry Milk and Dry Milk Products

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

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

618 Hayssen Manufacturing Company (2/18/91)
5300 Highway 42 North
P.O. Box 571
Sheboygan, Wisconsin 53082-0571
(Manufactured by Yamato Scale Co.
Akasi, 673, Japan)

625 Ishida Scales Mfg. Co., Inc. (4/2/91)
44, Sanno-Cho, Shogoin
Sakyo-Ku, Kyoto, Japan
(U.S. Rep: Heat & Control
225 Shaw Rd.
S. San Francisco, California 94080)

409 Mateer-Burt Co. (10/31/83)
436 Devon Park Dr.
Wayne, Pennsylvania 19087

816 Pacmac Inc. (2/24/95)
1611 Armstrong Ave., P.O. Box 360
Fayetteville, Arkansas 72702-0360

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

28-02 Flow Meters for Milk and Milk Products

270 ABB Kent-Taylor, Inc. (2/9/76)
P.O. Box 20550
Rochester, New York 14602-0550
ABB Kent-Taylor, Inc.
Oldends Lane Stonehouse
Gloucestershire, GL 103TA, England

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

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

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

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

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

797 Endress & Hauser, Inc. (10/10/94)
2350 Endress Place, P.O. Box 246
Greenwood, Indiana 46142
(Mfg. by: Endress & Hauser Flowtec AG
Kägenstrasse 7
CH - 4153 Reinach
Switzerland)

599 Euromatic Machine & Oil (4/26/95)
CO (UK) LTD
Westcroft Industrial Estate
Rhodes, Middleton, Manchester
M24 4GJ England
(Not available in the USA)

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

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

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

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

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

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

661 G/H Products Corp. (11/21/91)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53142

562 Great Lakes Instruments, Inc. (2/6/89)
9020 West Dean Road
Milwaukee, Wisconsin 53224-0056

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

574 Hersey Measurement Co., Inc. (10/12/89)
150 Venture Blvd.
P.O. Box 4585
Spartanburg, South Carolina 29305

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

744 Honeywell (11/16/93)
Industrial Controls Div.
1100 Virgina Drive
Fort Washington, Pennsylvania 19034

733 Honeywell, Inc. (5/18/93)
16404 Black Canyon Highway
Phoenix, Arizona 85023-3095

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

535 Invalco, Inc.
(A subsidiary of Smith Meter, Inc.)
P.O. Box 1183
Hutchinson, Kansas 67504

764 Johnson Yokogawa
4 Dart Road
Newnan, Georgia 30265-1040
(Mfg. by Yokogawa Electric Corp.
2-9-32 Nakacho
Musashino-shi, Tokyo,
180 Japan

529 Krohne America, Inc (5/18/88)
7 Dearborn Road
Peabody, Massachusetts 01960
(Mfg. by Altometer, Holland)

755 Liquid Controls Corporation (2/21/94)
105 Albrecht Drive
Lake Bluff, Illinois 60044
(Mfg. by Processautomatic
Box 117,
61070 Vagnharad, Sweden)

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

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

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

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

585 Schlumberger Industries, Ltd. (12/7/89)
11321 Richmond Ave.
Houston, Texas 77082-2615
(Mfg. by Schlumberger, England)

587 Schlumberger Ind., Measurement Div. (12/18/89)
1310 Emerald Rd.
Greenwood, South Carolina 29646
(Mfg. by Schlumberger, France)

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

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

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

803 Turck, Inc. (11/18/94)
3000 Campus Dr.
Plymouth, Minnesota 55441-2656
(Mfg. by: EGE - Eletronik
Ravensberg 34
D-24214 Gehorf
Germany

664 Schutte & Koerting (12/16/91)
(A division of Ketema, Inc.)
XO Technologies Products
2233 State Road
Bensalem, Pennsylvania 19020

29-01 Air Eliminators for Milk and Fluid Milk Products

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

662 G/H Products Corp. (11/21/91)
7600-57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53142

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

30-01 Farm Milk Storage Tanks

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

31-02 Scraped Surface Heat Exchangers

290 APV Crepaco, Inc. (6/15/77)
100 South CP Ave.
Lake Mills, Wisconsin 53551

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

274 Contherm, Inc. (6/25/76)
111 Parker St., P.O. Box 352
Newburyport, Massachusetts 01950

496 FR Mfg. Corp. (2/23/87)
2807 South Highway 99
Stockton, California 95202

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

32-01 Uninsulated Tanks for Milk and Milk Products

397 APV Crepaco, Inc. (6/21/83)
100 South CP Ave.
Lake Mills, Wisconsin 53551

264 Cherry-Burrell Corp. (1/27/75)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

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

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

354 C.E. Rogers Co. (3/3/82)
S. Hwy. #65, P.O. Box 118
Mora, Minnesota 55051

683 SANIFAB (7/9/92)
A Division of A&B Process Systems Corp.
528 North Street
Stratford, Wisconsin 54484

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

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

33-00 Polished Metal Tubing for Dairy Products

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

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

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

809 Damascus-Bishop Tube Co. (1/2/95)
795 Reynolds Industrial Park Road
Greenville, Pennsylvania 16125

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

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

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

776 Siam Stainless (7/18/94)
Fittings & Tubulars
Bangkok, Thailand
(U.S. Rep: Kurt Orban Partners
Kurt Orban
450 Kings Road
Brisbane, California 94005)

