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Dairy and Food Sanitation

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

Industry Support of Research and Extension

Lead Free Metal Can Technology

Milking Equipment Problem Areas

Genetic Engineering Uses in the Food Industry

American Association of Cereal Chemists Announces Three Short Courses

Reducing Sugar in your Diet

71st Annual IAMFES Meeting
August 5-9, 1984, in Edmonton
Alberta, Canada

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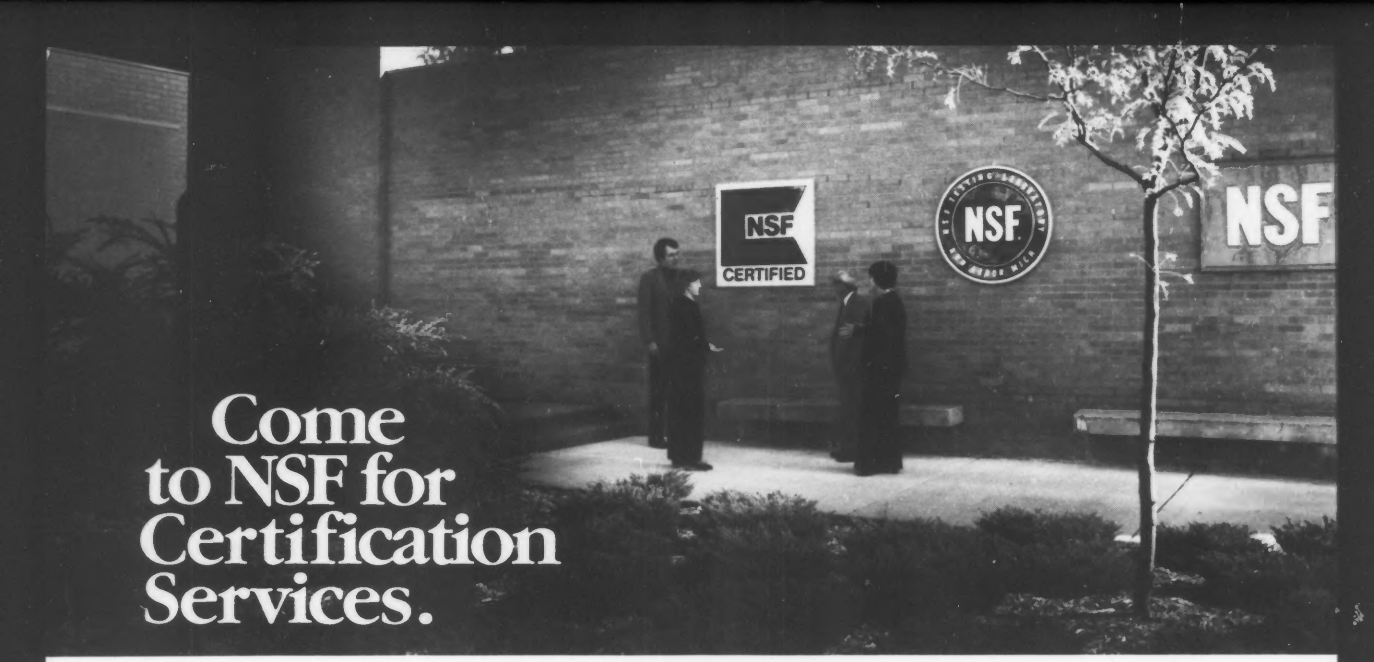

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Dairy and Food Sanitation

CONTENTS **Vol. 4 No. 2 February, 1984**

Dairy and Food Sanitation, Vol. 4, No. 2, Pages 44-46 (February 1984)

Industry Support of Research and Extension

JOHN M. WHITE

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Blacksburg, VA 24061

The Virginia Dairymen's Setaside program is a dairy farmer funded program designed to supplement and enhance research, extension and instructional programs in the Department of Dairy Science at Virginia Tech and to provide financial support for the operation of the Virginia State Dairymen's Association. Virginia dairy farmers contribute .14% ($1.40 per $1,000 worth of raw milk sold) of their milk checks to support Dairy Science research and extension programs (61% of the total), instructional programs (5% of total), an emergency fund used primarily to fund projects in other departments at Virginia Tech (8% of total) and to fund the State Dairymen's Association (26% of the total). Over 90% of Virginia dairy farmers participate in the program through their marketing cooperatives. The funds are used primarily for laboratory equipment purchases, graduate stipends, start-up funds for new programs, supplement extension program activities, additional lab technicians and computer programmers, and other operating expenses. The program has been highly successful since 1972 and is enthusiastically supported by Virginia dairy farmers.

The Dairy Science program at Virginia Tech was designed and developed over the last 15 years with the expressed purpose of better service to the industry. This program has the philosophy, design and approach which should result in improved productive efficiency on the dairy farm.

The dairy industry is the leading agricultural enterprise in Virginia in terms of economic value and returns. The Dairy Science Department, the College of Agriculture and Life Sciences and the University are committed to the mission of supporting the dairy industry in Virginia by providing excellence in appropriate instructional programs for undergraduate students, effective extension education and relevant and productive research programs. All these programs are designed to improve the productive efficiency of the dairy cow. Such increases in productive efficiencies directly benefit dairy farmers, the dairy industry and consumers of nature's most nearly perfect food.

DESIGN AND PHILOSOPHY OF THE PROGRAM

The Teaching Mission: We place a very high priority on the quality of our teaching effort. We strive to graduate a "finished product" at both the undergraduate and graduate levels. One indication of the quality of our teaching program is reflected in the fact that three members of our faculty have won the University's outstanding teacher award (Wine Award) since 1973. All dairy courses are critically reviewed each year for content, quality and appropriateness. New courses are added, courses dropped and others revised as necessary.

Several reasons can be cited for the high quality of the teaching program. All of the faculty members in Dairy Science at Virginia Tech are highly committed to excellence in the classroom. They recognize the value of effective instruction and are dedicated to that goal. They are willing to spend the extra time, go the extra mile, put forth the effort necessary to develop courses that are technically sound, interesting to the student and applicable to the needs of our students. A second major reason for the effectiveness of instruction is that most of our classroom teachers are also highly productive research and/or extension specialists. They are on the forefront of knowledge in their disciplines. We have many graduate students from other universities who register for our senior level undergraduate courses because they did not have such high quality courses in their undergraduate programs.

The Extension Mission: The mission of this group is to effectively transfer new and improved technology from the research laboratory to the dairy farms. This mission is accomplished through (1) extension publications (Dairy Guidelines) and articles in the popular press such as the *The Virginia Dairyman, Hoard's Dairyman* and *Dairy Herd Management;* (2) working in adult educational programs organized by local county agents; (3) statewide or

regional educational seminars and short courses; (4) assisting in problem solving and troubleshooting individual farm problems; (5) the DHI program; (6) radio and TV programs and (7) demonstration and problem identification research programs. These program objectives are met through a balanced program with major efforts in the primary disciplines.

The Research Mission: The dairy research program is designed to (1) provide new methods for improved efficiency of production on the dairy farm, (2) provide an environment for effective graduate student training, (3) create new knowledge of the biology of the dairy cow and (4) establish well recognized centers of professional excellence in dairy research at Virginia Tech. Our approach to achieving these worthy goals is based upon a balanced effort in the five major research discipline areas. These five areas are (1) dairy nutrition, (2) reproductive physiology, (3) genetics, (4) lactation, mastitis control and basic physiology and (5) dairy herd management. Each of these major research areas has established itself over the last 10-15 years as national and international centers of excellence. For example, the nutrition group conducted extensive research into forage utilization and ration balancing that led to the widely used computerized herd feeding programs and complete ration formulation. The reproduction group conducted research that led to the widely used laboratory quality control tests for frozen semen. The genetics group conducted research that led to the currently used genetic evaluation programs for type and other traits. The lactation group conducted extensive research which led to the widely used mechanized somatic cell counting mastitis control program. The management research program is much younger than the others, but has conducted research which allows for very accurate predictions of feed intake in cows, semen pricing and returns and on the farm mastitis control programs. These highly productive programs are operated with funds from state and federal sources (about 1/3), outside grants and contracts generated by the faculty (about 1/3) and the Virginia Dairymen's Setaside Fund program (about 1/3).

THE VIRGINIA DAIRY SETASIDE PROGRAM

The Setaside program is a dairymen-funded, self-help program designed to supplement and enhance effective research, extension and instructional programs at Virginia Tech and to provide financial support for the operation of the Virginia State Dairymen's Association. These programs are directed at dairy farm problems and opportunities. The use of these funds for this purpose is closely monitored by the Dairy Science Advisory Board and the Board of Directors of the Virginia State Dairymen's Association (VSDA). These funds do not, in any way, replace state and federal or other outside grant funds generated by faculty members. They, in fact, tend to lead to additional grant and contract funds generated by faculty members.

The Virginia Dairymen Setaside Fund was established in the following manner. In early 1971, the Board of Directors of VSDA approved a request by the Head of the Department of Dairy Science at Virginia Tech that a Dairy Science Advisory Board be established for the purpose of reviewing departmental research, teaching and extension programs and providing input for their improvement. This Board was composed of eight dairy farmers and one industry representative serving three year terms. Three people revolve off the Board each year and three new members are elected by the Board of VSDA to serve. The President and Executive Secretary of VSDA and a representative of the Virginia Department of Agriculture and Consumer Services also serve as ex officio members.

The Advisory Board meets twice a year (March and October). The officers are elected by the Board. The March meeting is held out in the state and rotated among the five areas of the state served by the five major milk marketing coops that serve Virginia dairy farmers. The October meeting is held on campus at Virginia Tech. These meetings are scheduled from 8:30 a.m. - 3:00 p.m. The Department pays travel expenses for Board members to attend.

The agenda for each Advisory Board meeting includes a complete review of the expenditure of "Setaside" funds by the Department of Dairy Science for the previous fiscal six months. For example, at the March 1982 meeting, the Board reviewed the use of funds for the period July 1, 1981 through December 31, 1981. Additional agenda items include intensive reviews of research, teaching and extension programs both within and outside the Department of Dairy Science, discussions of areas of opportunity, problem solving, review of state programs such as DHIA, antibiotics in milk, forage test lab, etc. The Board is also politically active in support of programs in the Department.

In January 1972, the Dairy Science Advisory Board presented a resolution to the Board of VSDA proposing the establishment of the Setaside program. The resolution was unanimously approved by the VSDA. The resolution indicated that the setaside would be activated by action of the Board of each of the five milk marketing coops serving Virginia. The program was initiated for all producers by Board action in three of the Coops (Southside, Valley and Old Dominion), and by individual member voluntary action in the form of a checkoff card in the other two. Funds are sent by each Coop each month to the Executive Secretary of VSDA who in turn allocates the funds to the various categories.

The actual contribution that dairymen on the program make was designed to be modest at $1.40 per $1,000 worth of milk sold. In the average Virginia dairy herd, this amounts to about 10-12 pounds of milk per day based upon current milk prices and herd sizes.

The budgeting of a Setaside dollar is as follows:

A. 26 cents for VSDA dues
B. 8 cents for the emergency fund
C. 5 cents for scholarships and other student support programs
D. 61 cents for dairy extension and research support

In the above budget, the 26% for VSDA dues is used to operate the Virginia State Dairymen's Association. The 8% for the emergency fund is a reserve fund that is used by the Dairy Science Advisory Board to expedite rapid reaction to specific problems. The 5% for scholarships and other student support is used for scholarships for worthy undergraduate students, supplemental support for college and 4-H judging teams and supplemental support for other 4-H and dairy youth programs. The 61% that goes to the Department of Dairy Science is used to initiate new, promising dairy extension and research programs, supplemental technical support for productive extension and research programs, support for graduate student stipends and some research and extension equipment and supplies. The Setaside fund provides approximately one third of the funds used for these research and extension purposes in the Department. The remaining two thirds is provided by state and federal funds and outside grants generated by the faculty.

Examples of the effectiveness of this program in terms of improved productive efficiency on the dairy farm are numerous. Setaside funds have been used over the last six years to totally or partially support research programs at Virginia Tech that have led to vastly improved forage evaluation, judging programs, frozen semen quality control programs, the test cane program, genetic evaluation of sires and cows for milk and type, on the farm mastitis screening test, computerized decision making programs, mastitis control programs and many others. The undergraduate enrollment in Dairy Science has grown from 60 to 110 with over 85% of the graduates returning to the dairy farm. The graduate enrollment has grown from 20 to 30. Extension programs in reproduction, mastitis control, DHIA, 4-H, nutrition and feeding forage evaluation, genetics and breeding, and management have developed and grown. An Extension Agent Advisory Committee has been developed and designed to improve the quality of our dairy extension programs and publications. In-depth "cow colleges" in genetics, feeding, reproduction and herd health, and managed milking will be held this year. New in-service training programs for both new and experienced extension agents are being developed. Intensive effort is being put into continued development and upgrading and computerized herd feeding programs. New systems for improved, more efficient forage testing are being tested. New, more reliable laboratory tests for rancidity in raw milk are being developed. Alternatives for expanding the market for milk and dairy products are being evaluated.

Many other programs and procedures for improving productive efficiency and profit in the dairy industry that have resulted from Setaside support could be cited. However, suffice it to say that the Virginia dairy industry has become a leader among states in virtually all the important herd management areas in the last six years. The Setaside fund has played a prominant role in that progress.

Dairy and Food Sanitation, Vol. 4, No. 2, Pages 47-51 (February 1984)

Lead Free Metal Can Technology Update & Trends in Food Packaging

EDWARD L. MOORE

V.P., American Can Company

Whenever you look at the can business in this country, you have to take into account the fact that within the arena called "food cans" there are two separate market segments:

- *One is made up of the merchant canmakers, which manufacture cans and sell them to food processing customers.*
- *The other group is the self-manufacturers, which are food processors who produce cans for their own use.*

When it comes to the subject of lead-free technology, there is a striking difference between these two segments, in terms of the market forces that are at work and the historical development of the technology.

Overall, as you can see, the U.S. can industry produces some 28 billion cans per year, with the merchant canmakers accounting for approximately 47 percent of this total, and the self-manufacturers producing 53 percent.

Let's direct our attention first to the merchant canmaker segment, where, frankly, packaging industry trends generally begin, and where all of the forces of the competitive marketplace are at work.

Essentially, these are the five key factors which are concerned with the development of lead-free technology in the merchant canmaker segment of the packaging industry. You will note that the first three items deal with an initial stimulus from the U.S. Government, and the separate responses to that stimulus by the food processing industry and the retail grocery industry. The last two items relate to the lead-free can itself -- how good it is as a container, and the economics of producing it for sale to the food processing industry.

Early in 1978, the Food and Drug Administration, concerned about the potential harm to humans due to excessive lead in the environment, announced its intention to use its rulemaking powers to require the reduction and ultimate elimination of lead in canned food which are introduced by the container itself. The FDA indicated that its proposed rulemaking would contain a schedule requiring the contribution of lead from soldered cans to be reduced at least 50 percent within five years, and totally eliminated within ten years.

Although lead comes to us from many sources in the environment, the food container represented a source of lead that could be eliminated relatively easily, simply by getting rid of the solder in cans. The other source of lead in canned food is the food itself. This occurs when, for example, the lead content in gasoline enters the air through auto emissions, falls onto farmland, and is absorbed by the food itself. By comparison, this source of lead in food is very difficult to eliminate.

This announcement by the Food and Drug Adminsitration had a major impact on the food industry in this country, and was a strong initial influence on the development of lead-free container technology here. It clearly started the momentum of the merchant canmakers' conversion to lead-free cans.

And how did the food processing industry react? Well, at first they reacted defensively. Some maintained that the threat posed by lead in food was not as great as the FDA believed . . . others cited research studies to defend the use of the soldered can . . and others claimed that lead could practically be eliminated by strict adherence to proper canmaking procedures.

But soon, canmakers seeking to gain a competitive edge came out with welded lead-free cans and sold them at the same price as comparable soldered cans. The welded can was a success, and other can manufacturers followed suit. And it wasn't long before the food processing industry's reaction evolved from defensiveness with the FDA to one of being pleased that the presence of lead-free cans on the market effectively eliminated the issue as far as they were concerned. "Why NOT buy lead-free cans?", they asked, in effect, and proceeded to tell their suppliers that they wanted them to produce such containers.

