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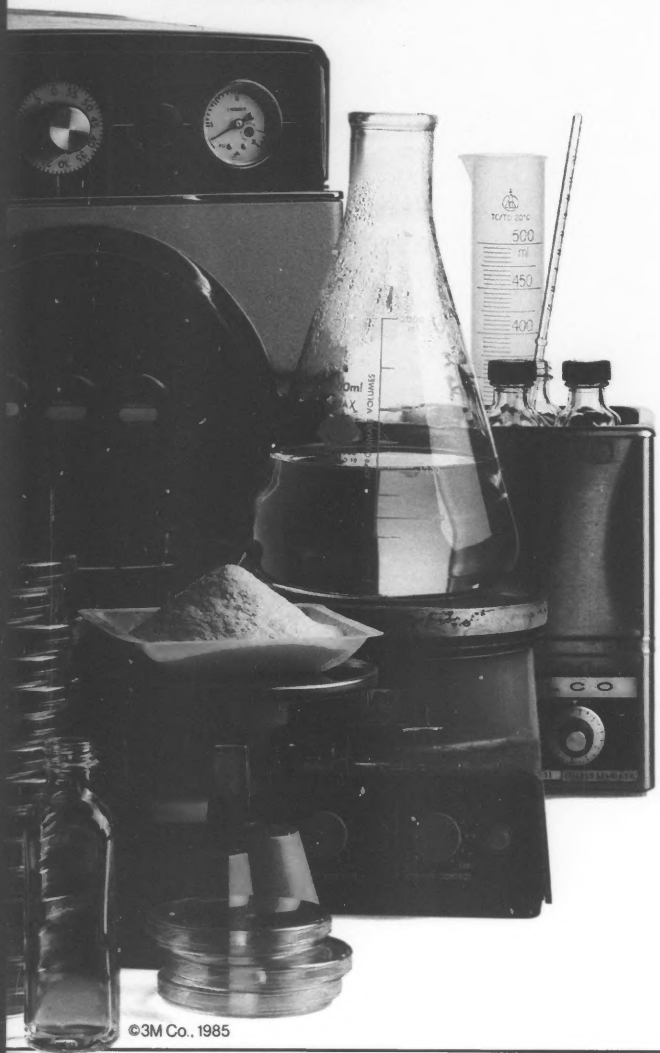

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Dairy and Food Sanitation

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Iowa's Manufacturing-Grade Milk Quality

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The quality of raw milk that dairy food manufacturing firms process, influences to a large extent the flavor, shelf-life and yield of the dairy foods they market. This is true especially for bacteriological quality.

Through the efforts of many people involved with the dairy industry, the quality of manufacturing-grade milk has improved each year for the past several years in Iowa. Approximately one-third of Iowa's dairy farms and Iowa's milk crop are classified as manufacturing-grade.

Results of bacterial and somatic cell counts made on farm milk samples show that much of the manufacturing-grade milk marketed by Iowa dairy farmers meets, and in some cases, exceeds the Grade A standards. However, a small percent of the manufacturing-grade milk is still of poor and unacceptable bacteriological quality. Poor quality milk should not be used in the manufacture of dairy foods.

In the USA there are two general grade classifications of raw milk quality, based on dairy farm production conditions and on various chemical and bacterial criteria for the milk from these farms, these are Grade A and manufacturing-grade.

"Grade A" dairy farms must market milk with a total aerobic bacteria count of 100,000 or less per ml. of milk.

For farms designated as manufacturing-grade, market milk is classified either Class I, II or Undergrade, based on bacterial test results. Table 1 illustrates these classifications. Class I milk has a Standard Plate Count (SPC) or its equivalent of 500,000 or less per ml. Class II milk may have a count exceeding 500,000 but less than 3 million bacteria per ml. A United States proposal to change the Undergrade classification to not over 1 million may go into effect July 1, 1986.

Since 1971, dairy laboratories in Iowa have evaluated the bacterial quality of manufacturing-grade milk using the Plate Loop Count (PLC), as illustrated in Table 2. Prior to that time the Direct Microscopic Clump Count (DMCC) and the resazurin and methylene blue dye reduction tests were allowed. In 1969 Iowa law required the SPC or its equivalent to be used. The DMCC and dye tests were disallowed for evaluation of manufacturing-grade milk for pay purposes.

TABLE 1. *USDA and Iowa raw milk bacterial standards.*

Manufacturing-Grade*	
Class	Standard Plate Count or Equivalent
1	< 500,000/ml
2	<3,000,000/ml
Undergrade	>3,000,000/ml

*1963 USDA recommended standards
*1969 Adopted by Iowa

GRADE A
<100,000/ml

TABLE 2. *Bacterial evaluation of raw milk in Iowa.*

Year	Methods
1959	Direct Microscope Clump Count Methylene Blue 5.5 hours Resazurin P/74 in 2.75 hours
1969	Standard Plate Count or equivalent (Plate Loop Count)
1971	Adoption of Plate Loop Count by Iowa dairy labs

Manufacturing-grade milk quality in Iowa has shown steady and significant improvement during the past 13 to 14 years. The bacterial test results from 10 dairy laboratories that determine the PLC on most all the Iowa manufacturing-grade farm milk samples are sent to me each month for summarization. A monthly newsletter reports the statewide results to the Iowa dairy industry.

Table 3 summarizes the results of this testing program and illustrates the trend in Iowa's manufacturing-grade milk quality since 1971.

TABLE 3. *Iowa's manufacturing-grade milk quality.*

	Class I	Class II	Under-grade	Number Samples
	Percent			
1971	60.1	31.1	8.8	47,737
1972	66.3	27.9	5.8	70,968
1973	64.5	27.4	8.1	61,293
1974	72.8	21.4	5.8	44,784
1975	73.9	21.7	4.4	45,536
1976	74.6	20.4	5.0	48,166
1977	77.1	18.1	4.2	48,457
1978	79.0	17.4	3.6	47,641
1979	81.4	15.2	3.4	39,856
1980	82.3	14.2	3.5	50.573
1981	84.5	12.8	2.7	37,594
1982	87.0	10.6	2.4	44,381
1983	88.4	9.7	1.9	52,928
1984	88.9	9.4	1.7	47,247
1985*	90.3	7.9	1.8	13,911

*January - April 1985.

In 1971, 60.1% of the 47,737 manufacturing-grade farm milk samples tested that year by the PLC method were placed in Class I (< 500,000/ml). The general trend for the percent of milk placed in the Class I category has been upward to the point that now 90% or more of all manufacturing-grade farm milk samples tested are in this category. In addition, a significant portion of manufacturing-grade farm milk samples actually is of Grade A bacterial quality according to most dairy laboratory directors.

As further evidence of the improvement in the bacterial quality of Iowa's manufacturing-grade milk, the percent of samples placed in Class II (500,000 - 3 million) has decreased from 31.1% in 1971 to around 8% at the present time. Also, the percentage of Undergrade samples has declined from 8.8% in 1971 to 1.8% in 1985.

The Iowa dairy industry has made excellent progress in improving farm milk quality in the past 20 years. This reflects the general and gradual improvement in recent years in the quality of processed dairy foods. Many factors during these years have influenced this improvement in the bacteriological quality of raw milk at the farm level. Table 4 summarizes some of these factors. Among the more important influences has been the change in bacterial estimating methods - from chemical tests (resazuring and methylene blue) and microscopic counts that did not detect accurately enough the numbers of the dominant psychrotrophic flora of well cooled bulk-tank milk, to plate count methods. Iowa law required this change in laboratory testing in 1969 after research at Iowa State University during the late 1950's revealed that the tests were not identifying farms marketing poor bacteriological quality milk (3,4).

The Iowa milk laws adopted in 1959 required that processing plants pay farmers a 5% price differential based on the bacteriological quality of the milk they marketed. When the price of milk rose to $10-$14 per hundred

TABLE 4. *Factors influencing the improvement in Iowa's raw milk bacterial quality.*

1. Change from can to bulk tank milk storage on farms--1960s and 1970s
2. Five percent pay price differential for bacterial quality--1959
3. Decline in number of less dedicated dairy farmers
4. Change from chemical reduction and microscopic tests to plate count methods--1969
5. Milk house requirements
   - Bulk tank 1973
   - All dairy farms 1979
6. Consolidation of creameries to fewer processing plants--more professional field and laboratory personnel
7. Adoption of Plate Loop Count Procedures--1971
8. Improvements in sanitation aids
9. Quality premiums--since 1978
10. Education efforts--Iowa State University Extension Service

pounds during the late 1970's, the required 5% price differential had a substantial influence on a farmer's dedication to milk quality. Complementing this state law requiring price differential has been a trend within the past few years for milk cooperatives and privately owned dairy food manufacturers to pay farmers premiums for milk that meets prescribed quality standards, including low bacterial and somatic cell counts.

During the past 20 years in Iowa, other influences have improved milk quality. Dairy farmers have switched from storing milk in 10 gallon cans to bulk tanks. Many farmers that were not dedicated to being dairymen, dropped dairying on their farms. The trend to fewer dairy farms and more cows per farm has also encouraged those more quality conscious dairymen. Coupled with this trend has been the change from several hundred small creameries to a few large processing plants. These changes have included more professional field and laboratory staff and better equipped laboratory facilities.

Behind this change has been the educational work and urging for quality improvement from the faculty of the Department of Food Technology at Iowa State University.

Table 5 illustrates the trends in numbers of dairy farms in Iowa and the percent of those farms that are classified as manufacturing-grade. In 1960, 85% of Iowa's 87,930 dairy farms were classified as manufacturing-grade. In 1984, 37% of the 9,000 dairy farms in Iowa were still classified as manufacturing-grade. The other 63% of the dairy farms are classified as Grade A. Currently one third of Iowa's 4 billion pound milk crop is classified as manufacturing-grade.

In 1983, Iowa farmers marketed 1.5 billion pounds of manufacturing-grade milk. If 10% of this milk is of poor (Class II and Undergrade) bacterial quality, as is shown by Iowa dairy laboratory test results, and if this quantity of milk would be eliminated from the market and not used for human food, this 150 million pounds would help cut milk surpluses. Nationally 19.4 billion pounds of manufacturing-grade milk was marketed in 1983. Assum-

TABLE 5. *Iowa's manufacturing-grade dairy farms.*

	Total Number Dairy Farms	% Manufacturing-grade
1960	87,930	85
1965	49,969	77
1970	23,000	67
1975	16,500	55
1980	14,000	41
1984	9,000	37

ing that 10% of this milk is of poor bacterial quality and also that this milk not be used for processing in dairy foods, the milk surplus would be reduced by nearly 2 billion pounds. The other side of the coin is the concern among dairy food manufacturers to maintain maximum plant efficiencies by maintaining their processing facilities near full production capacity.

In 1981 Johnson (2) wrote of Alberta, Canada's dairy industry efforts to improve milk quality. The result was a SPC maximum for fluid milk of 75,000/ml and 200,000/ml for their "industrial" milk. The industrial milk maximum was 2 million/ml prior to the change in standards. He reported that a high percentage of the milk tested recently met these new standards.

Most dairy microbiologists would agree that milk containing bacterial counts exceeding 3 million per milliliter should not be used for human food. The same could be argued for milk with bacterial counts that exceed 500,000/ml. Where do we draw the line on maximum allowable bacterial counts? Certainly much higher count milk has been consumed in one form or another over the years with minimum consequence. We do know, however, the close relationship between large numbers of bacteria and their heat resistant enzymes in raw milk that influence the flavor of milk and dairy foods, cheese yield, and shelf-life of many dairy foods. Cousin (1) in 1982 reviewed these and other influences that psychrotrophic microorganisms have on dairy foods.

The technology is readily available for all dairy farms to meet Grade A requirements. The need is also there for all milk to be of top quality that is to be used in fluid and manufactured dairy foods. As an aid to continue to improve not only raw milk quality but all dairy foods, as well as help eliminate the milk surplus, the manufacturing-grade standard should be eliminated and all milk be on one standard of excellence.

Now also is the time to go for improved standands for this one grade of milk. Table 6 summarizes my suggested standards on this matter. Producers should be paid substantially less when they do not at least meet these standards. Some dairy organizations now pay premiums for milk of such quality.

Four basic factors have and must continue to work in concert to bring about improvement in raw milk quality. Table 7 lists these 4 basic factors. They relate to regulations, education, technology advances and monetary incentives.

TABLE 6. *LaGrange's suggested standards for all raw milk.*

Standard Plate Count or Equivalent	< 25,000/ml
OR	
Preliminary Incubation and SPC	< 50,000/ml
Somatic Cell Count	<400,000/ml
No antibiotics or added water	

TABLE 7. *Summary - factors necessary to improve bacterial quality of raw milk.*

1. REGULATIONS
   - Realistic rules
   - Fair enforcement
2. EDUCATION
   - Research
   - Field and laboratory personnel training
   - Counseling dairy farmers
3. TECHNICAL ADVANCES
   - Sanitation methods and chemicals
   - Refrigerated storage
4. MONETARY INCENTIVES

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The Problem With Bathtub Mastitis Remedies

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The following paper was presented by Dr. Crawford at the National Mastitis Council Meeting in Las Vegas, Nevada on February 16, 1985.

Bathtub mastitis remedies, as well as being illegal are unsafe for the cow and the consumer. Though these mixtures are secretly touted as being more effective than legal mastitis products, most will never be approved by FDA because few present promise of being proved both safe and effective.

We live in a strange time. In many ways these are, in fact, the best of times. In other ways, these are the absolute pits.

Recently, my wife and I were in a very popular and very sophisticated gourmet food store in the Washington, D.C. area situated only a few miles from the National Institutes of Health, the Food and Drug Administration, and USDA's Agricultural Research Center. We were picking out some cheeses for a party that would be held later that evening at the National Gallery. In a quest for 7 or 8 different cheeses, we quickly exhausted our expertise. After summoning the cheese steward, we found him to be, as you would expect, an elegant French-American. He enthusiastically recommended a raw milk cheese from France.