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

289 Tri-Clover, Inc. (1/21/77)
9201 Wilmot Road
Kenosha, Wisconsin 53141

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

34-02 Portable Bins

647 Thomas Conveyor Company (9/18/91)
Tote System Division
555 I-35 South
Burleson, Texas 76028

35-00 Continuous Blenders

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

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

417 Cherry-Burrell (2/7/84)
Process Equipment Division
P.O. Box 35600
Louisville, Kentucky 40232-5600

825 GEI Processing, Inc. (3/30/96)
Machines Collette
One Indian Lane East
Towaco, New Jersey 07082
(Mfg. by: Machines Collette N.V.
Keerbaan 70
B-2160 Wommelgem
Belgium)

642 Mondomix Howden B.V. (8/7/91)
Reeweg 13
P.O. Box 98
1394 ZH Nederhorst den Berg
The Netherlands
(U.S. Rep: Donster and Co.
HCR-3, Box 128
Johnsburg, New York 12843)

680 Quadro Engineering, Inc. (6/3/92)
613 Colby Drive
Waterloo, Ontario
Canada N2V 1A1
(U.S. Rep.: Zajac Equipment Supply
270 Roosevelt Trail
Windham, Maine 04062)

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

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

36-00 Colloid Mills

808 Boston Shearpump, Inc. (12/16/94)
P.O. Box 390161
Cambridge, Massachusetts 02139-9998

608 Kinematica (10/17/90)
170 Linden Street
Wellesley, Massachusetts 02181
(Mfg. by: Kinematica AG,
CH-6014 Littau/Lucerne, Switzerland)

293 Waukesha Fluid Handling (8/25/77)
611 Sugar Creek Road
Delavan, Wisconsin 53115

37-01 Liquid Pressure and Level Sensing Devices

738 ABB Kent-Taylor, Inc. (6/25/93)
1175 John Street
Rochester, New York 14602-0550

576 Ametek/Mansfield & Green Division (10/13/89)
8600 Somerset Dr.
Largo, Florida 34643

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

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

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

525 Caldwell Systems Corporation (3/4/88)
(Formerly Zantel Instruments)
1500 Kansas Ave., Suite 2A
Longmont, Colorado 80501-6540

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

706 CTI Celtek Electronics (12/29/92)
136 Merizzi Street
St. Laurent, Quebec, Canada H4T 1S4
(U.S. Rep: CTI Celtek Electronics, Inc.
1000 Leonidas Street
New Orleans, Louisiana 70118)

829 DCT Instruments (4/13/95)
1165 Chambers Road
Columbus, Ohio 43212
(Mfg. by: Sensotec Inc.
1200 Chesapeake Avenue
Columbus, Ohio 43212)

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

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

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

459 Endress + Hauser, Inc. (10/17/85)
2350 Endress Place
Greenwood, Indiana 46142
(Mfg. by Endress + Hauser GmbH,
Hauptstrasse 1,
D-79689 Maulburg, Germany)

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

463 The Foxboro Company (12/6/85)
33 Commercial Street
Foxboro, Massachusetts 02035

668 GP: 50 New York, Ltd. (3/30/92)
2770 Long Road
P.O. Box 805
Grand Island, New York 14072

651 Granzow, Inc. (10/3/91)
2300 CrownPoint Executive Drive
Charlotte, North Carolina 28227
(Mfr: Kubler AG
Baar, Switzerland)

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

749 Haenni Cie & AG (1/17/94)
CH-3303
Jegenstorf, Switzerland
(U.S. Representative: Viatran Corporation
300 Industrial Drive
Grand Island, New York 14072)

771 Hawk America (6/13/94)
1741 W. Rose Garden Lane
Phoenix, Arizona 85027

832 H.O. Trerice Co. (5/12/95)
12950 W. Eight Mile Rd.
Oak Park, Michigan 48237-3288
(Mfg. by: Bourdon-Sedene
125 Rue De La Marre
41 100 Vendome
France)

