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DAIRY, FOOD AND ENVIRONMENTAL

SANITATION

AUGUST 1991

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

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Thoughts From The President . . .

By
Damien A. Gabis
IAMFES President

As your President for 1991-92, I will put forth my best effort to work towards the nine objectives of IAMFES. Article II of the Constitution and By-Laws will provide the focus for my stewardship. The objectives of IAMFES are:

1. Provide a forum for professionals in the areas of milk, food, and environmental safety and quality.
2. Improve the professional status of the members.
3. Assist members in their technical work and professional development.
4. Disseminate information regarding the protection of milk, food and the environment.
5. Develop, improve and promote sanitary methods and procedures for the development, production, processing, distribution, preparation and serving of milk and food.
6. Develop, improve and promote methods and procedures for supervision and inspection of the production, processing, distribution, preparation and serving of milk and food.
7. Develop and promote improved methods for the examination of milk, food and environmental samples.
8. Promote the development and adoption of uniform equipment and quality standards to improve the sanitary handling of milk and food.
9. Develop, improve and promote methods and procedures for protecting and improving the environment.
10. Cooperate with other professional groups in the improvement and promotion of milk, food and environmental sanitation.

With the help of the Executive Board; Executive Manager, Steve Halstead and the Ames Office Staff; and all IAMFES members, I hope to continue to develop and strengthen our Association.

Some of the principal areas that I hope to stress are strengthening of our membership development activities; increasing interactions and cooperative activities with other professional associations who work in food protection; and encouraging closer ties with our Affiliate Associations by providing useful services to them. Dee Buske of the Ames office has been very active for the past two years in increasing the services provided to the Affiliates.

I intend for the Ames office to conduct a survey of the members to determine the "demographics" of our association so that the Executive Board and Ames office will better know our members, their professional needs and expectations from membership in IAMFES. This information will allow the Association to better plan for the future.

The members of IAMFES work through Committees to achieve the objectives of IAMFES and I hope that we will be able to continue to strengthen our committees' work through increasing the participation of members.

On the administration side of our association, Steve Halstead has made many improvements to increase our fiscal and management performance. We will work to continue to improve management and operations at the Ames office. The implementation of effective management practices in the Ames office will allow the Association to operate smoothly and professionally. As we grow over the years, effective administration of the Association becomes more important. The Ames office staff is highly dedicated to working for the benefit of our Association.

The IAMFES Annual Meeting is the highlight of the year for our Association. Each year the technical program quality has improved through the efforts of the Program Advisory Committee, and I believe that we will continue to enhance the Annual Meeting Programs for the benefit of the members.

In 1988, IAMFES' Long Range Planning Committee made recommendations to the Executive Board in the form of a Long Range Plan. It is my intention that the Executive Board review this plan to determine our progress and to help the Association outline future needs.

Lastly, speaking for the Executive Board, I invite ALL IAMFES members to become active because the Association's vitality and our ability to contribute depends on all members' participation.

I am looking forward to a challenging and productive year working with all of you.

On My Mind . . .

By
Steven K. Halstead
IAMFES
Executive Manager

What's in a Name?

My academic training was to be a teacher, and as you know, teachers love to give tests (apologies to you academicians out there, I know that this is a myth—tests are at best a terrible amount of work but everybody else thinks you love to give them). So, take out a pencil (yes, Johnny, a pen is okay) and put everything else away. Each question is worth two points, and has only one correct answer.

1. Which of the following are members of the American Medical Association?
   a. Nurses
   b. Doctors
   c. Lawyers
   d. All of the above
2. Which of the following are members of the American Automobile Dealers Association?
   a. Automobile Dealers
   b. Restaurant Owners
   c. Tree Surgeons
   d. All of the above
3. Which of the following are members of the Natural Heritage Foundation?
   a. Nurses
   b. Automobile Dealers
   c. Food Processors
   d. All of the above
4. Which of the following are members of IAMFES?
   a. Food processors
   b. Government employees
   c. Research Scientists
   d. Quality Control Workers
   e. Students
   f. College Professors
   g. All of the above

For extra credit: What do questions 1 and 2 (set 1) have in common? What do questions 3 and 4 (set 2) have in common? How does the first set differ from the second set? And, what does all of this have to do with names?

I hope the answer to the last question is pretty obvious, but if not, keep reading.

The real meat of this quiz is in the extra credit questions. The AMA and the AADA are very homogeneous groups. Only doctors are allowed members of the AMA and only auto dealers can join the AADA. Their names clearly reflect the composition of their membership.

The Natural Heritage Foundation and IAMFES, on the other hand, are very diverse groups. It is impossible to say who is and who is not a member simply by their job title. Our research shows that our members have something like 63 different job titles. Obviously, no one single name can encompass all those.

So instead of all the members uniting in doing the same job (medicine or selling cars), NHF and IAMFES members are united in their dedication to a common cause--a safe food supply in our case and the preservation of nature in the other.

IAMFES has been considering a name change. On the one side are those who maintain that our name neither describes who we are or what we are about. They were joined by those who feel that the name is too long and cumbersome.

On the other side were those who felt that "if it ain't broken, don't fix it." They were joined by those who reflected on the proud origins and traditions of the Association.

It was just a matter of time before the two factions would meet in a show-down.

That show-down came when the Name Change Committee asked the membership if the committee should continue their efforts toward coming up with a new name. In essence, they were saying, "If you aren't serious about changing the name, then we don't want to waste our time working on one."

May 15 was the deadline for voting. The vote was 474 "NO" and 305 "YES". The message is pretty clear that you don't want to change the name.

My biggest concern about the whole issue was its potential for divisiveness. I had nightmares in which I saw emotional polarization leading to a split association. Happily that did not happen, and I have every reason to believe that both sides will accept the decision of the majority and that we will all pull together to make this the best association it can be. We don't need a new name to do that!

IAMFES Sustaining Members

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- ❑ Procedures to Investigate Arthropod-borne and Rodent-borne Illness

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Dairy, Food and Environmental Sanitation CONTENTS

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Food Service Sanitation Guidelines to Avoid Food Poisoning Outbreaks

Marvin E. Winston, CEO and President,
Winston Laboratories, Inc., 25 Mt. Vernon Street, Ridgefield Park, NJ

Is your club, organization, or religious group planning an activity involving the serving of a meal? If so, consider the following guidelines which are offered in conjunction with suggestions by various Board of Health Departments:

1) A person knowledgeable with food service should be designated to coordinate and supervise the food service activity.

2) When individual contributions are solicited, food service activities should be planned and coordinated so that as much of the food preparation as possible is conducted in an approved and licensed kitchen. Kitchens located in *synagogues*, churches, and social clubs are subject to Board of Health license and approval.

3) During food preparation, food handlers:

a) Should practice a high degree of personal hygiene and cleanliness.
b) Should always work with clean hands. Hands should be thoroughly washed after any work interruption or stoppage. Fingernails too, should be close cut and clean.
c) Should always keep hands away from mouth, nose and hair. Always cover coughs and sneezes with a clean handkerchief or tissue–"cover up that cough and sneeze"–"Don't spread disease."
d) Should never work around food if handler has any infection such as a boil, acne, cut, cold or "flu". Persons infected with a communicable disease or who are "carriers" are prohibited from preparing and/or serving any food.
e) Should always work with clean clothing and effective hair restraints. Casual and/or unclean street clothing is not to be tolerated.
f) Should never use tobacco or "controlled dangerous substances" in any form while engaged in food preparation or handling, or while in any washing areas for dishes or utensils.
g) Should never use cooking utensils to taste food while cooking or serving, nor should they lick their fingers, eat, or sample food while it is being prepared or served.

4) Food Display

a) Accurate and good quality thermometer(s) should be kept on hand and used to maintain safe temperatures.
b) Food display and service should be planned so that potentially hazardous foods, such as those containing milk, eggs, fish, meat, poultry or milk-containing products are served within three hours after preparation.
c) Foods to be served hot, are to be maintained at an internal temperature of at least 140 degrees F, and preferably over 150 degrees F prior to serving. Keep casseroles, gravies, and meats at 165 degrees F or above.
d) Rapidly cool all foods which are to be served cold to an internal temperature below 45 degrees F. Try to have ingredients which will be used in cold food preparation chilled prior to use.
e) Do not allow meat, poultry, or turkey dressings, stuffings, etc. to remain between 40 and 120 degrees F.
f) Avoid cross contamination between raw foods and cooked foods. Under no circumstances should any unused portions of foods be reused or redistributed.
g) Potentially hazardous foods represent the highest potential for foodborne illness. One must maintain such hot foods at or above 150 degrees F or keep cold foods below 45 degrees F.
h) Acidic beverages such as fruit juices, or punch must be stored and served in containers made from food grade plastic, stainless steel or glass. Do not use porcelain, enamelware, or plated bowls for serving or storage.

Leftovers

Leftovers are those foods prepared for a given period or function that are served, but not consumed. Upon completion of the function, all such foods that have been served but not consumed, must be discarded as garbage.

However, if the food is a packaged food, other than a potentially hazardous food, it can be served if it is in its original package and is in sound condition.

Keep leftovers to a minimum by good food management and serving practices.

Likewise, single service dish or utensilware if used once, cannot be re-used. They must be discarded.

Unserved Leftovers

All foods to be served at a function must be properly protected before serving. Once it is determined that there

will be unserved portions of food that will become leftovers, they should be promptly refrigerated and cooled quickly. Prompt use of these leftovers should be planned. Once a food categorized as an unserved leftover has been removed from storage for serving, it cannot be returned to storage for further use. If not eaten, it should be discarded as garbage.

Unserved leftovers should never be returned to caterers for their future reuse unless they are packaged foods which is still within its original unopened container.

Refrigerated Storage and Transportation

Religious or social organizations occasionally have meetings where the membership brings foods to be consumed during or after the meeting. If perishables are included, keep in mind the source of the foods, and the need to provide refrigerated storage.

NEVER transport food in any vehicle or compartment that has been used to carry pets, trash, rubbish, chemicals, fertilizers, or pesticides without first thoroughly cleaning the compartment or vehicle. When in doubt, find another vehicle for the job. Foods, animals, or other possible contaminants must never be transported together. Find out what a rented or borrowed vehicle previously carried before placing foods into it. All vehicles must be in good sanitary condition including that of a professional caterer.

Think about where the spare tire has been before using the trunk!

During transit, cold foods must be kept cold (below 45 degrees F) and hot foods must be kept hot (above 150 degrees F, preferably). Do use insulated carrying containers but as such, they do not raise or lower food temperatures to safe levels.

Catered Functions

Before hiring a caterer, you should insure that the catering establishment is inspected, approved, and licensed by the health department under whose jurisdiction the caterers' commissary comes.