I gently reminded him of Brucellosis, Listeriosis, Salmonellosis, Campylobacteriosis, and a few other sometimes fatal diseases. He replied, "What you must understand, Monsieur, is that cheese is a living thing which is fully capable of fighting germs until it is pasteurized, then it is lifeless whereupon it becomes quite vulnerable to contamination."

The worse thing was that he really believed all that and was not just trying to sell cheese. Louis Pasteur, Robert Koch, and Sir William Osler must have had similar conversations with cheese-mongers but the last one of these luminaries died over a half-century ago and this kind of destructive ignorance is still with us.

Similarly, the veterinary drugs of the early twentieth century were, for the most part, not sterile, not pH adjusted, and neither safe nor effective. For milk fever, the popular Peroncito remedy consisted of infusing caustic potassium iodide into the udder. And if the cow lived, she would never have milk fever again. Coincidentally, she likewise would never give milk again.

Peroncito, a noble Italian veterinarian, was honored at the 7th World Veterinary Congress in Baden-Baden, Germany, in 1899 for having pioneered intramammary infusion. Through serendipity, he had also developed a permanent cure for mastitis for when you totally replace the mammary glandular tissue with scar tissue, you have cured mastitis and milk fever forever.

Happily in 1929, Dryer and Gregg at Edinburgh announced the development of calcium gluconate for milk fever. By that time, many in the livestock agriculture community had taken notice of some of the enduring side-effects of caustic udder infusion and were pumping up the udder with bicycle pumps and tying the teats with ribbons to prevent the air from escaping in an effort to prevent milk fever.

We still have not discovered any drug for mastitis as specific as calcium gluconate is for milk fever. That, among other reasons, is why I believe you could sell potassium iodide today. In fact, since potassium iodide could not be approved by FDA, I am sure you could sell it.

Mastitis cures are kind of like cancer cures. Since it is not possible to guarantee complete recovery, the door is opened for the quack. The *modus operandi* of the quack is to mix up something in a bathtub without regard for sterility or pH, tout it as a miracle cure, and sell it for a disease entity for which only a real miracle would be required for a majority cure rate.

The current list of approved mastitis infusion products contains drugs from almost every category of antibiotics ever developed, including synthetic penicillins and even the cephalosporins, and more are on the way. But none of these will cover-up bad management, poor sanitation, improper feeding practices, inadequate genetics, or even - a dysfunctioning vacuum pump. Today's FDA approved mastitis products are important adjuncts to mastitis control programs but none are, or likely will

ever be, what calcium gluconate is to milk fever or insulin is to diabetes or pasteurization is to cheese.

In teaching veterinary pharmacology over a period of 15 years, I tried to bring a generation of University of Georgia veterinary students to come to grips with a few simple truths: 1) the Hippocratic admonition, "First of all do no harm"; 2) the Crawford dictum, "Read the label every time you use a drug and make a loose-leaf binder containing the package inserts of every drug you use for constant reference"; 3) the paradox of Liautard "If there is no label, you can't read it." In my view, the bathtub product cannot satisfy any of these principles.

A look at some of the home-made mixtures for mastitis that have recently come to the attention of FDA's Center for Veterinary Medicine reveals that many are combinations of aminoglycoside antibiotics, nitrofurans, sulfonamides, DMSO, and steroids.

Most of you can readily see what is wrong with these, but permit me to lead the discussion by pointing out these deficiencies:

(1) Sterility. None of these products are sterilized. Therefore, the possibility is real that use of these mixtures will introduce new disease - causing bacteria into the udder. Of particular concern is the use of these concoctions in dry cows with normal quarters.

(2) pH. None of these products is pH adjusted. The pH of normal milk is approximately 6.6. The pH of bovine blood is approximately 7.4. The pH of the mastitic udder varies but is usually more acidic than the normal udder. What is the pH of these mixtures? The people that mix them up neither know nor care, but FDA has compounded some similar mixtures and found one at 4.0 and another at 10. The pH of gentamicin is about 2.5; the pH of triple sulfa solution can be as high as 12. Infusion of the former would be like putting sulfuric acid in the udder; infusion of the latter would be like infusing red devil lye. Can you think of a better, more inhumane way to ruin a dairy cow?

(3) Drug interaction. Do you remember Darrell Royal's comment about the forward pass, "When you throw the football, three things can happen (completion, interception, or incompletion) and two of them are bad." The same thing could be said of mixing two or more unapproved drugs: the effectiveness may remain, the effectiveness may be lost, or the combination may be more toxic. Two out of three of these outcomes are therefore bad. (Perhaps another example from football best explains the popularity of home remedies - when its 3rd and 26, you don't send Riggins up the middle).

(4) Fraud. It takes only a cursory look at these concoctions to show that none are likely to be effective against mastitis and most are likely to cause more harm than good. Therefore, what we have is a good case of economic fraud where the victims include the gullible dairy farmer, the pharmaceutical industry, the veterinary profession, and the unsuspecting cow.

(5) Illegality. Production, possession, or use of these concoctions violates a number of significant state and federal laws. You cannot manufacture drugs in the United States without complying with the Good Manufacturing Practices (GMP) regulations. None of these mixtures is approved for any use, therefore, the Extra-Label Use Policy does not apply.

(6) Ethics. Use of any of these products can cause dangerous residues in milk or meat or both. Use of some can cause abortion. Use in the dry cow can cause residues in the bob veal calf.

(7) Liability. The protection of state or federal law or of a legitimate drug company is lost when one resorts to the use of these kinds of products. Whoever is caught polluting the food supply or causing damage to man or to animals through the use of these products stands naked before the law. Lawsuits are occurring and are bound to increase in our litigious society. If I were still in dairying or in private veterinary practice, this alone would stop me from using an unapproved product.

At CVM-FDA's Division of Veterinary Medical Research in Beltsville, Maryland, work has begun on a project to quantitate the risks involved in the use of bathtub mastitis mixtures. When that work is completed, we will release the results to the National Mastitis Council and to other interested groups and individuals in the hope that such knowledge will discourage the use of these kinds of preparations. Meanwhile, we will continue to take legal action against violators of this aspect of federal law.

I think this can be summed up in two statements: (1) there is no magic cure for mastitis, and (2) home-made remedies are not likely to be of value in the cure and prevention of the disease. By and large, the bathtub mixtures being secretly touted as more effective than legal mastitis products will never be FDA approved because few present much promise of being proved both safe and effective.

3-A Recognized For Dairy Industry Contributions

The 3-A Sanitary Standards Committees were recently honored with a formal resolution for their numerous contributions to the Dairy Industry by the National Conference on Interstate Milk Shipments. NCIMS is a group of milk sanitation agencies dedicated to producing and processing a safe and healthful milk supply for American consumers. NCIMS adopted the resolution of continued support for 3-A at their 20th biennial conference in Lexington, Kentucky.

The 3-A Sanitary Standards Committees' program, made up of 1,040 members, is a voluntary approach to safeguarding the public health and product safety through a unique nationwide industry-regulatory program of sanitary standards for equipment used in processing dairy foods. The organizations representing 3-A are: International Association of Milk, Food and Environmental Sanitarians; U. S. Public Health Service; Dairy and Food Industries Supply Association (DFISA); and Dairy Industry Committee.

The 3-A Sanitary Standards program was initiated in 1944 to develop standards for cleanability of dairy equipment. Their ultimate goal is to establish guidelines to protect dairy products from contamination during processing and to insure that all milk contact surfaces would be readily cleanable and/or easily dismantled for cleaning.

Currently there are 50 standards published by the 3-A program. Pending projects include aseptic processing equipment, membrane processing equipment and procedures for cleaning equipment.

For more information contact: 3-A Secretary, Thomas M. Gilmore, Ph.D.; 6245 Executive Boulevard, Rockville, Maryland 20852, 301-984-1444.

Cintex To Highlight Latest Developments In Metal Detection Technology At "AMI Expo"

Cintex of America Inc. plans to exhibit its latest developments in metal detection technology for meat processing operations at "AMI Expo", Booth Number 558, which is to be held at the McCormick Plaza, Chicago, from October 19 - 22, 1985. The company's display will highlight four *Microsearch* systems which are ideally suited for use in meat processing operations including the inspection of meat blocks and meat patties.

The Cintex *Microsearch* range of detector heads are available in a wide choice of rectangular and circular aperture sizes to suit any meat product being monitored. The AMI exhibit will include a 24 inch by 14 inch aperture model which is used to screen meat blocks prior to processing. This unit can be supplied with a variety of belt widths or non-metallic gravity roller sections and overall conveyor lengths.

In addition, Cintex will highlight its meat patty inspection unit which is designed specially to screen hamburger patties for possible metal contaminants. This *Microsearch* unit incorporates a urethane belt system with retracting band reject mechanism, it provides high sensitivities to all metals and like all Cintex metal detectors it is immune to vibration and moisture.

The Wisconsin-based company will also show its widely-used *Microsearch* Tube Separator System. Totally unobstructing product flow, this stainless steel unit is easily adapted for use with sausage and emulsion filling applications. Following the detection of a metal particle, a signal operates an air actuator which, in turn, rotates a ball valve through 90°. This action diverts a small volume of suspect product into a separate tube system, leading to a reject holding area.

Cintex will highlight its ability to build "customized" *Microsearch* metal detection systems to suit meat processing companies' specific needs. These can incorporate a wide range of conveyor, reject mechanisms and other ancillary equipment. *Microsearch* metal detectors are available in either stainless steel or durable epoxy paint finish, all U.S.D.A. approved and there is a U.L. Listed option.

For further information please contact: Howard C. Phillips or Terry E. Kinsey. P.O. Box 1020, Kenosha, WI 53141. 1-800-4-CINTEX

Raw Milk Hazards

Raw milk has become one of the newest - and most hazardous - fad foods for the health-conscious.

"Raw milk has always been available to consumers who went looking for it," says nutritionist Dr. Dymple Cooksey, "but now it is being promoted as a "health" food."

Some people claim that raw milk has a higher nutritive value than the pasteurized kind, says the Texas A&M University Agricultural Extension Service nutrition specialist. In addition, it supposedly protects against dental decay, provides greater resistance to disease, contains a higher enzyme and hormone content and includes an "anti-stiffness" factor, she says.

"These claims for raw milk either have no scientific basis or are greatly over-rated," Cooksey declares.

A study by researchers at the Center for Infectious Diseases has demonstrated the alarming risks of drinking raw milk, she reports. Eleven bacterial

diseases, including salmonella, tuberculosis and staphylococcal infections are shown to be spread by contaminated raw milk.

Since the most important component of unadulterated raw milk is germs, people interested in their health should drink the safe, pasteurized product, advises the specialist.

Dr. Rodney J. Brown

Winner of 1985 Pfizer Award In Cheese Research Announced

Dr. Rodney J. Brown, associate professor of Nutrition and Food Sciences, Utah State University, Logan, is the recipient of the 1985 Pfizer Award in Cheese and Cultured Products Research.

A bronze plaque and a $1,000 honorarium were presented to Dr. Brown during the 80th annual meeting of the American Dairy Science Association at the University of Illinois.

Dr. Brown was honored for his pioneering work in the application of microcomputers and advanced instrumentation to dairy and food chemistry research problems. According to the citation, he "wrote and provided software programs to help the industry adopt the product yield pricing formulas for milk payments that have received worldwide interest and acceptance."

The author or co-author of 59 scientific papers and publications, Dr. Brown has conducted dairy research in several areas and holds three patents. He evaluated chloride electrodes for abnormal milk detection and has made contributions to lactic culture research.

"The use of ultrafiltration to incorporate whey solids into cottage cheese represented some of the first work done on that technique in our country," the citation noted, adding "Many enzyme immunoassays for rapid detection of antibiotics are based upon techniques he proposed in 1977."

An ultraviolet spectrophotometer was used to evaluate milk coagulation and provide new insights into the details of milk coagulation in work which Dr. Brown discussed at the ADSA meeting in 1984.

Numerous instrument manufacturers have provided Dr. Brown with new devices and computers in recognition of his ability to maximize potential applications. While on sabbatical leave in York, England, he helped optimize infrared instrument precision and developed a method to quantitate casein electronically. At the same time, the 37-year-old scientist is directing research at USU aimed at developing capability to rapidly quantitate milk protein fractions.

Pfizer Inc. is a worldwide manufacturer of pharmaceutical and hospital products, specialty organic chemicals, agricultural, consumer and materials science products. The company reported sales of $3.9 billion in 1984.

Food Safety Begins At Home

"We have a far greater chance of contracting a food-borne illness as a result of our own negligence than from unsafe food products," says a Texas A&M University Agricultural Extension Service nutritionist.

The recent tragic food poisoning incidents involving cheese and milk have left many consumers concerned about the safety of foods they buy at the grocery store, says Marilyn Haggard.

But incidents such as these are very small in number when compared to the Food and Drug Administration's estimate of 69 - 275 million cases of food-borne illnesses per year, most of which result from improper food handling or storage at home, she says.

"The bacteria that cause most food-borne illnesses occur naturally in raw foods, so it's up to consumers to make sure these bacteria are destroyed before the food is eaten," Haggard explains.

The specialist recommends the following steps for increased food safety at home:

- Be sure to wash your hands carefully before handling food and wash raw foods very well.
- Be especially careful with your cutting board and knives. Cooked foods are often contaminated with raw foods that have been cut on the same cutting board. Wash your cutting board and knife in hot soapy water after each use.
- Heat foods to at least 155 degrees Farenheit before serving and keep cold foods well-refrigerated until serving time.
- Refrigerate or freeze leftovers immediately after a meal, and never allow foods to stand at room

temperature for more than 2 hours.

"Fortunately, most cases of food-borne illness cause only flu-like symptoms and diarrhea," says the nutritionist. However, the potential for more serious complications are always there, especially for young children, the elderly and the ill, she cautions.

"We can depend on our extensive food inspection system to maintain our food supply as the safest in the world," Haggard says, "but we can't become lax about proper sanitation and food preparation at home if these illnesses are to be avoided.