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

629 Intrinsic Safety Equipment of Texas (5/20/91)
907 Bay Star
Webster, Texas 77598-1531

598 Invalco, Inc. (3/22/90)
P.O. Box 1183
Hutchinson, Kansas 67504-1183

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

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

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

501 Lumenite Electronic Company (4/27/87)
2331 N. 17th Avenue
Franklin Park, Illinois 60131

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

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

627 Milltronics, Inc. (4/12/91)
730 The Kingsway
Peterborough, Ontario
Canada K9J 7B1
(U.S. Rep: Milltronics, Inc.
709 E. Stadium Drive
Arlington, Texas 76011)

597 NUOVA FIMA S.p.A. (3/20/90)
Via C. Battisti 59
28045 - INVORIO (N0) Italy
(Not Available in U.S.A.)

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

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

563 PI Components Corp. (2/13/89)
350 Loop 250 South
Brenham, Texas 77833

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

815 ProMag PM LTD (2/24/95)
4251 Rhoda Drive
Baton Rouge, Louisiana 70819

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

784 Sensotec, Inc. (8/31/94)
1200 Cheseapeake Ave.
Columbus, Ohio 43212-2288

515 Setra Systems, Inc. (9/14/87)
45 Nagag Park
Acton, Massachusetts 01720

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

638 Span Instruments (7/10/91)
1947 Avenue "K"
Plano, Texas 75074

285 K Systems Corp. (Tank Mate Division) (12/7/76)
4919 Butterfield Road
Hillside, Illinois 60162

641 Tempress A/S (7/16/91)
Engtoften 6, DK-8260
Viby J, Denmark

765 Tri-Clover, Inc. (4/27/94)
9201 Wilmot Road
Kenosha, Wisconsin 53141

754 Valmet Automation (2/15/94)
30 Thomas Drive
Westbrook, Maine 04092
(Mfg. by Valmet-Finland
P. O. Box 237 SF-33101
Tampere, Finland)

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

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

600 Weksler Instruments Corporation
800 Mill Rd.
Freeport, New York 11520-0808

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

685 Winter's Thermogauges, Ltd. (8/3/92)
2220-3 Midland Avenue
Scarborough, Ontario
Canada M1P 3E6
(U.S. Rep: Winter's Thermogauges, Inc.
100 Sonwil Drive
Buffalo, New York 14225)

38-00 Cottage Cheese Vats

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

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

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

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

453 Hosokawa MikroPul E. Systems (9/4/85)
102 American Road
Morris Plains, New Jersey 07950

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

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

41-00 Mechanical Conveyors

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

44-01 Air Driven Diaphragm Pumps

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

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

669 Skellerup Engineering, Ltd. (3/30/92)
2 Robert Street
P.O. Box 11-020
Ellerslie, Auckland 5
New Zealand
(U.S. Rep: Masport, Inc.
6140 McCormick Drive
Lincoln, Nebraska 68507)

805 Tri-Clover (11/18/94)
9201 Wilmont Road
Kenosha, Wisconsin 53141
(Mfg. by: KWW
Dusseldorf, Germany

45-00 Cross Flow Membrane Modules

807 CeraMem Separations (11/30/94)
12 Clematis Ave.
Waltham, Massachusetts 02154

813 Golden Technologies Co., Inc. (2/2/95)
1697 Cole Blvd., Suite 300
PO Box 4040
Golden, Colorado 80402

786 North Carolina SRT, Inc. (8/31/94)
1018 Morrisville Parkway
Morrisville, North Carolina 27560
(Mfg. by: Tohshin Seiko Co., Ltd.
42-2 Aza Shinmei Tazawa Ohkuma
Watari-Cho, Watari-Gun
Miyagi 889-23 Japan

46-00 (Refractometers and Optical Sensors)

785 Bran & Lubbe, Inc. (8/31/94)
1025 Busch Parkway
Buffalo Grove, Illinois 60089
(Mfg. by: Bran & Lubbe
Norderstdt
GMbH (Germany)

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

783 James C. Camp (8/31/94)
dba Advantec Process Systems
95 Wyngate Dr.
Newnan, Georgia 30265
(Mfg. by: BTG Inc.
2364 Park Central Blvd.
Decatur, Georgia 30035-3987)

737 Katrina, Inc. (6/17/93)
91 Western Maryland Pkwy
Hagerstown, Maryland 21740

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

751 Maselli Misure S.p.A. (1/20/94)
Via Baganza, 4/3
43100 Parma, Italy
(U.S. Representative:Maselli Measurements, Inc.
P. O. Box 7571
7746 Lorraine Avenue
Stockton, California 95267)

767 NIRSystems/Perstorp (6/6/94)
12101 Tech Road
Silver Spring, Maryland 20904

750 PT Papertech, Inc. (1/20/94)
4850 The Dale
West Vancouver
B. C. Canada V7W 1K3
(U.S. Representative: BD Services Corporation
300 North Commercial Street
Bellingham, Washington 98227)