Then, as the canmakers responded with more lead-free containers at no premium over the price of soldered cans, the demand on the part of the food processors began to build and became a major influence on the merchant canmakers to advance this technology. It was like a rolling stone coming down the mountain with nothing to retard its speed. Once the trend to lead-free technology had begun, it continued to gain momentum in the marketplace.

And what of the retail grocery industry's reaction to the FDA announcement and to the subsequent trend to lead-free cans? In point of fact, there was minimal reaction. As in the case of the food processors, the grocery retailers came to a point where they *accepted* the lead-free can, but, *unlike* the food processors, they still haven't expressed a strong *preference* for lead-free containers. They're happy to have them when they're available, but they're not particularly *unhappy* when only soldered cans are available. Also, since lead-free can volume has been relatively small to date, there has been little chance for retailers to gain a positive impression of these containers.

This situation could change, however, with the retail grocery industry becoming a significant factor in influencing conversion to the lead-free container in the marketplace. . .*if* consumer groups in the States become active and vocal about lead in food. At the moment, though, this is not the case; our information is there is only minimal consumerist activity in this area.

And how about the lead-free can itself, in terms of container quality? How does it perform compared to its soldered counterpart? To answer that, we have to look separately at each of the two lead-free metal container technologies -- welded and two-piece draw/redraw.

First, welded. As welded cans began finding their way into the food processors' systems, it soon became evident that in two very important ways the welded can was superior to the soldered can which it was replacing. First, the welded can had better sideseam integrity than the soldered can, and secondly, the welded can performed better in the processors' systems. The latter advantage was primarily due to the fact that the seaming operation went much more smoothly because of the welded can's reduced amount of metal at the crossover.

But if the welded can had better integrity and performed better in the processors' system than the soldered can, the two-piece draw/redraw can prove to be even higher in quality than both of these other containers. Integrity problems associated with both sideseam and crossovers are, of course, totally eliminated. And the absence of a crossover also assures maximum smoothness on the customer's closing machines. Also, consumers concerned with lead in food are able to tell at a glance that a two-piece can is lead-free, while welded and soldered cans are often difficult for a shopper to differentiate from each other -- a fact that has been noted by American consumer advocates.

The final factor influencing the develoment of lead-free technology is the question of canmaking economics. Long-term, there are substantial differences between the welded and the two-piece draw/redraw technologies in terms of their respective potentials for future cost efficiency improvements. Specifically, the two-piece draw/redraw container is significantly superior to the welded container in this respect. First of all, the welded can is essentially a product of the same three-piece technology that has served the soldered can for so long -- for over eighty years at American Can Company alone (much of the prod. equipment is the same).

During that time, three-piece technology has been improved and finetuned to the point that there are minimal opportunities to extract significant additional efficiencies from this technology. On the welding line machine itself, there is a built-in limitation which precludes the possibility of gradual, continual improvements in production speeds. I'm referring to the fact that a welder operates at a fixed line speed of a given number of welding pulses per second, and that any improvements in production speeds can only be made at great expense, through the replacement of existing equipment with new, faster welders, which is not a sound financial project I may add.

On the other hand, two piece draw/redraw containers are the product of a new technology, and one which is at the very beginning of its cost efficiency curve. We feel certain that in the years ahead this technology will yield substantial opportunities for continuing cost reductions. On the production line, the equipment which produces two-piece draw/redraw cans does not have the built-in speed limitation that welding equipment does, and we expect to see continual improvements in both outputs and ef-

ficiencies as the two-piece technology matures. We believe that we will see in the food business, just as we have seen in the beverage business, continual growth in the productivity of the investment in draw/redraw facilities as canmakers speed up the equipment and eliminate bottlenecks in their production operations.

But, bottom line, although there are opportunites for some cost savings with both welded and two-piece -- conversion to lead-free technology is *not justifiable* on the basis of cost savings *per se*. That's an extremely important fact that must be kept in mind during any discussion of lead-free technology. The fact of the matter is, the conversion to lead-free *was not* -- and *could not have been* -- driven by economics. In fact, soldered is the least cost technology when new fixed capital and working capital investment is considered. It's important to point out that even though these new technologies have lower direct or variable cost, it is a more expensive business to be in with them than without them. The return on investment is lower. Additionally, all can manufacturers strive to not over-invest which means equipment utilizations and therefore working capital increases over already high levels.

Once again, only two factors drove the conversion to lead-free technology on the part of the merchant canmakers:

- The first influence was the fact that the independent food processors, noting that lead-free cans were available in the marketplace at no premium in price, and seeing that their competitors were buying them, began to exert pressure on their can suppliers to move into this technology.
- The second influence was that the food processors were witnessing mounting evidence of the superior integrity and performance of lead-free cans in their canning operations and distribution systems.

The FDA's primary influence in the merchant canmakers' conversion was to get that lead-free stone rolling down the mountain in the first place. From there on, the marketplace forces took over and the momentum began to build.

Soon, the merchant canmakers were faced with an extremely difficult decision. as their competitors began to convert to lead-free technology and bring lead-free cans to an increasingly receptive market, they were faced with a basic choice: either convert to lead-free technology themselves. . .or lose business and market share to competitors who *are* converting.

Thus, among all the forces that were at work, *competitive pressure* was the driving force in lead-free development in the United States. If a merchant canmaker didn't convert, his competitors were *going* to convert, and they would get his business. And so, it was simply sales retention which drove the industry conversion.

As a result, the merchant canmakers' response to this challenge was to begin a widespread conversion to lead-free technology, supported by major capital appropriations. Those companies that were first to convert fell into two groups, both of which converted to welded technology:

- Continental Can Company on the one hand was seeking to deploy the welders that were left over from its beverage business when it converted to drawn-and-ironed technology.
- Other companies bought off-the-shelf welders from Soudronic in Switzerland.

Other companies took a close look at alternate technologies before making an investment of the magnitude required for the recapitalization of a business. Our analysis supported a dual technology approach for American Can -- welded and two-piece, depending upon the specific application. This decision was driven by our proprietary draw/redraw partial ironing technology, and placed us in a unique position while the rest of the industry opted to go to welded technology only.

Before long, the can marketplace was undergoing a major upheaval. What had formerly been a market characterized by relatively high stability and strong customer loyalities had become highly volatile, with suppliers using their new lead-free products as the basis for highly competitive offerings to long-standing customers of competing can manufacturers. And this competitive scramble has accelerated as all of the merchant canmakers moved into the lead-free arena. By the end of 1983, all merchant canmakers will have moved into lead-free technology.

Now let's discuss the self-manufacturers of food cans in the United States. The reason that some of the self-manufacturers have not converted to lead-free technology is evident when we examine the same set of factors that we noted earlier.

When we examine these factors vis-a-vis the self-manufacturing group, we see that only one of these elements -- can quality -- currently constitutes a positive factor. Once again, the pressure from the Food & Drug Administration has lessened ... the retail grocery industry is not exerting a pull-through effect ... and the economics of lead-free technology do not warrant its adoption on the basis of cost savings. But what's more, the real driving force that's pushing the merchant canmakers into lead-free technology -- competitive pressure generated by the independent food processors -- is completely missing in this market segment, since the customer and the canmaker are one and the same company.

In addition to these factors, the economic environment of the self-manfuacturers has changed since they originally invested 20 years ago. At that time, can margins were high and the self-manufacturers could justify their investment on the basis of savings. Today, however, can prices are, relatively speaking, much lower and asset commitment higher. As a result, the self-manufacturers' reinvestment decision will be more difficult than it would have been in the past.

Now, where is the market as a result of these forces both on canmakers and self-manufacturers? The best way to summarize is to quote statistics on can shipments by technology. In 1979 90% of cans produced were soldered. In 1981 that number shrank to 75%. By the end of 1983, I suspect 40% of all cans produced will be lead-free.

One must remember the book is still out on over 50% of the market (self-manufacturing). Now let me move on to a more indepth review of these technologies to illustrate some of the trade-offs still going on.

In terms of technological developments, the industry is moving ahead dramatically in both the welded and two-piece draw/redraw areas.

Even though the welded technology is a mature process, the industry is focusing considerable R&D attention on this area -- primarily in the direction of improving quality and reducing costs. Among the areas in which the industry has registered significant achievements are the development of sophisticated weld monitoring equipment which ensures extremely high levels of sideseam quality by detecting a wide range of problems, including open sideseams, litho contamination, metal fines, and overlap loss which were inherent in this technology as developed. There has also been success in the use of various alternate metals ... and the develoment of improved striping materials.

We have had small inverted presses for the manufacture of two-piece cans running for two years. We are focusing on getting outputs up and spoilage down. In addition to the process developments required, we are finding that for 2-piece and welded more consistent steel quality is needed. The processes are not as forgiving as soldered.

The major accomplishment in our two-piece technology is the ongoing conversion of all of our presses to include American Can's proprietary partial ironing process -- a major technological achievement which ensures the cost-effective production of two-piece cans on our presses. This is such an important process I feel it deserves more explanation.

Essentially, the partial ironing process serves to eliminate excess metal which results from the draw-redraw process, thereby keeping metal usage within acceptable limits. This is how the process works:

The draw/redraw process has a peculiar characteristic. The metal flows when the body blank is drawn into a shallow cup, and each time it is redrawn to increase its height, resulting in a sidewall that is progressively thicker toward the top. Such a can is exceptionally strong, but this extra strength is really not needed to withstand either the internal vacuum which comes from the cooking process, or the handling and distribution systems.

But thanks to our experience with both draw/redraw and the steel drawn and ironed technology of the beverage can, we were able to borrow from both of these disciplines and create a major breakthrough. We were able to bring the thickness of that sidewall back down to the thickness of the original body blank. We call this process by two names: partial sidewall ironing, and also precision sidewall thickness control. (PSTC).

Thus, as this exaggerated slide indicates, we are able to make our cans from significantly smaller body blanks, and thus reduce the amount of metal used -- and thus, reduce our costs.

Next, let's talk about canmaking economics. I'd like to focus on some short-term strategies as well as our long-term strategy. And tell you about some of the programs designed to achieve improvements and cost savings in both welded and in two-piece.

Many companies have achieved significant short-term cost improvements in both of these programs in manning reduction.

With respect to welded technology, we have several programs in place that are designed to achieve long-term reductions in costs:

- One such program consists of the continuing development of lower cost metals. This includes both alternate metals, such as chrome-coated steel and a nickel-coated plate, as well as lower levels of tin coating on tinplate.
- Another type of program involves improved sideseam striping systems, including lower cost striping systems, and the investigation of various stripe curing methods.
- Other cost-reduction programs under the welded technology include work on can parters and spin flangers, experimentation with beading profiles, and the exploration of the use of smaller diameter copper wire and of the need for gas shielding.

Longer-term development of an even more advanced weld monitor which will not only detect the kinds of weld problems that I referred to earlier, but correct them ... on line. Our focus is to perfect the primary function, then proceed with the enhancements.

With respect to two-pice draw/redraw technology, the major current effort in the area of cost reduction is the implementation of our partial ironing process, with retrofitting of all of our presses now complete.

Another major cost reduction program is the ongoing process of developing further lightweighting opportunities in connection with our two-piece draw/redraw container. This technology, which already owes so much to the two-piece beverage drawn and ironed technology which preceded it, may proceed along a similar, if less striking, lightweighting curve as it achieves greater maturity. Two-piece draw/redraw is in fact a very flexible technology and can be modified to produce much lighter weight cans than it is currently producing. We are at a point now, however, that any future significant improvements in the lightweighting of either type of can must be accompanied by specific programs at the food processing plant and in the distribution system to substantially reduce abusive handling and shipping all along the way. We are in fact currently discussing with a major customer future specification reductions that presume that certain specific improvements will be made in his system.

I pointed out before, in discussing the merchant canmaking industry as a whole, that, regardless of the various short-term and long-term cost efficiencies that were achievable, conversion to lead-free technology is not justifiable on the basis of cost savings alone. The conversion is proceeding as needed to protect business.

And now, in closing, I'd like to take a brief look at some current trends in alternate food packaging

technologies that we are seeing in the United States.

Our domestic can market is a huge business with a great many market segments, and in virtually every area there are ongoing programs to develop, test, and market new forms of packaging to meet the unique needs of the specific market in question. Let me touch on just a few.

Composite containers represent one packaging form that is making inroads into certain market segments.

One such segment in which composite containers are being tested is the nut market. Planters, a major can customer, has recently converted to a nitrogen flush package system, which makes less demands on the package than the former vacuum system. For this reason, they have converted to a much lighter metal container than in the past -- but, by the same token, they now are able to package nuts in composite containers as a substitute for metal.

Planters has two market tests underway, and is watching these tests carefully, particularly from the standpoint of consumer acceptance of composite containers, and the performance of these units in the distribution channel.

Other current activities in the composite container area also include experimentation with small fruit drink packages and semi-moist pet food. These units are provided with a resealable plastic top which can be used on the container after the product is opened.

The composite container industry has been trying to penetrate the canned food market for years. Many of you will recall that American Can was in this business but sold most of it off because it didn't meet our profit and return objectives. But apparently the composite business is no more profitable for other manufacturers than it was for American Can. For example, last year Owens-Illinois put its composite business up for sale, and this year we have heard rumors that one or two other manufacturers may be on the block. The instability of the composite container suppliers will probably slow the rate of penetration of this package into the traditional can market.

A second alternate food packaging technology is represented by the plastic container. We at American Can Company have made major contribution to this technology in the form of our plastic ham can. In the food packaging area, the only significant penetration of a polypropolene plastic container into our traditional markets has been the shortening container. In this market, growth may well be limited by both consumer reactions and by the desire on the part of the industry leader -- Procter & Gamble's Crisco -- to leave their successful product's physical appearance unchanged.

A third important food packaging technology that is currently moving into the beverage and dairy market in the United States is the aseptic process. This technology is just in its infancy here in the United States, because it was not until 1981 that our Food & Drug Administration approved the use of this type of package in conjunction with hydrogen peroxide sterilization. The initial U.S. applications of this technology and the associated laminated packaging forms are for fruit drink products in the 5 1/2 ounce size, which leading manufacturers are actively test marketing and expanding. We are witnessing the initial test markets of liter size aseptic packages by Ocean Spray for fruit juice, and they are being positioned against frozen concentrates packed in composite cans. Finally, at the World's Fair in Knoxville, Tennessee, a tetrepak type of carton for milk and other dairy products was exhibited by a regional milk cooperative in the Southeast, known as Dairymen, Inc. This will mark the first effort on the part of any American food manufacturers to use aseptic processing techniques for dairy products sold on a domestic basis.

Next, the retort pouch. The first application of this technology was in a U.S. Government program called MRE, which stands for Meal Ready to Eat; these products are designed to replace existing metal ration cans used by American armed forces and will amount to 40MM units a year.

In the consumer marketplace, the retort pouch is currently being seen in only one major application -- Kraft's a la carte line of entree products. These items are being positioned against a competitive line of frozen food products.

A third application of the retort pouch is in the institutional market, and it is in this area where the greatest potential competition to the metal food can is expected. Considerable testing is going on in this area, particularly with respect to pouch size. Sizes directly equivalent to the number 10 metal can which currently serves this market, along with various larger sizes, are currently being tests.

Finally, I would like to mention the rigid plastic container with barrier properties for extended shelf life as an important package of the future. We believe this to be the case because we see continuing strong evidence of the American consumer's strong acceptance of plastic as a packaging medium. The nationwide marketing research in this area is overwhelming and in effect points to a virtual love affair on the part of the American consumer with plastic for packaging purposes. At present, we believe that several suppliers are at work with active development programs in the rigid plastic area.

You can be sure of one thing: American Can is dedicated to the food industry, and we have continued to demonstrate this for more than 80 years through our continued leadership with new technology.

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Problem Areas in Installation and Operation of Milking Equipment

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Milk is as good as it ever will be when it leaves the teat end.

Production of high quality milk includes four basic requirements: 1. Good milking techniques. 2. A clean environment. 3. Milking equipment must be functionally adequate. 4. Healthy cows.

The ideal milking system should be easy to operate, clean properly and require only a reasonable amount of maintenance.

All milking systems perform two basic functions.