28th Annual National Educational Conference & Exposition Held

The Environmental Management Association (EMA) and its subsidiaries, Food Sanitation Institute, Health Care Facilities, Buildings-Grounds Subsidiary, Sanitation Suppliers & Contractors Institute, will hold its 28th annual National Educational Conferences & Exposition at the Holiday Inn Surfside Conference Center in Clearwater Beach, Florida on October 4-10, 1985. The theme of the 1985 EMA conference is "We Build Together for the Advancement of Industrial Sanitation & Maintenance." For more information contact: Jean M. Day, EMA, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

Cow Pregnancy Easily Tested

A milk test from Britain enables dairy farmers to measure changes in progesterone levels and determine when a cow is pregnant or ready to be artificially inseminated.

The OVUCHECK test is said to be 96% accurate in determining oestrus and 100% accurate in determining whether or not a cow is pregnant; easy to use, it requires no technical expertise and takes only an hour to perform. Results are visually interpreted or measured quantitatively with a plate reader.

To carry out the tests, a diluted milk sample is placed on a microtiter plate and two separate reaction processes are performed. Up to 88 tests can be run at a time; the resulting color development in each well will indicate the level of progesterone. A high level indicates pregnancy, while a low level confirms that a cow is not pregnant or in oestrus.

The test does not require laboratory back-up.

Inquiries from propective US agents are welcomed by the company: Cambridge Life Sciences PLC (Contact: Dr. Edward Lynch), Cambridge Science Park, Milton Road, Cambridge CB4 4BG England. 223-354144. Telex: 818713.

Small Business Program Assists Firms

The Small Business Representatives located throughout the country and in the various headquarters centers are most enthusiastic about assisting beginning and currently active small firms in adhering to the existing laws and implementing regulations for firms manufacturing, repacking, relabeling, and holding human and animal drugs, human food, animal feed, human cosmetics, human and animal medical devices, as well as radiation emitting devices such as T.V. sets, lasers, microwave ovens, and utlrasonic articles. These articles are subject to the Federal Food and Drug Cosmetic Act, and the Radiation Control for Health and Safety Act.

Services are *free* and include the following:

- Discussing and leading entrepreneurs through the development and marketing of these articles;
- Interpreting the statutes and implementing regulations relating to these products;
- Supplying informational and educational material, Federal Register announcement, and policy guides;
- Assisting in formulating, or taking part in seminars and workshops in particular interest areas;
- Assisting firms in filling out required documents such as registration.

For more information contact: Philip Sheeler, Acting Small Business Representative, Region V, Room 1410, CNA Plaza, 55 E Jackson Blvd., Chicago, IL 60604. 312-353-8643.

Cardinal Packaging Purchases Reb Plastics

Cardinal Packaging, 1275 Ethan Avenue, Streetsboro, Ohio, 44241, has purchased the injection molding dairy and food assets of Reb Plastics (formerly Romac) in Avon Lake, Ohio.

Cardinal Packaging will be using the assets acquired from Reb Plastics to enter the cultured dairy container business. With the addition of cultured product containers to its extensive line of 1/2 gallon through 3 gallon plastic ice cream pails and tubs, Cardinal Packaging can offer dairy customers one-stop shopping, saving them time and freight expense.

International Dairy Federation

IDF SEMINAR ON NEW DAIRY PRODUCTS VIA NEW TECHNOLOGY

8 - 9 October 1985

Georgia World Congress Center, Atlanta, Georgia, USA

The above IDF Seminar is organized by the US National Committee during the Food and Dairy Expo, from 5 to 9 October 1985 in Atlanta, USA. The programme is given below. The Seminar will be held in English only.

Registration fee has been set at US $125.—(US $50.—for accompanying persons).

TENTATIVE GENERAL PROGRAMME

8 OCTOBER

09.00 — 09.15	Convening of Seminar and Introductions	Dr. Tony Luksas, Dairy Research, Inc.
CHEESE TECHNOLOGY Chairman: Dr. C. H. Amundson, University of Wisconsin		
09.15 — 09.45	On-Farm Ultrafiltration	Dr. Robert Zall, Cornell University
09.45 — 10.15	Ultrafiltration prior to Cheese Making	Dr. C. A. Ernstrom, Utah State University
10.15 — 10.30	Break	
10.30 — 11.15	Reverse Osmosis prior to Cheese Making	Dr. David Barbano, Cornell University
11.15 — 12.00	Low Sodium Cheese	Dr. Robert Lindsay, University of Wisconsin
12.00 — 13.30	Lunch - Speaker	Dr. Ernest Mann (IDF)
ENZYME AND WHEY TECHNOLOGY Chairman: Dr. E. Renner, Justus Liebig Universität, Giessen		
13.30 — 14.15	Immobilized Enzymes - For Treatment of Milk, Cheese and Whey & Whey Permeate	Mr. J. W. Morris, Corning Glass Works
14.15 — 15.00	Whey Protein Fractionations & Protein Functionality	Dr. John Kinsella, Cornell University
15.00 — 15.45	New Uses for Whey Protein Concentrates	Dr. Mike Otten, Ridge Tech Industries
15.45 — 16.00	Break	
16.00 — 16.45	Animal Feed from Whey - Urealactosyl Ammonium Lactate	Dr. Fred W. Juengst, Jr., Packerland Whey Products
16.45 — 17.30	Animal Feed from Whey - Mycelial Mass Production	Dr. Joe Ruocco, Biotech Associates
18.00 — 20.00	Cocktail Reception	

9 OCTOBER

ADVANCING NEW TECHNOLOGIES AND PRODUCTS Chairman: Dr. Wayne Sanderson, New Zealand Dairy Research Institute		
08.45 — 09.30	Fermented Products from Whey & Whey Permeate	Dr. Gary Sanderson, Universal Foods Corporation
09.30 — 10.15	Energy Recovery Systems from Spray Dryers	Dr. Burt Krumnenacher, Air Frohlic
10.15 — 10.30	Break	
10.30 — 11.15	Mechanical Vapor Recompression Evaporators	Mr. Arthur Zimmer & Mr. Lauthar Schappeler, GEA Vigano Corporation
11.15 — 11.40	Freeze Concentration	Ing Wim Swinkels, Grenco A.G., Inc.
11.40 — 12.00	Freeze Concentration	Dr. William T. Andrews, Concentrex, Inc.

Registration Forms can be obtained from:

Harold Wainess — Secretary USNAC
464 Central Avenue
Northfield, IL 60093
(312) 446-2402

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

Sani-Matic COP Tanks Feature Combination Wash Action

• Sani-Matic Systems, the primary supplier of Clean-out-of-place (COP) wash tanks, proudly unveils a new standard in recirculation COP washing. The combination washer combines *both* the push/pull and jet recirculation wash action in one tank. As always, standard COP washers can be fabricated in dimensions ranging from as small as 4'L x 20"W x 18"D to as large as 12'L x 36"W x 36"D.

The basic push/pull recirculation washing action is intended to wash lengths of take-down tubing up to 12 ft. long. Wash solution is circulated lengthwise through the tank to erode soil from the tubing interior and exterior. The solution is pumped through flared jets at the tank end. This lengthwise circulation is promoted by locating the pump suction ports at the opposite end of the tank.

The basic jet recirculation washing action is intended to wash parts and fittings. In addition, even pans and molds can be cleaned with the aid of racks and baskets to hold them in position. Wash solution enters from both sides of the tank through a series of machined jets connected by a manifold. A rolling turbulence is created by these jets.

The combination washer features both of these systems, push/pull and jet recirculation. Two pumps are typically required so that these systems can operate independently or simultaneously. Versatility is the hallmark of this COP concept.

For additional information on various models of jet recirculation/push-pull COP parts washing systems contact: Sani-Matic Systems, P.O. Box 8662, Madison, WI 53708. 608-222-2399.

Please circle No. 315 on your Reader Service Page

Aseptic Bulk Unloader Systems Available

• Aseptic Bulk Unloader Systems are available to dispense a presterilized product under sterile conditions providing continued control of the product environment throughout the processing/packaging system.

Used in conjunction with an aseptic 300 gallon bag-in-bin container, this unit can be initially sterilized with chemicals or steam, followed by breaking the bag sterile barrier, and then dispensed under aseptic conditions.

Standard units are available, however, systems can be designed to meet specific requirements.

For more information contact: ASTEC, 4403 1st Ave SE, Ste 301, Cedar Rapids, IA 52402. 319-395-7882.

Please circle No. 316 on your Reader Service Page

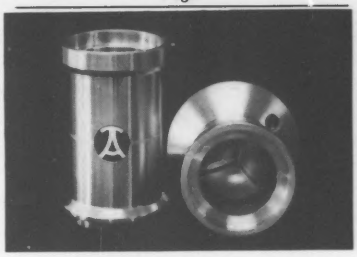
Two Hour B.O.D. Test

• The short term B.O.D. Tester provides timely and much more precise results than the standard 5-day B.O.D. test, and its use is eligible for approval on a plant-by-plant basis by the E.P.A. Full information and assistance in obtaining an alternative use permit to use this new test is furnished free by Tech-Line Instruments. The instrument produces precise B.O.D. results in as little as two hours with no need to dilute the sample, mix chemicals, incubate, wash B.O.D. bottles and maintain D.O. probes. A continuous graphic readout of test results and the "immediacy" of the information received are two of the B.O.D. Tester's greatest benefits.

The fully automatic instrument is also commonly used to measure toxicity-treatability, for plant process control, in bioassay testing, compost stability testing, to measure gas utilization, as an automated pilot plant and in plant troubleshooting. Features include temperature and atmospheric pressure compensation, a water jacket for testing at a full range of temperatures, continuous air circulation, foam detection and automatic zeroing.

For complete information contact: Tech-Line Instruments, Tri Campus Park, P.O. Box 1236, Fond du Lac, Wisconsin 54935. 1-800-328-7518. In Wisconsin, 1-800-242-3505.

Please circle No. 317 on your Reader Service Page



Aseptic Rupture Disk from ASTEC

Aseptic Rupture Disks Now Available

• Aseptic Rupture Disks are now available that meet ASME code requirements for pressure relief devices. Welded construction of the stainless steel rupture disk body eliminates the possibility of microbiological contamination and meets 3A and USDA regulations. Rupture disks are available in standard or steam traced ferrules. Typical pressure rating of a 1 1/2" unit is 60 psig, other ratings available.

For more information contact: ASTEC, 4403 1st Ave SE, Ste 301, Cedar Rapids, IA 52402. 319-395-7882.

Please circle No. 318 on your Reader Service Page

New Food Handling System from Regal Plastic Company

Regal Plastic Company Introduces New Integrated Food Handling System

• Regal Plastic Company has announced the development of a new returnable-reusable food container (tote) with lid and companion pallet. This new integrated food handling system, which features a container with 4.2 cu. ft. shipping volume, has, because of widespread applications in handling inter and intra plant shipments of food products, become a featured product in the new Regal Plastic Company catalog of material handling containers, tote boxes, and dunnage trays.

The integrated system is *guaranteed against damage for one year* of normal usage by the manufacturer. This new system is made from rugged, natural white, high-density, low cost polyethylene plastic and has full approval from the United States Department of Agriculture. This polyethylene plastic features a non-porous surface for easy steam cleaning and this plastic will withstand temperatures down to minus 100 F for freezing applications and elevated temperatures up to 190 degrees.

The system is particularly well suited for handling product freezing and transportation of frozen food products. Regal containers can be filled with food products and then stacked on Regal Spacer-Trays which have molded-in depressions to securely locate the container. Next, the Spacer-Tray is used as a lid on units below. This also prevents the load from shifting in transit.

Spacer-Trays and containers are then stacked to desired height with minimum danger of spillage and shifting. Unique design permits circulation of air throughout containers and food products to aid in rapid and complete product freezing.

For more information contact: Regal Plastic Company, 4405 E. 11th Street, Kansas City, MO 64127. 816-483-3040.

Please circle No. 319 on your Reader Service Page

Food Science Facts
For The Sanitarian

Dr. Robert B. Gravani
Cornell University
Ithaca, NY

FOOD DETERIORATION AND SPOILAGE BY AIR AND OXYGEN

Another important cause of food deterioration and spoilage is air and oxygen. Since air is colorless, odorless and tasteless, it is often taken for granted and sometimes overlooked when food deterioration is discussed.

Air is a mixture of gases that compose the atmosphere of the earth. Air consists of:

78% Nitrogen
21% Oxygen
1% A Mixture of Several Other Gases

While oxygen is essential for life, it is also the cause of many problems to the food industry. Oxygen can have deteriorative effects on fats, food colors, vitamins, flavors and other food constituents. Basically, oxygen can cause food deterioration in several ways. It can provide conditions that will enhance the growth of microorganisms; it can cause damage to foods with the help of enzymes. Oxygen alone can also affect foods. Each of the ways oxygen deteriorates food will be discussed below.

Microorganisms

Oxygen can provide conditions that enhance the growth of microorganisms. Some bacteria require oxygen for growth (aerobes) while others can grow only in the absence of oxygen (anaerobes). Many bacteria can grow under either condition and are called facultative anaerobes. Molds and most yeasts require oxygen to grow. They can often be found growing on the surface of foods when air is present.

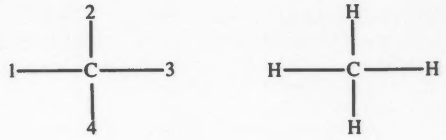
Enzymes

Certain natural food enzymes are known as oxidizing enzymes. These enzymes catalyze (speed up) chemical reactions between oxygen and food components, and this leads to food deterioration. Although there are many oxidizing enzymes, two that can cause darkening in diced and sliced vegetables are catalase and peroxidase. The browning of vegetables caused by these enzymes is often accompanied by off-flavors and odors. A simple heat treatment (blanching) is used to inactivate these enzymes.