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

817 Technitron Labs Inc. (2/24/95)
306 Looney Road
Piqua, Ohio 45346

50-00 Level Sensing Devices

705 CTI Celtek Electronics (12/29/92)
136 Merizzi Street
St. Laurent, Quebec, Canada H4T 1S4
(U.S. Rep: CTI Celtek Electronics, Inc.
1000 Leonidas Street
New Orleans, Louisiana 70118)

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

801 Alloy Products Corp. (11/10/94)
P. O. Box 529
Waukesha, Wisconsin 53187

787 Cipriani, Inc. (8/31/94)
Tassalini S.P.A.
23195 LaCadena Dr., Suite 103
Laguna Hills, California 92653

772 G & H Products (6/13/94)
7600 - 57th Avenue
Kenosha, Wisconsin 53141

780 L. C. Thomsen, Inc. (8/31/94)
1303 - 43rd St.
Kenosha, Wisconsin 53140

788 Puriti, S.A. De C. V. (8/31/94)
Alfredo Nobel No. 39
Fracc. Ind. Pte. de Vigas
Tlalnepantha, Mexico
(U.S. Rep: Waukesha Fluid Handling
611 Sugar Creek Road
Delavan, Wisconsin 53115)

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

777 Tech Control Ent. (7/18/94)
3725 N. Murray Road
Otis Orchard, Washington 98027

790 Tri-Clover, Inc. (9/14/94)
9201 Wilmont Road
Kenosha, Wisconsin 53141-1413

759 VNE Corporation (3/16/94)
1149 Barberry Drive
Janesville, Wisconsin 53545

761 Waukesha Fluid Handling (12/17/93)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115

52-00 (Formerly 08-17H) Thermoplastic Plug Type Valves

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

53-00 (Formerly 08-17A) Compression Type Valves

484 APV Crepaco, Inc. (10/22/86)
100 South CP Avenue
Lake Mills, Wisconsin 53551

730 APV Rockford, Inc. (4/21/93)
1303 Samuelson Road
Rockford, Illinois 61109

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

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

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

686 Bardiani Valvole S.R.L. (8/3/92)
Via G. Vittorio, 53
43045 Fornovo (PR) Italy
(U.S. Rep: Sanchelima Int.
1763 Northwest 93rd Ave.
Miami, Florida 33172)

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

716 Conexiones Inoxidables (3/4/93)
de Puebla S.A. de C.V.
Vicente Guerrero No. 211
Xicotepec de Juarez
Edo, Puebla Mexico
(U.S. Rep: Ben Dolphin Consulting,
4735 Lansing Drive
North Olmsted, Ohio 44070)

376 Definox Division (9/13/93)
Defontaine, Inc.
16720 W. Victor Road
New Berlin, Wisconsin 53151

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

480 GEA Food and Process Systems Inc. (8/8/86)
8940 Route 108
Columbia, Maryland 21045

607 Kammer Valve, Inc. (9/25/90)
510 Parkway View Drive
Pittsburgh, Pennsylvania 15205
(Mfg. by: Kammer Ventile GmbH
Manderscheidtstr. 19
45141 Essen 1, Germany)

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

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

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

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

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

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

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

762 Stainless Products, Inc. (12/18/80)
P.O. Box 169
1649 - 72nd Avenue
Somers, Wisconsin 53171-0169

806 Steri Technologies, Inc. (11/23/94)
857 Lincoln Ave.
Bohemia, New York 11716
(Mfg. by: Aseptomag AG
Bachweg 3, Postfach 415
CH-3401 Burgdorf
Switzerland)

804 Sudmo North America (11/18/94)
4740 E. 2nd St., Suite C-20
Benicia, California 94510
(Mfg. by: Sudmo Schleicher AG
Industriester 7 D-73469
Reisburg, Germany)

823 Sudmo North America (3/17/95)
4403 First Ave., Suite 500
Cedar Rapids, Iowa 52402
(Mfg. by: Sudmo Schleicher AG
Industiester 7 D-73469
Riesburg, Germany)

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

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

467 Tuchenhagen North America, Inc. (1/13/86)
(Mfg. by Otto Tuchenhagen, West Germany)
8949 Deerbrook Trail
Milwaukee, Wisconsin 53223

789 Tuchenhagen North America, Inc. (8/31/94)
8949 Deerbrook Trail
Milwaukee, Wisconsin 53223
(Mfg. by: Scan Flow A/S
Skelhojsvej 9, d k 9541 Suldrup
Denmark)

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

584 Valvinox, Inc. (11/27/89)
650 1ere Rue.
Iberville-QUE-Canada J2X 3B8

796 VNE Corp. (10/11/94)
1149 Barberry Dr.
Janesville, Wisconsin 53547
(Mfg. by: EGMO LTD.
1 Hayotsrim, P. O. 266
Nahariya, Israel)