Each caterer by law is required to register with the local Board of Health. This registration is required to be filed at least seven days before the serving of said meal.

Furthermore, insist on hiring only caterers whose establishment and vehicles are inspected, approved, and licensed. Reliability and integrity should be sought in selecting the caterers for your event. Do not make your selection based upon who delivers the most food for the lowest price! Check with your local health department concerning their experiences with any firm under consideration.

Dairy, Food and Environmental Sanitation, Vol. 11, No. 8, Page 432 (August 1991)

Breaking the Salmonella/Chicken Connection

Irradiation is approved for poultry processing

Brian Kinzel, ARS

When the U.S. Food and Drug Administration approved irradiation of poultry in May 1990, that decision was based in part on research by Agricultural Research Service scientists.

In December 1986, the U.S. Department of Agriculture petitioned the FDA for approval of poultry irradiation, which is expected to benefit consumers by reducing spoilage and illness. The primary target was *Salmonella*–a bacterium that can contaminate chicken, turkey, and other fresh or frozen poultry and cause food illness or poisoning.

"Irradiation doesn't make poultry radioactive or unsafe," says Donald W. Thayer, a microbiologist in charge of ARS' Food Safety Research unit in Philadelphia, "but it does offer a means of substantially reducing the risk of foodborne pathogens."

Because salmonella bacteria are so widespread in the environment, fresh poultry can become contaminated even under the best of conditions.

The best way to prevent foodborne salmonellosis is through the use of proper food processing techniques, refrigeration, good household handling, and proper cooking.

A nationwide survey by USDA's Food Safety and Inspection Service found 35 percent of broiler chickens checked harbored the *Salmonella* microorganism.

On the average, Americans consumed 84.9 pounds of poultry in 1989, compared with 81.1 pounds in the previous year. Also, food companies are developing poultry products that can be cooked much faster in conventional and microwave ovens as well as precooked, ready-to-eat poultry products.

In response to such changes in the poultry industry, ARS scientists have added irradiation to proper cooking and refrigeration as effective tools for salmonella control.

Thayer says researchers at the Eastern Regional Research Center considered processing temperatures and packaging conditions as factors to help determine an effective irradiation dose to control or eliminate *Salmonella*. Researchers also studied how irradiation affects the vitamin content in poultry and conducted studies to see if any toxic products are formed by the treatment.

The maximum dosage approved by the FDA is 3.0 kiloGray and the minimum 1.5 kiloGray. A kiloGray is a unit of absorbed radiation energy.

"What we are saying is that the 3-kiloGray limitation approved by the FDA should provide ample protection for poultry," Thayer says.

Scientists found that 99.5 percent of *Salmonella* cells are inactivated at the minimum dose and 99.99 percent at the maximum level.

When raw poultry is irradiated to a dose as low as 0.9 kiloGray, the number of living *Salmonella* cells decreases by 31 percent, according to Thayer.

Irradiation followed by heating provides an extra punch.

"The important thing is that irradiation will provide a safer product, even if the treated product is held at proper storage temperatures before cooking," Thayer says. "There is a higher degree of safety because those cells that do survive irradiation treatment remain much more sensitive to heat, an effect that lasts up to 6 weeks.

To simulate the temperatures that poultry might encounter during processing, the samples were tested at temperatures from minus 4°F to 68°F above.

While the facts show that irradiation is an effective killer of harmful bacteria, the jury's still out on consumer acceptance. To answer some questions raised by consumers, Jay B. Fox, Jr., a research chemist at the Philadelphia lab, conducted an extensive study on vitamin changes in irradiated poultry.

Fox and other members of the research unit looked at how low-doses affect the B vitamins–thiamine, riboflavin, and niacin. Chicken breasts were cut apart, leaving the bones attached, and packed in vacuum-sealed bags before irradiation. After they received treatment at various doses, the samples were cooked in a conventional oven until they reached an internal temperature of 180°F. They were then analyzed for vitamin B content in the Philadelphia lab.

Fox found that irradiating the samples within the limits set by the FDA for chicken produced a thiamine loss ranging from 2.9 percent to 8.6 percent. However, the results indicated that there were no losses of riboflavin and niacin. The loss of thiamin from irradiated chicken was directly related to the temperature during irradiation, Fox says.

Chicken and turkey contribute about 0.9 percent of the thiamine, 2.16 percent of the riboflavin, and 8.22 percent of the niacin consumed in the American diet.

ARS also did nutritional, genetic, and toxicological studies of shelf-stable chicken sterilized by irradiation at doses 12 times greater than the maximum dose permitted for *Salmonella* control. No evidence of genetic toxicity or malformation in fetuses was found in mice, hamsters, and rats ingesting irradiated chicken as 35 percent of their total diet. Long-term feeding studies with mice and dogs did not produce evidence of either nutritional or toxicological effects on these animals.

USDA estimates that illnesses caused by *Salmonella* and other foodborne bacteria have a $1 billion to $10 billion economic impact through lost wages, decreased worker productivity, medical expenses, industry production losses, and destruction of products.

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Effect of ^{131}I on Lactic Acid Microflora of Yoghurt

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Abstract

Yoghurt, a cultured milk product, routinely consumed in Greece, was prepared from cow milk and sheep milk by a procedure normally used in Greece. The effect of artificially added ^{131}I on lactic acid microflora was studied. The contamination was introduced directly to the milk in doses amounting to those Greece received during the Chernobyl accident (6-12 kBq/kg milk). The lactic acid bacteria (LAB) counts were decreased by 45% in the "set style" or "concentrated style" yoghurt due to the presence of ^{131}I. The decrease of LAB counts was greater for the "concentrated style" yoghurt in both cultures used.

Introduction

Yoghurt and other cultured milk products have traditionally been significant contributors to the diets of European and Middle Eastern population (Tamime and Deeth, 1980).

One of the main criteria of quality assessment of yoghurt are the physical properties of the gel. Physical characteristics depend upon the type of yoghurt, with "set style" yoghurt exhibiting a firm gel, while "concentrated style" yoghurt is a reduced moisture product. The latter is very popular in the Balkans and the Middle East, and comes under different names as Labneh, Tan or Torba (Tamime and Robinson, 1978), produced by keeping the coagula in hanging cloth bags to drain the whey.

It is known that lactic acid cultures are commonly used to improve the shelf life of various food products because of the metabolic products such as lactic acid, propionic acid, diacetyl and antibiotic-like substances produced by these organisms. These end products have a profound inhibitory effect on a variety of gram-negative food spoilage bacteria (Pulusani et al., 1979; Rao et al., 1981; Gilliland et al., 1977).

The effect of radioactive materials on milk and their distribution in feta cheese have been studied quite extensively (Vosniakos et al., 1989). However, there is no available information in literature with respect to yoghurt prepared from radioactively contaminated milk. Therefore the objective of this study was to determine the physicochemical and microbiological properties of "set style" or "concentrated style" yoghurt made from sheep or cow milk artificially contaminated with ^{131}I.

Analytical Methods

The determination of ^{131}I was done by ν-spectroscopy system, consisting of a high purity coaxial Germanium detector p-type (CP 2100 Tennelek). The sample chamber was a cylinder 12cm in diameter and 25cm in height and was shielded by 5.0 cm of lead and 0.5 cm of copper. The full width at half maximum (FWHM) of the system was found 1.95keV at 1332keV of ^{60}Co. The linearity of the detector was checked with a ^{152}Eu source and a simple regression analysis gave a straight line with a correlation coefficient of 0.999. The liquid samples were measured into 50ml cups with 5.5cm in diameter. The radionuclides used were supplied by "The Nucleus", Oak Ridge, USA.

Fresh, chilled cow milk and sheep milk was supplied by the Agricultural Experimental Station of our Institution. The determination of fat in milk and yoghurt was done according to the Gerber method (standard 1/1963 IDF). The Kjeldahl method (standard 20/1962 IDF) was used for protein determination, with a nitrogen conversion factor of 6.38. Spectrophotometric method was used for the determination of lactose (Lawrence, 1968). Ash and total solids in milk and yoghurt were determined according to standard methods (British standard 1741/1963, standard 21/1962 IDF). All samples were analyzed according to standard methods for the Examination of Dairy Products (APHA, 1978) for lactic acid bacteria (LAB) counts. After homogenization and cooling, milk was inoculated with 2% mixed activated culture (*Streptococcus thermophilus* and *Lactobacillus bulgaricus* 1:1 in ratio). The inoculum supplied by Chr. Hansen's Laboratorium, Denmark, was CH1 culture.

Preparation of Set and Concentrated Yoghurt

The milk standardized for fat content (3.9% for cow milk and 6.0 % for sheep milk) and boiled for 5 to 10 min., cooled to 45°C and inoculated with 2% starter culture (Rasic and Kurmann, 1978; Davis et al., 1971). The milk was incubated for 3h at 45°C. This fermented milk was subsequently held in a refrigerator at 4-5°C for 12h. The coagula were held at room temperature (21°C) for 10h in hanging cloth bags to drain the whey.

Results and Discussion

The approximate chemical compositions of cow or sheep milk used for the production of yoghurt are presented in Table 1.

Table 1. Chemical composition of milk used.

Species	Protein	Fat	Lactose	Ash	Total solids
	(g /100 g sample)				
Cow	3.8[1]	3.9	4.8	0.8	13.3
Sheep	5.3	6.0	4.8	0.8	16.9

[1]Each value is a mean of four replice determinations.

The radioactivity doses used for the production of yoghurt were varied from 6,000-12,000 Bq/kg of milk.

Cow yoghurt set and concentrated was similar to sheep yoghurt in gross composition (Table 2).

Table 2. Chemical composition of set and concentrated yoghurt.

	Species					
	Cow yoghurt			Sheep yoghurt		
g/100g sample	set	concentrated	whey	set	concentrated	whey
Protein	4.2	10.2	0.2	5.9	12.7	0.3
Fat	4.4	11.0	0.0	6.7	14.8	0.1
Lactose	4.3	4.1	4.1	4.1	3.9	3.8
Ash	0.9	1.6	0.5	0.9	1.4	0.6
Lactic acid	1.0	2.0	0.7	1.2	2.1	0.9
Total solids	14.8	28.9	5.5	18.8	34.9	5.7

The yield of set yoghurt from cow milk and sheep milk was approximately 90%.

The yield of concentrated yoghurt from cow milk and sheep milk was 42% and 46% respectively. The possible reasons for different results obtained for the concentrated yoghurt may be due to differences in milk composition for both species and the duration of draining whey from set yoghurt. It seems that the amount of radioactivity did not affect the yield and the chemical composition of the two types of yoghurt compared to control samples. The microbial counts of set or concentrated yoghurt are presented in Tables 3 and 4. In general, any differences obtained in microbial counts of set or concentrated yoghurt can be attributed to differences in composition of milks since the same starter culture of similar microbial quality was used for production of both types of yoghurt.