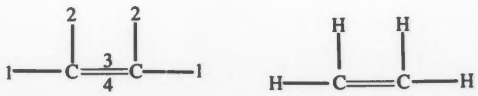
Oxygen

Oxygen can also cause deterioration of foods spontaneously, by itself. This process is called atmospheric oxidation or autoxidation (self oxidation). Oxidative deterioration is the chief cause of quality loss in fats and fatty portions of foods. This process of autoxidation is quite complex, but it can easily be understood by first thinking about fats in foods. Fats and oils are chemically similar and are known as lipids. Fats are those lipids that are solid at room temperature (ex. - lard) while oils are liquid at room temperature (ex. - salad oils).

All biological compounds contain carbon and hydrogen, and lipids are no exception. Carbon is an element capable of reacting with many other elements. Each carbon atom always has four (4) places (bonds) where other elements can attach. This can be seen below.



These carbon atoms are said to be saturated. If two adjacent carbon atoms do not have anything to attach to their bonds, they join together, forming a double bond.

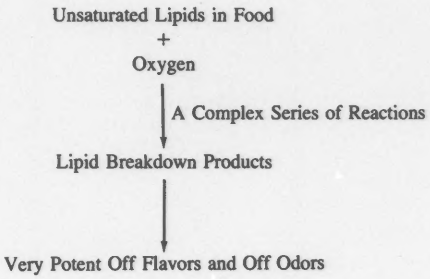


These carbon atoms are said to be unsaturated since they contain double bonds. Compounds that contain double carbon bonds are very chemically active, since they are "looking" for the addition of other elements to attach to these carbon atoms.

Lipids are generally composed of fatty acids. These fatty acids can be saturated or unsaturated and those that contain many double bonds are polyunsaturated. Unsaturated fatty acids are susceptible to autoxidation.

Mechanism of Autoxidation

The autoxidation of a food lipid follows the sequence shown below.



When lipids oxidize, short chain carbon compounds are formed; these compounds have very strong odors and flavors and are very undesirable and unacceptable. The off odors resulting from this type of deterioration are sharp and acrid and have been described as linseed oil-like, tallowy, fishy or perfume-like.

The mechanism of autoxidation, as well as the breakdown products that result from the process depend on many factors, including the:

- amount of oxygen available
- degree of fatty acid unsaturation
- temperature
- catalysts or enzymes present
- light
- presence of metals
- antioxidants present

The more double bonds present, the more susceptible the food is to autoxidation. Heat tends to accelerate the rate of atmospheric oxidation as does light of certain wavelengths. Metals such as copper, maganese, and iron also accelerate the autoxidation of lipids.

The colors of certain vegetables (like carrots), spices (such as paprika and red pepper) and shrimp are due to natural chemical compounds known as carotenoids. Carotenoids have an unsaturated structure and can also be autoxidized. The deep reddish-orange carotenoids are oxidized to a light, yellowish gray color. This color change is a sign of oxidative deterioration.

Food industry personnel should be aware of the importance of oxygen in the deterioration and spoilage of foods.

Please circle No. 119 on your Reader Service Page

Dairy Quality

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

BIOCHEMICAL CHANGES IN DAIRY PRODUCTS CAUSED BY GROWTH OF PSYCHROTROPHIC MICROORGANISMS

Part I: Microbial Enzymes

Previous articles pointed out that when establishing a quality control/quality assurance program it is necessary to identify specifications for ingredients and products that reflect a high degree of consumer acceptance. Certainly specifications need to be established for sensory attributes of both fresh and stored products. Conformance to specifications must be monitored by trained personnel to help assure a high degree of consumer acceptance. Training of personnel for effective product evaluation should include instruction in detecting changes or defects that occur in dairy products as a result of growth of psychrotrophic microorganisms. Growth of psychrotrophic organisms in dairy products can result in several product defects that will affect consumer satisfaction. The intent of this and next months article is to aid in understanding how defects occur in dairy products as a result of growth of psychrotrophic microorganisms. The articles will also describe the action of microbial enzymes (from either viable cells or enzymes present in the product) as the primary factor responsible for product defects.

According to the *Standard Methods for Examination of Dairy Products* (1), "In the dairy industry the term psychrotrophic indicates organisms capable of appreciable growth in milk and milk products at commercial refrigeration temperatures, 2-7C, irrespective of the optimum growth temperature." Psychrotrophic bacteria differ from psychrophilic bacteria (cold loving) in that psychrophilic bacteria have optimum growth temperatures at refrigeration temperatures. From a quality control standpoint, growth of microorganisms in dairy products at refrigeration temperatures - regardless of the organism's optimum growth temperature - can result in product defects and consumer dissatisfaction. Most psychrotrophic organisms found in milk and milk products are gram-negative rods, although some gram-positive spore-forming thermoduric rods belonging to the genera *Bacillus* and *Clostridium* (thermoduric psychrothroph) have caused defects in dairy products at refrigeration temperatures.

Psychrotrophic microorganisms are widely distributed in nature and can be found in large numbers in soil, vegetation, water, and on poorly cleaned milk-handling equipment. Factors affecting the number of psychrotrophic organisms in milk are: 1) sanitary condition of production, 2) temperature of storage, 3) time of storage, and 4) growth rate of the psychrotrophic organisms found in the milk or other dairy products. Factors affecting the growth rate of psychrotrophic microorganisms are: 1) pH of the growth media, 2) presence of oxygen, 3) inhibitors, 4) nutrients, 5) available water, and 6) temperature. In milk the only factor that can adversely affect growth is temperature. Milk is almost an ideal growth media, and as a result, it is quite inducive to growth of microorganisms even at refrigeration temperatures; however, lower temperatures result in a slower microbial growth rate.

Bacterial growth and activity in milk and dairy products can produce several chemical changes that result in product defects. These undesirable changes include: 1) production of pigments that discolor dairy products, 2) fermentation of lactose, glucose, and other sugars to produce acids and/or gases that are undesirable, 3) hydrolysis or breakdown of milk proteins to produce polypeptides or amino acids that result in undesirable off-flavors, and 4) lypolysis or breakdown of milk fat that result in rancid and other off-flavors. The microbial alterations of milk constituents (fat, protein and carbohydrates) are biochemical activities essential for microbial cell synthesis and maintenance. These biochemical activities are catalyzed by microbial enzymes that may be active in the presence or absence of viable microorganisms.

Enzymes are organic catalysts produced by living cells. Enzymes found in milk may originate from two sources: 1) from the mammary tissue, 2) from contamination and growth of microorganisms. All enzymes are proteins with very specific catalytic activity. Individual enzymes differ greatly in their susceptibility of heat treatment. Some enzymes such as alkaline phosphatase are inactivated by high temperature short time pasteurization treatments; however, many enzymes of bacterial origin are very heat-stable and may remain active after HTST or ultra-high temperature heat treatments.

A recent review by Cousin (2), summarizes the literature concerning biochemical changes in milk as the result of microbial growth and enzyme activity. Shipe et al. (3), in a paper entitled, "Off-Flavors of Milk: Nomenclature, Standards, and Bibliography, describe the flavor defects that occur in milk as a result of psychrotrophic growth and enzymatic activity.

In summary, although milk is a liquid it contains 13% solids. Solids consist primarily of protein, fat, and carbohydrates. These constituents are normally found in milk as large complex molecules that give milk its characteristic flavor, texture, and color. When microbial growth and/or enzymatic action occurs, large molecules of milk fat and protein are broken down into smaller compounds. These smaller compounds may be volatile, may precipitate, may be acidic, or may have special flavor characteristics that will result in product defects.

(1) American Public Health Association, 1978. *Standard Methods for the Examination of Dairy Products*, 14th Edition.
(2) Cousin, M. A., 1982. Presence and Activity of Psychrotrophic Microorganisms in Milk and Dairy Products: A Review. J. Food Prot, 45(2):172-207.
(3) Shipe, W. F., et al., 1978. Off-Flavors of Milk: Nomenclature, Standards, and Bibliography. J. Dairy Sci., 61(7):855-869.

Next month's *Dairy Quality* will discuss specific changes in milk fat and milk proteins caused by lipolytic and proteolytic microorganisms and their enzymes.

N.M.C.
NATIONAL MASTITIS COUNCIL

Milking Machines Spread Mastitis Three Ways

Monitoring milking system function is a necessary step to minimize the machine's contribution to herd mastitis, said Tom Fuhrmann, an Arizona veterinarian who specializes in mastitis control and who recently joined the management team of United Dairymen of Arizona, a dairy cooperative headquartered in Tempe.

Fuhrmann said that the milking machine contributes to the spread of mastitis in any one of three ways:

1. By carrying mastitis - causing organisms from one cow to another.

2. By causing teat end trauma and sores when malfunctioning so that mastitis pathogens are able to invade the tissues near the teat end.

3. By propelling microorganisms toward the teat end and actually causing reverse flow of milk and bacteria up into the teat.

Equipment evaluation needs to be done at two levels. First, it should be performed by a qualified individual with specialized testing equipment. The work must be done on a regular basis, which means monthly on most large dairies. Fuhrmann says that at least four components of the milking system function should be evaluated: controller function, teat end vacuum level and stability, pulsation characteristic of each pulsator and reserve vacuum. This evaluation should be performed not only to identify machine malfunction, but also to determine if milking personnel and the herd manager are identifying and correcting machine malfunctions as they occur daily.

The second level of equipment evaluation should be performed by milking personnel and the herd manager continuously. Malfunctions occur daily and must be corrected immediately. Equipment evaluation done by a specialist at the first level, along with dairy personnel, affords an excellent opportunity to train them about daily equipment malfunction.

Daily observation and listening to equipment can identify machine malfunctions in any of the following areas: pulsation function, improper vacuum level determined by checking vacuum gauges or a mercury column, condition of rubberware, patency of the air inlet hole in the claw or inflations and take-off function of automatic detachers.

In addition to monthly and daily checks, schedules need to be established for liner changes, filter changes at the vacuum pump and the controller, routine pulsator cleaning and rubberware changes. Milker training sessions can emphasize the responsibility they have in identifying and correcting machine malfunction problems.

Material for this item was taken from the proceedings of the 1985 annual meeting of the National Mastitis Council. For information about mastitis or the council, contact the National Mastitis Council, 1840 Wilson Blvd., Arlington, VA 22201.

Iowa Association Will Hold 1985 Annual Meeting

The Iowa Association of Milk, Food and Environmental Sanitarians, Inc. Executive Board met on May 31, 1985 to finalize the agenda for the fall meeting. The Association voted in the Spring of 1984 to have a one, two-day, meeting per year. This year's meeting will be held in conjunction with the Iowa Environmental Health Association, at the Starlite Village, Ames, on October 16 and 17.

The tentative program includes topics such as:

Oct. 16	8.00 - 9:45	Registration
	9:45 - 10:00	Introductory Remarks
	10:00 - 11:00	Geological Water Supplies and Problems
	11:00 - 12:00	Salmonella Outbreak
	12:00 - 1:15	Lunch
	1:15 - 2:15	On the Farm - Industrial Hygiene, Waste Management, and Animal Health Hazards
	2:15 - 2:30	Break
	2:30 - 3:15	P.I. Count and Farm Conditions
	3:15 - 4:00	Methods of Production of High Protein Milk
	4:00 - 5:00	Business Meeting
	6:00 - 7:00	Wine and Cheese Hour
	7:00 -	Banquet and Awards
Oct. 17	8:25 - 8:30	Introductory Remarks
	8:30 - 9:45	Mastitis Prevention Workshop
	9:45 - 10:15	Break
	10:15 - 12:00	Mastitis Prevention Workshop (con't.)

The following committees will function at the business meeting:

Nomination Committee: Chairperson, Scott Core, Al Ackerman, and Herb Belz.

Legislation Committee: Chairperson, Marshall Inman, Derward Hansen, Monty Berger, Bill LaGrange, Ralph Sander, Dale Cooper, and Charles Allen.

A Membership list is available upon request.

For more information contact: Derward Hansen, RR 3, Box 26, Exira, IA 50076. 712-268-2798.

TAMFES Meeting Highlights

Two hundred and fifty-five individuals registered for the Third Annual Texas Association of Milk, Food, and Environmental Sanitarians meeting which was held June 24 and 25 at the South Plaza Hotel in Austin, Texas.

The meeting featured a program with highly successful dairy and food sections highlighted by locally and nationally recognized speakers. Speakers for the dairy section included: George Muck, Dean Foods; Glenn Witte, The Milk Industry Foundation; Richard Flemming, The Texas Federal Milk Market Order; Jim Beatty, Louisiana State University; Nick Nickelson, Applied Microbiological Services; H. E. Randolph, H. E. Randolph and Associates; Ron Richter, Texas A&M University; and Bill Fry, H.E.B. Grocery.

Featured speakers during the food sessions were: Dennis Eastin, FDA in Dallas, Texas; Clyde Farrell, Office of the Texas Attorney General; Tom Smith, Second Harvest; Nelson Cox, USDA Richard Russell Research Center; Gary Hanna, Ft. Sam Houston; Ted Labree, Riviana Foods; and Hank Dembrosky, Texas Tech University.

Presentations at the General sessions kicking-off and concluding the meeting were made by Dr. Robert Bernstein, Commissioner of Health, The State of Texas; Charles Duncan, senior reporter for WFAA-TV in Dallas; Louis Hinders; Associated Milk Producers, Inc., and Scott Gross, Church's Fried Chicken. A popular event at the meeting was the Bar-B-Que and Country-Western dance that was held at the Manchaca Volunteer Fire Department.

Gerry Hein of Associated Milk Producers, Inc., served as President throughout the year and conducted the annual business meeting. Joe Goddard from Texas Tech University will be the President for 1985-86 and James Roberson from H.E.B. Groceries in San Antonio was selected as President-Elect.

Speakers at TAMFES meeting. Left to right: George Muck, Dean Foods; Jim Beatty, Louisiana State University; Glenn Witte, Milk Industry Foundation; and Louis Hinders, Associated Milk Producers, Inc.

Members of Program Planning Committee. Left to right: Kirmon Smith, Texas Department of Health Dairy Division; Ron Richter, Texas A&M University; Rex Sherry, Texas Department of Health, Division of Food and Drug; and Chris Woelfel, Texas A&M University.