1. It imposes a controlled vacuum on the teat end.
2. It intermittently massages the teat.

The current trend is to install larger systems using 2 and 3 inch milk and vacuum lines. Many of the changes have been associated with the fact that vacuum instability is linked with increased mastitis, therefore, any changes to improve vacuum stability anywhere in the installation must be good. Mein (1979) suggests vacuum stability seems to have been a goal in its own right.

On the other hand, one mechanism associated with mastitis and the milking machine is "impact" (Thiel et al. 1973; Thiel, 1974). Thiel concludes "Droplets of bacteria laden milk are jetted against the teat end with sufficient force to partially penetrate the teat canal".

Why do problems exist with the installation and operation of milking equipment? I find many of the problems revolve around proper installation and service of the equipment. Dairies may be on a routine service but the quality of service can vary considerably. This observation is supported in a report by Williamson (1982) in which he stated "Many dairymen believe regular 4-6 week visits by servicemen are adequate, however, adequate machine testing does not regularly occur". Rook and Watrin (1983) found 44% of the milking systems checked to have some type of major problem. Areas identified included line size, air reserve, regulators, pulsators and undesirable milking vacuum levels. They also noted that while all of the dairymen surveyed washed cows, only 56% used individual towels and only 28% dried teats. The Nebraska Mastitis Control Program reported by Don Kubik et al. (1982) noted a number of problems with careless and incorrect installation of milking equipment frequently inconsistent with 3-A minimum recommendations. Their observations on procedures and practices was interesting. They stated: "the situation on most dairies is worse than most people think. We found milking--time visits are necessary to really evaluate sanitation and milking procedures". I would agree with their observations. Many times what you say is not what the producer hears. Many of us underestimate the importance of good communication.

I will attempt to describe some of the problems with use, function and design of the milking equipment.

Vacuum pump: Vacuum pumps are designed to operate above 32°F. The oilers on the pumps do not work when its -10°F outside. The pump should have a check value or a flapper on the exhaust to prevent it from running backwards. Leaky exhaust pipe connections allow oil fumes to

"grease" everything up in the equipment room and cause controllers to be sticky.

Vacuum supply lines: Schedule 40 or greater PVC 2 and 3 inch lines must be adequately supported and connected together. A rubber connection should be between the pump and the line so vibration will not cause it to come loose or break.

Vacuum supply lines should be sized so maximum air velocity does not exceed a suggested 12 meters/second (Spencer, 1982).

Vacuum balance tank: Accumulation of moisture can cause steel tanks to rust out. The drain valve needs to be checked regularly to prevent air leaks. If the balance tank has a filter system, the filter needs to be changed regularly.

Pulsators: Dust and dirt causes a lot of problems. Dusty grain fed in the parlor causes pulsators to fail very quickly. Electric pulsators tend to require less maintenance than pneumatic operated pulsators.

Air Controllers: I find less than 50% of the air controllers are functionally adequate. Controllers located in areas where dust, dirt or oil fumes are present tend to gum up and become sticky. Performance of most of the older style weighted controllers are unacceptable according to current guidelines.

Milk line: Cleaning of 3 inch milk lines has been a sore spot with sanitarians. Unfortunately, most of the problem systems were not installed correctly. Some of the problems come from insufficient water and dead ends on the large milk lines. In the winter excessive surface area can cause a temperature drop below the melting point of fat even though the water temperature is at 165°F at the start of the cycle.

Liners: Liner slippage is associated with mastitis. Most dairymen do not rotate two sets. Distortion of the mouthpiece can result in excessive slippage. Dried milk and milk fat enhances the deterioration of rubber liners.

Trouble spots: Self draining valves require close attention. Added equipment such as milk flow sensing devices slow the velocity of wash water and can cause significant irregularities in milking vacuum stability. Cracks in rubber jetter cups result in air leakage whereby adequate cleaning of that claw does not occur.

Hose support arms are essential in parlors, especially with low line milking systems. Most milking claws or bowls have an air inlet. They should be washed only when the vacuum is shut off. Vacuum gauges tend to corrode and stick. Vacuum gauges should be made to self destruct every two years!

Large spray nozzels should be prohibited in the parlor. I find too many cows with drippy wet udders after the unit is attached.

Spray voltage can cause uneven milk out or even lead to mastitis problems.

Lastly, the attitude of the dairyman is very important. If the operator finds milking cows to be a pleasant experience, it is surprising how well the system works. It is essential the dealer explains how to use the equipment and be there at milking time initially and a follow up visit in 4 to 6 weeks.

The milking equipment is only one part of producing high quality milk but many times its the details that make the difference.

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1984 IAMFES AWARD NOMINATIONS

IAMFES is proud of its members and their contributions.

As a member you're entitled to nominate deserving colleagues for the IAMFES Awards.

Previous award winners are not eligible for the same award. Present Executive Board members are not eligible for nomination. Candidates must be active IAMFES members.

Simply check your January issue of JOURNAL OF FOOD PROTECTION and DAIRY AND FOOD SANITATION for a complete listing of past award winners, or contact the IAMFES office in Ames.

Nomination forms were recently sent to all members. If you require another form, simply contact the IAMFES office.

PRESENTATION of the IAMFES Awards will be held during the Annual Awards Banquet, during the IAMFES 71st Annual Meeting, August 5-9, 1984 in Edmonton, Alberta, Canada.

Combine business with vacation and enjoy beautiful Edmonton.

Contact: K. R. Hathaway, IAMFES, P.O. Box 701, Ames, IA 50010, 515-232-6699 for any questions.

SANITARIANS AWARD

In recognition of outstanding service to the profession of the Sanitarian.

$1000 award and plaque

EDUCATOR AWARD

Presented to an educator in recognition of outstanding service in academic contributions to the profession of the Sanitarian.

$1000 award and plaque

HONORARY LIFE MEMBERSHIP

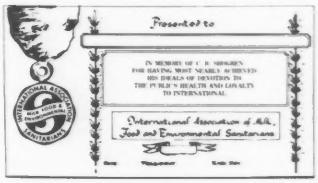
In recognition of outstanding service and devotion to the high ideals and principles of IAMFES.

plaque and life membership with IAMFES

CITATION AWARD

For many years devotion to the ideals and objectives of the association.

plaque award



SHOGREN AWARD

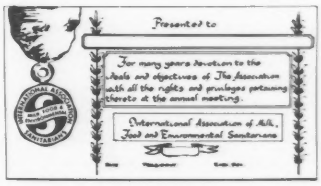
Presented to an affiliate association nominated for service to their members.

certificate award

HAROLD BARNUM INDUSTRY AWARD

In recognition of outstanding service to the public, International Association and the Profession of the Sanitarian.

$500 award and plaque



CERTIFICATE OF MERIT

Presented yearly to those members who are active within their affiliate and and the international group.

certificate award

Crumbine Award Applications Being Accepted

Applications are now being accepted for the Samuel J. Crumbine Consumer Protection Award for 1984. The Crumbine Award is given annually to a deserving local public health agency for the excellence of its program of food and beverage sanitation.

The competition is open to all U.S. local government units who can demonstrate outstanding qualities in the design and implementation of the public health measures they have instituted to prevent the outbreak of foodborne illness in the community.

Deadline for the 1984 Award entries is March 23, 1984.

Presentation of the Award will be made at the annual meeting of the National Environmental Health Association in Grand Rapids, MI, June 26, 1984.

Applications may be obtained by writing to the Award sponsor, the Single Service Institute, Inc., 1025 Connecticut Ave., NW, Suite 513, Washington, DC 20036.

National Conference for Food Protection Meets May 9-11

The Second National Conference for Food Protection will be held May 9-11, 1984 in Washington, D.C. The conference will take up where the first conference left off, for instance exploring the microbiological aspects of food safety; in addition, it will take on the toxicological concerns which have been building in recent years.

The purpose of the Conference is "to share perspective on the toxicological and microbiological aspects of food safety problems in the U.S., to identify the needs, directions and opportunities of food production, processing, handling and regulation through the year 1990; and to establish an organization for the continuing study of food safety problems and for promotion of the recommendations of the Conference."

Seven major problems areas have been selected for discussion at the Conference. They are: Toxicology, Microbiology, Food Processing and Preservation, Standards and Regulation, Education and Training, New Foods and Continuing Conference Organization.

Several aspects of each of these major topics will be taken up by the conference. A white paper on each subtopic will be prepared for distribution to Conference registrants 30 days in advance of the meeting. Each paper will define the problem, describe how it impacts on consumers, business and government, and list possible solutions. Conference participants can then come to the meeting prepared to react to alternative solutions and to see a consensus recommendation.

An opportunity will be given participants to hear some of the country's leading spokesmen in the field of food safety. At the same time, the presence of more than 500 key food protection people will assure participants of an exceptional opportunity in their professional careers.

Response to the Second National Conference for Food Protection has been very enthusiastic. Registration is limited, so interested people are urged to register early.

For more information contact: National Conference, PO Box 1828, Washington, DC 20024, 202-347-0020.

USDA Sponsors Workshop on Harmful Chemicals in Food

The presence of harmful chemicals in our foods is of great concern to consumers, those reponsible for ensuring the safety of foods, and the food industry. A one-day workshop, April 12, 1984, at the U.S. Department of Agriculture in Philadelphia, PA will feature the latest information on potentially harmful chemicals in our foods to be presented by recognized authorities from the USDA, academia, and industry. Topics to be discussed include drug residues and their detection, safety of nitrite and sodium, lipids and health, cooking induced mutagens, food irradiation, and the food safety legislation.

For more information contact: Arthur Miller, Eastern Regional Research Center, U.S. Department of Agriculture, 600 E. Mermaid Lane, Philadelphia, PA 19118, 215-233-6525. The fee for the one day seminar is $40 which includes lunch and coffee breaks.

American Association of Cereal Chemists Sponsors Three Short Courses

The American Association of Cereal Chemists announces three upcoming short courses to be held between March and May, 1984.

"Food Fortification: Practical Aspects of Fortifying Foods with Vitamins, Minerals and Proteins" will be held March 8 and 9, 1984 at the Holiday Inn O'Hare/Kennedy in Rosemont, IL. The course is designed to provide food technologists, product managers, and management personnel who are involved in the formulation, development, and marketing of foods with a practical in-depth understanding of why and how vitamins, minerals, and protein can be added to foods.

"Flavor Applications for Product Development" will be held April 5 and 6, 1984 at the Sheraton O'Hare in Chicago, IL. The course will present the latest information about flavor applications and technology. It will be useful for anyone in the food processing industry who works with flavors.

"Dough Rheology and Experimental Bread Baking" will be held May 8 through 11, 1984 at North Dakota State University, Fargo. The course is designed to provide food researchers, product development scientists, mill chemists, and baking technicians with a fundamental understanding of physical dough testing and principles of bread baking.

For more information contact: Dotty Ginsburg, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul MN 55121. 612-454-7250.

Genetic Engineering Techniques Have Promise In Food Industry

The food industry will probably use the products of genetic engineering techniques within a few years.

Techniques such as gene-splicing and protoplast fusion will help produce a variety of high-value, low-volume products such as amino acids, vitamins, speciality proteins and enzymes, as well as new and improved fermented products such as cheese.

Genetic engineering will be used to develop better start organisms for cheese manufacturing and "bugs" which more efficiently convert crop residues into alcohol.

"Recombinant DNA technology gives geneticists more control in developing new and useful microorganisms," says Tom Richardson, food chemist with the University of Wisconsin-Madison.

Richardson is using recombinant DNA technology to change the structure of ovalbumin, the main egg white protein found in many baked goods. He hopes to determine how these structural changes are related to the protein's functional properties but sees many other uses for genetic engineering in the food industry.

Scientists elsewhere have programmed bacteria to produce prochymosin, the precursor of the enzyme in calf rennet (chymosin) which clots milk during cheesemaking. A decline in the number of calves slaughtered, the principal source of the enzyme, has increased interest in getting microorganisms to produce the enzyme.

Richardson estimates that only about 25 pounds of cloned protein would be produced when 20,000 gallons of raw material are fermented. Those yields are too low to compete with commodity proteins now derived from plants and animals (for example, 10.5 million dairy cows in the United States produced 4 billion pounds of milk protein during 1982) but only 120 batches could provide all the chymosin needed annually for U.S. cheese production.

Improving the microbial processes now used to produce vitamins and amino acids might make it feasible to use expensive amino acids such as trypotophan and threonine as feed additives. Scientists have already used recombinant DNA techniques to make bacterial strains more efficient in producing amino acids.

Genes which code for the three major enzymes that degrade cellulose might be cloned into other organisms. These orgaisms would then convert cellulose in wood or other materials into fermentable sugars for ethanol production. Cellulose, one of the most plentiful substances on earth, is a renewable source of energy and chemicals.

Milk-fermenting bacteria will eventually be "programmed" to better metabolize lactose, hydrolyze casein and produce better flavored dairy products. Bacteria might be developed that are resistant to viruses which can ruin certain fermentations.

Wisconsin Educational Conference to be Held in September

The Fifth Annual Joint Educational Conference of the Wisconsin Association of Milk and Food Sanitarians, The Wisconsin Environmental Health Association, The Wisconsin Dairy Technology Society and the Wisconsin Association of Dairy Plant Field Representatives will be held at the Stevens Point Holiday Inn and Holidome Indoor Recreation Center on Wednesday, September 12 and Thursday, September 13, 1984.

David G. Myers of the Wisconsin Association of Milk and Food Sanitarians is general chairman for the conference.

For more information contact: Ron Buege, West Allis Health Department, 7120 West National Avenue, West Allis, WI 53214. 414-476-3770.

Reducing Sugar in Your Diet

Reducing the amount of sugar in your diet takes more than putting away the sugar bowl, since many sweeteners are hidden in processed convenience foods, drinks, baked items, confections and frozen foods.

About one-fourth of the average American's calorie intake is from sugar, says Mary K. Sweeten, a foods and nutrition specialist. Natural forms of sugar found in fruits, vegetables and dairy products contribute six percent of these calories and the remaining 19 percent come from sugars added to foods.

About two-thirds of the sugar added to foods comes from eating processed foods and the rest from sugar used for cooking or taken from the sugar bowl at home, she adds.

"Most people want to cut down on sugar because of health concerns," says Sweeten, who is with Texas A & M's Agricultural Extension Service.

While sugar intake has not been directly linked to diabetes or heart disease, it may be a contributing factor. Any dietary practice that results in obesity may contribute to the onset of these metabolic disorders, she explains.

"But we should not forget that sugar also plays an important role in the diet," says the specialist. "Although they offer little food value, sugars are absorbed quickly by the body and provide a quick form of energy."

Sugar also adds color, texture and flavor to baked goods. It prolongs the life of food by inhibiting microbial growth in food preservation and helps firm, thicken and preserve fruits to be canned, frozen or dried.

To reduce sugar consumption consumers should carefully read the labels on processed foods, says Sweeten.

Workshop II in Food Flavor

A course titled "Workshop II in Food Flavor: A Hands on Course in Flavor Applications" will be offered at the University of Minnesota, St. Paul, MN, April 25-27, 1984. The registration fee for this course is $475.

This course is intended for individuals in either the food or flavor industry. The emphasis of this course will be in providing "hands on" experience. The course will be divided nearly equally between lecture and laboratory. Laboratory sessions will include learning how to evaluate flavors for use in food products and properly using a flavor in ice cream, baked goods, snacks and several other food products. While the lectures will focus on flavor applications, time will also be devoted to learning how to communicate with flavor suppliers.

This course will be taught by Drs. Paul Perry (Flavor Consultant) and Gary Reineccius (Professor). Enrollment is limited to 25.

For more information contact: Dr. Gary Reineccius, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Ave., St. Paul MN 55108.

Homogenized Milk Linked to Heart Disease

Two Connecticut doctors, punching holes in popular theories about cholesterol, warned that consumption of homogenized milk can lead to heart disease, the number one killer of Americans.

Dr. Kurt Oster and Donald Ross say the problem is not milk itself, but the homogenization process which allows small quantities of the enzyme to escape digestion and pass to the bloodstream. Once in the bloodstream the enzymes, XO, damage the walls of an artery, the two said. That is the first step toward arteriosclerosis, or hardening of the arteries, which can be fatal, they said.

"Arteriosclerosis is an environmental disease that starts in young people and goes on to cause disease in old people," Oster said at a news conference in December 83 at Fairfield University, announcing the publication of their book, "The XO Factor."