Table 3. Viable cell counts of *L. bulgaricus* and *S. thermophilus* in yoghurt and whey from cow milk.

	L. bulgaricus cfux10^8/g sample		*S. thermophilus* cfux10^8/g sample	
Product	Control	Radioactive Product	Control	Radioactive Product
Set yoghurt	705.2[1]	368.8	598.0	193.4
	(23.2)	(15.6)	(19.8)	(12.4)
Concentrated yoghurt	701.3	167.1	338.3	99.3
	(21.5)	(11.7)	(14.9)	(5.6)
Whey	3.1	1.4	3.0	1.1
	(0.2)	(0.1)	(0.2)	(0.1)

[1]Each value is a mean of four replicate determinations (standard error of the mean in parentheses).

Table 4. Viable cell of *L. bulgaricus* and *S. thermophilus* in yoghurt and whey from sheep milk.

	L. bulgaricus cfux10^8/g sample		*S. thermophilus* cfux10^8/g sample	
Product	Control	Radioactive Product	Control	Radioactive Product
Set yoghurt	719.2[1]	375	591.1	181
	(23.9)	(15.9)	(19.8)	(12.1)
Concentrated yoghurt	718.1	175.2	310.4	111.0
	(25.8)	(15.7)	(15.5)	(7.9)
Whey	3.2	1.5	3.1	1.2
	(0.2)	(0.1)	(0.2)	(0.1)

[1]Each value is a mean of four replicate determinations (standard error of the mean in parentheses).

The percentage of lactic acid bacteria (LAB) that survive in both types of yoghurt and whey are presented in Table 5.

Table 5. Lactic acid bacteria (LAB) surviving in both types of yoghurt and whey.

Species	Product	%	
		L. bulgaricus	*S. thermophilus*
Cow	Set yoghurt	52.2	32.3
	Concentrated yoghurt	23.8	29.4
	Whey	45.2	36.7
Sheep	Set yoghurt	52.1	30.6
	Concentrated yoghurt	24.4	35.8
	Whey	4.69	38.7

It is quite clear from the Tables 3, 4 and 5 that the isotope ^{131}I inactivates a great percentage of lactic acid bacteria. This is more obvious in the case of concentrated yoghurt where there is more time and quanity of ^{131}I available to react with the bacteria. It seems also, that in concentrated yoghurt, the amount of acid present affects the amount of the microbial species survived. The behavior of ^{131}I is exactly the same in both kinds of milk, however *S. thermophilus* is more sensitive to ^{131}I than *L. bulgaricus*. This difference in sensitiviy to ^{131}I, between the two organisms may cause problems in structure, taste and shelf-life of yoghurt, due also to proteolysis which is faster in the presence of *L. bulgaricus* (Rapp, 1969).

The decrease in viability of *L. bulgaricus* and *S. thermophilus* in the presence of ^{131}I may cause the ionization of a portion of the water molecules with the formation of highly reactive hydrogen and hydroxyl radicals, which inactivates the enzyme system in both food and its microbial content. It is believed that the indirect effects of ionizing radiations are apparently largely responsible for killing organisms (Desrosier, 1963).

Conclusions

The results demonstrate that the radioisotope ^{131}I decreased the viability of *L. bulgaricus* and *S. thermophilus* by 45% in set and concentrated yoghurt prepared from artificially contaminated cow or sheep milk. The presence of ^{131}I had minimal or no effect on the gross composition and percent yield of yoghurt prepared from both kinds of milk.

This study provides evidence that the nutritional implications to humans of the use of such product certainly deserves consideration. Biological testing of traditional and fabricated yoghurt is required to help to elucidate the possible nutritional differences that exist in radioactively contaminated products.

Further work is in progress to increase the survival of lactic acid bacteria in yoghurt from radioactive contaminated milk by manipulating the parameters of yoghurt production.

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A Year in the Life of Inspection Services Mobile County Health Department

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As a means of assessing the adequacy of its environmental complaint investigation program, the Mobile County Health Department initiated a records review to determine the type of public health related concerns received from the public as well as the frequency of referrals. Mobile County is located in southwest Alabama and encompasses 1,238 square miles, bounded on the south by the Gulf of Mexico and to the west by the State of Mississippi. With a metropolitan population of 380,060, the county has eleven incorporated jurisdictions with the City of Mobile being the largest at a population of 195,869. Mobile County is the second largest county in the State of Alabama with a public health organization dating back to 1824.

The Mobile County Health Department addresses a wide array of public health issues through its environmental health activities with major programs focusing on food protection, lodging, and onsite sewage. By legislative mandate, a number of environmental programs addressing air, land, and water quality issues have been removed from health department oversight and delegated to a separate statewide agency. The Health Department issues approximately 1600 annual permits for operation of food service establishments which include full food and limited food service as well as retail and limited retail food stores. Fifty-seven hotels and motels are also regulated by the issuance of annual operating permits. In addition, the Health Department assesses the siting requirements and supervises the installation of approximately 1000 onsite sewage systems per year. Based on 1990 census population projections, approximately 70 percent (271,817) of the county's total population utilize public water and approximately 60 percent (232,261) utilize municipal sewer services.[1]

Table 1 summarizes the frequency of complaints by program areas for calendar year 1989 and 1990. Sewage related complaints incorporated all references to unauthorized discharges irrespective of whether the initial problem stemmed from municipal sewer or onsite sewage disposal facilities. Some seasonal variations can be noted in the frequency of certain types of complaints as has been reported in other public health jurisdictions.[2] This is most noticeable in sewage related complaints which tend to peak during the winter and spring months which typically record the highest rainfall amounts.

Complaints related to food service for the same time period are represented in Table II. In an effort to discern the type of establishment typically associated with food related

TABLE 1. 1989-1990 summary of complaints by category

	Sewage	Food	Animal	Refuse	Lodging	Pool	Pub Fac	Other	Total
Jan-March	78	61	19	24	5	0	5	1	193
April-June	96	63	21	17	1	14	3	5	220
July-Sept	72	71	16	17	8	2	3	2	191
Oct-Dec	53	59	10	6	3	1	2	0	134
Total 1989	**299**	**254**	**66**	**64**	**17**	**17**	**13**	**8**	**738**
Jan-March	145	63	18	15	5	1	6	0	253
April-June	117	49	19	4	6	2	2	5	204
July-Sept	59	50	12	3	1	6	2	1	134
Oct-Dec	57	27	8	4	0	0	1	1	98
Total 1990	**378**	**189**	**57**	**26**	**12**	**9**	**11**	**7**	**689**
Grand Total	**677**	**443**	**123**	**90**	**29**	**26**	**24**	**15**	**1427**

TABLE II
FOOD COMPLAINTS BY FACILTY TYPE

1989 - 1990

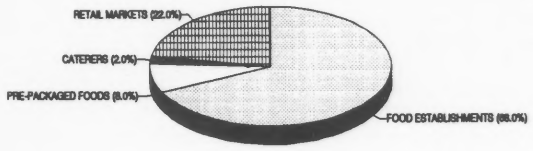
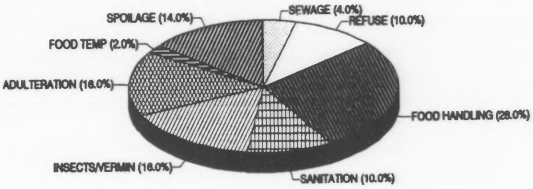


TABLE III
FOOD SERVICE COMPLAINTS BY PROBLEM AREA

1989 - 1990



problems, complaints were sorted to reflect their origination from either a food service establishment, retail market, caterer, or prepackaged food.

As an additional point of interest, food related complaints were further segregated to distinguish franchise operations which had more than one establishment in the county or were affiliated with a regional or national food chain. While franchise operations having complaints referenced to their establishment represented only 20 percent of the total permitted food service establishments, these same operations accounted for 42 percent of the total complaints. Quite obviously this reflects the significant volume of food sales in these establishments and may logically provide additional opportunities to extend training for food service workers.

Table III categorizes the problems prompting food related complaints from the public. As expected, complaints relating to foodhandling practices comprise the most significant area of concern for consumers. This is especially true within Mobile County which has a long established regulation regarding mandatory training for all food service workers and has experienced routine news media coverage of food service inspection scores for much of 1990.

Investigation of public complaints often provides a reliable barometer of sanitation levels within a community and, as such, should be incorporated in a positive fashion in public health programs. While experience has shown that not all complaints referenced to environmental health programs concern legitimate public health issues, investigation of complaints on a prioritized basis is an important component in the delivery of public health services.

Record reviews of this type not only allow for an assessment of resource utilization and may perhaps delineate trends within the community but they also permit a projection of resource requirements based on present and future public concerns. Increased awareness of the potential transmission of foodborne illnesses like Hepatitis A and the growing "green" movement propelling recycling efforts in the food service industry and a possible return to reusable service items may legitimately increase public concerns regarding foodhandling procedures.[3] Acknowledgement of the potential for groundwater contamination and misuse of wetlands along with possible decreased federal and state funding of municipal water and sewer facilities may also prompt closer scrutiny of the siting and utilization of onsite sewage disposal options.[4] Growing population densities coupled with these nationwide concerns will continue to require an aggressive public health role in addressing these community problems.

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Mastitis Control in Heifers and Dry Cows

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Control of mastitis in heifers and dry cows appears to have a marked influence on the level of intramammary infection (IMI) during the subsequent lactation. This paper reviews the prevalence of infection in unbred and primigravid heifers as well as that in dry cows, and summarizes attempts to prevent new IMI and treat existing cases of mastitis as methods of control.

Prevalence of Mastitis in Dairy Heifers

A study designed to determine prevalence of mastitis in breeding age and pregnant heifers demonstrated that bacteria were isolated from teat canals of 93% of heifers and 71% of quarters (44). Intramammary infections were present in 97% of heifers and 75% of quarters. The most common isolates from both samples were *Staphylococcus chromogenes, Staphylococcus hyicus*, and *Staphylococcus aureus*. *Staphylococcus aureus* was isolated from mammary secretions of 37% of heifers and 15% of quarters. In infected quarters, mean somatic cell count (SCC) was 13,547 x 10^3/ml vs. 5,706 x 10^3/ml in uninfected quarters. Approximately 29% of heifers and 15% of quarters showed clinical symptoms of mastitis.

Staphylococcus aureus infections in heifers are of great concern because of the contagious nature and possible harmful effect on future milk production. Other investigations have also found *S. aureus* associated with young dairy animals. This organism was isolated from 3.3 to 3.8% of teat canals of heifers aged 1 d to 24 mo in one study (14), and 10% of skin swabs of heifers in another (34). In the later study, 81% of heifers had skin sites positive for *S. aureus*, and 12% of heifers freshened with *S. aureus*, representing a significant reservoir for infecting herd mates.