Rob Elliot
Alberta East-Central Hlth. Unit
Alberta, Canada

John Wakelin
Ontario, Canada

John S. McAllister
STD Biological Labs
Ontario, Canada

Cyriel Duitschaever
Univ. of Guelph
Ontario, Canada

Pafcal Delaquis
Univ. of Saskatchewan
Saskatchewan, Canada

Dr. E. S. Humbert
Univ. of Saskatchewan
Saskatchewan, Canada

Kenji Isshiki
Kitakyushu Municipal Institute
Kitakyushu, Japan

Lucullus Food & Wines Co.
Quarry Bay, Hong Kong

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Food Sanitation Consultation Serv.
New York, NY

Fred Jacobsen
Pine Consultants Inc.
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Tastykake Inc.
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Richard Todd
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Chas Wilson
Columbus, OH

Tom G. Pappas
Warren Rupp-Houdaille
Mansfield, OH

Barry Pokorny
Texo Corp.
Cincinnati, OH

Donald Bundy
John Sexton Co.
Indianapolis, IN

Dorothy Owens
Steuben Cty. Hlth. Dept.
Angola, IN

Lowell Allen
Michigan Milk Prod. Asso.
Southfield, MI

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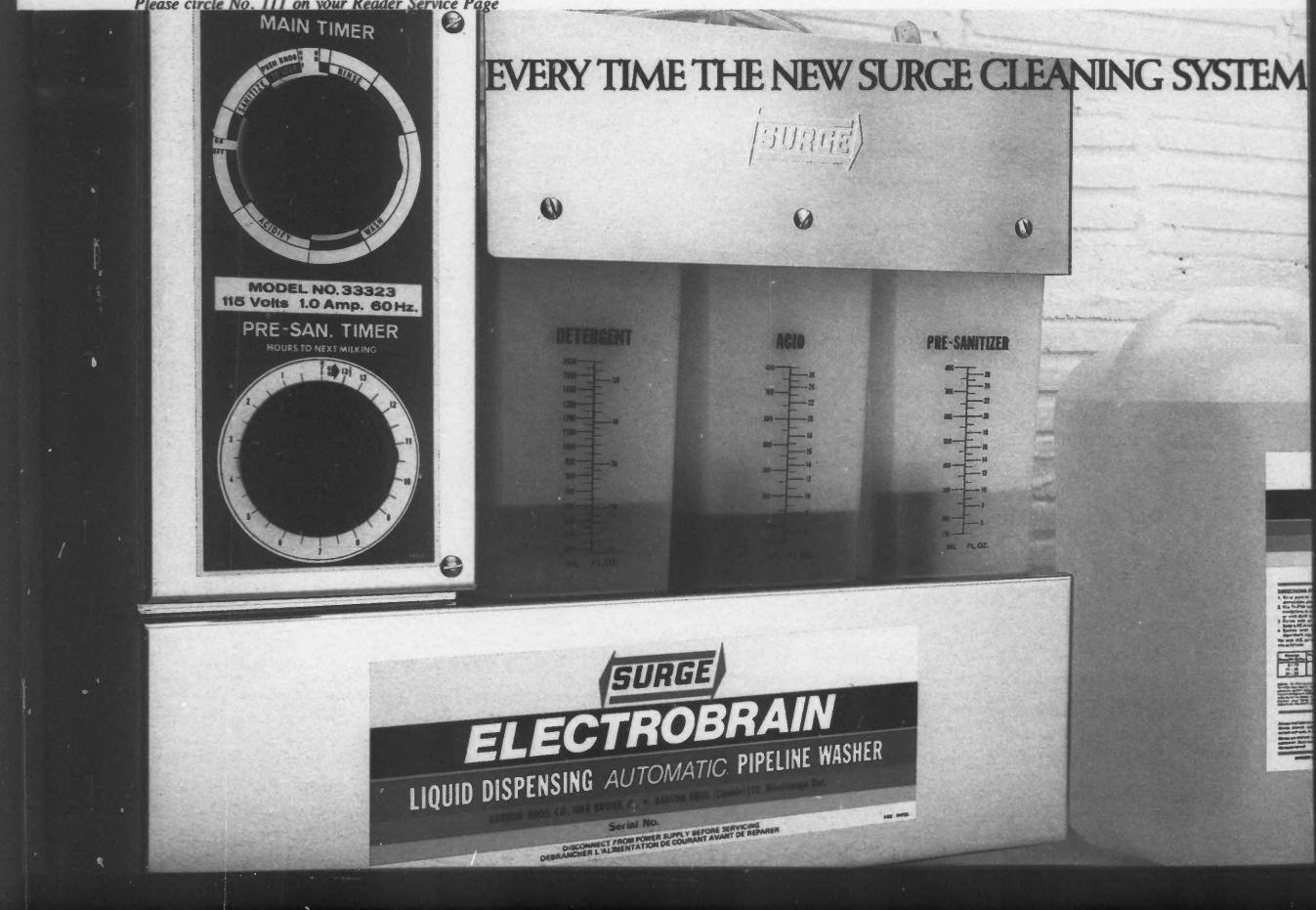

Members

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Disease Control & Lab. Serv.
Lansing, MI

Leo Timms
Ames, IA

Ray Wilken
Beatrice Cheese Inc.
Plainfield, IA

Francis Cobian
Land O Lakes Inc.
Sheboygan, WI

Clyde H. Amundson
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Madison, WI

Kathleen Straseski
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Madison, WI

Lloyd Ward
Madison, WI

Richard G. Schifsky
Minn. Dept. of Agric.
St. Paul, MN

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3-M Company
St. Paul, MN

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Seattle, WA

PLENTY OF REASONS TO GUARD AGAINST FOOD POISONING

Food poisoning incidents are far more prevalent in the United States than many people realize and far greater than the number that actually are reported. For example, in 1981 - the last year for which figures are available - more than 14,000 cases of people afflicted by food-borne disease were reported to the federal Center for Disease Control in Atlanta. Yet public health experts estimate that the actual number of cases each year may range as high as 44.5 million.

Many cases go unreported because the symptoms were mild or because the victims didn't realize their illnesses were due to food poisoning (sometimes the symptoms don't develop until long after the tainted food is eaten.) Outbreaks involving large numbers of people, including those where deaths occur, are the ones that generally are recorded and closely investigated by public health authorities.

According to CDC, food-borne disease "can be associated with foods at any stage of their production, processing, storage, or final preparation." The majority of outbreaks reported occur in restaurants and other food service establishments, but many also occur through mishandling of food in the home. In many instances, however, investigators are unable to determine the cause of the outbreak.

CDC reports show that the main causes of food-borne illnesses are in this order: inadequate refrigeration of foods, too much time between preparing and serving foods, contamination of foods by infected individuals, foods not kept warm enough to keep bacteria from multiplying, inadequate reheating of foods that were cooked and then refrigerated, and eating raw foods with contaminated ingredients.

Bacteria-caused food poisoning is of two types. The first is food infection, caused by the presence in food of bacteria that grow rapidly in the intestinal tract of humans, producing such symptoms as nausea, diarrhea and vomiting. *Salmonella, Campylobacter jejuni, Escherichia coli* and *Shigella* are the tongue-twisting names of bacteria that are the principal culprits in this kind of food-borne disease.

Food intoxication is the second type of food poisoning: it is due not to the bacteria themselves, but rather to toxins produced by the bacteria in the food and then ingested. Typical of bacteria that produce harmful toxins are *Clostridium botulinum, Clostridium perfringens,* and *Staphylococcus*. Botulin and perfringen toxins are destroyed by boiling temperatures, but staphylococcal toxins are not.

Following is a brief summary of some of the more common bacteria - produced types of food poisoning. (For a more detailed discussion, see "Who, Why, When And Where Of Food Poisons" in the July - August 1982 FDA Consumer).

Salmonella is common in many foods (raw meat, poultry, milk and milk products, and egg and egg products) and in the environment. There are some 1,700 types of *Salmonella* bacteria. While not as potent as the botulin toxin (the most deadly but relatively rare source of food poisoning), *Salmonella* contamination is so prevalent that it is the leading cause of death due to food-borne disease in the United States. Diarrhea, abdominal cramps, and frequently nausea and vomiting may develop within eight to 72 hours. Fever, headaches and chills also may occur. Typhoid fever also could develop up to a month after contaminated food is eaten and is evidenced by higher fever, headache, body aches, weakness, abdominal tenderness and even delirium.

Campylobacter jejuni bacteria are found in poultry, cattle and sheep and can contaminate the meat and milk of these animals. Campylobacterosis is the leading cause of food-borne disease in the United States and many other countries. Diarrhea, abdominal cramps, fever and sometimes bloody stools develop two to five days after eating food contaminated with *Campylobacter,* and reactions can be particularly serious in infants, the elderly, and debilitated individuals. The symptoms last up to a week.

Staphylococcal food poisoning is one of the most frequently reported food-borne diseases in the United States and is common throughout the world, CDC says. It is caused by toxins produced by certain strains of *Staphylococcus aureus* as they multiply in foods high in protein. The toxins develop in such foods - meat, poultry, egg products, custards, cream-filled pastries, potato salad, macaroni salad, fish salad, and others - that are left standing too long at room temperature. Such foods should be refrigerated immediately after preparation; heat does not destroy the toxin produced by Staphylococcus.

Retching, vomiting, abdominal cramps, diarrhea, watery stools, sweating, cold and clammy skin, cramps in the legs, and dehydration are symptoms that can begin developing one to eight hours after the staphylococcal - contaminated food is eaten. Death occurs rarely, mostly in children and elderly people.

Shigellosis is a form of dysentery that is spread by people with poor sanitation habits who are carriers of the organisms. Contamination often occurs when they handle liquid or moist foods - milk and other dairy products, poultry, and potato salad for example - that are either not cooked thoroughly or are left standing at room temperature too long. Stomach pains, cramps, and sometimes vomiting and blood and pus in the stools will develop one to seven days after the tainted food is eaten. Again, infants, the elderly and debilitated people are more susceptible to serious reaction.

Clostridium perfringens is another widespread source of food poisoning. Meat and poultry are common carriers, and cooked meat, poultry, gravies, beans and dishes made from these foods are usually found by investigators to be the sources of outbreaks. Most incidents are mild, with symptoms developing from six to 24 hours after the bad food is eaten. Diarrhea and cramps are the usual symptoms; vomiting and fever also may occur. Fatalities are rare. Foods eaten immediately after cooking usually pose no problem, says CDC, but foods prepared several hours or a day or more before consumption can become hazardous if they are not properly refrigerated or are not reheated adequately (to a temperature of at least 140 degrees Fahrenheit throughout).

Escherichia coli is a type of bacteria common throughout the world and probably a principal culprit in the diarrhea problems of travelers. (See "Traveler's Diarrhea" in the May 1985 FDA Consumer.) According to CDC, it is the "most common oxygen-tolerant bacterium" in the large intestine of humans and is transferred from feces and intestinal contents to carcasses and meat during processing of animals. The organism can contaminate people's hands after defecating or during handling of foods of animal origin. Shell-fish and watercress also become contaminated when grown in sewage-contaminated waters.

Obviously, poor sanitary habits increase the possibility of *E. coli* contamination and illness. Mild to severe diarrhea with severe dehydration and shock can occur within 44 hours after the contaminated food is eaten. Good hygiene, thorough cooking of foods and a safe water supply are essential to prevent *E. coli* - induced diarrhea outbreaks.

Clostridium botulinum is the deadliest type of food poisoning - so deadly, in fact, it has been considered for germ warfare. Botulism is rare, but when it does occur it is often fatal. Widespread in the environment, *Clostridium botulinum* is an anaerobic organism - it cannot grow in the presence of oxygen. Hence, it often occurs in canned vegetables, especially home-canned, and other foods where oxygen is not present.

Botulism can develop, says CDC, within two hours to 14 days, although it usually develops within 12 to 36 hours after eating. Early symptoms include stomach pain, nausea, vomiting, diarrhea, fatigue, dizziness and headache. It also may be accompanied by constipation, double vision, difficulty in speaking and swallowing, and progressive paralysis of the respiratory tract and heart. If not treated in time with antitoxins, death usually will result from respiratory failure.

DIARRHEA UPDATE 1985

In North America infectious gastroenteritis rivals the common cold in prevalence. The clinical spectrum ranges from minor annoyance to life threatening illness.

Although all diarrhea for which no bacterial or parasitic agent can be found as a cause has traditionally been labelled as viral-induced, recent studies have more definitively demonstrated that viruses are indeed the foremost cause of this illness. Rotavirus which causes over half the cases of infantile diarrhea during the winter months, enteric adeno-virus and Norwalk virus are the most prevalent agents which cause illness. Fulminant diarrhea with a possibly fatal outcome due to dehydration is a risk in infants in particular. Enteric adenovirus also predominantly affects younger children while Norwalk virus affects older children and adults and usually causes vomiting rather than diarrhea. Numerous bacteria are capable of causing diarrhea. *Salmonella, Shigella* and *Campylobacter* are among the foremost bacterial agents.

Campylobacter jejuni, although pathogenic in all age groups, most frequently causes self-limited, often bloody diarrhea associated with fever and malaise in young children. The organism can survive up to 5 weeks in untreated water, is commonly excreted by and contaminates poultry, and causes infections in puppies and kittens. Outbreaks have occurred in association with consumption of unpasteurized milk. A carriage state is unknown and most victims excrete the organism for 2-3 weeks if untreated. Erythromycin therapy has little effect on the uncomplicated clinical course but may be effective in terminating prolonged and serious infections. However, this antibiotic does halt the excretion of the organism.

Shigella species are usually regarded as the agents of bacillary dysentery, a fulminant form of bloody diarrhea with prostration. However, the bacteria can also cause less dramatic non-bloody enteritis and infections can even be asymptomatic. Therapy with ampicillin or cotrimoxazole may be effective in relieving symptoms and ending excretion but resistance to either or both of these antibiotics will necessitate a change in therapy. While amoxicillin and ampicillin are often felt to be interchangeable, the former is far less effective in the treatment of shigellosis and should not be used.