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

86R Waukesha Specialty Co., Inc. (12/20/57)
P.O. Box 160, Hwy. 14
Darien, Wisconsin 53114

54-00 (Formerly 08-17B) Diaphragm-Type Valves

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

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

814 Burkert Contromatic Corp. (2/2/95)
1091 North Batavia Street
Orange, California 92667
(Mfg. by: Buerkert Steuer-Und Regeltechnik
Christian-Buerkert-Str 13-17
D-74653 Ingelfinger
Germany)

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

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

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

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

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

494 Saunders Valve, Inc. (2/10/87)
16516 Air Center Blvd.
Houston, Texas 77032-5103

55-00 Boot Seal Valves for Milk & Milk Products

821 Mark James Company (3/17/95)
P.O. Box 23505
Milwaukee, Wisconsin 53223-0505
(Mfg. by: Keofitt A/S
Snaremosvej 27
DK-7000 Fredericia
Denmark)

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

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

556 Waukesha Fluid Handling (12/12/57)
611 Sugar Creek Road
Delavan, Wisconsin 53115

57-00 (Formerly 08-17F) Tank Outlet Valve

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

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

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

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

691 Definox Division (1/25/83)
Defontaine, Inc.
16720 W. Victor Road
New Berlin, Wisconsin 53151

835 G & H Products Corp. (5/22/95)
7600 - 57th Avenue, P.O. Box 1199
Kenosha, Wisconsin 53141-1199

834 Stanfos, Inc. (5/22/95)
3908 - 69th Avenue
Edmonton, Alberta
Canada T6B 2V2
Not Available in the USA

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

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

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

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

693 Micropure Filtration, Inc. (9/17/92)
2323 6th Street, P.O. Box 7007
Rockford, Illinois 61125
(Mfg. by: Olper Maschinen & Armaturen
Olpe, Germany)

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

422 BS & B Safety Systems, Inc. (6/12/84)
7455 E. 46th St.
Tulsa, Oklahoma 74145

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

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

728 APV Crepaco, Inc. (4/14/93)
395 Fillmore Avenue
Tonawanda, New York 14150

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

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

62-00 (Formerly 08-17L) Hose Assemblies

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

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

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

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

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

727 Pure Fit, Inc. (4/14/93)
924 Marcon Blvd.
Allentown, Pennsylvania 18103

799 Rubber World (10/21/94)
936 Links Ave.
Landisville, Pennsylvania 17538

698 Sanitary Couplers, Inc. (10/23/92)
696-698 Pleasant Valley Dr.
Springsboro, Ohio 45066

700 Titan Industries, Inc. (10/23/92)
11121 Garfield Avenue
South Gate, California 90280

63-00 Sanitary Fittings

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

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

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

304 VNE Corporation (3/16/78)
1149 Barberry Drive
Janesville, Wisconsin 53547

63-00 (Formerly 08-17R) Sanitary Fittings

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

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

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

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

688 Cajon Company (8/4/92)
9760 Shepard Road
Macedonia, Ohio 44056

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

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

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

677 EXCEL-A-TEC, Inc. (5/8/92)
W141 N5984 Kaul Avenue
Menomonee Falls, Wisconsin 53051

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

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

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

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

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

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

703 Parker Hannifin Corp. (11/6/92)
Instrument Connectors Div.
9400 South Memorial Pkwy.
Huntsville, Alabama 35803

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

726 Pure Fit, Inc. (4/14/93)
924 Marcon Blvd.
Allentown, Pennsylvania 18103

242 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico
(U.S. Rep:Waukesha Fluid Handling
611 Sugar Creek Road
Delavan, Wisconsin 53115)

424 Robert-James Sales, Inc. (8/31/84)
699 Hertel Ave., Suite 260
Buffalo, New York 14207

699 Rodger Industries, Inc. (10/23/92)
P.O. Box 186
Blenheim, Ontario
Canada N0P 1A0
(Not available in the U.S.A)

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

741 Steel & O'Brien Mfg., Inc. (8/26/93)
545 South Route 219
Springville, New York 14141

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

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

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

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

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

707 Valvinox, Inc., SG RM Div. (1/5/93)
650 - 1st Street
Iberville, Quebec, Canada J2X 3B8
(Mfg. by: SG RM, France
Not available in USA)

82R Waukesha Fluid Handling (12/17/93)
611 Sugar Creek Road
Delavan, Wisconsin 53115

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

782 CASHCO, Inc. (8/31/94)
P. O. Box 6
Ellsworth, Kansas 67439-0006

753 G & H Products (2/1/94)
7600 - 57th Avenue
P.O. Box 1199
Kenosha, Wisconsin 53141

769 Richards Industries Valve Group (6/6/94)
3170 Wasson Road
Cincinnati, Ohio 45209

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

818 Tri-Clover, Inc. (3/10/95)
9201 Wilmot Road
Kenosha, Wisconsin 53141-1413

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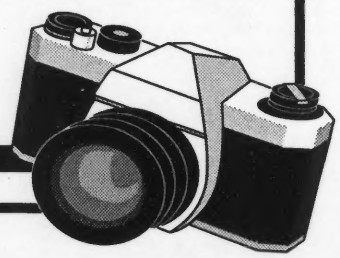