The statistics gathered by the doctors showed the death rate from heart disease is highest in countries where most of the milk is homogenized, a procss that reduces the size of the fat particles to give the liquid a uniform consistency. Before homogenization, the fat in milk separated and rose to the surface.

The National Dairy Council in Chicago says its own research as well as independent research, disputes the book's conclusions. "Our reaction is that the XO hypothesis has not only not been proven but has been disproven by a number of researchers," said Dale Kemery, spokesman for the National Dairy Council. "Milk has been homogenized for about 35-40 years to make it a more palatable product," Kemery said. "People want a more uniform product is what it amounts to."

Better Soybean Oil May Be Coming

Genes discovered in soybeans have increased researchers' hopes that nonhydrogenated soybean oil in margarines, salad dressings and cooking oils may one day have as good or better shelf lives and nutritional quality than today's hydrogenated soybean oil.

Through genetic studies scientists of USDA's Agricultural Research Service (ARS) and Purdue University, W. Lafayette, IN, are exploring ways to decrease off flavors associated with breakdown of unsaturated fatty acids.

Previous research has suggested that linolenic acid is somehow involved in the generation of objectionable flavors and odors in soybean products, says ARS geneticist Niels C. Nielsen.

The scientific team led by ARS geneticists James R. Wilcox is undertaking two approaches to deal with the flavor stability problem--breeding soybeans for low linolenic acid content and for reduced activity of enzymes that cause the breakdown of this polyunsaturated linolenic acid.

Nielsen and Wilcox chemically mutated seeds of Century soybeans. With the help of ARS chemist James F. Cavins of the Northern Regional Research Center, Peoria, IL, they have identified a mutant soybean plant that had beans with low linolenic acid content. They have grown two generations of progeny derived from these seeds and have found the same low linolenic acid content in them indicating the trait is genetically stable.

Linolenic acid content of the new lines are 3.2 to 3.4 percent compared with 8 to 10 percent in conventional soybean varieties. The new lines already have attractive agronomic characteristics similar to Century.

"While reduction of linolenic acid is an attractive consideration in the case of flavor stability," says Nielsen, "it is an essential fatty acid for human nutrition.

One could question the advisability of its complete removal."

That means the second approach is also needed--breeding soybeans with little activity of the enzyme, lipoxygenase, which causes the breakdown of linolenic acid.

At least three forms of lipoxygenase exist in the seed. They are called L1, L2 and L3. Research in Theodore Hymowitz's laboratory, University of IL, Champaign-Urbana, led to identification of a line of soybeans lacking L1. The team at W. Lafayette identified a line lacking L3 from among edible soybean varieties brought to Purdue from Japan by postdoctoral associate Keisuke Kitamura several yeras ago.

Nielsen and his collegues found that soybean plants could be bred to lack both L1 and L3 without creating obvious detrimental effects to the plants grown in both greenhouse and field studies. The L1 and L3-less genes have already been introduced into plants with agronomically acceptable characteristics and are being intercrossed with low linolenic acid lines. Since the scientists began these studies they have identified soybeans lacking L2.

The scientists anticipate similar mechanisms of inheritance common to soybeans lacking each of the lipoxygenase forms based on studies conducted by postdoctoral associate Corrine Davies and funded in part by the American Soybean Association. This may enable the research team to breed lines lacking all three forms of lipoxygenase.

The experimental germplasm already available is being used to assess the effect of eliminating lipoxygenase on flavor stability in soybean products. Regardless of how the flavor stability problem turns out, the experimental germplasm will help answer some basic questions about lipoxygenase. Could lipoxygenases have a role in biosynthesis of ethylene, a compound having varied effects on plant and seed development? Could they have a role in protecting plants from diseases?

The research on soybeans that are low in linolenic acid also is oriented to increasing basic knowledge as well as practical application. For example, scientists want to know how linolenic acid in soybeans is converted to linolenic acid. This process is of particular interest because linolenic acid is a major fatty acid found in chloroplasts, where photosynthesis occurs.

Series of Papers Probes Future of U.S. Agriculture

Michigan State University agricultural economists, in cooperation with other economists across the United States, are putting together a comprehensive analysis of national agricultural issues.

Called the "Farm and Food System in Transition-Emerging Policy Issues," the series is intended as background information for media representatives, policy makers, government representatives, teachers and others interested in agriculture.

The series, to be issued over the next 18 months, will analyze the changing U.S. farm and food system and its implication for everyone from the farm to the consumer. The series will consist of about 60 papers, which will be distributed in small packets.

"The series is a national project of the Cooperative Extension Service, an educational arm of the U.S. Department of Agriculture," says Jim Shaffer, MSU agricultural economist. The authors are economists, primarily from universities and the USDA. Each provides an in-depth look at a particular aspect of food production or food distribution.

There is no charge for the series. To obtain the complete series, contact Jim Shaffer, Department of Agricultrual Economics, Room 40 Agriculture Hall, MSU, East Lansing, MI 48824.

Culled Dairy Cows May Hurt Beef Market

A new law encouraging cutbacks in milk production is probably going to send a lot of extra culled dairy cows to slaughter, possibly lowering cattle prices significantly during 1984.

The dairy bill recently passed by Congress and signed by President Reagan will reduce dairy price supports and encourage a decrease in milk production through increased culling of cows, says Dr. Ed Uvacek, economist in livestock marketing with the Texas Agricultural Extension Service, Texas A & M University System.

"While the question of how many head of dairy cows will be marketed in 1984 is still undetermined, the potential number is probably close to 1.5 million head over and above the normal dairy cow slaughter," says Uvacek.

He estimates that a cow kill this large could lower 1984 fed Choice steer prices by $1.25 to $1.50 per hundredweight, and salvage cow prices by $4 to $6 per hundredweight. Feeder cattle prices could also be forced downward about $3 to $4 per hundredweight.

"These lower prices could, in themselves, then precipitate some panic selling of beef cows by cattlemen," Uvacek says. "That would compound the problem and further impact on the market."

To try to prevent the damage it would cause to the beef market, the dairy act charged the USDA with the responsibility of insuring "orderly marketing" of dairy cows. Uvacek maintains, however, that this may be extremely difficult.

"Unfortunately, there are still many unanswered questions about the bill's final effect on the entire cattle industry," Uvacek says. "Cattlemen will just have to wait and see."

Proposed Ban on Antibiotics in Livestock Feed is Unnecessary

The use of antibiotics as animal feed additives has not been shown to be a threat to human health. Consumers would pay substantially more for meat and poultry if the use of anitbiotics in livestock and poultry feeds were prohibited. So states a new report from the American Council on Science and Health (ACSH), an independent national scientific organization.

Low doses of antibiotics have been added routinely to livestock and poultry feeds for more than 30 years, because the drugs promote the animals' growth and permit them to be brought to market more economically.

This practice has been questioned because it could increase the prevalence of antibiotic-resistant bacteria which might cause human diseases that would be difficult to treat.

The Food and Drug Administration has proposed banning most uses of penicillin and tetracycline in animal feeds, but Congress has ordered FDA to postpone action on this issue until more scientific evidence is available.

"During the more than 30 years in which antibiotics have been used as animal feed additives, no human health problems attributable to this practice have been reported. There have been no known outbreaks of untreatable bacterial disease as a result of the feeding of low doses of antibiotics to livestock, not even among farmers, slaughterhouse workers, or other groups of people who come into contact with farm animals daily," said Dr. Richard A. Greenberg, Associate Director of ACSH.

"The feeding of antibiotics to farm animals does pose a theoretical health risk," Dr. Greenberg continued. "Fortunately, though, we don't have to rely on theory alone to determine whether this risk is a significant one. We also have a large body of evidence from practical experience. The widespread use of low doses of antibiotics in livestock feed during the past three decades has provided us with a 'natural experiment' on an enormous scale. The thirty year record of safety that has come out of this 'experiment' is strong evidence in favor of permitting the addition of antibiotics to livestock feeds to continue."

Consumers might have to absorb economic losses as high as $3.5 billion per year if the addition of penicillin and tetracycline to animal feeds were discontinued, according to studies cited in the ACSH report.

ACSH recommends that the health impact of the use of antibiotics in animal agriculture should continue to be assessed periodically, to see if conditions have changed in any way that might lead to a significant hazard in the future.

The American Council on Science and Health is an independent, nonprofit consumer education organization promoting scientifically balanced evaluations of food, chemicals, the environment, and health. ACSH has offices in New York, New Jersey, and Washington, DC.

A single complimentary copy of the ACSH report ANTIBIOTICS IN ANIMAL FEEDS: A THREAT TO HUMAN HEALTH? can be obtained by sending a self addressed, stamped (.37 postage), business size (#10) envelope to ACSH, 47 Maple St., Summit, NJ 07901.

14 Countries Lose Meat Import Eligibility

The U.S. Department of Agriculture has notified 14 countries that early in January they will lose their eligibility to export meat and poultry to the United States because of deficiencies in their inspection programs.

The countries are: Dominican Republic, El Salvador, Haiti, Mexico, Nicaragua, Panama, Honduras, Romania, Sweden, Finland, Belgium, Switzerland, Ireland and France.

The 1981 farm bill requires exporting countries to have residue testing programs equal to USDA's and to have equivalent systems for preventing species violations, such as horsemeat misrepresented as beef, said Donald L. Houston, administrator of the Food Safety and Inspection Service. Last July USDA notified 23 countries that they would lost their eligibility on Jan. 1 if they did not correct specific deficiencies, he said. Nine of those countries have subsequently complied.

Imports from these 14 countries represent a small fraction of the U.S. meat supply, Houston said.

To regain export elibility, each country must correct all deficiencies and demonstrate that its inspection system is as effective as ours, Houston said.

USDA has no health concerns about meat products now being imported from the 14 countries, Houston said, since USDA carefully examines each shipment as it enters the U.S. to assure it is safe, wholesome and accurately labeled.

From the IAFMES office in Ames, Iowa, New addition...

Welcome to Amber Nordine, the newest member of the IAMFES team.

Amber is the IAMFES Advertising Contact Person. Through the use of telephone marketing, Amber is contacting advertisers for *Dairy and Food Sanitation* and the *Journal of Food Protection*.

For a free media kit including an issue of *Dairy and Food Sanitation, Journal of Food Protection,* rate card and brochures, simply write or call: Amber Nordine, IAMFES, PO Box 701, 5th and Burnett, Ames, IA 50010.

Amber can be contacted Monday through Friday, 9-12 Central Time at 515-232-6699.

Happy Valentines Day
from
the IAMFES Staff

Kathy Hathaway
Suzanne Trcka
Jeanine Strodtman
Amber Nordine

N.M.C.
NATIONAL MASTITIS COUNCIL

Ten Steps to Prevent Coliform Mastitis

Mastitis control, regardless of the causative organism, should be based primarily on prevention, points out Robert Harmon, assistant professor of animal science, University of Kentucky. A number of control measures for coliform mastitis are recommended, although the usefulness of some still needs to be verified in controlled studies.

1. Hygiene is of utmost importance. Keep stalls, alleyways and other areas as clean as possible.
2. Bedding materials, especially sawdust, may be a source of coliform bacteria. If a problem arises, changing to alternate bedding materials may help reduce new infections.
3. Increasing space allotted per cow and reducing amount of housing time may decrease exposure to coliforms.
4. Don't apply excessive amounts of water when washing cows' udders and dry udders and teats prior to milking.
5. Dip teats in an effective germicide after each milking as part of an effective mastitis control program. Teat sealers may be helpful against coliforms in some situations.
6. Properly maintin and sanitize milking equipment to reduce the involvement of the milking machine in coliform mastitis.
7. Thoroughly clean the teat end with cotton soaked in 70 percent alcohol and use your teat dip prior to dry treatment. Be sure to use sterile cannulas to prevent introducing any bacteria.
8. Maintain dry cows in a clean environment, on pasture if possible. It is probably better to have cows calve on clean, dry straw than on sawdust.
9. Minimize stress on cows. Pay attention to proper lighting, humidity, temperature and air circulation in the barn environment. Sudden changes in daily routine, feed and climate increase the risk of mastitis.
10. Fence off farm ponds and water holes to prevent cows from wading in them.

The control of coliform mastitis boils down to good management. There are no quick solutions to the problem of coliform mastitis. Hopefully, future work in this area will aid dairymen in finding some concrete solutions.

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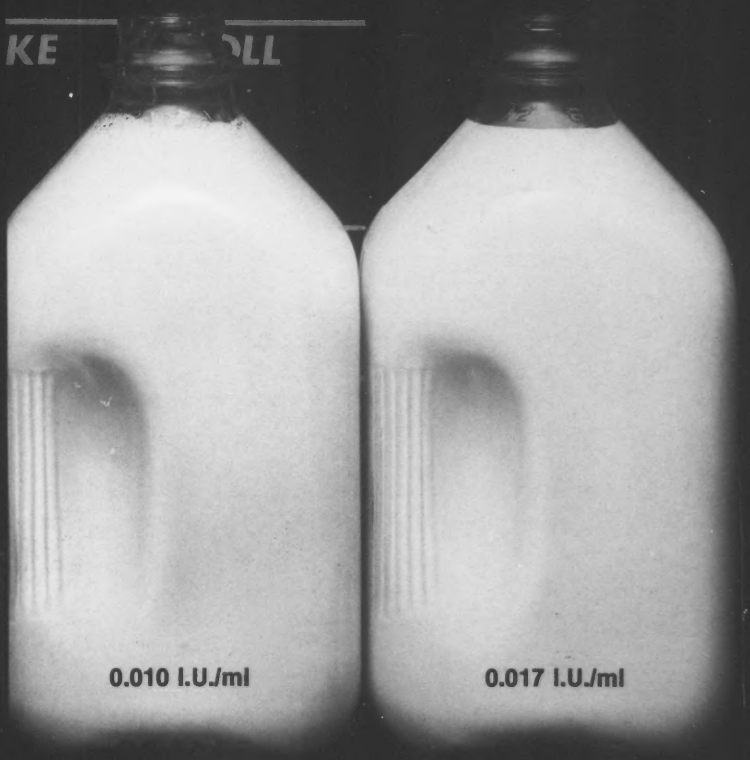

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New Product News

The products included herein are not necessarily endorsed by Dairy and Food Sanitation

Testoterm electronic pocket thermometers

•Over its -150°to 400°F range, Testoterm's Model 7200 *technoterm* electronic pocket thermometer provides an accuracy of ± 1.8°F. The sensor used in this measuring range, which encompasses a wide variety of laboratory and heating, ventilating and air conditioning applications, is a 100-ohm platinum RTD.

The Model 9200 uses a type "K" thermocouple for sensing temperature in the 0-1999°F or -20 to 1000°C ranges, into which the vast majority of process-control applications fall. Accuracy of the Model 9200 is ± 1°F to 212°F and ± 1% of measured value above 212°F. Resolution for the Model 7200 is 0.1°C; for the Model 9200, 1°C.

Technoterm's 4.5-ounce weight belies its rugged construction. The case is made of impact-resistant ABS plastic. Interchangeable temperature probes are enclosed in corrosion-resistant sensor tubes. Electronic circuitry, which includes the high-visibility liquid crystal display, ensures long-term reliability. The long-life 9 volt battery provides 100 hours of continuous use or 18,000 measurements of 20 seconds duration each. The display switches off automatically when battery is low.

For additional details, call or write Testoterm, Inc., PO Box 468, Mount Freedom, NJ 07970. 201-989-8869.

Testoterm pocket thermometer

New catalog from New Brunswick Scientific

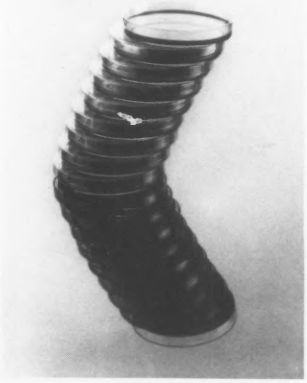
•A new 16-page catalog presents the broad selection of Watson-Marlow peristaltic pumps available from New Brunswick Scientific. Unlike most peristaltic pumps, Watson-Marlow pumps are modular in design so the user can select a pump that more closely suits the application. The modularity of these pumps adds versatility to any application because new pumps can be created by interchanging pumpheads and drive modules as required.

For more information contact: New Brunswick Scientific Co., Inc., PO Box 986, Edison, NJ 08818. 201-287-1200 or 800-631-5417.