Escherichia coli has gained increased prominence lately as a cause of gastroenteritis. While these bacteria are usually benign colonizers of the human gut, they can result in illness if they are enterotoxigenic, enteroinvasive or enteropathogenic. Verotoxin-producing strains, such as serotype 0157:H7, have been linked to hemorrhagic colitis and hemolytic-uremic syndrome. If hemolytic-uremic syndrome is suspected or a patient has bloody diarrhea, the laboratory should be requested to serotype the *E. coli*. Enterotoxigenic strains of *E. coli* are a leading cause of "travellers' diarrhea" in visitors to more tropical climates. If a patient with diarrhea has a recent travel history, the laboratory should be advised to also look for such "exotic" pathogens as *Vibrio cholerae* and other *Vibrio* species.

It has become increasingly evident that intestinal parasites are important causes of gastroenteritis in Canada. *Giardia lamblia* primarily produces illness in children and young adults and can be a particular problem in groups of day-care children. *Dientamoeba fragilis* also is mostly prevalent in young children and may be the cause of protracted diarrhea.

Cryptosporidia are intestinal parasites which are related to *Isospora* species and more distantly to *Toxoplasma* and have been responsible for cases of chronic and life-threatening diarrhea in immunosuppressed patients, especially among AIDS victims. However, as interest in the parasite increased and diagnostic techniques were improved and became more widely available, it became increasingly apparent that *Cryptosporidia* can cause self-limited but sometimes profuse watery diarrhea of 7 to 14 days' duration in immunologically competent patients. Outbreaks have been associated with contact with domestic animals such as cattle, and have occurred in day-care centers. Sporadic cases have also been widely reported in the last 2 years. The parasite, although capable of producing illness among all age groups, seems to have a predilection for children and appears to be especially prevalent in "Third World" countries. Increased awareness and suspicion by physicians of *Cryptosporidium* undoubtedly will result in increased reports of cases and a fuller understanding of its epidemiological characteristics.

In conclusion, it is important to keep in mind that all these pathogens are spread by the fecal-oral route, by direct contact or through such vehicles as food and water and that prevention is the most important means of control of infectious gastroenteritis. Careful preparation and cooking of food and proper handwashing can effectively decrease the risk of contacting an infection. Routine reliance on antibiotics is not always appropriate. They can either be ineffective as with viral infections or cryptosporidiosis or can prolong carriage as in cases of salmonellosis or can be selective for resistant strains during prophylaxis for "travelers' diarrhea". *Can. Diseases Weekly Report 5/18/85*

HOUSEHOLD OUTBREAK OF SHIGELLA FLEXNERI I - BRITISH COLUMBIA

On 17 February 1985, a 4-year-old girl from the Spallumcheen Reserve near Enderby, B.C., was admitted to the Vernon Hospital with a 24-hour history of fever and diarrhea. On 19 February her stool culture was positive for *Shigella* and the specimen, sent to the Provincial Laboratory for confirmation and typing, was reported as *Shigella flexneri* I. On the same day, stools for culturing were obtained from the 10 household members (2 parents, 3 natural children, 3 foster children, and a neighbor and daughter who helps with housework in the home daily). The 6 children were all under 7 years of age (4 were 4 years of age and under).

All 6 children subsequently became ill and were admitted to the hospital. The attack rate for all ages was compared to the normal of 25%. The attack rate in those 4 years of age and under was 100% compared to the normal of 40%. Five of the children had positive cultures for *Shigella flexneri* I. The sixth

child developed clinical illness 2 weeks after the last of the 5 other children had been hospitalized. He was hospitalized in Vernon and treated with ampicillin. Two attempts to culture *Shigella* from his stool were unsuccessful while he was on antibiotics. Because he had not been in recent contact with any of the other children, the 3 adult householders with previous negative stools were again cultured and were again negative.

Management: Personal hygiene, emphasizing handwashing and cleanliness in food preparation, was stressed during discussions with the family. The house appeared clean but was given a thorough scrubbing including toys. Water came from a well shared by other houses in the subdivision and sewage was provided by septic tank. Water testing was negative for coliforms and *Shigella*. Food and milk were obtained from the store and kept refrigerated. One asymptomatic child with a positive stool culture was treated prophylactically with amoxicillin by her family doctor and developed diarrhea and was hospitalized 3 days later. All the children remained in the hospital under enteric precautions until they had 12 negative stool cultures following the cessation of antibiotic (ampicillin) therapy. No initial source for the outbreak was identified, although a neighbor who was not available for culture is said to have had diarrhea 1 month previously. As of 2 April there had been no spread of the infection beyond the household.

Comment: Shigellosis is an acute infectious diarrheal disease caused by 4 species of the genus *Shigella* - *S. dysentaraiae* (usually associated with the most serious disease), *S. flexneri, S. boydii, and S. sonnei* (the most common isolate in developed countries). Man is the principal reservoir, spread is by direct fecal contact, and water, food, and flies may transmit the infection, hence its association with conditions of crowding and poor hygiene. The incubation period ranges from 1 to 7 days, usually 1 to 3 days, and the disease is communicable until the organism is no longer present in feces - usually with 4 weeks of infection. The carrier state occasionally persists for a longer period and may last up to a year. Ampicillin is the drug of choice when an antibiogram indicates sensitivity but multiple drug resistance tends to evolve rather quickly. Trimethoprim-sulfamethoxazole is the drug of choice when sensitivities are not known. Antibiotic use *may* shorten the carrier state and should probably be reserved for serious cases and where public health considerations demand treatment of carriers. It is interesting to note that amoxicillin is not effective possibly because it is so well absorbed. The newer poorly absorbed antibiotics such as bicozamycin show the most promise, suggesting the importance of an intraluminal effect.

Some of the anti-diarrheal agents such as Lomotol® (diphenoxylate) may actually worsen such infections and should not be used in cases of shigellosis. *Can Diseases Weekly Report 5/18/85.*

IAMFES Secretary-Treasurer Nominations Due

Nominations are open for the IAMFES Secretary-Treasurer. This year an industry representative will be elected.

Send a biographical sketch and photograph of your nominee to the Nominating Committee as soon as possible, but no later than November 1, 1985.

Send the information to: William Arledge, Dairymen's Inc., 10140 Linn Station Road, Louisville, KY 40223.

Holders of 3-A Symbol Council Authorization on August 15, 1985

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Robert E. Holtgrieve, Sec'y.-Treasurer, W255 N477 Grandview Blvd., Suite 100, Waukesha, Wisconsin 53188

01-06 Storage Tanks for Milk and Milk Products

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

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

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

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

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

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

432 TCI-Superior Division, (11/9/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

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

02-08 Pumps for Milk and Milk Products

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

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

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

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

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

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

148R Moyno Industrial Products (4/22/64)
of Robbins & Meyers, Inc.
1895 Jefferson St.
Springfield, OH 45506

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

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

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

219 TCI-Superior Division, (2/15/72)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

175R Universal Dairy Equipment (10/26/56)
408 S. First Ave.
Albert Lea, MN 56007

52R Viking Pump-Houdaille, Inc. (12/31/56)
406 State St.
Cedar Falls, IA 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

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

75 APV Gaulin, Inc. (9/26/57)
44 Garden St.
Everett, MA 02149

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

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

309 Pasilac, Inc. (7/19/78)
660 Taft St., NE
Minneapolis, MN 55413

425 TCI-Superior Division, (8/31/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

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

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

66 Kari-Kool Transports, Inc. (5/29/57)
P.O. Box 538
Beaver Dam, WI 53916

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

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

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

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

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

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

403 APV Crepaco, 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

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 200 Route 219 South
Bradford, PA 16701

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

422 BS&B Safety Systems, Inc. (6/12/84)
7455 E. 46th St.
Tulsa, OK 74133

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

443 Badger Meter, Inc. (5/1/85)
6116 East 15th Street
Tulsa, OK 74158

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

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

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

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

350 H&K, Inc. -Rosista Div. (1/7/82)
2365 S. 170th Street
P.O. Box 54
New Berlin, WI 53151

369 IMEX, Inc. (11/3/82)
4040 Del Rey Ave. Unit 9
Marina del Rey, CA 90292

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 688
Philipsburg, PA 16866

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

416 Process Engineers, Inc. (1/11/84)
3329 Baumberg Ave.
Hayward, CA 94545

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

424 Robert-James Sales, Inc. (8/31/84)
P.O. Box 1672, 269 Hinman Ave.
Buffalo, NY 14216-0672

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)
672 Hwy. 202-206N-Box #5
Bridgewater, NJ 08807

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 TCI-Superior Division, (11/23/66)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

250 Universal Dairy Equipment (6/11/73)
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

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

428 ARi Industries, Inc. (9/12/84)
381 ARi Court
Addison, IL 60101

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

418 Pasilac, Inc. (4/2/84)
660 Taft St., NE

Minneapolis, MN 55413

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

420 Stork Food Machinery, Inc. (4/17/84)
672 Hwy. 202-206N-Box #5
Bridgewater, N.J. 08807

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

444 Tuchenhagen North America, Inc. (6/17/85)
4119 Green Tree Road
Milwaukee, WI 53209

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

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

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

435 Sermia Equipment Limited (11/27/84)
(Not available in USA)
2511 Barbe Avenue
Chomedey, Laval, Quebec, Canada H7T 2A2

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

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

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

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

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

426 TCI-Superior Division, (8/31/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

12-04 Tubular Heat Exchangers for Milk and Milk Products

438 APV Equipment, Inc. (12/10/84)
395 Fillmore Ave.
Tonawanda, NY 14150

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

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

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

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. (1/28/85)
P.O. Box 178, Salino Station
Syracuse, NY 13201

392 Stork Food Machinery, Inc. (6/9/83)
672 Hwy. 202-206N-Box #5
Bridgewater, N.J. 08807

13-06 Farm Milk Cooling and Holding Tanks

49R Alfa-Laval, Ltd. (12/5/56)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

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

132 APV Crepaco, 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

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

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

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)
672 Hwy. 202-206N-Box #5
Bridgewater, N.J. 08807

427 TCI-Superior Division, (8/31/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

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

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

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

382 Combibloc, Inc. (4/15/83)
4800 Roberts Rd.
Columbus, OH 43228

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

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

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

351 Tetra Pak (1/7/82)
4885 Alpha Rd.
Suite 100
Dallas, Texas 75234

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

18-00 Multiple-Use Rubber & Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment

429 Bepex Corporation (9/25/84)
P.O. Box 880
Santa Rose, CA 95402

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

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

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

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

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

262 Alfa-Lava, Ltd. (11/11/74)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

439 JV Northwest Engineering, Inc. (1/22/85)
18088 S.W. Lower Boones Ferry Rd.
Portland, OR 97223

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

434 TCI-Superior Division, (11/9/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

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 APV Anderson Bros. Mfg. Co. (9/28/65)
1303 Samuelson Rd.
Rockford, IL 61109

209 Doboy Packaging Machinery Incorp. (7/23/69)
869 S 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

24-01 Non-coil Type Batch Pasteurizers

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

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

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

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

25-01 Non-coil Type Batch Processors for Milk and Milk Products

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

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

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

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

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

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

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

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

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

223 Invalco Measurement & Control (11/15/71)
P.O. Box 556
Tulsa, OK 74101

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

431 Pasilac, Inc. (10/11/84)
660 Taft St., N.E.
Minneapolis, MN 55413

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

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

30-01 Farm Milk Storage Tanks

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

31-01 Scraped Surface Heat Exchangers, as Amended

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

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

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

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

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

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

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

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

433 TCI-Superior Division, (11/9/84)
Mueller Canada Inc.
6500 Northwest Dr.
Mississauga, Ontario, Canada L4V 1K4

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 200 Route 219 South
Bradford, PA 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

417 Cherry-Burrell (2/7/84)
Anco/Votator Division
P.O. Box 35600
Louisville, KY 40232

415 Luwa Corporation (1/5/84)
4404 Chesapeake Dr.
Charlotte, NC 28216

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

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

423 Dynisco (6/15/84)
Ten Oceana Way
Norwood, MA 02062

317 Invalco Measurement & Control (2/26/79)
P.O. Box 556
Tulsa, OK 74101

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

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Abstracts of papers in the September Journal of Food Protection

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Survival of *Listeria monocytogenes* During the Manufacture and Storage of Nonfat Dry Milk, Michael P. Doyle, Louise M. Meske and Elmer H. Marth, Food Research Institute and Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 48:740-742

The ability of *Listeria monocytogenes* to survive in skim milk during spray drying and to persist in nonfat dry milk during storage was examined. Concentrated (30% solids) and unconcentrated skim milks were inoculated with ca. 10^5 to 10^6 *L. monocytogenes*/ml and spray dried (inlet temperature, 165 ± 2°C; outlet temperature 67 ± 2°C) to a moisture content of 3.6 to 6.4%. The nonfat dry milk was packaged in moisture-resistant film and stored at 25°C for up to 16 wk. A reduction of ca. 1 to 1.5 $\log_{10}$ *L. monocytogenes*/g occurred during the spray drying process, irrespective of whether the milk was concentrated or not before spray drying. The organism progressively died during storage at 25°C, with a >4-$\log_{10}$ CFU/g decrease occurring within 16 wk of storage.

Thermal Resistance of *Listeria monocytogenes* in Milk, J. G. Bradshaw, J. T. Peeler, J. J. Corwin, J. M. Hunt, J. T. Tierney, E. P. Larkin and R. M. Twedt, Division of Microbiology, Food and Drug Administration, Cincinnati, Ohio 45226

J. Food Prot. 48::743-745

The thermal resistance of *Listeria monocytogenes* associated with a milkborne outbreak of listeriosis was determined in buffer and whole milk. Thermal resistance was stable over a 2-year period and could not be altered by selecting heat-stressed survivors. The rate of inactivation was linear and did not differ significantly between pH 5.5 and 9.0. When portions of whole milk containing 1×10^5 cells of *L. monocytogenes*/ml were heated at seven temperatures from 52.2 to 74.4°C, the D-values ranged from 1683.7 to 0.7 s, respectively. The z_D-value was 6.3°C. The D-value at 71.7°C was 0.9 s. *L. monocytogenes* would not survive the pasteurization process.