Advertising Index

ComingEvents

SEPTEMBER

• **4-5, Symposium on Advances in Membrane Technology for Better Dairy Products,** Budapest (Hungary). The main purpose of the Symposium is to update the most current knowledge and to bring the work of the IDF group of experts to the attention of dairy technologists, industrial scientists, process engineers and researchers. For more information contact IDF Secretariat, 41 Square Vergote, B-1040 Brussels, Belgium; telephone (+32 2 733 98 88); fax (+32 2 733 04 13).

• **6-8, Symposium on Heat Treatments and Alternative Methods,** The purpose of the Symposium is to provide a forum of exchange of information on processing technologies and their product-related effects as well as the methodology and criteria of measurement of these effects. For more information, contact IDF Secretariat, 41, Square Vergote, B-1040 Brussels, Belgium; telephone (+32 2 733 98 88); fax (+32 2 733 04 13).

• **8-9, 1995 Annual Conference of the Wisconsin Laboratory Association,** The overall theme for this year's conference is Analytical Precision. On Thursday, Sept. 9, Dr. Michael H. Brodsky, Ontario Ministry of Health, will keynote the general session with a presentation on Quality Assurance in the Laboratory, entitled, "What is this thing called QA?" For more information, write to WLA, PO Box 28045, Green Bay, WI 54324; or call George Nelson at (715) 232-2560.

• **11-13, Food Microbiology Course,** This course assumes some minimal prior knowledge relation to microbiology or biology and will provide the participant with up-to-date concepts, facts and details which will be useful in making decisions about product safety and stability. The participant should also gain greater awareness of the utility and limitations of microbial capabilities within the corporation. For more information, contact Registrar, The Center for Professional Advancement, PO Box 1052, East Brunswick, NJ 08816; telephone (908) 613-4500; fax (908) 238-9113.

• **12-13, Food Plant Sanitation Workshop,** Specific subjects will include basic principles of HACCP, sanitary design standards, updates on pesticide concerns, and successful control strategies. For further information, contact Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502; or call (913) 537-4750 or (800) 633-5137.

• **20-21, OSMO® RO/UF Equipment Operation and Maintenance Seminar,** "Equipment Operation and Maintenance" is oriented specifically for operators of RO/UF equipment used for water treatment, pollution control and process applications. This seminar will provide operators a complete background necessary to operate and maintain RO/UF equipment at peak performance year-in and year-out. For more information, contact Ms. Bette Nelson, Travel & Seminar Coordinator, 5951 Clearwater Dr., Minnetonka, MN 55343-8990; telephone (612) 933-2277.

• **20-22, The 2nd International Conference on Nutrition and Aging,** Tokyo, Japan. The conference will focus on the eating habits and societal and psychological eating attitudes of the elderly, as well as their nutritional status and the effects of nutrition on physiological changes associated with aging. For more information, please contact ILSI Japan, Conference Secretariat, Koike Building, 9-11-403, 2 Chome Umezato, Suginamiku, Toyko 166, Japan; telephone (81-33-318-9663), fax; (81-33-318-9554).

• **25-29, The 12th European Symposium on the Quality of Poultry Meat and the 6th European Symposium on the Quality of Eggs and Egg Products,** Zaragoza, Spain, Auditorium/Congress Palace. Working languages will be English, Spanish and French. Simultaneous translations will be organized in plenary sessions. For more information, please contact the Symposia Secretariat, Ricardo Cepero Briz, Veterinary Faculty, Miguel Servet 177, 50013 Zaragoza Spain.

• **26-29, The 1st International Conference on East-West Perspectives on Functional Foods,** Singapore. Overview of the concept from the Eastern and Western viewpoints, including historical and cultural background, and the perceived role in disease prevention and health promotion. For more information contact Conference Secretariat/Official Travel Agent, Conference & Travel Management Associates Pte Ltd, 425A Race Course Road, Singapore 0821; phone (65) 299-8992; fax (65) 299-8983.

• **27-28, SD State Dairy Association & Dairy Fieldmen's Association Joint Annual Convention,** For more information, call John Parsons, Dairy Science Department; telephone (605) 688-4116.

• **27-30, Healthcare Food Service Management National Training Conference,** The National Society for Healthcare Food service announced the details of its 1995 National Training Conference at La Quinta Resort in Palm Desert, CA. For the first time HFM will also sponsor four pre-conference workshops. For registration information, contact HFM at (202) 546-7236.