Antibiotic Treatment of Heifers

A 59% reduction in infection at calving was observed in heifers receiving an intramammary dry-cow product containing penicillin/dihydrostreptomycin during pregnancy (44). Only 2.9% of quarters retained antibiotic residues at freshening, and all positive quarters tested negative after 5 d. Heifers treated during the second trimester of pregnancy responded best to antibiotic treatment. There was no change in level of infection after treatment in controls. In this study, 83% of the heifers (91% of quarters) were cured. Thus, therapy was much more effective in controlling mastitis in heifers compared with that in lactating cows. In contrast, Bray et al. (3) found no effect on new IMI at calving when therapy was administered to heifers 3 wk prepartum; however, 91 and 36% of IMI by major pathogens were eliminated in treated and control quarters. Management practices such as fly control, use of individual calf hutches to prevent suckling, segregation of pregnant heifers from dry cows, and maintaining heifers in a clean, dry environment may also help control the level of IMI.

Because of the high prevalence of mastitis, there has been interest in developing a systemically or locally administered treatment especially formulated for unbred and primigravid heifers. However, before a new product is developed, a national survey is being carried out to determine prevalence of the disease. Results of herd surveys in Louisiana among two Holstein and two Jersey herds (171 animals total) have shown that prevalence of infection at initial sampling averaged 69% of animals (55.5% of quarters). In one Holstein herd, *S. aureus* was isolated from 47.1% of heifers. Prevalence of mastitis at calving across herds averaged 44.5% of heifers (31.5% of quarters).

Summer Mastitis

Summer mastitis is a disease of pregnant heifers and dry cows caused primarily by *Actinomyces pyogenes, Peptococcus indolicus*, and *Streptococcus dysgalactiae*. It is thought to be spread by the fly *Hydrotaea irritans*, and occurs during summer months. Infection results in an acute suppurative inflammation that results in loss of the quarter. The disease is most commonly reported in Northern European countries, and incidence ranges between 1.2 and 6.7% (10). Major economic losses are due to mortality, abortion, loss of condition, and irreversible damage to the affected quarter. Use of vaccination and immomodulation with levamisole for prevention have been disappointing. Repeated intramammary antibiotic infusion combined with fly control appears to be the best method of control when detected early. If the disease has progressed to the systemic stage, i.m. administration of tetracycline is the treatment of choice. Prevention is based on fly control, preventing suckling among calves, and avoiding access to damp, low-lying pastures.

Dynamics of Intramammary Infections During the Nonlactating Period

Early studies on the dynamics of IMI during the dry period revealed that rate of infection during early involution was over six times that observed during lactation (22). Subsequent investigations have found that susceptibility to new IMI is elevated again prepartum. Increased incidence of infection during the dry period results in an elevated number of infected quarters at calving, and is responsible for the high level of IMI during lactation in many herds. It is now generally accepted that without dry cow therapy, approximately 8 to 12% of quarters in herds with average infection levels will become infected during the dry period. Such infections cause inflammation and affect mammary cell differentiation prior to calving, resulting in production losses. Elevated rate of new IMI during early involution may be due to one or several of the following: 1) flushing of colonized bacteria in the teat canal is terminated; 2) udder sanitization and teat dipping are discontinued; 3) the teat canal becomes dilated and shortened due to milk stasis; 4) phagocytes are involved in removing accumulated milk components instead of bacteria; and 5) lymphocytes are less responsive to antigenic stimulation suggesting reduced activity.

The fully involuted udder is highly resistant to infection and this may be attributed to 1) formation of a keratin plug, and 2) antibacterial factors, i.e., lactoferrin and immunoglobulin. Secretions of the fully involuted gland are inhibitory to coliform growth, which explains why over 50% of IMI present in early involution are eliminated (40). However, *Streptococcus uberis* is not inhibited by secretions of the mid dry period, yet infection rates with this organism are low during this time. Thus, mechanisms other than internal protective factors are of greater importance, i.e., teat canal characteristics. Cousins (8) showed that challenging teats during the first 2 wk of involution more likely resulted in IMI than challenging at 3 to 4 wk, suggesting greater bacterial penetration during early involution. Similarly, Comalli et al. (7) showed that teat canal diameter was greater on d 7 of the dry period than on d 0, 16, or 30.

Susceptibility again increases prior to calving and this may be due to 1) increased fluid volume and dilation of the teat canal; 2) decreased lactoferrin concentration; 3) reduced leukocyte numbers and phagocytic ability; 4) increased citrate: lactoferrin molar ratio; and 5) utilization of milk components for bacterial growth.

Conventional Dry Cow Antibiotic Therapy

After Neave et al. (22) established the early dry period as a time of increased susceptibility to infection, it was subsequently shown that dry cow therapy effectively reduced this elevation in IMI during the early involution (29). This practice is also the most effective means of preventing new IMI at calving. In addition, other advantages include: 1) the cure rate of existing infections is higher than during lactation; 2) tissue adversely affected by presence of IMI may redevelop before freshening; 3) clinical mastitis at calving is reduced; and 4) risk of antibiotic contamination of salable milk is minimal.

Overall cure rate for *S. aureus* is >50% and that for streptococci is >80%. However, coagulase-negative staphylococci (CNS) are the most prevalent organisms causing IMI in the majority of herds and should not be overlooked as they are associated with moderate increases in SCC and loss in milk production. Recently, dry cow therapy with various products was found to eliminate 80 to 100% of CNS infections, although spontaneous cure rate was 72.7% (15). Therapy is much more effective against contagious vs. environmental pathogens. Antibiotics approved for use in dairy cows are not effective against coliforms because of resistant strains and the fact that exposure to environmentals is constant across the dry period. However, therapy is effective against environmental streptococci during early involution.

Treatment of all quarters of all cows is recommended at drying off rather than selective treatment. In this way, new infections arising shortly after drying off are prevented and laboratory or screening procedures to decide which quarters to treat are eliminated. In a 100 cow herd, the production gain from preventing nine new IMI would pay the cost of treating all cows at drying off (20). New infection rate was higher at calving than at drying off when selective therapy was used in low mastitis prevalence herds (36).

Prevention of new IMI appears to be of greater benefit than attempting to cure existing infections (20). One infected quarter that is treated at drying off and is cured at calving will produce 90% of its potential during the next lactation. Alternatively, a quarter that becomes infected during involution or is infected at drying off and remains infected at calving will produce 30 to 40% less milk.

Use of Multiple Infusions to Increase Efficacy of Dry Cow Treatment

Because dry cow therapy does not always cure existing infections and is ineffective in preventing new IMI during the latter portion of the nonlactating period, multiple infusions to maintain elevated antibiotic concentrations have been tested. Smith et al. (39) found that cloxacillin treatment at drying off and 3 wk later was superior to treatment at drying off only in curing existing infections and preventing new IMI. Conversely, Cummins and McCaskey (9) demonstrated that multiple dry cow treatment with cloxacillin at 0, 7, and 14 d was not advantageous over a single treatment at drying off.

Pankey et al. (31) found that infusion of antibiotics at drying off and near parturition appeared to be no more efficacious than infusion at drying off only. However, prepartum antibiotic administration eliminated >90% of new *S. uberis* IMI, but numbers were generally low. Philpot (33) conducted a similar study except that cows were treated with antibiotics at parturition and concluded that therapy near parturition may be useful in herds experiencing an environmental mastitis problem, but potential antibiotic residues in milk need to be considered. Natzke (20), however, reported the results of two field trials that indicated no benefit from multiple sequential infusions of antibiotic in the dry period. He also indicated that such infusions may increase the risk of introducing pathogens into the mammary gland.

Disadvantages of Conventional Dry Cow Therapy

Dry cow therapy is not always effective in curing existing infections, particularly those caused by *S. aureus*. In addition, present formulations are not effective against all species of bacteria, i.e., coliforms; also, they provide no protection against new infections during the late dry period. Elimination of common udder pathogens via treatment may render cows more susceptible to less common pathogens like coliforms. Development of antibiotic resistance is sometimes considered; however, routine use of dry cow therapy does not lead to development of resistant organisms (35). Alternative methods for the treatment of coliforms are needed across the dry period as well as new streptococcal infections that occur during the prepartum period. Clean, dry environmental conditions during this time are recommended to reduce IMI at calving. Use of straw or inorganic bedding material in maternity pens is preferred to use of sawdust.

Influence of the Method of Antibiotic Infusion on New IMI

Manipulation of teat canal keratin and surrounding tissues, such as full cannula insertion during intramammary treatment, may enhance bacterial penetration. Keratin could be forced against the interior teat wall by the cannula, creating a larger than normal opening. The syringe cannula may also push colonized bacteria into the teat cistern and induce IMI. When a syringe cannula is inserted through the "sanitized" teat orifice, surviving bacteria may be carried along with it and enter the cistern. If bacteria gaining access to the teat cistern by these routes are resistant or inaccessible to the infused drug, a new IMI may result. Consequently, studies were designed to compare conventional full insertion with partial insertion of only the distal 2 to 3 mm of the cannula tip.

Newbould's (23) studies on teat duct inoculations showed that significantly fewer IMI occurred when *S. aureus* was placed in the distal 3 mm of duct compared with 4 mm, and at 5 mm, infection rate was almost 100%. Thus, an attempt was made to limit insertion to a maximum of 3 mm. An initial study on 86 cows at drying off showed a significant 58.8% reduction in the number of new IMI with major pathogens at parturition in quarters treated by partial insertion (2). A somewhat higher treatment efficacy against major pathogens was also found using partial insertion (81.4 vs. 57.9) and may be due to the antibiotic being placed near the initial site of infection. To accomodate partial insertion, a modified syringe that allowed protrusion of 3.5 mm of the syringe cannula was developed and evaluated in five commercial dairies. The cannula sleeve was bevelled, forming a seal with the teat orifice to provide support during infusion and ensure upward movement of the antibiotic. Use of partial insertion was optional as the entire cannula cap could be removed, allowing full insertion. A 45.8% reduction in number of new IMI with major pathogens at parturition was experienced in quarters treated using modified syringes compared with those treated using conventional syringes; *S. aureus* and *S. uberis* IMI were reduced 43.8% and 50%.

Systemic Dry Cow Therapy

Because of poor distribution of infusion drugs within the inflamed mammary gland due to duct blockage and abscess formation, the most effective method for treating IMI may be via systemic administration. In light of the phamacokinetic principles, it is likely that intramammary dry cow therapy often leads to treatment failures when dealing with bacteria such as *S. aureus* due to the low tissue concentrations of antibiotic. Also, systemic therapy does not risk infection with organisms introduced via the teat duct during infusion.