Gibco Laboratories introduces CIN Agar

•Gibco Laboratories has recently released CIN Agar medium. CIN Agar is recommended as a selective medium for the recovery of yersinia enterocolitica from both clinical specimens and food sources. This medium is highly selective especially against *Pseudomonas aeruginosa, Escherichia coli, klebsiella pneumoniae, Proteus mirabilis, Salmonella typhimurium, Shigella sonnei* and *Streptococcus faecalis*. Studies show CIN Agar to be superior to MacConkey and SS Agars for the recovery of *Y. enterocolitica*. The inclusion of sodium deoxcholate in the media is important to assure the characteristic "bulls-eye" appearance (depressed center with transparent margin).

For more information contact: Fran Griggs, Gibco Labortories, 421 Merrimack St., Lawrence, MA 01843. 800-343-8156.



CIN Agar

New catalogs describe Brinkman Homogenizers

•Brinkman Instruments Co., Division of Sybron Corporation, has released two new catalogs which explain in detail how to select the appropriate Brinkmann Homogenizers and accessories for industrial or biomedical applications.

Brinkmann Homogenizers employ the Willems "Kinematic" high frequency principle, combining mechanical shearing with cavitation and, to a small degree, sonic energy to assure the fast breakdown (usually within 30 to 60 seconds) to soup-like consistency of a wide variety of materials. Interchangeable stainless steel generators from 7 mm to 50 mm diameter handle sample volumes from 0.5ml to 25L. Special foam reducing generators minimize sample aeration. Teflon (R) bearing generators are available for use with chemically abrasive organic solvents.

Brinkmann offers two standard Homogenizer models, PT 10/35 and PT 45/80, as well as handheld and explosion proof models and a model for continuous in-line homogenization. Accessories to minimize vortex, maintain constant homogenization conditions and create a sealed homogenizing system are also available.

Biomedical and industrial applications include: homogenization of plant and animal tissue prior to chemical analysis; pharmaceutical emulsions; drug metabolism and drug receptor studies; isolation of mitochondria, intact golgi apparatus, uterine nuclei and plasma membrane; dispersion of pigments in dyes, inks and paints; extraction of pesticides from soil; and moisture determinations in food.

For more information, request BR466 (biomedical version) or BR466A (industrial version)from Brinkmann Instruments Co., Cantiague Rd., Westbury, NY 11590. 800-645-3050 or 516-334-7500.

Tru-Test Sampling System from QMI

•The Tru-Test Sampling System with the Galloway sampler provides an aseptic method of process sampling or ingredient introduction. Cultures, enzymes, nutrients, or other food ingredients can be introduced into a process with reduced risk of microbial contamination. In addition, product samples for microbiological or analytical analysis can be aseptically obtained. The system can be utilized for tanks, process lines, or other stainless steel processing equipment. The Tru-Test system features a presterilized injection or sampling port (the Galloway aseptic sampler) which provides seven injection or sampling sites before being replaced with another presterilized sampler. For details, contact Food and Dairy Quality Managment, Inc. (QMI), St. Paul, MN. 612-228-0474.

Tru-Test Sampling System

Food Science Facts
For The Sanitarian

Robert B. Gravani
Cornell University
Ithaca, NY

YEASTS

Yeasts are the most important and widely used microorganisms in the food industry. Although yeasts were first observed by early scientists in the 1600's, they have served man for centuries by fermenting fruit juices, leavening bread and by making many foods palatable and nutritious.

Yeasts are single celled organisms that are usually larger than bacteria. Individually, yeasts are invisible to the naked eye, but large masses can be easily seen. Yeasts come in a variety of forms and shapes; they can be spherical, oval, lemon-shaped, pear-shaped, cylindrical or triangular. The size and shape of the 350 known types of yeasts are used to classify them into groups for identification.

Typical shapes of yeasts are shown below.

Yeasts are commonly found on plants, grains, fruits and other foods containing sugar. They are present in soil, in the air, on the skin and in the intestines of animals and in some insects. They are transferred from place to place by carriers (people, equipment, food) and air currents.

GROWTH

Most yeasts grow and reproduce by a process known as budding. A small bulge appears in a yeast cell and gradually grows in size. When it is about half the size of the original cell, or larger, it breaks off and forms a new yeast cell. This new yeast will increase in size until it too is ready to reproduce by budding.

Yeast reproduction by budding:

Some yeasts also reproduce by a sexual method involving the mating of two cells. This mating results in the production of spores. These spores are different from those produced by bacteria and are not resistant to adverse conditions. A small number of yeasts reproduce in a manner similar to bacteria.

FACTORS AFFECTING YEAST GROWTH

1) *Water*-- Most yeasts grow best with a plentiful supply of available moisture. Many yeasts are capable of growing in foods that contain high levels of sugar or salt. The water requirement of yeasts is generally less than bacteria but more than molds.
2) *Food/Nutrients*-- Yeasts can grow in a variety of foods but grow best in foods that contain carbohydrates (sugar and starch) and acid. They also need nitrogen and several minerals to grow properly. Given these optimum conditions, yeasts usually produce carbon dioxide and ethyl alcohol which make them very important to the food industry.
3) *Oxygen*-- Yeasts grow best in the presence of oxygen (aerobically) but some fermentative yeasts can grow slowly without oxygen (anaerobically).
4) *Temperature*-- Yeasts can grow over a wide temperature range from 32°F to 117°F with the optimum for most yeasts being between 68°F and 86°F. Disease producing varieties grow well between 86°F and 98.6°F. Yeasts are easily destroyed by heat.
5) *pH*-- Most yeasts grow best in an acid environment. They prefer a pH of 4.0-4.5 and lower and do not grow well in alkaline (above pH 7.0) conditions.

TYPES OF YEAST

Although some yeasts are known to cause disease in plants, animals and man and others can cause spoilage of foods, yeasts are primarily beneficial to the food industry.

BENEFICIAL YEASTS

Yeast fermentations are involved in the manufacture of foods such as:

Bread	Liquor	Soy Sauce
Beer	Vinegar	B Vitamins
Wine	Surface Ripened Cheese	Enzymes

Alcohol Fermentation

The best known and one of the most important uses of yeast is the production of ethyl alcohol from carbohydrates

(sugar or starch). This fermentation process is used in the manufacture of beer, wine, liquor, (rum, scotch, bourbon, gin) bread, chemicals, and many other products.

Baking

The use of yeast as a leavening (rising) agent in baking dates back to early civilizations. Today, selected yeasts are mixed with bread dough and are allowed to grow and ferment. This fermentation produces carbon dioxide which is responsible for the leavening of the dough. The quality of the product depends on:

the type of yeast
choice of raw materials
growth conditions (time and temperature of incubation)

Yeasts as Food

Several types of yeast have been grown in mass culture and used as a source of food for humans and animals. Because they are easy to grow and have a high nutritive value, yeasts have been used to supplement diets and to improve a variety of food products.

SPOILAGE YEASTS

Yeasts are undesireable when they cause spoilage of:

Sauerkraut	Molasses	Meats
Fruit Juices	Honey	Beer
Syrups	Jellies	Wine

Salt tolerant yeasts can spoil salted meats, fish and soy sauces; they can also grow in curing brines containing cucumbers and meats.

DISEASE PRODUCING (PATHOGENIC) YEASTS

The great majority of yeasts are beneficial to man, but some yeasts are capable of causing disease in humans and plants. Yeast infections in humans usually affect the skin, nails and mucous membranes.

Dairy Quality

by **Darrell Bigalke,** *Food & Dairy Quality Mgmt., Inc., St. Paul, MN*

THE EFFECT OF HIGH SOMATIC CELL COUNTS ON THE QUALITY OF DAIRY PRODUCTS

The effect of mastitis in reduction of milk yields and shortening of the productive life of a cow has been well documented. Most producers and dairy processors are aware of this fact and several programs have been proposed to reduce the mastitic problems of many herds, however, several producers have not initiated mastitis improvement programs. As a result, many milk supplies still have high somatic cell counts. The intent of this month's Dairy Quality is to discuss the effect of high somatic cell count milk on the quality and yield of dairy products.

Somatic cells or body cells in the milk originate from two sources: a) epithelial cells (tissue cells) from the udder and b) leukocytes from the blood. Normal milk contains epithelial cells that are present due to normal breakdown and repair of mammary tissue. These cells increase in late lactation or as a consequence of injury. Schultz (5) estimates that from 35-70% of total somatic cells are epithelial cells. Normal milk has reported levels of 65-70%, chronic mastitic milk contains about 50% epithelial cells, and more severe cases of mastitis lower the percentages to 10-45% due to dilution with leukocytes from the blood. Leukocytes enter the milk from the blood being attracted by chemical substances released due to mammary tissue infections.

High somatic cell counts have been related to compositional changes which may result in both quality and yield problems in cultured products. In Table 1, Schultz (5) points out the general changes in milk composition associated with elevated somatic cell counts. It is interesting to note that while there are only minor changes in total protein, the percentage of casein decreases while the percentage of whey protein increases. In Table 2, Haenlein, et. al. (2) reported the percentage changes in casein and whey proteins at various levels of somatic cells. In examining specific whey proteins, Chandan (1) points out that mastitic milk contains secreted immunoglobulins which have an inhibitory effect on the growth of starter organisms. Therefore, the use of mastitic milk in cheese making could result in slow vats and direct loss of quality and yield.

The percentage and composition of milkfat is also affected by subclinical mastitis. Randolph and Irwin (4), in Table 3, point out the changes in milkfat as influenced by mastitis. From a quality standpoint, the increase in free fatty acid and lipase activity is indicated by a higher acid degree value which would have a negative effect on quality. These changes can explain why mastitic milk is more susceptible to both spontaneous and induced hydrolytic rancidity.

Other compositional changes in mastitic milk that can have an effect on quality is a decrease in lactose and an increase in chloride. Henderson (3) points out that when milk is free from any acquired flavor such as non-microbial off-flavors (weed, feed, etc.), the chloride lactose ratio will affect the taste of milk. When the percentage of lactose is high and chloride low, a desirable taste will result. However, when lactose concentrations are decreased and chloride concentrations are increased, the desirable flavor is lost and salty flavors may be produced.

In summary, mastitic milk or high somatic cell count milk can result in compositional changes in milk. These compositional changes can result in quality defects in fluid milk and other dairy products. Therefore, a necessary component of a dairy's quality assurance program must include a program for monitoring and controlling milk with high somatic cell counts. Economic considerations are also pertinent to monitoring and controlling high somatic cell count milk because with decreased percentages of casein in mastitic milk, one could anticipate a decrease in yield in cultured products manufacture.

TABLE 1. *GENERAL CHANGES IN MILK COMPOSITION ASSOCIATED WITH ELEVATED SOMATIC CELLS.*

Decrease	Minor Changes	Increase
Lactose	Total Protein	Whey Proteins (total)
Fat		Chloride
Casein (total)		Sodium
		pH

(Data from Reference #5)

TABLE 2. *AVERAGE PROTEIN COMPOSITION (%) OF QUARTER SAMPLES GROUPED BY RANGE OF SOMATIC CELL COUNT (HOLSTEIN COWS).*

	Estimated Somatic Cells (thousands)		
Measurement	<250	500-1,000	>1,000
Total Protein	3.61	3.59	3.56
Casein	2.79	2.65	2.25
Whey Proteins	.82	1.10	1.31

(Data from Reference #2)

TABLE 3. *INFLUENCE OF MASTITIS ON MILKFAT AND RELATED COMPONENTS.*

Measurement	WMT <10	WMT >20	Change
Milkfat (%)	3.45	3.20	–
Phospholipid (mg/g fat)	4.78	3.55	–
Free Fatty Acids (mg/g fat)	23.27	34.10	+
Lipase Activity	1.49	1.73	+
Acid Degree Value	.64	1.17	+

(Data from Reference #4)

(1) Chandan, R. 1979. Practical measures for cost control in the cheese plant. Dairy Record, March, 1979. pp. 52, 54.

(2) Haenlein, G.F.W., L.H. Schultz, and J.P. Zikakis. 1973. Composition of proteins in milk with varying leukocyte counts. J. Dairy Sci. 56:1017-1024.

(3) Henderson, M.S. 1971. *The Fluid Milk Industry*. The AVI Publishing Co., Inc., Westport, Connecticut pp 201-202.

(4) Randolph, H.E., and R.E. Erwin. 1974. Influence of mastitis on properties of milk. X. Fatty acid composition. J. Dairy Sci. 57:865-868.

(5) Schultz, L.A. 1977. Somatic Cells in Milk -- Physiological aspects and relationship to amount and composition of milk. J. Food Protection 40:125-131.

Illinois Affiliate Fall Business Meeting

Carl Ziesemer, Evanston-North Shore Health Dept., was elevated as president of the Illinois Affiliate of IAMFES (the Associated Illinois Milk, Food and Environmental Sanitarians, -AIMFES) at the annual fall business meeting held in Elgin, Illinois November 8, 1983.

Other officers elected were: Jerry Kopp, Dean Foods Company, president-elect; Ken Anderson, Illinois Department of Health, second vice president; Clem Honer, DAIRY RECORD, secretary-treasurer; Phil Hermsen, Associated Milk Producers Inc., sergeant-at-arms; Sarah Hastings, Federal Milk Marketing Order-30, auditor; and Wayne Bell, Dean Foods Company, auditor.

Outgoing president, Tim Hedlin of Hedlin's Dairy, was presented with a plaque of recognition for his services during the recent year.

The program was very informative and included the following speakers and topics.

George Muck, vice president R & D, Dean Foods Company described the company's quality assurance program and emphasized managements total commitment toward this objective. "In fact," he said, "new production people brought into the company first train through quality assurance responsibilities before advancing to other plant processing duties."

Addressing the present state of UHT fluid milk processing, Harold Wainess, Harold Wainess and Associates, discussed the recent advances made in UHT heating methods that lessen the degree of cooked flavor in milk.

Robert Flentge, Chief, Division Food, Drug and Dairies, Illinois Department of Health described his first three weeks in this new position. He took the opportunity to relay his intent on cooperating with all groups in industry associated with food and dairy products.

Everett Greschel, Illinois Department of Health, discussed the application of the new retail food regulations in the State of Illinois, which are patterned after the U.S. -FDA regulations.

L-R Dr. Robert Marshall, past president, IAMFES, Carl Ziesemer, president, Illinois Affiliate, Tim Hedlin, past president, Illinois Affiliate, Robert Grossman, past president, Illinois Affiliate, Ken Anderson, first vice president, and Jerry Kopp, president elect of the Illinois Affiliate.

Harold Heiskell Receives 1983 California Affiliate Sanitarians Award

The California Association of Dairy and Milk Sanitarians met in Fresno, October 4 for their annual Dairy Industry Conference sponsored by the California Association and the California Dairy Industry Association.

Both the educational program and banquet were a huge success. Attendees commented that it was the best meeting and banquet they had ever attended. Entertainment during the banquet included a magician.

Richard Tate, past president of the California Association has replaced the late Lee Lockart as Chief of the Bureau of Milk and Dairy Foods Control.

Harold Heiskell was award the 1983 Sanitarians Award by the California Association of Dairy and Milk Sanitarians.

Harold has served the dairy industry for more than 40 years. His career started in 1934 when he sold Sharples Cream Separators. When he learned Babson Brothers paid $5 for every free trial a farmer would take of their cream separators, he scattered free trial offers around the tri-state district of Missouri, Kansas and Oklahoma. This led to his appointment as a divisional manager.

In 1945 he moved to Arizona and started his own Surge business. In 1969 he moved to California where he was with the management of the California, Washington, and Oregon branch. He later was a public relations representative for various health departments around the country.

He has served on the Farm Methods Committee of IAMFES, and chaired the IAMFES Membership Committee. Harold was co-chairman of the arrangements committee for IAMFES in 1971 when the IAMFES Annual Meeting was held in San Diego. Harold is also a honorary life member of IAMFES. He received a citation from IAMFES for his work as the National Membership Chairman.

Harold is active in the California Association of Dairy and Milk Sanitarians. He has been a member of the Arizona Dairy Technology Society and the Missouri Milk and Dairy Association. He is a trustee for the California Dairy Museum Educational Foundation, and has been a member of the National Mastitis Council.