Survival of *Listeria monocytogenes* During Manufacture and Storage of Cottage Cheese, Elliot T. Ryser, Elmer H. Marth and Michael P. Doyle, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 48:746-750

Cottage cheese was made by the short-set procedure in pilot-plant-sized vats from pasteurized skim milk inoculated to contain 10^4 - 10^5 *Listeria monocytogenes* (strains Scott A or V7)/ml. Half the curd from each trial (two trials with each strain of *L. monocytogenes*) was creamed and half remained uncreamed. Numbers of *L. monocytogenes* were determined by surface-plating samples diluted in Tryptose Broth (TB) on McBride's Listeria Agar (MLA). Initial TB dilutions were then stored at 3°C and plated on MLA after 2, 4, 6 and 8 weeks or until *L. monocytogenes* was recovered. Selected *L. monocytogenes* colonies from each sample were serologically confirmed. Results for both strains indicate that during manufacture, numbers of *L. monocytogenes* remained relatively constant until after cooking of curd was completed. All samples analyzed after cooking curd 30 min at 57.2°C (135°F) contained fewer viable *L. monocytogenes* than could be detected by our methods (10 or 100 CFU/g or ml). Both strains were recovered from cold-enrichment samples, indicating that small numbers of the organism survived the cheesemaking process. Using direct plating onto MLA, *L. monocytogenes* was recovered from 43 of 112 (38.4%) cottage cheese samples during storage at 3°C for up to 28 d. After cold-enrichment in TB for up to 8 weeks, 59 of 112 (52.7%) samples were positive for *L. monocytogenes*. Greater numbers of *L. monocytogenes*, particularly strain Scott A, were found in creamed rather than uncreamed cottage cheese; however, numbers seldom exceeded 100/g.

Incidence of *Streptococcus zooepidemicus* Mastitis, Lynn S. Hinckley, Mastitis Laboratory U-193, 3113 Horsebarn Hill Road, University of Connecticut, Storrs, Connecticut 06268

J. Food Prot. 48:751-753

The first outbreak of *Streptococcus zooepidemicus* infection in humans in the United States occurred in 1983, when sixteen cases were reported in New Mexico. The source of infection was traced to cheese made with raw milk from cows with *S. zooepidemicus* mastitis. A study of the incidence of mastitis caused by *S. zooepidemicus* in cows on the Connecticut Mastitis Control Program was conducted for a 6-month period. Seventeen percent of the 255 herds monitored had *S. zooepidemicus* mastitis cases and two of these herds had large numbers of cows infected.

Methods of Chilling and Packaging of Beef, Pork and Lamb Variety Meats for Transoceanic Shipment: Physical and Sensory Characteristics, D. M. Stiffler, J. W. Savell, D. B. Griffin, M. F. Gawlik, D. D. Johnson, G. C. Smith and C. Vanderzant, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 48:754-764

The effects of chilling/tempering treatments on the pH, weight loss and quality characteristics of beef, pork and lamb variety meats (livers, hearts, tongues and kidneys) that were packaged either in polyethylene (PE) bags or vacuum packaged (VP) in the USA and transported fresh-chilled to Antwerp, Bel-

gium, were evaluated. Product arrived at the final destination 11 d after departure from the United States seaport (13 to 15 d after packaging). Changes in pH during overseas shipment were generally small and suggested a lack of product quality deterioration resulting from major microbial proliferation during this period. Variety meats that were not prechilled before packaging generally had the lowest weight loss among chilling/tempering treatments. In general, fresh-chilled variety meats that were vacuum packaged incurred less weight loss than those that were packaged in PE bags. Livers lost a greater percentage of their weight during shipment than did other variety meats. Vacuum-packaged variety meats had more desirable quality characteristics after shipment than those that were packaged in PE bags. Shipping fresh-chilled variety meats in PE does not appear feasible. Although some statistical differences were noted, the chilling/tempering treatments appeared to have little appreciable effect on quality characteristics of variety meats, with two exceptions: (a) cooler-chilled variety meats packaged in PE bags had superior quality characteristics as compared to those that were not prechilled and packaged in PE bags; and (b) livers that were not prechilled before vacuum packaging did not maintain their qualitative characteristics as well as did those in other chilling/tempering treatments.

Methods of Chilling and Packaging of Beef, Pork and Lamb Variety Meats for Transoceanic Shipment: Microbiological Characteristics, C. Vanderzant, M. O. Hanna, J. G. Ehlers, J. W. Savell, D. B. Griffin, D. D. Johnson, G. C. Smith and D. M. Stiffler, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 48:765-769

The effect of various initial chilling treatments on the numbers and types of microorganisms of beef, pork and lamb tongues (n=60) and livers (n=60) packaged either in polyethylene (PE) film or in vacuum packages in Texas and transported fresh-chilled via transoceanic shipment to Antwerp, Belgium, was evaluated. Initial chilling treatments included: cooler-tempered (4 to 6 h at 2°C), cooler-chilled (24 h at 2°C) freezer-tempered (0.5 to 1 h at -20°C), freezer-chilled (2 h at -20°C), ice-chilled (2 h in ice water slush) and no prechilling (NPC) before packaging and subsequent refrigerated storage at 2°C. After the initial chilling treatments, the microflora was varied with *Micrococcus* spp. with or without coryneform bacteria being the predominant bacterial types of most samples. After refrigerated storage for 13 to 15 d, lactic acid bacteria became dominant in most vacuum-packaged samples and in pork and lamb samples stored in PE film. *Brochothrix thermosphacta* and *Pseudomonas* spp. constituted a greater part of the microflora of beef tongues and livers stored in PE film than that of comparable vacuum-packaged samples. Increases in aerobic plate counts (APC) of refrigerated vacuum-packaged samples nearly always were greatest for samples (NPC) that were not pre-chilled before packaging and usually were smallest for samples that were either freezer-chilled, freezer-tempered or ice-chilled.

Enumeration of Enterococci and Aerobic Mesophilic Plate Count in Dried Soup Using Three Reconstitution Methods, Wei-Tsyi Ting and George J. Banwart, Department of Microbiology, The Ohio State University, 484 West 12th Avenue, Columbus, Ohio 43210

J. Food Prot. 48:770-771

A naturally contaminated dried soup sample was reconstituted by three different methods (1:1 swirl, 1:9 soak and 1:9 rapid rehydration) and analyzed for enterococci on m-enterococcus agar and aerobic mesophilic plate count on plate count agar. The enterococcal counts obtained by the 1:1 swirl and the 1:9 soak methods were 41.6% and 26.5%, respectively, higher than that of the commonly used 1:9 rapid rehydration method. The aerobic mesophilic plate counts for the three systems were not significantly different.

Aluminum Levels in Foods Cooked and Stored in Aluminum Pans, Trays and Foil, J. L. Greger, William Goetz and Darryl Sullivan, Department of Nutritional Sciences, University of Wisconsin, Madison, Wisconsin 53706 and Hazleton Laboratories America, Inc., Madison, Wisconsin 53704

J. Food Prot. 48:772-777

The aluminum content of 26 different foods was determined before and after the foods were cooked in uncoated new, conditioned and old aluminum pans, in stainless steel pans or in disposable aluminum trays and foil. All the foods tested contained small amounts of aluminum naturally. Some foods (i.e., potatoes boiled in new aluminum pans; cabbage and beef roasts cooked in aluminum pressure cookers; applesauce and eggs cooked in conditioned aluminum pans; tomatoes cooked in old aluminum pans; and mashed potatoes frozen and heated in TV dinner trays) accumulated significant ($P<0.05$) amounts of aluminum during preparation. However, the actual amounts of aluminum that were added to foods through the use of aluminum utensils were quite small as compared to the average dietary intake of aluminum by Americans.

Competitive Exclusion of *Salmonella* from Newly Hatched Chicks by Mixtures of Pure Bacterial Cultures Isolated from Fecal and Cecal Contents of Adult Birds, S. Stavric, T. M. Gleeson, B. Blanchfield and H. Pivnick, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 48:778-782

Oral administration of defined mixtures of bacterial isolates from fecal and cecal contents of adult chickens protected young chicks against infection with *Salmonella*. One-day-old chicks were treated with mixtures containing 50, 40, 25 and 10 bacterial isolates and challenged 2 d later with 10^4, 10^5 and 10^6 colony-forming units of nalidixic acid-resistant *Salmonella typhimurium*. The chicks were examined for infection 6 d after challenge. The mixture of 50 bacterial cultures gave protection

comparable to that obtained with fecal or cecal cultures of unknown bacterial composition. Less protection was evident with mixtures containing fewer cultures.

Adherence and Hemagglutination of Mammalian Cells by Epidemiologically Distinct Strains of *Vibrio vulnificus,* A. L. Reyes, B. K. Boutin, J. T. Peeler and R. M. Twedt, Division of Microbiology, Food and Drug Administration, 1090 Tusculum Avenue, Cincinnati, Ohio 45226

J. Food Prot. 48:783-785

Thirty-eight strains of *Vibrio vulnificus* were examined for their ability to adhere to human buccal epithelial cells and to hemagglutinate mammalian erythrocytes. Clinical isolates showed significantly greater mean adherence than environmental strains. The ability to hemagglutinate human erythrocytes was closely associated with vigorous buccal cell adherence.

Efficiency of Treatments Involving Ultraviolet Irradiation for Decontaminating Packaging Board of Different Surface Compositions, Catherine J. Stannard, John S. Abbiss and John M. Wood, Leatherhead Food Research Association, Randalls Road, Leatherhead, Surrey, KT22 7RY, United Kingdom

J. Food Prot. 48:786-789

Reflectivity, smoothness and geometry of several types of food packaging board were studied in relation to the effectiveness of decontamination treatments involving ultraviolet (UV-C, 254 nm) irradiation. Surfaces containing aluminum in the laminate reflected more light in the 325 to 550 nm range and showed a lower lethal effect when *Bacillus subtilis* spores were irradiated. Visible light of wavelengths between 325 and 550 nm is known to cause photoreactivation of UV damage in vegetative cells. It was suggested that a similar phenomenon might occur in spores on reflective surfaces. Smoothness of the board surface was not an important factor in the extent or the variability of the lethal effect. The geometry of the irradiated surface was shown to be important for aluminum/polyethylene laminate-lined surfaces only, as more spores were killed on board normal to incident UV-C irradiation than in cartons with reflective angles. Spores on the inner sides of this type of carton may have received more reflected light of photoreactivation wavelengths.

Enzyme Immunoassay - Membrane Filter Method for Detection of Salmonellae in Foods, Jeffrey M. Farber, Pearl I. Peterkin, Anthony N. Sharpe and Jean-Yves D'Aoust, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 48:790-793

An enzyme-linked immunosorbent assay (ELISA) technique using a horseradish peroxidase-protein A-Spicer Edwards antiserum complex was developed for the detection of *Salmonella* colonies on membrane filters. In pure culture, 64 *Salmonella* species tested gave a positive reaction (purple stain). Of 22 naturally contaminated food samples, there was an exact correlation between the AOAC hydrophobic grid-membrane filter procedure and the ELISA technique (40.9% positives). This technique is simple, requires little equipment and can be completed in less than 2.5 h, thus allowing the detection of *Salmonella* spp. in foods within 48 h from initiation of sampling.

Enumeration and Isolation of Mesophilic Anaerobic Sporeformers from Cannery Post-Processing Equipment, Donald E. Lake, Roland S. Lesniewski, Jean E. Anderson, Richard R. Graves and Joseph F. Bremser, American Can Company, 433 North Northwest Highway, Barrington, Illinois 60010

J. Food Prot. 48:794-798

Microbiological surveys of post-processing can handling equipment were conducted in three low-acid food canneries to identify the source and numbers of mesophilic anaerobic sporeformers isolated from post-processing spoilage of cans packed at those canneries. Significant numbers of spores of these organisms were found on various equipment and can tracks. The spores were also isolated from the can cooling waters in two of the canneries and in numbers higher than have been reported previously. No correlation was noted between mesophilic anaerobic spore counts and total aerobic counts in samples obtained from the surveys. *Clostridium botulinum* was not isolated from any of the survey samples. A medium useful in the isolation of mesophilic anaerobic sporeformers is described.

Microbiological and Flavor Evaluation of Fluoridated Milk, Joseph F. Frank and Genevieve L. Christen, Animal and Dairy Science Department, University of Georgia, Athens, Georgia 30602

J. Food Prot. 48:799-802

Supplementation of milk with fluoride is one method for insuring that infants and children living in areas where water fluoridation is not practical consume adequate amounts of fluoride. The purpose of this research was to evaluate the shelf-life and flavor of fluoride-supplemented milk and to determine the effect of fluoridation on microbial growth. Triangle taste tests were used to determine whether fluoride at 100 ppm could be detected in fresh and 8-d-old milk. These tests employed between 91 and 178 tasters, and indicated that addition of fluoride produced no detectable flavor change. A shelf-life

study using three trained judges indicated that pasteurized milk supplemented with 10 ppm fluoride had a shelf-life and off-flavor development similar to that of normal pasteurized milk. Growth of 11 microbial cultures representing a variety of important milk-associated species was not significantly affected by fluoride supplementation.

Bacterial Cell Characteristics and Conditions Influencing Their Adhesion to Poultry Skin, H. S. Lillard, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 48:803-807

Conflicting reports appear in the literature regarding attachment of flagellated and nonflagellated bacteria to poultry skin. The following parameters which may influence bacterial attachment were examined: (a) sample type and size; (b) skin from fully processed and scalded but uneviscerated broilers; (c) skin from hard- and soft-scalded broilers; and (d) potentially variable tap rinse and constant pressure spray wash (50 psi). Gram-positive and gram-negative, flagellated and nonflagellated bacteria were used in suspension fluids (*Salmonella typhimurium, Salmonella gallinarum, Proteus vulgaris, Pseudomonas fluorescens, Clostridium perfringens, Staphylococcus aureus* and a nonflagellated species of *Micrococcus*). Results showed that none of the variables tested affected the ability of bacteria to adhere to poultry skin in 0.25 min. All species tested adhered to skin, and there was a generally linear increase in rate of attachment with time (0.25 to 60 min) following exposure of poultry skin to suspending fluid. It was concluded that nonflagellated bacteria attach as readily as flagellated bacteria under the same controlled conditions.