Fluoroquinolones are well distributed in body fluids, have a long half-life, enter milk in sufficient concentrations to be effective, and easily kill phagocytosed staphylococci. Soback et al. (41) compared s.c. injection of the fluoroquinolone norfloxacin nicotinate (10 mg/kg), i.m. injection of oxytetracycline-HCl (20 mg/kg), infusion of 500 mg cephapirin benzathine, and an untreated control at drying off. The number of existing *S. aureus* IMI: was reduced only in the norfloxacin nicotinate group, and new infection rate appeared lower using systemic treatment. Overall, results indicated that use of the fluoroquinolone was more effective than the other treatments. Systemic use of macrolides is also being considered because of the affinity for mammary tissues.

Teat Canal Colonizations and How to Treat Them

Teat canal colonizations are more common than formerly realized and may be four to five times more prevalent than IMI. Such colonizations survive for as long as 3 mo, serving as potential sources for IMI. Du Preez and Greef (11) treated dry cows by depositing .25 ml penicillin/streptomycin into the teat canal and demonstrated that therapy cured existing and prevented new teat canal colonizations. Untreated controls showed no change, but IMI in treated quarters were reduced from 66.5 to 19.4% at calving. In addition, with certain antibiotics, no residues were detected in milk obtained 12 h after treatment, suggesting that local therapy may be applied prepartum without discarding milk.

Dietary Supplementation to Reduce Incidence of Mastitis

Diet appears to play a role in resistance to udder infection because certain nutrients affect somatic cell function, antibody transport, and tissue integrity. Smith et al. (38) supplemented diets of bred heifers with vitamin E (50 to 100 ppm) and selenium (.3 ppm) 60 d prepartum and throughout lactation. Dietary supplementation reduced staphylococcal and coliform infections at calving by 42%, and duration of infection by organisms other than *Corynebacterium bovis* was reduced 40 to 50%. Clinical mastitis was reduced in early lactation (57%) as well as throughout lactation (32%), and mean SCC was lower. In addition, injection of 50 mg selenium 3 wk prepartum decreased new infections at calving. Similarly, Chew and Johnston (6) supplemented 60 Holstein cows with vitamin A and β-carotene starting 30 d

prepartum and continuing for 10 wk into lactation and found that supplementation reduced SCC. However, a report by Oldham et al. (27) showed that supplementation of vitamin A or β-carotene during the last 2 wk of lactation, throughout the dry period, and for the first 6 wk of lactation did not reduce incidence of new IMI or decrease SCC.

Accelerated Involution as a Means to Increase Resistance

Because the nonlactating udder is resistant to IMI, involution has been accelerated using colchicine and endotoxin to effectively shorten the period of high susceptibility that occurs after drying off (30). Infusion of these products resulted in elevated levels of lactoferrin and immunoglobulin, lower citrate: lactoferrin molar ratios, and reduced fluid volume at 7 d of involution. Mammary secretions became progressively more inhibitory to coliform growth as involution progressed, and new IMI during early involution were reduced 50%, but there was no effect on new IMI at calving. The plant lectins, concanavalin A and phytohemagglutinin, have also been used to accelerate mammary involution (4), and because of their mitogenic properties, may induce proliferation of protective lymphoid cell populations in mammary tissues. Infusion of these lectins resulted in elevations of natural protective factors that may play a role in udder defense during early involution.

Method of Drying Off May Affect Incidence of New Infection

Oliver et al. (28) showed that method of drying off (intermittent or abrupt cessation of milking) did not influence new IMI. However, Natzke et al. (21) found that in cows not receiving dry cow therapy, new IMI were more numerous using abrupt cessation, but when dry cow therapy was used, there was no effect of method of drying off. Increases in natural protective factors in mammary secretions can be induced by method of drying off. Bushe and Oliver (5) dried off cows by 1) abrupt milk cessation; 2) intermittent milking for 1 wk; and 3) intermittent milking and fed only free choice hay. The latter feeding regime differed from the diet of silage and concentrate fed Groups 1 and 2. Dry cow therapy was not used on any treatment. The third method of drying off had the greatest effect on concentrations of protective factors with higher levels of lactoferrin, SCC, and IgG, and a lower citrate:lactoferrin molar ratio. Secretions from such cows were more inhibitory to in vitro growth of coliforms.

Use of Prepartum Milking to Reduce Risk of New Infections at Calving

As plant lectins, colchicine, and endotoxin have been used to accelerate involution, prepartum milking has been used to stimulate lactogenesis. New IMI during the peripartum period may be due, in part, to accumulation of fluid and associated structural changes to the teat duct, allowing entrance of bacteria. Thus, prepartum milking has been attempted to reduce risk of IMI. Greene et al. (13) designed a study to evaluate udder health after initiating prepartum milking 14 d prior to expected calving date. They found no effect on SCC, but incidence of mastitis during the 1st mo of lactation was reduced. There was no effect on milk yield or persistence of milk production.

Use of Immunomodulators and Cytokines to Stimulate Immunity During the Nonlactating Period

Immunopotentiation has been attempted using systemic administration of levamisole. Ziv et al. (48) injected levamisole i.m. at 2 mg/kg four times at weekly intervals starting on the day of drying off. Levamisole treatment had no effect on curing existing infections or on preventing new IMI during the dry period. Similarly, incidence of clinical mastitis during the first 10 wk of lactation was not influenced by this form of therapy.

Teat end tissues may function, in part, by recruiting immunoglobulin-producing lymphoid cells as a local protective mechanism. Because cell concentrations are reduced during the early dry period when the udder is highly susceptible to infection (25), this appears to be the optimum time for implementing local immunostimulation. Interleukin-2 (IL-2) stimulates proliferation and differentiation of B-cells and immunoglobulin secretion; responses are enhanced by presence of *S. aureus* (1). Thus, a study was designed to examine the ability of locally administered bovine IL-2 to enhance the cellular immune response in teat end tissues during the early dry period in quarters with (sensitized) and without (unsensitized) previous *S. aureus* infection (24). Results showed that tissue concentrations of lymphocytes were significantly higher in unsensitized IL-2 quarters and in sensitized placebo and sensitized IL-2 quarters compared with unsensitized placebos. Concentrations of IgG_1 and IgG_2 cells were significantly higher in sensitized IL-2 quarters compared with all other treatments, suggesting that the cytokine was more effective in quarters with prior exposure to *S. aureus* antigens. Sensitized placebo quarters and unsensitized IL-2 quarters were similar, indicating IL-2 stimulated a cellular immune response equal to that of quarters infected with *S. aureus*. Increases in lymphocyte and plasma cell populations in response to IL-2 suggested enhanced ability of teat end tissues to recruit and/or stimulate expansion of these lymphoid cells.

Studies have also been carried out with granulocyte-macrophage colony stimulating factor (GM-CSF) to heighten intramammary immunity at drying off (42). Recombinant bovine GM-CSF was given s.c. to goats at doses of .1 and 1 μg/kg body weight twice daily for 5 d before and 5 d after drying off. Preliminary results with peripheral blood leukocytes showed increases in antibody-dependent cytotoxicity and nitroblue tetrazolium reduction compared with leukocytes from untreated control animals indicating increased killing ability and increased oxidative metabolism. Similarly, intramammary infusions of interferon-gamma were found to provide protection against experimental *Escherichia coli* challenge, and it was suggested that prophylactic treatment during the periparturient period may be effective against coliform mastitis during this time of increased susceptibility (43).

Vaccination During the Dry Period

Vaccination has been attempted to increase the antibody titers in blood and milk to a specific organism, thereby providing immunity. To be effective, a vaccine should inhibit bacterial growth and toxin production, but to date immunization generally has been unsuccessful because protection is not absolute. Progress has, however, been made with a heat-killed *E. coli* J-5 mutant vaccine administered s.c. at drying off, 30 d later, and within 14 d of calving (12). This mutant is unique because it does not revert to the wild type and stimulates immunoglobulin production against gram-negative common core antigens, providing protection against a wide variety of coliform bacteria. A field study using this vaccine showed that prevalence of coliform mastitis over the first 100 d of lactation was only 2.6% in vaccinated cows, but 12.8% in unvaccinated controls.

Hogan et al. (16) tested the efficacy of an *E. coli* J-5 bacterin in oil adjuvant by experimental challenge. Vaccinations were given s.c. at drying off, 30 d later, and at calving. Compared with controls, vaccinated cows exhibited fewer bacteria in milk and lower rectal temperatures following infusion of *E. coli*. In addition, milk production and dry matter intake were depressed greater in controls than vaccinates, but milk SCC did not differ. A similar vaccine combined with Freund's incomplete adjuvant was field tested for 2 yr in a commercial herd under natural exposure conditions. At calving, rate of clinical coliform mastitis and percent quarters with coliform infections were lower in vaccinated vs. controls during the first 12 mo of the trial.

Immunizations against *S. aureus* mastitis have also been attempted. No difference was observed in the new infection rate over three lactations during which cows were either immunized with an experimental *S. aureus* protein-A vaccine in the area of the supramammary lymph node or i.m. with a commercial bacterin (32). However, the spontaneous cure rate was significantly higher in vaccinated cows, and the occurrence of clinical mastitis was lower.

The Australian workers (46) had recent success with a novel *S. aureus* vaccine given with the adjuvant dextran sulphate. This combination stimulated an increase in IgG_2 to aid in opsonization of bacteria and caused a more rapid immune response to pathogens that entered the udder. This vaccine has successfully immunized dairy cattle against mastitis and is effective against many strains of *S. aureus* under experimental conditions.

Teat Dipping and Application of Teat Seals

Dipping teats in 5% tincture of iodine at drying off and 24 h later significantly reduced new *S. aureus* IMI but not those caused by *S. uberis* (28). Conversely, no protection was found by dipping daily using a 1% iodine dip for 7 d after drying off (45). Likewise, dipping in a .5% iodine twice daily for 7 d prepartum did not reduce new IMI before calving (37). Matthews (17) indicated that number of new IMI at parturition in quarters dipped with a latex teat dip with germicide was similar to undipped controls and suggested that there was no benefit to prepartum teat dipping. McArthur et al. (18) also showed that there was no advantage in dipping teats of cows in a latex teat dip for the first and last 7 d of the dry period.

Studies on the use of a bismuth/paraffin based intramammary teat seal (19) demonstrated a significant reduction in percentage of new dry period infections after experimental challenge. Inclusion of antibiotic into the seal gave similar results (5.8 vs. 32.4%). In general, the seal remained in place on the teat duct and cistern for 3 to 4 wk; however, some loss via the orifice occurred during the dry period.