• **28-29, Wisconsin 16th Annual Joint Conference, A Dairy, Food and Environmental Health Symposium,** The Wisconsin Association of Milk and Food Sanitarians

(WAMFS), Wisconsin Environmental Health Association (WEHA), Wisconsin Association of Dairy Plant Field Representatives (WADPFR), joint conference at the Paper Valley Inn in Appleton, WI. Each group is planning separate programs at the conference that would be of interest of all groups. For more information, please contact Neil Vassau, Dept. of Agriculture, Trade, & Consumer Protection, Bureau of Laboratory Services, PO Box 7883, Madison, WI 53707; telephone (608) 267-3504.

OCTOBER

·**4-5, Crossflow Membrane Technology Workshop,** The workshop will cover the fundamentals of reverse osmosis, nanofiltration, ultrafiltration and microfiltration, total system design considerations, pilot testing of new applications, and the "zero discharge" approach to pollution control. Hands-on operation of bench-top, pilot and full-scale equipment will be included both days of the workshop. For more information, contact Ms. Bette Nelson, Travel & Seminar Coordinator, OSMONICS, 5951 Clearwater Dr., Minnetonka, MN 55343; (612) 933-2277.

·**7-10, ACIL 58th Annual Meeting,** "The Science of Service," The meeting is designed for owners, managers and senior executives in commercial laboratory, testing, and R & D industry. For further information, contact ACIL, 1629 K Street, NW, Washington, DC; 20006; phone (202) 887-5872 or fax (202) 887-0021.

·**10-11, Food Plant Sanitation Workshop,** Specific subjects will include basic principles of HACCP, sanitary design standards, updates on pesticide concerns, and successful control strategies. For further information, contact Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502; or call (913) 537-4750 or (800) 633-5137.

·**11-12, IAMFES Iowa Affiliate,** will meet in Waterloo, Iowa. Please contact Dale Cooper at (319) 927-3212 for further details.

NOVEMBER

·**1-3, Designing a Modern Milking Center Conference,** During this conference, the audience will learn methods for planning and operating an efficient milking center, including parlor selection, milking center layout, materials and equipment selection, cow handling, labor management, financing and economics. For further information, contact Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Ithaca, NY 14853-5701; telephone (607) 255-7654; fax (607) 255-4080.

·**4-6, 6th Egyptian Conference of Dairy Science and Technology,** Cairo, Egypt. Organized by The Egyptian Soc. of Dairy Science. For more information, contact Dr. M. H. Abd El-Salam, National Research Center, Dokki, Cairo, Egypt; telephone (20-2-625 026) or fax (20-2-700 931).

·**5-9, Anuga FoodTec International Food Technology Fair,** Anuga FoodTec will be an extensive multi-industry food technology trade fair, but will also allow individual product categories to present themselves independently. Anuga Foodtec guarantees a comprehensive overview of the food processing and packaging technology sectors. For further information, contact Cologne International Trade Fairs, Inc., 40 West 57th St., 31st Floor, New York, NY 10019; telephone (212) 974-8836.

·**5-9, American Association of Cereal Chemists 80th Annual Meeting,** The world's largest gathering of cereal industry professionals will convene their 80th Annual Meeting in San Antonio, Texas at the Henry B. Gonzales Convention Center. AACC Annual Meeting registration materials are available after July 1, 1995, from AACC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121-2097 U.S.A.; telephone (612) 454-7250; fax (612) 454-0766.

·**8-9, Food Plant Sanitation Workshop,** Specific subjects will include basic principles of HACCP, sanitary design standards, updates on pesticide concerns, and successful control strategies. For further information, contact Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502; or call (913) 537-4750 or (800) 633-5137.

·**9-10, Getting Started with Hazard Analysis and Critcal Control Point (HACCP) System,** For more information, contact the AACC Short Course Dept., 3340 Pilot Knob Road, St. Paul, MN 55121-2097; telephone (612) 454-7250 or fax (612) 454-0766; e-mail aacc@scisoc. org.

JANUARY 1996

·**10-12, Calves, Heifers and Dairy Profitability,** This conference is intended to provide an interdisciplinary view but will emphasize engineering topics. For further information, contact Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Ithaca, NY 14853-5701; telephone (607) 255-7654; fax (607) 255-4080.

FEBRUARY 1996

·**18-22, 2nd International Meeting on Predictive Microbiology,** Hobart, Australia. This conference will present the world's best practice in the development and application of modelling microbial behavior in foods. For more information, please contact Tom McMeeking, Dept. of Agricultural Science, University of Tasmania, GPO Box 252C, Hobart 7001 Tasmania; telephone (+61) 02 20 2620 or fax (+61) 02 20 2642.