Harold has attended all CADMS and IAMFES meetings. He is now retired to Sacramento with his wife Mildred.

L-R Harold Heiskell, Wayne Bargray, Howard Eastham and George Gamaling. Mr. Eastham is the CADMS president and Mr. Gamaling is the CDIA president.

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JFP Abstracts

Abstracts of papers in the February Journal of Food Protection

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Attachment of Psychrotrophic Meat Spoilage Bacteria to Muscle Surfaces, J. M. Farber and E. S. Idziak, Department of Microbiology, Macdonald College of McGill University, 21111 Lakeshore Road, Ste. Anne de Bellevue, Quebec, Canada H9X 1C0

J. Food Prot. 47:92-95

Attachment of psychrotrophic meat spoilage organisms to longissimus dorsi (l. dorsi) muscle placed in an attachment bath was studied. The numbers of bacteria (log_{10}) attaching to 10.0 g of l. dorsi muscle during a 20-min incubation period in the attachment bath ranged from 3.88 for *Acinetobacter* LD-2 to 5.66 for *Pseudomonas fluorescens*. The lowest attachment values were recorded with two non-motile bacteria, *Acinetobacter* LD-2 and *Moraxella osloensis;* the highest, with two motile fluorescent pseudomonads, *Pseudomonas putida* and *P. fluorescens*. Attachment strength values (S values) ranged from 0.19 for *P. putida* to 0.70 for *Acinetobacter* LD-2. In general, the non-motile bacteria possessed higher S-values than the motile organisms. When two different microorganisms were in contact with the l. dorsi muscle in the attachment bath, minimal competition for attachment to the meat occurred.

Hamburgers and Broiler Chickens as Potential Sources of Human *Campylobacter* Enteritis, C. O. Gill and Lynda M. Harris, Meat Industry Research Institute of New Zealand (Inc.), P.O. Box 617, Hamilton, New Zealand

J. Food Prot. 47:96-99

Freezing to -18°C for 7 d reduced numbers of *Campylobacter jejuni* in artificially contaminated hamburgers by one log cycle. Minimal cooking rapidly eliminated the organism. No campylobacters were detected in 50 samples of commercial ground meat. Ground meat dishes such as hamburgers are therefore unlikely vectors for human *Campylobacter* enteritis. Freezing of aritificially contaminated chicken carcasses greatly reduced or eliminated *C. jejuni* initially present at 10^5 cells/carcass. Minimal cooking for 20 min at 190°C eliminated all *C. jejuni* unless close pressing of limbs to the body preserved areas of uncooked skin. With commercial carcasses, 15/22 chilled and 6/37 frozen carcasses were contaminated with *C. jejuni,* maximum numbers being 10^5 and 10^3/carcass, respectively. Significant recontamination with *C. jejuni* could not be obtained by unhygienic handling after cooking of commercial chickens that had been moderately contaminated (10^3 to 10^4 cells/carcass), but substantial recontamination occurred with similar handling of carcasses that had initial heavy artificial contamination (10^6 cells/carcass). The limited circumstances under which cooked poultry meat is likely to carry *C. jejuni* in significant numbers suggest a need for caution in ascribing outbreaks of *Campylobacter* enteritis to consumption of poultry.

Effect of Garlic Extract on Red Blood Cells, Eitan Bogin, Miriam Abrams and Yehoshua Earon, Department of Biochemistry, Kimron Veterinary Institute, P.O. Box 12, Bet Dagan, Israel

J. Food Prot. 47:100-101

Osmotic fragility of red blood cells exposed to garlic extract was greatly elevated and the hemoglobin spectrum was changed, giving rise to peaks at 505, 536, 576 and 630 nm instead of peaks at 542 and 572 nm of the native hemoglobin. The factor responsible for these changes was heat stable and undialyzable in its native form. Following its boiling, the substance was lost during dialysis.

Comparative Effect of Concentration of Carbohydrate and Salt on Detection of Thermonuclease and Coagulase in Pathogenic Strains of *Staphylococcus aureus,* S. S. Barve and P. R. Kulkarni, Food Technology Division, Department of Chemical Technology, University of Bombay, Bombay-400 019, India

J. Food Prot. 47:102-104

In a study on nine pathogenic strains of *Staphylococcus aureus,* it was observed that detection of thermonuclease in these strains was not influenced by the level of glucose, mannitol or salt in the BHI broth medium. However, free coagulase was influenced by these additions.

Influence of Enzyme Activity of Bacteria and Leucocytes in Raw Milk on Age Gelatin after UHT Processing, Barbara P. Keogh and G. Pettinghill, Dairy Research Laboratory, Division of Food Research, Commonwealth Scientific and Industrial Research Organization, Highett, Victoria 3190, Australia

J. Food Prot. 47:105-107

An investigation was undertaken into the relationship between the enzyme activity of cells harvested from raw milk and time taken for age gelation (TAG) to occur in the milk after ultra-high-temperature processing. It was shown that there was no relationship between the TAG and the bacterial counts on milk agar at 30°C or 7°C nor was there a relationship between the counts and the level of enzyme activity of the harvested cells. There was, however, a significant correlation between the level of enzyme activity of the harvested cells and the TAG. When extra bovine leucocytes were added to raw milk before processing, the TAG was increased. This suggested that there was an inhibitory action of leucocytes in development of age gelation.

Evaluation of a Method for Recovering Poliovirus 1 from 100-Gram Oyster Samples, R. Sullivan, J. T. Peeler, J. T. Tierney and E. P. Larkin, Virology Branch, Division of Microbiology, Food and Drug Administration, Cincinnati, Ohio 45226

J. Food Prot. 47:108-110

A method is described that uses commonly available laboratory equipment and materials to detect low numbers of poliovirus 1 in oysters. Thirty 100-g oyster samples inoculated with poliovirus 1 were processed by blending at pH 4.8 in water, centrifuging, extracting the pellet at pH 9 in a mixture of Eagle's medium, nonfat dry milk, $MgCl_2 \cdot 6H_2O$, and Freon TF, and centrifuging again. The supernatant fluids were diluted in water, precipitated at pH 4.8 and centrifuged. The pellets were resuspended in Na_2HPO_4 and Cat-Floc, and centrifuged. The final supernatant fluids (~10 ml per sample) were assayed for viral plaque-forming units (PFU) in BGM African monkey green kidney cell monolayers. The average inoculum per sample was 95 PFU, and the average recovery from 30 samples was 53 PFU. The percent recovery with 95 percent confidence intervals was 55.4 ± 2.1.

Efficacy of an International Method for Detection of *Salmonella* in Chocolate and Cocoa Products, J.-Y. D'Aoust and A. Sewell, Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 47:111-113

The methods of the International Office of Cocoa and Chocolate and International Sugar Confectionery Manufacturers' Association (IOCC/ISCMA), and of the Health Protection Branch (HPB) were compared for their ability to detect *Salmonella* in chocolate and cocoa products. Of 152 samples tested, 13 contaminated samples were identified, 10 by the HPB and 8 by the IOCC/ISCMA method. Prolonged (48 h) incubation of enrichment media produced two false-negative results each with the Muller-Kauffman tetrathionate and the selenite cystine broths, exerted no effect on tetrathionate brilliant green, and identified one additional positive sample with the selenite brilliant green broth. More samples were found positive on bismuth sulfite than on brilliant green and brilliant green sulfa agar media. The present study underlines the limited sensitivity of both standard methods and questions the determinant role of casein in the neutralization of toxic agents in cocoa products.

Effect of Time and Method of Aging on the Composition of the Microflora of Beef Loins and Corresponding Steaks, R. L. Newsome, B. E. Langlois, W. G. Moody, Nelson Gay and J. D. Fox, Department of Animal Sciences, University of Kentucky, Lexington, Kentucky 40546

J. Food Prot. 47:114-118

Twenty-four cattle were slaughtered at a commercial packing plant. Carcasses were chilled for 72 h at 4°C, and then fabricated into wholesale cuts. Right loins were vacuum packaged and aged for 1, 3 and 5 weeks at 4°C while the left loins were aged conventionally for 1, 2 and 3 weeks at the same temperature. Core samples were removed from both ends of the conventionally and vacuum-aged loins and analyzed using standard microbiological procedures. Isolates from aerobic plates incubated at 35 and 20°C, and from gram-negative enteric plates were used to determine the composition of the aerobic (35 and 20°C) and gram-negative enteric microflora. Loins were cut into 2.54-cm thick steaks, wrapped in oxygen permeable fresh meat wrap and placed at 4°C in a simulated retail meat case. After 1, 3, 6 and 7 d, steaks were evaluated using the same microbiological techniques used for loins. Vacuum packaged loins had lower percentages of pseudomonads than conventionally aged loins after 1 and 3 w of aging. The lactobacilli were higher in vacuum packaged loins than in conventionally aged loins after 3 weeks. The aerobic (35 and 20°C) microflora of the retail cuts generally reflected the flora of the loins from which they were prepared. *Enterobacteriaceae* tended to be higher in vacuum packaged loins and corresponding steaks, and constituted 34% of the flora of the vacuum packaged loins after 5 weeks of aging.

Residual Nitrite Concentration and Total Plate Counts in White and Dark Chicken Patties, Alfred A. Bushway and Kai-Wan C. Jen, Department of Food Science, University of Maine, Orono, Maine 04469

J. Food Prot. 47:119-121

Effects of formulated nitrite (initial nitrite concentration added to patties) and muscle type on the residual nitrite concentration in raw and cooked chicken patties were studied. Microbiological determinations were done on raw chicken patties. Residual nitrite concentration in raw (104 ppm) and cooked (85 ppm) dark meat was higher than raw (90 ppm) and cooked (65 ppm) white meat after storage at 4 to 5°C. Cooking reduced the residual nitrite content of both white and dark meat. Formulated nitrite concentrations of 100 and 150 ppm lowered the total number of aerobic microorganisms developing in raw white meat patties by 10^2 and 10^4 colony-forming units/g, respectively, but were not effective in raw dark meat patties. A nitrite concentration of 400 ppm was required to repress the growth of aerobic microorganisms in raw dark meat for 6 d.

Effect of Time and Method of Aging on the Microbiological Quality of Beef Loins and Corresponding Steaks, R. L. Newsome, B. E. Langlois, W. G. Moody, Nelson Gay and J. D. Fox, Department of Animal Sciences, University of Kentucky, Lexington, Kentucky 40546

J. Food Prot. 47:122-125

Twenty-four cattle were slaughtered at a commercial packing plant. Carcasses were chilled for 72 h at 4°C, and then fabricated into wholesale cuts. Right loins were vacuum packaged and aged for 1, 3 and 5 weeks at 4°C while the left loins were aged conven-

tionally for 1, 2 and 3 weeks at the same temperature. Core samples were removed from both ends of the loins and were analyzed using standard microbiological procedures. Loins were cut into 2.54-cm thick steaks, wrapped in oxygen-permeable fresh meat wrap and placed at 4°C in a simulated meat case. On days 1, 3, 6 and 7 steaks were evaluated using the same microbial technique used for loins. Counts generally were similar for conventionally and vacuum-aged loins after aging 1 week. After 3 weeks of aging, the vacuum-aged loins had higher ($P<.05$) coliform, anaerobic, streptococcus and lactobacillus counts. In addition to these counts, the aerobic (20°C and 35°C) of vacuum-aged loins increased ($P<.05$) after an additional 2 weeks of aging. Counts of steaks from 1-week old loins generally were not different as a result of method of loin aging. Lactobacillus counts of steaks from 3-week old loins differed as a result of method of aging. Except for higher lactobacillus counts, counts of steaks from 5-week old vacuum aged loins were similar to the counts of steaks from loins which were vacuum-aged for 3 weeks.

ELISA of Picogram Quantities of Aflatoxin M_1 in Urine and Milk, Wen J. Hu, Nancy Woychik and Fun S. Chu, Department of Food Microbiology and Toxicology, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 47:126-127

Pretreatment of milk or urine with a Sep-Pak C-18 reversed-phase cartridge permits detection by direct enzyme-linked immunosorbent assay (ELISA) of 10 to 25 pg/ml of aflatoxin M_1 added to samples. The samples were first loaded to the Sep-Pak cartridge followed by washing with 10% acetonitrile in water. Aflatoxin M_1 was eluted from the cartridge with 30% acetonitrile in water and then transferred to the methylene chloride. After the solvent was removed, the sample was redissolved in 50 µl of methanol, diluted with 0.45 ml of buffer, and finally subjected to the ELISA. The recovery of aflatoxin M_1 added to milk and urine in the range of 10 to 250 pg/ml was between 77 to 110%.

Shelf-Life of Meat Loaves Packaged in Vacuum or Nitrogen Gas I. Effect of Storage Temperature, Light and Time on the Microflora Change, B. H. Lee, R. E. Simard, C. L. Laleye and R. A. Holley, Research Station, Agriculture Canada, St-Jean-sur-Richelieu, Québec, Canada J3B 6Z8; Centre de recherche en nutrition and Département de sciences et technologie des aliments, Université Laval, Ste-Foy, Québec, Canada G1K 7P4; and Food Research Institute, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6

J. Food Prot. 47:128-133

The effects of storage temperature, light and time on the microflora of vacuum- or nitrogen-packed meat loaves were examined at intervals during 49 d at -4, 0, 3 and 7°C under dark and lighted displays. Storage of cooked cured meat loaves at -4°C for 49 d produced little increase in lactobacilli numbers (from $\log_{10}$ 5.2 to 6.3) but resulted in significant ($P<0.05$) increases in psychrotrophs ($\log_{10}$ 3.9 to 5.9) and anaerobes ($\log_{10}$ 5.1 to 6.3 under vacuum). Storage time and temperature above 0°C resulted in a significant ($P<0.05$) increase in lactobacilli, psychrotroph and anaerobe numbers, regardless of packaging atmospheres, but the times at which counts reached approx. 10^8/g were deferred, i.e., day 7 at 7°C, day 21 at 3°C and day 28 at 0°C. Apart from a few exceptions in the numbers of psychrotrohs and lactobacilli, there were no significant differences in the numbers of microflora between vacuum- and nitrogen-packed meat loaves. At day 0, the dominant flora in both types of packaged samples was composed of *Pseudomonas* (32 to 34%), *Brochothrix* (24 to 38%), *Micrococcus* (9 to 22%) and *Lactobacillus* spp. (7 to 20%). By day 49, *Lactobacillus* spp. became a predominant part (62 to 76%) of the psychrotrophs. Few significant differences in the composition of psychrotrophs were found among different treatments. With an initial level of 10^2 coliforms per gram, there was no significant ($P>0.05$) change in coliforms counts between treatments but the numbers of yeasts and molds were lower in nitrogen-packed samples at 3 and 7°C as compared with similarly treated vacuum-packed samples.

Shelf-Life of Meat Loaves Packaged in Vacuum or Nitrogen Gas 2. Effect of Storage Temperature, Light and Time on Physicochemical and Sensory Changes, B. H. Lee, R. E. Simard, C. L. Laleye and R. A. Holley, Research Station, Agriculture Canada, St-Jean-sur-Richelieu, Québec, Canada J3B 6Z8; Centre de recherche en nutrition and Département de sciences et technologie des aliments, Université Laval, Ste-Foy, Québec, Canada G1K 7P4; and Food Research Institute, Agriculture Canada, Ottawa, Ontario, Canada K1A 0C6

J. Food Prot. 47:134-139

Effects of temperature, light and time of storage on the physicochemical (gas composition, pH, extract release volume (ERV), exudate and TBA) and sensory (appearance and off-odor) changes of vacuum- or nitrogen-packed meat loaves were examined at intervals during 49 d of storage at -4, 0, 3 and 7°C under dark and lighted display. Meat loaves stored at -4°C did not exhibit significant changes during 49 d of storage, but extending duration and increasing temperature above 0°C had a significant effect on the shelf-life of meat loaves, regardless of treatments. Appearance and off-odor changes were not related to those of ERV, exudate and TBA, but significant relationships were noted between CO_2, pH and sensory changes. Overall, nitrogen packaging significantly improved appearance by retarding the greenish discoloration of meat loaves. Light increased the frequency of green discoloration of vacuum-packed samples after 28 d at 0, 3 and 7°C as compared to nitrogen-packed samples.