Use of Intramammary Devices During the Dry Period

Attempts to amplify leukocyte antibacterial activity have been made using intramammary devices (IMD) placed in the gland cistern. An abraded IMD inserted at the beginning of the nonlactating period increased SCC and decreased the number of new IMI (47), but formation of plaque enhanced microbial colonization, especially with CNS. A histologic study revealed that contact of an intracisternal bead device (ICB) with the teat cistern epithelium during the nonlactating period markedly increased a localized leukocytosis into subepithelial connective tissues without affecting milk-producing tissues (26). In addition, SCC, leukocyte viability, and percentage neutrophils were elevated. However, 41.5% of ICB quarters became infected with CNS whereas only 16.4% of the controls became infected with these organisms.

Conclusions

Prevalence of mastitis in unbred and pregnant dairy heifers is higher than previously realized and contributes to the level of infection at calving. Although development of control measures is still in its infancy, antibiotic treatment was successful in reducing prevalence at calving in one study. Likewise, intramammary treatment of summer mastitis is the method of choice although some success has been realized through fly control. Infusion of antibiotics at drying off has been very successful in curing existing infections and preventing new IMI; however, the practice is ineffective against coliforms and new IMI that develop shortly before parturition. In general, multiple drug infusions over the dry period have not improved efficacy. Recent results with systemic therapy alone or combined with intramammary infusion may increase effectiveness of dry cow therapy, especially against *S. aureus*. Use of substances to stimulate local immune mechanisms and accelerate involution to enhance antibacterial mechanisms are purely experimental, but could have application if they are found to be effective in reducing IMI. Recent immunization strategies against coliforms have been successful, as has dietary supplementation to reduce rate of infection. Although results of studies evaluating management tools such as method of drying off and prepartum milking are positive, practical application cannot be recommended at this time. The majority of studies on use of teat dips during the dry period indicate little benefit of the practice, and although placement of various intramammary devices at drying off may increase antibacterial mechanisms, colonization with CNS becomes a prob-

lem. Thus, although nonantibiotic approaches to the control of IMI are warranted, use of antimicrobials appears to be the most effective method to control mastitis in nonlactating cattle.

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The Yogurt Story - Past, Present and Future Part V

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Introduction

The marketability of any food product is dependent upon four factors, namely, body, texture, flavor and keeping quality or shelf-life. Yogurt is no exception to this rule. The first three factors to a large extent depend on the product mix and the manufacturing procedures employed, all of which constitute technological aspects. Keeping quality is mainly influenced by the handling and the sanitation exercised in the production and packing of the product - in other words, shelf-life is a microbiological problem. By paying close attention to both technological and microbiological aspects of yogurt manufacture a consistently high quality product could be made.

In discussing the factors that affect quality of yogurt, it is first necessary to define the terms "body", "texture", and "flavor". Body and texture refer to the physical nature of a substance. Compactness, consistency, resilience, viscosity etc., are terms that denote "body" characteristics. Texture describes the fine structure of a substance or its "feel". Grainy, sandy, smooth, and slimy are a few of the terms used in describing textural characteristics. Flavor is a multidimensional attribute. It is the composite of the chemical components that elicit the physiological, psychological and biochemical responses involved in "flavor perception". Flavor not only describes the taste but also the smell (olfactory response), mouth-feel and visual aspects.

The factors that affect body, texture and flavor of yogurt are (3):

1. Composition of the yogurt mix.
2. Homogenization of the mix.
3. Heat treatment of the mix prior to inoculation.
4. Starter culture and incubation conditions.
5. Handling of the ripened yogurt, and
6. Stabilizers used.

Many of the problems with yogurt body, texture and flavor stem from the difficulties in adapting the traditional procedure of small-scale incubation and cooling in the cottage-scale or consumer receptacle to large-scale operations with incubation in large vats and subsequent cooling-in-place and transport to packaging equipment. Other complications are introduced by cooling from a relatively high incubation temperature with attendant agitation and from operations involved with fruit incorporation (3).

Body in Yogurt

The body of yogurt should have a relatively high viscosity and should be firm and cohesive enough to be removed from the container and eaten with a spoon. Further, it should have enough resilience to withstand normal handling during post-incubation operations, and by consumers in the home without undue wheying-off or shattering. Shrinkage of the curd within the package and surface wheying-off are also related to body defects. Wheying-off is not only detrimental to visual appearance but also reveals body and texture problems (3).

To obtain the smooth, viscous body resistant to easy shattering or wheying-off, the solids content of the mix should be high. The curd structure of yogurt is primarily composed of milk casein. Other milk components do not actually have a part in the structural matrix of the yogurt coagulum. Other milk components are merely entrapped in the structural matrix of casein. So, in order to firm up the coagulum, the solids content of the mix is raised by adding high quality, high heat-treated non-fat dry milk. High heat-treated milk is preferable because of its better water-holding properties. The amount of powder added usually ranges from 2% to 3.5%. Another possibility as mentioned in the previous article in this series is the concentration of milk by removal of 15 - 20% of water in a vacuum pan. This has an added benefit of the removal of any volatile off-flavors from milk during vacuum pan treatment. Another way of increasing solids content is the membrane-filtration of milk, namely the application of ultrafiltration or reverse osmosis. The legality of using these procedures, however, is still unsettled. Although a firm, viscous body can be obtained by the use of retentate from ultrafiltered milk, certain problems crop up in the finished product. Yogurt made with retentate after breaking yields a smooth, viscous product. Upon packaging and storage, the product tends to get too firm, and brittle with tendency for wheying-off. The

explanation for this phenomenon is probably the low ash or mineral content of the retentate, which affects curd rheology. To overcome such drawbacks, it is recommended that the mix containing retentates be pasteurized at 187° - 188° F.

Stabilizers aid the water-holding capacity of the yogurt mix and thus indirectly influence the viscosity and wheying-off characteristics of the finished product. Gelatin is considered to be the most desirable stabilizer. Other materials used are alginates, carrageenan, locust bean gum, guar gum, carboxy methyl cellulose, agar and pectin. These materials can be used singly or in combinations.

Once a desirable mix formula has been established it is necessary to maintain tight control over the proportions and actual weights of the individual components in the mix. Plants with a high volume have a myriad of product lines, and storage tanks. It is especially important under such conditions, dilution of mix with water or other fluids does not happen. As a rule of thumb, the solids level should not vary more than +/- 0.2%.

As mentioned in the previous article, proper heat treatment of the mix (180° F for 30 min.) ensures good, heavy body. Excessive heat treatment should be avoided.

Certain coccus-rod combinations yield heavier body than others. Also slime-producing coccus-rod combinations could be used to increase the viscosity of yogurt. Excessive sliminess although acceptable for ethnic yogurt products, is not desirable for general usage. Selection of starter cultures is thus important.

Process control is extremely critical in obtaining good well-rounded product. The process should be standardized with regard to incubation time and temperature, pH at cooling etc,. This should be backed up by laboratory testing, and proper testing equipment such as reliable thermometers, pH meters or titrimeters and solids testing equipment.

Post-fermentation handling could retain or ruin desirable qualities carefully nurtured through all the preceding operations. This was discussed in the previous article. To briefly summarize, the operations that are critical include agitation (and the design of the agitator) during cooling, pumping and the kind of pump used, the distance pumped, constrictions and the number of elbow-joints in the piping, and procedures and equipment involved in fruit incorporation.

With fruit yogurt, it is important to use a highly concentrated fruit preparation. A fruit preserve with a fruit content higher than 45% is likely to cause body weakness in Swiss style yogurt. Too high a sugar content in fruit preserves causes a relatively large differential in osmotic pressure between the yogurt and the fruit layer. This leads to wheying-off.

Texture in Yogurt

Ideally, yogurt should have a smooth, rich texture free of lumps, granules or graininess. There should be no gas pockets or fissures or gassy effervescence. Finished yogurt tends to get grainy when the coagulum becomes excessively firm before stirring. Sometimes graininess is also caused by slow acid development as a result of low incubation temperature or poor temperature control or inactive starter due to acid injury or the presence of phage or inhibitors. Coarse texture can result if the set-mix is disturbed just before gelling occurs - close to the isoelectric point of casein. The use of rennet to firm up body could also result in graininess. If powdered ingredients are not uniformly dissolved or mixed, yogurt will develop a granular mouth-feel. Excessive use of whey powder in the mix will cause a coarse texture (3).

Homogenization of the mix definitely contributes to the smoothness and richness of yogurt. As discussed in an earlier article, homogenization aids in uniform distribution of the milkfat and powdered ingredients in the mix. The milkfat content of the mix helps to give a smooth, rich mouth-feel. So milkfat percentage of the mix has a direct bearing on yogurt texture. It is difficult to achieve the same richness and smoothness in low-fat or non-fat yogurt as in full-fat yogurt. Proper combination of stabilizers or modified starches are necessary to compensate for the the lack of milkfat.

Exopolysaccharide-producing starter cultures yield a smooth, silky texture. They are especially useful in getting a milk-shake-like texture in yogurt drinks or liquid yogurts.

Gas-pockets, fissures or gassy effervescence are caused by trapped gases like carbon dioxide or hydrogen produced by either improperly made starter cultures or contaminant flora. Coliform bacteria, spore-forming *Bacillus* species and yeasts produce the above mentioned gases. These unwanted microorganisms usually come from poorly made or improperly stored fruits, preserves or nut meats used in flavored yogurts. These ingredients should be carefully checked for such contaminant flora.

Flavor in Plain Yogurt

Dr. Manfred Kroger of Pennsylvania State University wrote the following about yogurt flavor: " The typical yogurt flavor can only be detected in plain yogurt....There is some international controversy over what a good plain yogurt should taste like. The flavor depends almost entirely on the culture organisms and their metabolism during incubation. Off tastes and odors are usually by-products of faulty fermentation. The characteristic flavor of yogurt is due to lactic acid, which has no odor of its own, and to trace amounts of acetaldehyde, diacetyl, and acetic acid. The original milk components and their concentrations also play a role, especially the fat and solids-not-fat. There may also be certain additives that contribute to flavor....The flavor of yogurt is different from that of other cultured milk products"(2).

In simple terms, good yogurt has a clean, sharp, acid flavor with no note of sweetness (indicative of too much propionic acid) or vinegary taste (indicative of too much acetic acid). The major volatile flavor note is the typical acetaldehyde-green apple flavor. Top quality yogurt should be tart and green to taste. One without the other will fail to give the characteristic flavor of yogurt. The coccus and the rod work *together* and *in succession* to produce this "completeness" in flavor. Thus the need for selected pairing of the rod and coccus in proper proportions. Yogurt is after all, a product of symbiotic bacterial fermentation. The various factors involved in symbiotic yogurt fermentations were

discussed in a previous article in this series.