·**28-March 2, 4th International Machinery Equipment and Raw Material Dairy Fair,** in Guadalajara, Jalisco (Mexico), Promotion to potential buyers, positioning in the market, and image consolidation. For further information contact Grupo Gefecc, S.A. DE C.V. Av. Baja California No. 32-A, Col. Roma C.P. 06760 Mexico, D.F., telefaxes (525) 264-70-29/564-03-29/564-70-40/574-56-96.

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111	126	141	156	172	186	201	216	231	246	261	276	291	306	321	336	351	366	381	396
112	127	142	157	172	187	202	217	232	247	262	277	292	307	322	337	352	367	382	397
113	128	143	158	173	188	203	218	233	248	263	278	293	308	323	338	353	368	383	398
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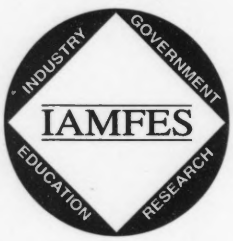

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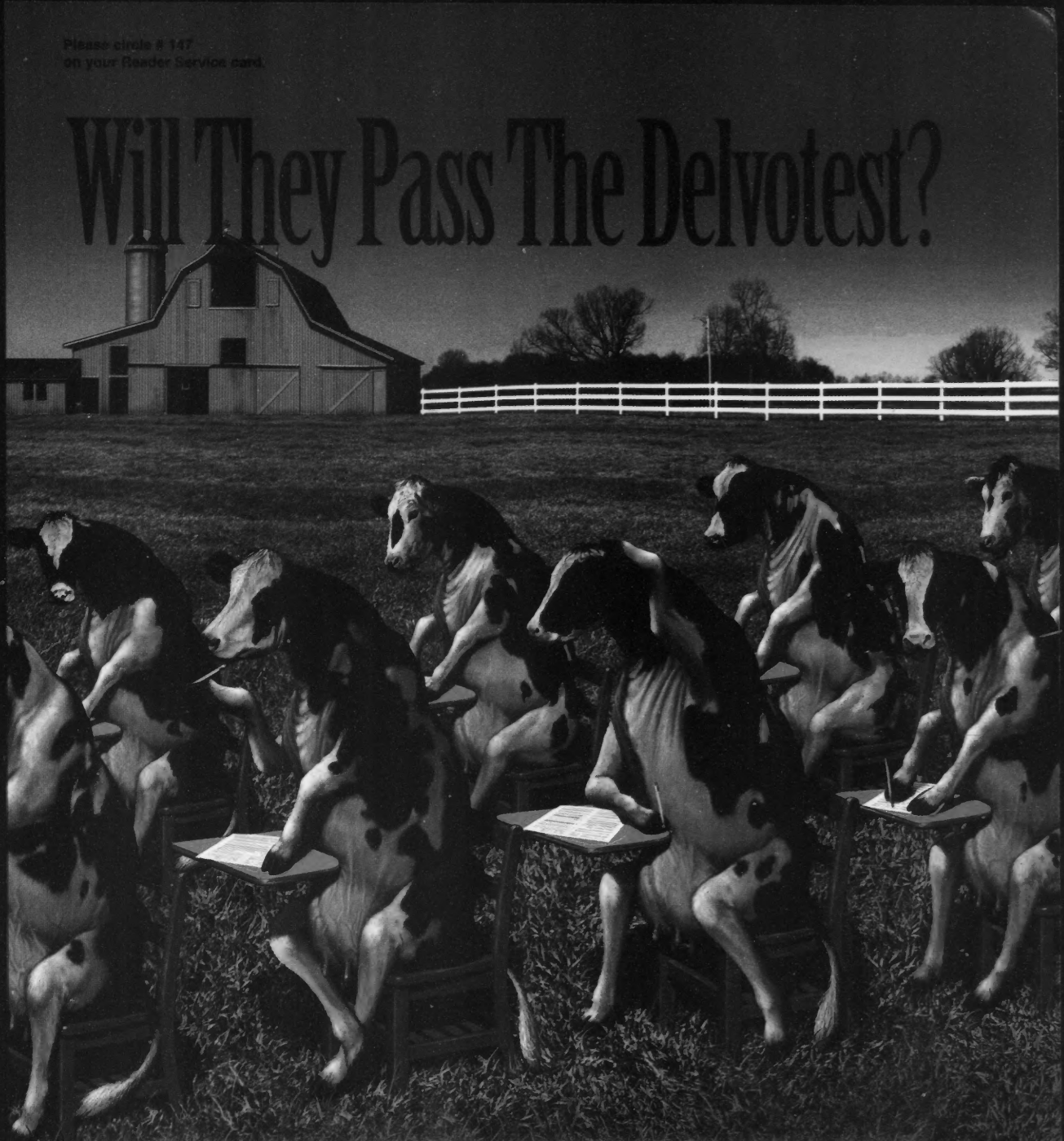

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