Method to Determine Foaming Property of Reconstituted Nonfat Dry Milk, Jonathan P. Burlingame-Frey and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 47:140-141

A 250-ml graduated cylinder was modified by attaching it to a blender base assembly. It was used to measure the foaming capacity of reconstituted nonfat dry milk. Measurements of foaming capacity with this device had a lower standard deviation (1.30-2.63) than those made with a conventional method (1.71-9.15). The device is easier to use and has fewer sources of error than conventional methods used to determine foaming capacity.

Relative Numbers of Coliforms, *Enterobacteriaceae* (by Two Methods), and Total Aerobic Bacteria Counts as Determined from Minced Goat Meat, T. R. K. Murthy, Division of Livestock Products Technology, Indian Veterinary Research Institute, Izatnager - 243122, India

J. Food Prot. 47:142-144

Coliforms *Enterobacteriaceae* and total aerobic bacteria poulations were determined for 32 samples of fresh minced goat meat. Surface counts of *Enterobacteriaceae* were significantly higher than the overlay counts and coliform counts. Ratios of the above counts to one another were determined. Ratios of surface counts to overlay counts of *Enterobacteriaceae* were more consistent than the ratios of either count to coliforms. Among the total aerobic bacteria count to indicator ratios, the ratios of the former to surface counts of *Enterobacteriaceae* were consistent.

***Bacillus cereus* Foodborne Illness--An Update,** K. M. Johnson, Cornell University, New York State Agricultural Experiment Station, Department of Food Science and Technology, Geneva, New York 14456

J. Food Prot. 47:145-153

Bacillus cereus causes two distinct forms of gastroenteritis, and also contributes to infections such as mastitis. The two foodborne illness syndromes are caused by toxins that elicit vomiting or diarrhea ca. 4 or 10-12 h, respectively, after consumption of contaminated food. The emetic (vomiting) response is generally associated with rice as a vehicle. Work is required to determine if the syndrome produced in an outbreak is a function of the strain involved, the food implicated, and/or other environmental factors. The heat resistance of *B. cereus* spores and the nonfastidious nature of the organism facilitates survival and/or growth of the organism in a wide variety of foods. This review describes *B. cereus* gastroenteritis, toxins, sources, survival, growth characteristics, enumeration, and prevention.

Calendar

1984

March 18-20, FOOD SANITATION INSTITUTE MID-YEAR EDUCATIONAL CONFERENCE & EXPOSITION, Holiday Inn, Downtown, Baltimore, MD. For more information contact: Jean M. Day, Executive Director, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

March 18-21, AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE ANNUAL MEETING AND CONFERENCE, Kultures and Kurds Klinic, National Cultured Product Evaluations Session. Marriott Hotel, Quorum Center, Dallas, TX. For more information contact: C. Bronson Lane, ACDPI, PO Box 7813, Orlando, FL 52854.

March 19-23, MID-WEST WORKSHOP IN FOOD SANITATION, The Ohio State University. For more information contact: John Lindamood, Dept. of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 22-24, DAIRYMEN'S INSTITUTE AND DAIRY FIELDMEN'S CONFERENCE. University of Missouri-Columbia. Contact: Dr. Barry Steevens, S-103 Animal Sciences Research Center, Columbia, MO 65211. 314-882-3459.

March 25-28, MEATEX (Meat Technology and Food Processing Exhibition). At the National Exhibition Centre in Birmingham, England. For more information contact: Tom Webb, British Trade Development Office, 212-593-2258.

March 27-28, WESTERN FOOD INDUSTRY CONFERENCE. University of California, Davis, 95616. For more information contact: John C. Bruhn or Shirley Rexroat, Dept.of Food Science & Technology, University of California, Davis, CA 95616. 916-752-2192.

March 27-30, MICROBIOLOGICAL QUALITY ASSURANCE IN INDUSTRY, at the University of Sussex, Falmer, Brighton, England. For more information contact: Beverly Humphrey, Scientific Symposia, Ltd., 33-35 Bowling Green Lane, London ECIR 0DA, England.

April 1-3, FOOD INDUSTRY CERTIFICATION/RECERTIFICATION PESTICIDE UPDATE WORKSHOP, Holiday Inn, Harvey, IL. For more information contact: Jean M. Day, Executive Director, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

April 2-3, FOOD TECHNOLOGY CONFERENCE AND SUPPLIER'S EXHIBITION. Breckenridge Concourse Hotel, St. Louis International Airport. Co-sponsored by St. Louis IFT and University of Missouri-Columbia. Contact: Mr. Keith Haffer, The 7-Up Company, 8900 Page Boulevard, St. Louis, MO 63114.

April 2-4, STATISTICAL QUALITY CONTROL SHORT COURSE - Statistical Methods Applied to Productivity Improvement and Quality Control - for the Food Processing Industry. Statistical Methods and Techniques. University of California, Davis. Registration Fee: $180. For further information contact: Robert C. Pearl, Food Science & Technology Dept., University of California, Davis, CA 95616. 916-752-0980.

April 4-6, STATISTICAL QUALITY CONTROL SHORT COURSE - Statistical Methods Applied to Productivity Improvement and Quality Control - for the Food Processing Industry: Application of SQC to the Jobs of Quality. University of California, Davis. Registration Fee: $180. For further information contact: Robert C. Pearl, Food Science & Technology Dept., University of California, Davis, CA. 95616. 916-752-0980.

April 9-11, BIOTECHNOLOGY OF MARINE POLYSACCHARIDES is the topic of the third annual MIT Sea Grant Lecture and Seminar at Massachusetts Institute of Technology, Cambridge, MA. For more information contact: Therese Z. Henderson, MIT Sea Grant Information Center, 77 Massachusetts Ave., Bldg. E38-302, Cambridge, MA 02139. 617-253-7041.

April 9-12, UCD/FDA BETTER PROCESS CONTROL SCHOOL. University of California. Contact: Robert C. Pearl, Department of Food Science & Technology, University of California, Davis, CA 95616. 916-752-0980.

April 12, CHEMICAL ASPECTS OF FOOD SAFETY ONE DAY WORKSHOP by the Eastern Regional Reseach Center, U.S. Dept. of Agriculture, 600 E. Mermaid Lane, Philadelphia, PA 19118. For more information contact: Arthur Miller, 215-233-6525. April 16-18, MIAMI INTERNATIONAL SYMPOSIUM ON THE BIOSPHERE. For more information contact: Ms. Grace Mayfield, Miami International Conference on the Biosphere, Clean Energy Research Institute, University of Miami, PO Box 248294, Coral Gables, FL 33124.

April 16-18 CONFERENCE OF THE MISSOURI MILK, FOOD AND ENVIRONMENTAL HEALTH ASSOCIATION, Ramada Inn, Columbia, MO. For more information contact: Dr. J. E. Edmondson, 201 Eckles Hall, Dept. of Food Science and Nutrition, Columbia, MO 65211. 314-882-2630.

April 18-19, THE JOINT ANNUAL MEETING OF THE AMERICAN DRY MILK INSTITUTE AND THE WHEY PRODUCTS INSTITUTE will be held at the Chicago Marriott O'Hare Hotel, 8535 West Higgins Road, Chicago, IL. For more information contact: Dr. Warren S. Clark, Jr., Exec. Dir., 130 N. Franklin St., Chicago, IL 60606.

April 24-25, FAMFES ANNUAL EDUCATIONAL CONFERENCE, Cypress Gardens Quality Inn, Cypress Gardens, FL. For more information contact: Franklin W. Barber, 1584 Cumberland Ct., Ft. Meyers, FL 33907.

April 25, SOUTHERN CALIFORNIA FOOD PROCESORS SANITATION WORKSHOP FOR THE FOOD PROCESSING AND FOOD SERVICE INDUSTRIES. Presented by the University of California Cooperative Extension with assistance from industry trade associations and food industry personnel. Inn at the Park, Anaheim, Ca. For more information contact: Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616. 916-752-1478.

April 25-27, WORKSHOP II IN FOOD FLVAOR; A HANDS ON COURSE IN FLAVOR APPLICATIONS. For more information contact: G. Reineccius, Dept. of Food Science and Nutrition, University of MN, 1334 Eckles Avenue, St. Paul, MN 55108.

April 30-May 3, ASEPTIC PROCESSING AND PACKAGING WORKSHOP, For more information contact: Dr. James V. Chambers, Purdue University, Dept. of Food Science, West Lafayette, IN 47907. 317-494-8279.

May 2-4, SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL MEETING. Staurolite Inn, South Dakota State University, Brookings, SD. For more information contact: Morris V. Forsting, Secretary-Treasurer, 1320 S. Minnesota Ave., Room 101, Sioux Falls, SD 57105.

May 6-11, FOOD SANITATION INSTITUTE EXECUTIVE LEADERSHIP INSTITUTE IN ENVIRONMENTAL SERVICES MANAGEMENT, University of Illinois, Champagne, IL. For more information contact: Jean M. Day, Executive Director, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

May 7-11, AN INTRODUCTION TO THE SENSORY EVALUATION OF FOOD: EXPERIMENTAL METHODS AND STATISTICAL ANALYSIS is a 5-day course for beginning sensory scientists. To be held at the University of California - Davis. For more information contact: Michael O'Mahony, Department of Food Science & Technology, UC Davis, Davis, CA 95616. 916-752-0980.

May 7-11, INTERNATIONAL MILK PROTEIN CONGRESS. For more information contact: International Milk Protein Congress, Congress Secretariat, PO Box 399, 5201 AJ's-Hertogenbosch, The Netherlands.

May 9-11, NATIONAL CONFERENCE FOR FOOD PROTECTION, Hyatt Regency Crystal City, Arlington, VA. For more information contact: Charles W. Felix, 1025 Connecticut Ave., NW, Suite 1015, Washington, DC 20036. 202-347-0020.

May 14-16, SEMINAR ON FERMENTED MILK, International Dairy Federation, Avignon, France. For more information contact: Harold Wainess, Secretary U. S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

May 15-17, SANITATION - BACK TO BASICS II, Food Sanitation Institute Western Regional Educational Conference, Oakland Airport Hilton, Oakland, CA. For more information contact: Jean M. Day, Executive Director, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

May 19-23, 65TH NRA RESTAURANT, HOTEL-MOTEL SHOW, Chicago's McCormick Place. For more information contact: Jeffrey R. Prince, Senior Director, 800-424-5156 or 202-638-6100.

Aug. 5-9, IAMFES ANNUAL MEETING, Edmonton Inn, Edmonton, Alberta, Canada. For more information contact: Peggy Marce, Alberta Association of Milk, Food & Environmental Sanitarians, PO Box 8446, Station F, Edmonton, Alberta, Canada T6H 5H3 or call IAMFES at 515-232-6699.

Holders of 3-A Symbol Council Authorizations on August 15, 1983

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Robert E. Holtgrieve, Ass't. Sec'y.-Treasurer, W255 N477 Grandview Blvd., Suite 100, Waukesha, Wisconsin 53186

01-06 Storage Tanks for Milk and Milk Products

115 Alfa-Laval, Ltd. (9/28/58)
(not available in USA)
113 Park Street South
Peterborough, Ontario, Canada K9J 3R8

28 Cherry-Burrell Corporation (10/3/56)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

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

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

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

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

02-08 Pumps for Milk and Milk Products

325 Albin Pump, Inc. (12/19/79)
1260 Winchester Pkwy., Suite 209
Smyrna, Georgia 30080

65R Alfa-Laval, Inc. (5/22/57)
(Flow Equipment Division)
5718-52nd St.
Kenosha, Wisconsin 53141

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

212R Babson Brothers Co. (2/20/70)
2100 S. York Rd.
Oak Brook, Illinois 60521

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

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

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

377 Energy Service Co. (2/4/83)
B200 Walker Bldg., 734 15th St., NW
Washington, DC 20005

404 Fullwood-Packo N.V. (8/25/83)
(Not available in USA)
Cardijnlaan 10
8160 Diksmuide, Belgium

348 ITT Jabsco Ltd. (12/3/81)
(A Unit of ITT MARC Div.)
3200 Bristol St., Suite 701
Costa Mesa, California 92626

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

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

372 The Kontro Co., Inc. (12/20/82)
450 W. River St., P.O. Box 30
Orange, Massachusetts 01364

26R Ladish Co., Tri-Clover Div. (9/29/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

373 Luwa Corporation (12/27/82)
4404 Chesapeake Dr.
Charlotte, North Carolina 28216

364 M D Pneumatics, Inc. (7/28/82)
4840 W. Kearney
Springfield, Missouri 65803

319 Mono Group, Inc. (3/21/79)
847 Industrial Dr.
Bensenville, Illinois 60106

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

375 Pasilac, Inc. (1/25/83)
660 Taft St., NE
Minneapolis, Minnesota 55413

241 Puriti, S.A. de C V. (9/12/72)
(not available in USA)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

148R Robbins & Myers, Inc. (4/22/64)
1895 W. Jefferson St.
Springfield, Ohio 45506

306 Stamp Corporation (5/2/78)
2410 Parview Rd.
Middleton, Wisconsin 53562

332 Superior Stainless, Inc. (12/10/80)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115

370 Texas Process Equipment Co. (11/9/82)
5880 Bingle Rd.
Houston, Texas 77092

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

219 Tri-Canada, Inc. (2/15/72)
6500 Northwest Dr.
Mississauga, Toronto
Ontario, Canada L4V 1K4

175R Universal Milking Machine Division (12/26/65)
Universal Cooperatives, Inc.
408 South First Ave.
Albert Lea, Minnesota 56007

329 Valex Products Corp. (6/10/80)
20447 Nordhoff St.
Chatsworth, California 91311

52R Viking Pump Division (12/31/56)
Houdaille Industries, Inc.
406 State St.
Cedar Falls, Iowa 50613

5R Waukesha Foundry Division (5/6/56)
Abex Corporation
1300 Lincoln Avenue
Waukesha, Wisconsin 53186

408 Westfalia Systemat (10/18/83
1862 Brummel Drive
Elk Grove Village, IL 60007

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

344 Alfa-Laval, Inc. (8/23/81)
2115 Linwood Ave.
Ft. Lee, New Jersey 07024

390 American Lewa, Inc. (6/9/83)
11 Mercer Rd.
Natick, Massachusetts 01760

247 Bran & Lubbe, Inc. (4/14/73)
512 Northgate Pkwy.
Wheeling, Illinois 60090

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

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

75 Gaulin Corporation (9/26/57)
44 Garden St.
Everett, Massachusetts 02149

256 Liquipak Int'l. Inc. (1/23/74)
2285 University Ave.
St. Paul, Minnesota 55114

309 Rannie Tech, Inc. (7/19/78)
1050-29th Ave. SE
Minneapolis, Minnesota 55414

05-13 Stainless Steel Automotive Milk Transportation Tanks for Bulk Delivery and/or Farm Pick-up Service

379 Bar-Bel Fabricating Co., Inc. (3/15/83)
RR 2
Mauston, Wisconsin 53948

70R Brenner Tank, Inc. (8/5/57)
450 Arlington Ave., P.O. Box 670
Fond du Lac, Wisconsin 54935

66 Dairy Equipment Co. (5/29/57)
1919 South Stoughton Rd.
P.O. Box 8050
Madison, Wisconsin 53716

388 Frell, Inc. (5/24/83)
1313 Corn Products Rd.
Corpus Christi, Texas 78408

45 The Heil Co. (10/26/56)
3000 W. Montana P.O. Box 593
Milwaukee, Wisconsin 53201

40 Hills Stainless Steel & Equip., Inc. (10/20/56)
405 S. Water
Hills, MN 56138

297 Indiana Tank Co., Inc. (8/29/77)
P.O. Box 366, N. Main St. Rd.
Summitville, Indiana 46070

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

305 Light Industrial Design Co., Inc. (3/23/78)
8631-A Depot Rd.
Lynden, Washington 98264

338 Murphy's, Inc. (4/20/81)
Box 18, Route 2
Avon, Minnesota 56310

85 Polar Manufacturing Co. (12/20/57)
Holdingford, Minnesota 56340

121 Technova, Inc. (12/9/59)
(not available in USA)
1450 Hebert St. CP758
Drummondville, Quebec
Canada J2C 2A1

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

25 Walker Stainless Equipment Co. (9/28/56)
New Lisbon, Wisconsin 53950

08-17 Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products

349 APN, Inc. (12/15/81)
400 W. Lincoln
Caledonia, Minnesota 55921

403 APV Equipment, Inc. (8/22/82)
395 Fillmore Ave.
Tonawanda, NY 14150

291 Accurate Metering Systems, Inc. (6/22/77)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

67R Alfa-Laval, Inc. (6/10/57)
Flow Equipment Div.
5718-52nd St.
Kenosha, Wisconsin 53141