The final flavor of yogurt is also dependent upon the type and quality of the ingredients used in the yogurt mix. Fresh milk, cream, and skim milk powder for fortification yield a fresh, clean-tasting product.

Flavor Control in Fruit and Flavored Yogurts

Fruit and flavoring materials play an important role in the success of a yogurt product in the marketplace because:

* Most customers do not like plain yogurt. Thus, flavor base dictates the consumer acceptance of the product.
* In finished cup of yogurt, 15 - 25% of the contents is made up of the flavoring base, which in effect means that the fruit flavor base supplier actually represents the yogurt manufacturer in the estimation of the consumer.
* The high usage of fruit base accounts for a large portion of the cost of the finished product.

Yogurt fruit-flavor base consists of fruit, flavor(s), stabilizers and miscellaneous functional additives dispersed in a cooking-cum-flavoring medium such as corn syrup. The fruit portion of the fruit-flavor base consists of selected fruits chopped into different sized pieces and preserved in sugar syrups. Needless to say, fruit or flavored yogurt is only as good as the fruit mixture or flavoring used. This is true with regard to flavor, color and microbial contamination. Kroger (2) maintains that whether artificial flavor or W.O.N.F. or natural flavor is used, the product quality should be evaluated carefully in the laboratory and test-marketed before widespread distribution. He also warns that good quality fruit or fruit-flavors cannot be replaced with cheap syrup or citric acid.

In formulating fruit yogurt some knowledge of flavor bases to complement the specific fruit is necessary. Mark Compere (l) writes, "A common misconception regarding the fruit (added to yogurt) is that the flavor (in the finished yogurt) is totally derived and perceived from the actual fruit itself. That is, adding strawberries, for example, to yogurt is a good way to flavor. Developments in food technology have improved flavor dispersion and cooking techniques to such an extent that adding fresh strawberries to yogurt will not be perceived as well as a strawberry fruit-and-flavor-base specifically designed for yogurt. Even if fresh strawberries at a high usage level were perceived well, it would not be economical, available, or practical." The following terms are used in the flavor trade for additional flavorings mixed with yogurt fruit bases to enhance the specific flavor(s) of fruit(s) used. These products do not necessarily refer to the flavor derived from the fruit itself.

*Natural flavor: Strawberry concentrate or strawberry extract added to strawberry yogurt base exemplifies a "natural flavor".

*W.O.N.F.: These initials stand for "with other natural flavors". These products represent extracts and juices derived from other "natural" sources such as fruits other than the ones used in the yogurt base. Such products complement and intensify the specific fruit-flavor desired in the finished yogurt by synergistic interaction. An example of this is the use of plum juice in strawberry yogurt base.

*Artificial flavor: Artificial flavors are usually composed of pure chemicals blended together to give the specific flavor desired in the final product. The formulation of these flavor blends represent sustained chemical and technological research and development. The identification and quantitation of the individual pure chemicals used in the formulations are based upon the chemical analysis of the natural product itself. The individual compounds are identified and added together in the specific proportions found in the initial analyses of the natural product to see if the flavor is reproduced. Based on these observations, adjustments are made and technological developments such as the specific carrier to be used, standardization of the flavor, dosage levels and adaptations to the final systems in which they are to be used, are made.

Mark Compere (1) has further thoughts on selection and application of flavors in yogurt. He states that it is very important to evaluate the fruit and flavor base with the exact yogurt formula in which they are to be used, because differences in fat, non-fat milk solids, sugar, acidity etc., will affect the final flavor. He also cautions that the time or the period after which flavor evaluation is done is quite critical, for example, in evaluating a Swiss style flavored yogurt, the flavor does not "bouquet" for several hours after the flavoring has been incorporated.

Color does have a psychological appeal in the acceptance of flavored yogurt. A deep pink color is associated with strawberry and a bluish hue with blueberries. Any deviation from these accepted norms sends negative signals to the consumer although the product may have the characteristic flavor of the fruit in question. Many of the natural pigments in fruits and berries undergo color modifications with changes in pH and oxidation-reduction potential. Also blending with yogurt tends to lighten the color. Bleaching will occur with increase in acidity. Yogurt producers should be familiar with these changes and make suitable adjustments.

References

1. Compere, Mark. 1979. Evaluation and selection of yogurt fruit and flavor bases. Amer. Dairy Rev. 41(6): 64-65.
2. Kroger, Manfred. 1976. Quality of yogurt. J. Dairy Sci.59:344-350.
3. Nielson, V.H. 1975. Factors which control the body and texture of commercial yogurts. Amer. Dairy Rev. 37(11):36,38.

New "Broth" For Food Pathogens Simplifies Tests for Processed Meats

Food processors could soon have a simpler, cheaper way to begin routine tests of hot dogs and other processed meats as a safeguard against two major food-poisoning bacteria, said U.S. Department of Agriculture researchers.

Before testing whether *Salmonella* and *Listeria* are present, processors now incubate samples of the product for 24 hours in separate "broths" or growth media for each bacterium. Microbiologists Joseph S. Bailey and Nelson A. Cox of USDA's Agricultural Research Service have developed a growth medium that makes it possible to incubate both bacteria together.

"Switching to the new growth medium could save processors $5 million to $7 million a year in conducting food-safety tests, with no loss in accuracy," said Bailey.

He said the incubating periods are needed to revive bacteria injured but not killed by heating or other methods that make processed meats free of harmful bacteria.

"If processors didn't do this, small amounts of bacteria could go undetected in the safety test," he said.

Separate broth media are used currently, Bailey said, "because what's good for *Salmonella* is bad for *Listeria*, and vice versa." The new medium multiplies both bacteria "so that if either one is present in a food sample, it'll be easier to detect," he added.

Each year, the food industry runs about seven million tests for *Salmonella* and four million for *Listeria*. "With the new medium," Bailey said, "companies could run the same number of tests with half as many of the preparatory steps."

A patent application has been filed by Bailey and Cox. They are based at the ARS Russell Agricultural Research Center, Athens, Ga.

The new medium contains protein, sugar and salts that the two bacteria need to thrive on. It also contains chemicals called buffers that maintain a stable environment.

Several manufacturers of laboratory chemicals are interested in commercializing the new medium, said Ann Whitehead, ARS patent coordinator, Beltsville, Md. Once licensed to a firm, the medium could be made and sold for use by processors, she said.

"Ready-to-eat meat products such as hot dogs and cold cuts have a 'zero tolerance' for *Salmonella* and *Listeria*," Cox noted. "That is, they must contain no amount of either bacterium when they leave the processing plant. Manufacturers of other food products also test for these bacteria to assure that their products are safe."

After the 24-hour incubation period in the new growth medium, safety tests begin with the culturing of two food samples in a series of other media. These media contain antibiotics and chemicals that don't affect *Salmonella* or *Listeria*, but kill or inhibit other, generally harmless bacteria.

"At the end of the test there should be practically pure cultures of *Salmonella* or *Listeria* or both or, hopefully, neither--giving the food sample a clean bill of health," said Cox.

For more information contact Joseph S. Bailey or Nelson A. Cox at The Russell Agricultural Research Center, Agricultural Research Service, USDA, Athens, Ga. 30613, telephone (404) 546-3356.

Stanley Charm Receives DFISA-ASAE Food Engineering Award from the American Society of Agricultural Engineers (ASAE)

Stanley E. Charm, Sc.D., is the recipient of the 1991 DFISA-ASAE Food Engineering Award.

The award was presented by the American Society of Agricultural Engineers during the Society's International Summer Meeting, June 23-26, at the Albuquerque Convention Center, Albuquerque, New Mexico.

Charm is recognized for his pioneer work in irradiation, blood rheology and flow behavior, and drug residues testing in milk, which has resulted in numerous advances in these fields of study.

Besides being a pioneer food engineer and an exceptional entrepreneur, Charm has also been professor of Biochemistry at Tufts University since 1986. His books Fundamentals of Food Engineering and Blood Flow and the Microcirculation have both helped to establish the then-blossoming research areas. He has also authored or co-authored over 70 other publications, and holds six patents related to antibiotics detection.

Charm's current activity with the development of rapid antibiotic testing procedures for bovine milk has probably resulted in some of his most influential work with regard to industrial practices. The promotional slogan of the company he founded, Penicillin Assays Inc. probably said it best, "Nothing works like a Charm."

ASAE is a worldwide professional and technical organization whose members are interested in engineering knowledge and technology for agriculture, associated industries, and related resources. The Society, headquartered in St. Joseph, Michigan, includes over 10,000 members in 50 states, 10 provinces, and 110 countries.

For further information contact Pamela A. Cole (616) 429-0300.

Listeria *Book Now Available*

"*Listeria*, Listeriosis and Food Safety" is a 620-page book that has just been published. Co-authored by Elliot T. Ryser, Ph.D. and Elmer H. Marth, Ph.D., R.S. of the Department of Food Science, University of Wisconsin, Madison, Wisconsin, the book contains 15 chapters, two appendixes, and numerous illustrations. Topics covered include characteristics and classification of *Listeria monocytogenes*; behavior of *L. monocytogenes* in natural environments; listeriosis in animals and humans; characteristics of *L. monocytogenes* important to food processors, conventional and rapid methods to detect and isolate *L. monocytogenes*; foodborne listeriosis; incidence and behavior of *L. monocytogenes* in unfermented dairy products, cheese and other fermented dairy products, meat products, poultry and egg products, fish and seafood, and products of plant origin; and incidence and control of *Listeria* in food processing facilities. One appendix gives formulae of numerous culture media used to isolate and cultivate *L. monocytogenes*. The other appendix lists several hundred references published through the end of 1990 but not cited in the text of the book.

"*Listeria*, Listeriosis and Food Safety" is intended for food processors, food scientists, food microbiologists, food technologists, toxicologists, sanitarians, epidemiologists, public health and regulatory personnel, veterinarians, and upper-level undergraduate, graduate and continuing education students. The publisher is Marcel Dekker, Incorporated, 270 Madison Avenue, New York, N.Y. 10016. The book is priced at $165.00 in the United States and Canada and at $189.75 in all other countries.

Outstanding Seniors in Dairy Science Honored During Cal Poly Banquet

Three students who distinguished themselves in programs and activities related to the university's nationally recognized dairy science program have been honored as Cal Poly's outstanding seniors in dairy science for 1991.

Gilbert Bourgouin of San Luis Obispo, Nanette de Jong of Hanford, and Steven C. Kelm of Waterville, Minn., were recognized during the recent annual banquet of Los Lecheros, the campus dairy science club. Each received a plaque, and their names were placed on a permanent trophy displayed in the university's Dairy Science Department.

The outstanding seniors were selected by a committee of faculty and third-year students from the department. The committee's decisions were based on the candidates' leadership, character, and academic abilities.