Incidence of *Campylobacter jejuni/coli* on Pork Carcasses in the Northeast Georgia Area, A. J. Bracewell, J. O. Reagan, J. A. Carpenter and L. C. Blankenship, Food Science Department, University of Georgia, Athens, Georgia 30602 and Richard B. Russell Agricultural Research Center, United States Department of Agriculture, Science and Education Administration, Agricultural Research Service, P.O. Box 5677, Athens, Georgia 30604

J. Food Prot. 48:808-810

One hundred and twelve freshly slaughtered pork carcasses from three packing plants were sampled before and after chilling for the presence of *Campylobacter jejuni/coli* by the use of two isolation methods (Preston enrichment and Skirrow direct plating). Preston enrichment media gave the highest isolation rate, 12.5%, on freshly slaughtered carcasses. No isolations were obtained from chilled carcasses. More isolates were obtained from the ham skin area compared with the jowl area. All isolates were confirmed as *Campylobacter coli*.

Microbiological Quality of Shawarma in Saudi Arabia, M. Ayaz, F. A. Othman, T. O. Bahareth, A. M. Al-Sogair and W. N. Sawaya, Food Science and Nutrition Section, Regional Agriculture and Water Research Center, Ministry of Agriculture and Water, P.O. Box 17285, Riyadh, Saudi Arabia 11484

J. Food Prot. 811-814

A total of 108 shawarma (cooked meat) samples were aseptically collected from various fast-food restaurants in Riyadh, Saudi Arabia. These samples were examined by standard procedures for determination of aerobic plate count (APC), and counts of coliforms, *Staphylococcus aureus, Clostridium perfringens,* and the detection of salmonellae. The APC ranged from 10^2 to 3.0×10^8 CFU/g. The counts for coliforms, *S. aureus* and *C. perfringens* ranged from <10 to 10^6, <10 to 10^5 and <10 to 10^6 CFU/g, respectively. Twelve percent of the shawarma samples was positive for *Salmonella*. The results of this investigation indicate that foodborne pathogens present in shawarmas constitute a potential public health hazard.

Outbreaks of Shellfish-Associated Enteric Virus Illness in the United States: Requisite for Development of Viral Guidelines, Gary P. Richards, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Southeast Fisheries Center, Charleston Laboratory, P.O. Box 12607, Charleston, South Carolina 29412-0607

J. Food Prot. 815-823

Outbreaks of hepatitis A, Norwalk illness, and nonspecific viral gastroenteritis are associated with consumption of sewage-contaminated shellfish. Over 100 outbreaks have been reported in the United States during the past 50 years. Reported cases of shellfish-associated enteric virus illness are on the increase, whereas bacterial illness from shellfish is on the decline. As yet, there are no procedures for detecting hepatitis A virus, Norwalk virus and numerous other pathogenic viruses in environmental samples, but virus extraction and assay procedures for water and shellfish are available for the more easily cultivated enteric viruses. Current standards rely on bacterial indicators as a means to evaluate the sanitary quality of shellfish and their growing waters, but the adequacy of using bacteria as indicators of possible virus contamination is questionable. The feasibility of employing enteroviruses or rotaviruses as possible viral indiators is discussed. It is proposed that easily cultivated enteroviruses, such as poliovirus, be used as an interim indicator for the possible presence of human pathogenic viruses in seafoods, with the subsequent formulation of guidelines to limit the levels of virus contamination in shellfish.

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116	136	156	176	196	216	236	256	276	296	316	336	356
117	137	157	177	197	217	237	257	277	297	317	337	357
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Calendar

1985

September 9-10, ILLINOIS SANITARIAN'S AND DAIRY FIELDMEN, will combine their fall meeting, to be held in Champaign, IL. For more information contact: Clem Honer, 1 S 760 Kenilworth Ave., Glen Ellyn, IL. 312-693-3200.

September 9-10, REGIONAL BASIC SANITATION SEMINAR, Dallas Texas. Contact Shirley Grunder at 913-537-4750 or write: Shirley Grunder, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 9-13, ADVANCED COOKIE PRODUCTION TECHNOLOGY COURSE, Manhattan, Kansas. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 9-12, ASEPTIC PROCESSING AND PACKAGING OF FOODS, sponsored by The International Union of Food Science and Technology Food Working Party of the European Federation of Chemical Engineering, to be held in Tylosand, Sweden. For more information contact: Ann-Britt Madsen, Kurssekretariatet, Lund Institute of Technology, P.O. Box 118, S-221 00 Lund, Sweden.

September 12-13, REGIONAL BASIC SANITATION SEMINAR, Hershey, Pennsylvania. Contact Shirley Grunder at 913-537-4750 or write: Shirley Grunder, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 16-20, MAINTENANCE MANAGEMENT SEMINAR, to be held in Manhattan, Kansas. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 17-19, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to be held at the Sheraton Inn, Syracuse, NY. For more information contact: D. K. Bandler, 11 Stocking Hall, Cornell University, Ithaca, NY 14853. 607-256-3027.

September 21, UPDATE ON OVEN TECHNOLOGY, Orlando, Florida. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 18-24, EMETREX-ENPROTEX-INTERNATIONAL ENVIRONMENTAL AND ANTI-POLLUTION EXHIBITION '85, to be held at Beijing Exhibition Centre, Beijing, People's Republic of China. For more information contact: Harry C. Lepinske, Clinton International Trade Center, 1719 South Clinton Street, Chicago, Illinois 60616. 312-421-7000.

September 25-26, SIXTH ANNUAL JOINT EDUCATIONAL CONFERENCE, to be held at Valley Inn, Neenah, WI. For more information contact: Ron Buege, West Allis Health Department, 7120 West National Avenue, West Allis, WI. 414-476-3770.

September 30 - October 2, ADVANCED SANITATION PROGRAM, to be held in Chicago, IL. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

September 30 - October 11, IN-STORE BAKERY TRAINING PROGRAM, to be held in Manhattan, KS. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

October 1-2, SOUTH DAKOTA STATE DAIRY ASSOCIATION CONVENTION to be held at the Ramada Inn, Sioux Falls, So. Dakota. For more information contact: Shirley W. Seas, Ex Secretary, Dairy Science Dept., So. Dakota State University, Brookings, SD 57007.

October 1-3, STORAGE LIVES OF CHILLED AND FROZEN FISH AND FISH PRODUCTS, to be held at The Conference Centre, University of Aberdeen, Aberdeen, Scotland. For more information contact: IIR Conference Organiser, Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen AB9 8DG, UK.

October 1-4, BETTER PROCESS CONTROL SCHOOL, to be held at the University of Nebraska-Lincoln. For more information contact: Michael Liewen, University of Nebraska-Lincoln, 134 Filley Hall, Lincoln, NE 68583. 402-472-2814.

October 2-4, WORKSHOP IN FOOD FLAVOR: DEVELOPMENT, MANUFACTURE AND USE, to be held at the University of Minnesota, St. Paul, MN. For more information contact: Joanne Parsons, Office of Special Programs, 405 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, MN 55108. 612-373-0725.

October 4-10, THE ENVIRONMENTAL MANAGEMENT ASSOCIATION, and its subsidiaries will hold its 28th annual National Educational Conferences and Exposition at the Holiday Inn Surfside Conference Center, Clearwater Beach, FL. For more information contact: Jean M. Day, EMA, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

October 5-9, DFISA FOOD & DAIRY EXPO '85, to be held at the Georgia World Congress Center, Atlanta, GA. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

October 7-9, BIOTECHNOLOGY IN THE FOOD PROCESSING INDUSTRY, sponsored by the Department of Food Science and Nutrition, University of Minnesota. To be held at the University Radisson Hotel, Minneapolis, Minnesota. For more information contact: Lynette Marten, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108. 612-373-0725.

October 7-9, IN-STORE BAKERY TRAINING-MANAGEMENT SECTION, Manhattan, Kansas. Contact Donna Mosburg at 913-537-4750 or write: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

October 8-9, SEMINAR ON NEW DAIRY PRODUCTS VIA NEW TECHNOLOGY, jointly sponsored by USNAC and IDF, Georgia World Congress Center, Atlanta. For more information contact: Harold Wainess, Secretary, U. S. National Committee of IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 14-18, ADVANCED BAKERY PRODUCTION, to be held in Manhattan, KS. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. Register by Phone: Call Donna at 913-537-4750 or 1-800-633-5137.

October 16-17, IOWA ENVIRONMENTAL HEALTH ASSOCIATION MEETING, to be held at the Starlite Village, Ames, IA. For more information contact: Derward Hansen, RR 3, Box 26, Exira, IA 50076. 712-268-2798.

October 21-23, STABILITY AND QUALITY CONTROL WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

October 21-23, COOKIE-CRACKER TECHNOLOGY FOR ALLIED AND NON-PRODUCTION PERSONNEL, Manhattan, Kansas. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

October 21-26, 69TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION AUCKLAND, NEW ZEALAND. For more information contact: H. Wainess, Secretary, U. S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 22-23, CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS ANNUAL CONFERENCE, to be held at the Clarion Hotel, 401 East Millbrae Avenue, Millbrae, California. For more information contact: Richard C. Harrell, Executive Sect/Treas, 1554 West 120th Street, Los Angeles, CA 90047.

October 21-25, 69TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, to be held in Auckland, New Zealand. For more information contact: H. Wainess, Secretary, U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 24, FOCUS ON FOOD SYMPOSIUM VI; ASSURING MEAT WHOLESOMENESS, to be held in Manhattan, Kansas. For more information contact: Dr. David Schafer, Department of Animal Sciences and Industry. 913-532-6134. Or contact Dr. Karen Penner, Extension Home Economics, Kansas State University, Manhattan, KS. 913-532-5773.

October 28-30, PCO RECERTIFICATION, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American In-

stitute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

October 28 - November 1, PRE-MIX SEMINAR, to be held in Manhattan, KS. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 55402. 913-537-4750.

October 28 - November 8, COOKIE TECHNOLOGY, Manhattan, Kansas. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

November 5-7, TECHNOLOGY OF BAKING, to be held in Las Vegas, NV. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

November 6, SANITATION THRU DESIGN, Las Vegas. Contact Shirley Grunder at 913-537-4750 or write: Shirley Grunder, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

November 11-15, CRACKER PRODUCTION COURSE, Manhattan, Kansas. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

November 13-15, GUM CHEMISTRY AND TECHNOLOGY IN THE FOOD INDUSTRY, to be hald at the Holiday Inn, Chicago City Centre in Chicago. IL. For more information contact: Raymond J. Tarleton, 3340 Pilot Knob Road, St. Paul, MN. 612-454-7250.

December 2-4,TECHNOLOGY OF TORTILLAS, Manhattan, Kansas. Contact Donna Mosburg at 913-537-4750 or write: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

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January 14-16, 11TH ANNUAL MEETING TROPICAL AND SUBTROPICAL FISHERIES TECHNOLOGISTS, to be held at Holiday Inn, International Airport, Tampa, FL. For more information contact: John Koburger, 449 Food Science Building, University of Florida, Gainesville, FL 32611. 904-392-1991.

February 5-6, FOOD PROCESSORS' SANITATION WORKSHOP, Presented by the University of California Cooperative Extension, Food Processors' Sanitation Association, and Golden Gate Chapter of the Environmental Management Association, along with representatives of various food trade associations. For more information contact: Kathryn Boor, Food Science and Technology, University of California, Davis, CA 95616. 916-752-1478.

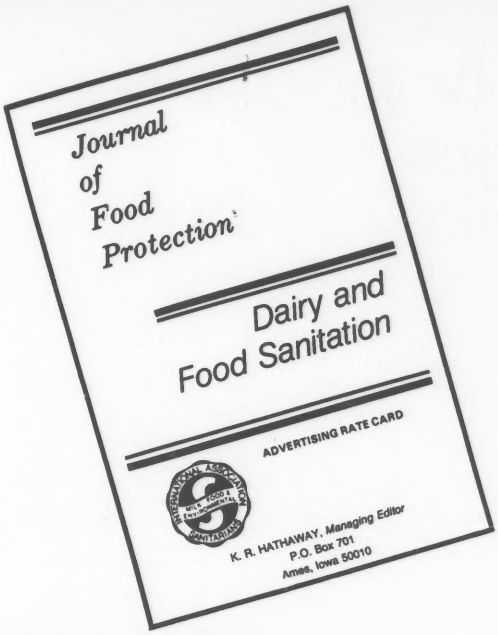
April 14-18, FRUIT AND FRUIT TECHNOLOGY RESEARCH INSTITUTE INTERNATIONAL CONFERENCE to be held at the CSIR Conference Centre, South Africa. For more information contact: Symposium Secretariat S.341, CSIR, P.O. Box 395, Pretoria 0001, South Africa. Telephone: 012 869211 x 2063. Telex: 3-630 SA.

May 26-31, 2ND WORLD CONGRESS FOODBORNE INFECTIONS AND INTOXICATIONS will take place in Berlin (West) at the International Congress Centre (ICC). For more information contact: FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine (Robert von Ostertag-Institute), Thielallee 88-92, D-1000 Berlin 33.

June 29-July 2, 29TH CONFERENCE OF THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY, to be held in Calgary, Alberta, Canada. For more information contact: Terry Smyrl, Ph.D., Alberta Horticultural Research Center, Brooks, Alberta, Canada, T0J 0J0. 403-362-3391.

July 15-19, PURDUE CANNERS TECHNICIANS MOLD COUNT SCHOOL. For more information contact: Dr. James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

AUGUST 3-7, IAMFES ANNUAL MEETING to be held at the Radisson South, Minneapolis, MN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.



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