322 Alfa-Laval, Ltd. (7/16/79)
(not available in USA)
113 Park Street South
Peterborough, Ontario
Canada K9J 3R8

380 Allegheny Bradford Corp. (3/21/83)
P.O. Box 264
Bradford, Pennsylvania 16701

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

245 Babson Bros. Company (2/12/73)
2100 So. York Rd.
Oak Brook, Illinois 60521

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

411 Capital Equipment Corp. (11/15/83)
2421 Darwin Road
Madison, WI 53704

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

407 Continental Disc Corp. (10/14/83)
4103 Riverside NW
Kansas City, MO 64150

260 Crepaco, Inc. (5/22/74)
100 South CP Ave.
Lake Mills, Wisconsin 53551

271 The Foxboro Co. (3/8/76)
38 Neponset Ave.
Foxboro, Massachusetts 02035

369 IMEX, Inc. (11/3/82)
6733 So. Sepulveda Blvd.
Suite E
Los Angeles, California 90045

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

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

398 Ladish Co., Tri-Clover Div. (7/29/83)
9201 Wilmot Road
Kenosha, WI 53141

389 Lee Industries, Inc. (5/31/83)
P.O. Box 537
Port Matilda, Pennsylvania 16870

239 Lumaco, Inc. (6/30/72)
P.O. Box 688
Teaneck, New Jersey 07666

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

374 Pasilac, Inc. (1/25/83)
660 Taft St., NE
Minneapolis, Minnesota 55413

242 Puriti, S.A. de C.V. (9/12/72)
(not available in USA)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

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

376 Rollix Bearings, Inc. (1/25/83)
563 A. J. Allen Circle
Wales, WI 53183

350 Rosista, Inc. (1/7/82)
808 No. Central Rd.
P.O. Box 685
Wood Dale, Illinois 60191

287 Sanitary Processing Equipment Corp. (1/14/77)
P.O. Box 178, Salino Station
Syracuse, New York 13201

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

391 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

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

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

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

191R Tri-Canada, Inc. (11/23/66)
6500 Northwest Dr.
Mississauga, Ontario
Canada L4V 1K4

250 Universal Milking Machine Div. (6/11/73)
Universal Cooperatives, Inc.
408 First Avenue, So.
Albert Lea, Minnesota 56007

304 VNE Corporation (3/16/78)
1415 Johnson St., P.O. Box 187
Janesville, Wisconsin 53547

278 Valex Products Corp. (8/30/76)
20447 Nordhoff St.
Chatsworth, California 91311

383 Walker Stainless Equipment Co. (5/4/83)
601 State Street
New Lisbon, Wisconsin 53950

384 Walker Stainless Equipment Co. (5/4/83)
601 State Street
New Lisbon, Wisconsin 53950

86R Waukesha Specialty Co., Inc. (12/20/57)
Hwy 14
Darien, Wisconsin 53144

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

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

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

206 The Foxboro Co. (8/11/69)
38 Neponset Ave.
Foxboro, Massachusetts 02035

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

32 Taylor Instrument Co. (10/4/56)
Div. of Combusion Eng.
95 Ames St.
Rochester, New York 14601

10-00 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

35 Ladish Co., Tri-Clover Div. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

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

11-03 Plate-type Heat Exchangers for Milk and Milk Products

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

316 Agric Machinery Corp. (2/7/79)
2 Green Village Rd., P.O. Box 6
Madison, New Jersey 07940

17 Alfa-Laval, Inc. (8/30/56)
2115 Linwood Ave.
Ft. Lee, New Jersey 07024

120 Alfa-Laval, Ltd. (12/3/59)
(DeLaval Agric. Div.)
11100 No. Congress Ave.
Kansas City, Missouri 64153

326 American Vicarb Corp. (2/4/80)
77 Oriskany Dr.
Tonawanda, New York 14150

30 Cherry-Burrell Corp. (10/2/56)
(A Unit of AMCA Int'l. Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

38 Crepaco, Inc. (10/19/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

362 Kroeze Dairy Equipment, Inc. (7/20/82)
14393 Euclid Ave.
Chino, California 91710

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

360 Laffranchi Wholesale Co. (7/12/82)
P.O. Box 698
Ferndale, California 95536

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

365 Pasilac Therm, Inc. (9/8/82)
660 Taft St., N.E.
Minneapolis, Minnesota 55413

279 The Schlueter Co. (8/30/76)
112 E. Centerway
Janesville, Wisconsin 53545

12-04 Tubular Heat Exchangers for Milk and Milk Products

307 Alfa-Laval, Inc. (5/2/78)
Flow Equipment Div.
5718-52nd St.
Kenosha, Wisconsin 53141

248 Allegheny Bradford Corp. (4/16/73)
P.O. Box 264
Bradford, Pennsylvania 16701

243 Babson Bros. Company (10/31/72)
2100 So. York Rd.
Oak Brook, Illinois 60521

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

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

252 Laffranchi Wholesale Co. (12/27/73)
P.O. Box 698
Ferndale, California 95536

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

298 Sanitary Processing Equipment Corp. (2/4/83)
P.O. Box 178, Salino Station
Syracuse, New York 13208

392 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

393 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

394 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

395 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

13-06 Farm Milk Cooling and Holding Tanks

240 Babson Bros. Company (9/6/72)
2100 So. York Rd.
Oak Brook, Illinois 60521

11R Crepaco, Inc. (7/25/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

119R DCI, Inc. (10/28/59)
P.O. Box 1227
St. Cloud, Minnesota 56302

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

49R DeLaval Agric. Div. (12/5/56)
Alfa-Laval, Inc.
11100 No. Congress Ave.
Kansas City, Missouri 64153

336 Merle D. Haberer (2/3/81)
P.O. Box 220
Bowdle, South Dakota 57428

179R Heavy Duty Products (Preston) Ltd. (3/8/66)
(not available in USA)
1261 Industrial Rd.
Cambridge (Preston)
Ontario Canada N3H 4W3

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

16R Zero Manufacturing Co. (8/27/56)
811 Duncan Ave.
Washington, Missouri 63090

16-04 Evaporators and Vacuum Pans for Milk and Milk Products

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

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

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

356 Damrow Co. (3/10/82)
(Div. of DEC Int'l. Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

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

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

299 Stork Food Machinery, Inc. (11/17/77)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

387 Unitech Div. of the Graver Co. (5/13/83)
2720 Hwy. 22
Union, New Jersey 07083

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

311 Wiegand Evaporators, Inc. (8/28/78)
8940 Rt. 108
Columbia, Maryland 21045

17-06 Fillers and Sealers of Single Service Containers for Milk and Milk Products

366 Autoprod, Inc. (9/15/82)
12 So. Denton Ave.
New Hyde Park, New York 11040

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

382 Blocpak Canada, Inc. (4/15/83)
Suite 1818, 130 Adelaide St. West
Toronto, Ontario, Canada M5H 3P5

351 Brik Pak, Inc. (1/7/82)
P.O. Box 402605
Dallas, Texas 75240

192 Cherry-Burrell Corp. (1/3/67)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

324 Conoffast (11/29/79)
711 Jorie Blvd.
Oak Brook, Illinois 60521

137 Ex-Cell-O Corp. (10/17/62)
850 Ladd Rd., Bldg. "A"
Walled Lake, Michigan 48088

352 GMS Engineering (1/12/82)
1936 Sherwood St.
Clearwater, Florida 33515

220 Liquipak International, Inc. (4/24/71)
2285 University Ave.
St. Paul, Minnesota 55114

330 Milliken Packaging (8/26/80)
White Stone, South Carolina 29353

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

211 Twinpak, Inc. (Canada) (2/4/70)
2225 Hymus
Dorval, Quebec, Canada H9P 1J8

19-03 Batch and Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amdended

146 Cherry-Burrell Corp. (12/10/63)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

401 Coldelite Corp. of America (8/22/82)
Robinson Rd. & Rt. 17 So.
Lodi, NJ 07644-3897

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

286 O. G. Hoyer, Inc. (12/8/76)
201 Broad St.
Lake Geneva, Wisconsin 53147

412 Sani Mark, Inc. (11/28/83)
5767 Dividend Road
Indianapolis, IN 46241

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

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

262 Alfa-Laval, Inc. (11/11/74)
11100 W. Congress Ave.
Kansas City, Missouri 64153

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

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

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

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

312 Sanitary Processing Equipment Corp. (9/15/78)
P.O. Box 178, Salino Station
Syracuse, New York 13201

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

23-01 Equipment for Packaging Frozen Desserts, Cottage Cheese, and Similar Milk Products, as Amended

174 Anderson Bros. Manufacturing Co. (9/28/65)
1303 Samuelson Rd.
Rockford, Illinois 61101

209 Doboy Pkg, Mach. Div. of Nordson Corp. (7/23/69)

215 No. Knowles Ave.
New Richmond, Wisconsin 54017

302 Eskimo Pie Corp. (1/26/78)
530 E. Main St.
Richmond, Virginia 23219

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

222 Maryland Cup Corp. (11/15/71)
Owings Mills, Maryland 21117

24-00 Non-coil Type Batch Pasteurizers

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

402 Coldelite Corp. of America (8/22/83)
Robinson Rd. & Rt. 17 So.
Lodi, NJ 07644-3897

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

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

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

25-00 Non-coil Type Batch Processors for Milk and Milk Products

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

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

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

177 Girton Manufacturing Co. (2/18/66)
Millville, Pennsylvania 17846

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

202 Walker Stainless Equipment Co. (9/24/68)
New Lisbon, Wisconsin 53950

26-02 Sifters for Dry Milk and Dry Milk Products

173 Blaw-Knox Food & Chemical Equip. Co. (9/20/65)
P.O. Box 1041
Buffalo, New York 14240

229 Russell Finex, Inc. (3/15/72)
156 W. Sandford Blvd.
Mt. Vernon, New York 10550

363 Kason Corp. (7/28/82)
231 Johnson Ave.
Newark, New Jersey 07108

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

172 SWECO, Inc. (9/1/65)
6033 E. Bandini Blv.
P.O. Box 4151
Los Angeles, California 90051

176 Sprout-Waldron, Koppers Co., Inc. (1/4/66)
Muncy, Pennsylvania 17756

27-01 Equipment for Packaging Dry Milk and Dry Milk Products

347 Accurate Metering Systems (10/28/81)
1731-33 Carmen Dr.
Elk Grove Village, IL 60007

353 All-Fill, Inc. (3/2/82)
40 Great Valley Pkwy.
Malvern, Pennsylvania 19355

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

313 St. Regis Paper Co. (10/10/78)
Pkg. Mach. Group
1881 W. North Temple
Salt Lake City, Utah 84116

28-00 Flow Meters for Milk and Liquid Milk Products

272 Accurate Metering Systems (4/2/76)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

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

223 C-E Invalco (11/15/71)
Combustion Engineering, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

265 Electronic Flo-Meters, Inc. (3/10/75)
P.O. Box 38269
Dallas, Texas 75238

359 Emerson Elec. Co. (6/11/82)
Brooks Instrument Div.
P.O. Box 450, North 301
Statesboro, Georgia 30458

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

224 The Foxboro Co. (11/16/71)
38 Neponset Ave.
Foxboro, Massachusetts 02035

399 E. Johnson Engineering & Sales (8/3/83)
11 N. Grant St.
Hinsdale, IL 60521

320 Max Machinery, Inc. (3/28/79)
1420 Healdburg Ave.
Healdburg, California 95448

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

270 Taylor Instrument Co. (2/9/76)
Div. of Combustion Eng.
95 Ames St.
Rochester, New York 14601

386 Turbo Instruments (5/11/83)
2133 Fourth St.
Berkeley, California 94710

29-00 Air Eliminators for Milk and Fluid Milk Products

340 Accurate Metering Systems, Inc. (6/2/81)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

30-00 Farm Milk Storage Tanks

257 Babson Bros. Company (2/7/74)
2100 S. York Rd.
Oak Brook, Illinois 60521

31-00 Scraped Surface Heat Exchangers, as Amended

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

323 Anco-Votator Div. (7/26/79)
Cherry-Burrell Corp.
P.O. Box 35600
Louisville, KY 40232

323 Cherry-Burrell Corp. (7/26/79)
(A Unit of AMCA Int'l., Inc.)
2400-6th St., SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

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

361 Damrow Co. (7/12/82)
(A Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

32-00 Uninsulated Tanks for Milk and Milk Products

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

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

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

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

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

33-00 Polished Metal Tubing for Dairy Products

310 Allegheny Bradford Corp. (7/19/78)
P.O. Box 264
Bradford, Pennsylvania 16701

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

289 Ladish Co., Tri-Clover Div. (1/21/77)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

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

368 Gordon J. Rodger & Sons Ltd. (10/7/82)
P.O. Box 186
Blenheim, Ontario Canada N0P 1A0

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

345 Trent Tube Div., Crucible, Inc. (9/16/81)
2188 Church St.
East Troy, Wisconsin 53120

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

35-00 Continuous Blenders

292 Waukesha Div., Abex Corp. (8/25/77)
1300 Lincoln Ave.
Waukesha, Wisconsin 53186

36-00 Colloid Mills

293 Waukesha Div., Abex Corp. (8/25/77)
1300 Lincoln Ave.
Waukesha, Wisconsin 53186

37-00 Presure and Level Sensing Devices

318 Anderson Instrument Co., Inc. (4/9/79)
R.D. #1
Fultonville, New York 12072

317 C-E Invalco (2/26/79)
Combustion Engineering, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

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

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

328 Rosemount, Inc. (5/22/80)
12001 W. 78th St.
Eden Prairie, Minnesota 55344

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

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

38-00 Cottage Cheese Vats (In Press)

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

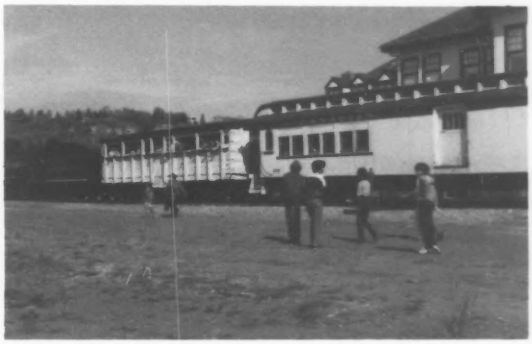
40-00 Bag Collectors for Dry Milk and Dry Milk Products

406 Chicago Conveyor Corporation (10/5/83)
330 LaLonde Avenue
Addison, IL 60101

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

ENJOY A VOYAGE TO YESTERDAY!

During the 71st Annual Meeting of the IAMFES to be held in Edmonton, Alberta, August 5-9, 1984, you'll have the opportunity to step back in time more than one hundred years, to experience what life used to be like in frontier and pioneer days - and learn about those who made Edmonton the vibrant, vital city that it is today. The sights and sounds of the past are part of the atmosphere at Fort Edmonton Park where you will stroll down the boardwalk of 1885 Street, tour a real frontier fort, ride on an authentic steam driven train, and top off the evening with a barbequed dinner of world-famous Alberta beef. Then wake up the next morning to a Klondike Breakfast held in retrospect of the Gold Rush of yet another era in Edmonton's history. You - and your family - are sure to have a wonderful time. Join us in Edmonton in '84!



I'M LOOKING FOR TROUBLE.

TRAINED TO FIND IT.
If something is causing you sanitation trouble, I'll find it. I'm trained in effective (and cost effective) ways to keep your operation clean and running smoothly.

TRAINED TO SOLVE IT.
I'll bring you the latest and the best product knowledge. Plus team up with veterinarians, university specialists and others to help you solve your problems.

THOROUGH.
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I'M ARMED TO THE TEETH.
With quality Surge detergents, acids, sanitizers and teat dips. Each a proven performer. All from a single source.

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I'm trained to work side by side with you. Doing whatever it takes to get your problems solved. And keep them solved. For the Surge sanitation program tailored to your operation, call me today. Or write Babson Bros. Co., 2100 South York Road, Oak Brook, Illinois 60521.