Bourgouin enrolled at Cal Poly in 1988 after graduating from Damien High School in La Verne.

At Cal Poly, he has been a member of Golden Key National Honor Society and Los Lecheros and has been on both the Dean's Honors List and President's Honors List. He has also worked in the university's dairy plant and for the Alta-Dena Dairy in the Los Angeles area and been a member of the U.S. Naval Reserve.

De Jong began her career at Cal Poly in 1987 after having graduated from Central Valley Christian High School in Visalia.

The winner of several scholarships, she was on the California Milk Advisory Board's dairy sales enhancement team and dairy sales promotion and research team. She also won the American Dairy Science Association's paper competition in 1988 with a presentation on milk quality at the retail level.

While at Cal Poly, de Jong was a member of Los Lecheros; Alpha Zeta, the national professional and honor fraternity for agriculture; the National Agricultural Marketing Association; Golden Key National Honor Society; and Mortar Board national honor society. She was also on the Dean's Honors List and took part in the Cornell University student exchange program in 1988.

Kelm was a student at the University of Minnesota's Waseca campus before enrolling at Cal Poly in 1988. Since that time, he has received a number of scholarships, been president of Los Lecheros, and been elected to membership in both Golden Key National Honor Society and Mortar Board national honor society.

A graduate of Waterville-Elystan Public High School, he also served as chairman of the junior college judging contest held annually at Cal Poly; was a teaching assistant for two members of the dairy science faculty; and was a member of the university's nationally ranked dairy cattle judging team.

The Cal Poly Dairy Science Department offers courses leading to the bachelor's degree in dairy science with course concentrations in dairy husbandry and dairy products technology. It has more than 100 students enrolled in its degree program.

For more information contact Don McCaleb (805) 756-1511.

1991 Directory of BISSC Registered Companies Now Available

The 1991 Baking Industry Sanitation Standards Committee (BISSC) directory of registered bakery equipment companies is now available. The directory features over 120 registered companies whose equipment has been certified as conforming to the BISSC Sanitation Standards.

The directory is divided into two sections. The first contains an alphabetical listing of BISSC-registered companies and the Standards for which authorization has been obtained.

The second section is organized by Standard, indicating those companies who have secured authorization for each Standard. A complete listing of the 42

BISSC Standards is provided in the directory. BISSC Sanitation Standards for the Design and Construction of Bakery Equipment and Machinery are published every four years. The current edition was published in 1990. The next scheduled reprinting will be in 1994.

The Office of Certification of BISSC was established in 1966 to promote greater recognition and use of bakery equipment conforming to the criteria of BISSC Standards. Under this program, individual bakery equipment manufacturers may apply for BISSC Registration and certify equipment which meets the requirements of the particular Standard(s) for which they are seeking authorization.

Once certification is approved, the equipment manufacturer may then display the BISSC Symbol on the equipment certified within the program.

The BISSC registration period runs from January 1, 1991 through December 31, 1991. Registration and authorization must be renewed annually if the manufacturer wishes to continue to display the BISSC Symbol on the certified equipment.

Requests for application forms to register and certify bakery equipment with the BISSC Office of Certification should be directed to Bonnie Sweetman, secretary-treasurer, BISSC, 401 N. Michigan Ave., Chicago, IL 60611 or call 312/644-6610.

The directory is published annually in June and is available upon request at no charge from BISSC headquarters.

Silliker Offers new Food Microbiology Short Course

As one of the nation's leading advocates of education as a practical tool in the detection of foodborne disease, Silliker Laboratories Group, Inc. is sponsoring a new short course, "Principles of Food Microbiology."

This two and one-half day lecture is designed for practicing food technologists responsible for the microbiological safety and quality of food and for those individuals whose job function require a knowledge of these areas. Location and meeting dates are as follows: Chicago, IL (September 24-26, 1991); San Antonio, TX (January 7-9, 1992); Washington, D.C. (April 21-23, 1992); and Anaheim, CA (July 7-9, 1992). The registration fee is $750 and participants, who register 60 days in advance of their desired session, can take advantage of the $675 early bird registration fee.

Designed and coordinated by Dr. John H. Silliker, the course combines lectures, discussions, and informal evening meetings to provide participants with a basic understanding of the factors that affect microbial growth in the safety and survival of food products. Special emphasis is placed upon the microbial ecology of foods, the influence of processing techniques on microflora, and the influence of these factors on the safety and quality of various foods.

In addition to Dr. Silliker, a number of highly respected food industry professionals are scheduled to serve as lecturers for various presentations. They include: Dr. Damien A. Gabis, Dr. Russell S. Flowers, Dr. Richard B. Smittle and Dr. Ranzell Nickelson II, of Silliker Laboratories; Dr. Elmer Marth, professor emeritus, the University of Wisconsin-Madison; and Dr. Carl Vanderzant, professor emeritus, Texas A&M University.

Founded in 1961, Silliker Laboratories provides chemical and microbiological analyses, technical and consulting services, research and informational services related to the safety, stability and nutritional value of food. Silliker Laboratories are located in Chicago Heights, IL, Columbus, OH, Garwood, NJ, Stone Mountain, GA, Sinking Spring, PA, Carson, CA, Hayward, CA, San Antonio, TX, College Station, TX, Grand Prairie, TX, and Mississauga, Canada.

For additional information contact Silliker's short course registration at (708) 756-3210.

Industry Products

Mocon Announces the Ox-Tran® 2/20 A New Modular Oxygen Transmission Rate Testing System

The New OX-TRAN 2/20 System utilizes a unique, patented coulometric sensor for detecting the oxygen transmission rate through flat barrier materials and finished packages. This completely redesigned OX-TRAN line allows users to design and specify their own OX-TRAN system by combining Master Base Control Modules with Satellite Application Modules. The OX-TRAN 2/20 simultaneously conditions and tests up to 20 samples (flat films or finished packages) and can perform over a range of temperature and humidity conditions similar to the package's actual storage environment. Measurements of very low oxygen transmission rates are easily accomplished by semi-skilled personnel. Two models of the sensor are available and can provide parts per billion (ppb) sensitivity even in the presence of water vapor.

The OX-TRAN 2/20 provides MOCON Oxygen Transmission Rate Software and computer-control, thereby reducing operator attention to an absolute minimum, while creating the ability to interface large amounts of 0_2 TR data with in-house computers. Ten different modules are available to address specific testing applications.

The OX-TRAN systems are designed to assess barrier materials, and meet the needs of the food, pharmaceutical, chemical, and medical industries where oxygen plays a critical role in determining a product's flavor, texture and/or usable shelf life. ASTM testing methods D-3985 and F-1307, are written specifically around this instrumentation. European test methods DIN 53380, and Asian JIS K-7126 also specify this instrumentation. MOCON offers a full product line with accessories to meet the specific requirements of many packaging applications.

Mocon Controls - Minneapolis, MN

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New Foam Cleaner from Rochester Midland

Aluminum and galvanized equipment is quickly and safely cleaned of animal fats, proteins and other soils with FOAM SAFE, Aluminum Safe Chlorinated Alkaline Foam Cleaner.

Engineered and manufactured exclusively by Rochester Midland, FOAM SAFE is USDA authorized in category A-1, for use on all surfaces in all departments, followed with a potable water rinse. FOAM SAFE produces a dense, copious, clinging foam which penetrates soils rapidly and safely. Free rinsing, FOAM SAFE leaves equipment film-free, bright and shining.

FOAM SAFE is available packaged in 4 x 1 gallons, 5 gallon pails, 55 gallon drums, totes and bulk tank trucks.

Rochester Midland - Palisades Park, NJ

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Lyph-Lock® 18-Liter Freeze Dry System Processes Large Sample Volumes

Labconco Corporation, Kansas City, Missouri, offers an 18-Liter Freeze Dry System designed for applications involving large volumes of material and numerous sample batches.

The 18-Liter is the model of choice for users requiring large volume throughput, such as pharmaceutical research laboratories and pilot plant facilities.

The high capacity refrigeration system collects up to 18 liters of ice before defrosting is necessary, and will remove up to 12 liters of water from the sample load in 24 hours, providing efficient, reliable performance. Up to six liters of material may be processed at one time.

The versatile design of the Lyph-Lock Freeze Dry System allows selection of a variety of drying accessories, including stoppering tray dryer, chamber, heated chamber or manifold.

Interior components are accessible through a removable front panel making the unit easy to maintain. A retractable drain hose is also located in the front for convenient defrosting of the upright coil.

The 18-Liter system also comes equipped with electronic temperature and vacuum gauges for monitoring during operation.

For more information on the Lyph-Lock 18 -Liter Freeze Dry System;

Labconco Corp. - Kansas City, MO

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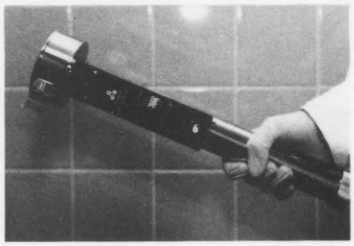

Airborne Microorganisms Controlled Using RCS Air Sampler

A battery-operated air sampling device designed in Europe can lead to improved control of airborne microorganisms in food plants. Often overlooked as a cause of food product contamination, airborne microorganisms can cause reduced shelf life, flavor defects and spoilage. If air quality in food plants is monitored at all, methods are often primitive compared with other quality control techniques. Recognizing this, food processors are adopting highly effective methods used by health care and pharmaceutical industries. Among these the RCS Air Sampler, made by Biotest and sold in the U.S. by Nelson-Jameson, Inc., provides the ideal combination of convenience and accuracy for food industry applications.

The RCS Air Sampler is effective because air is pulled through the instrument, thrusting microorganisms onto an agar-coated strip using a constant centrifugal force. This feature is important because aerosols containing bacteria, yeast and mold may otherwise remain suspended for hours, thus escaping detection by *exposure plates*.

Exposure plates, a commonly used technique for air sampling, are simply petri dishes in which the agar is exposed to the air for a period of time to collect the sample. The method detects only microorganisms which settle onto the plate.

The RCS Air Sampler precisely controls the volume of air sampled, permitting an accurate assessment of changing quality. Samples are representative and comparable from day-to-day. Problems may be detected days or even weeks before they are discovered using typical monitoring procedures.

Hand held and battery-operated, the unit is convenient for quality control personnel to use throughout the plant. It weighs only 2 1/2 pounds and measures 13 1/2 inches.

A variety of selective media are available to permit early detection of organisms which indicate major potential problems. These media are provided ready-made on agar strips which fit into the RCS Air Sampler. Samples are incubated and read using conventional methods.

Nelson-Jameson, Inc. - Marshfield, WI

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New Antimicrobic Supplement Simplifies Listeria *Detection*

Simplify testing food and dairy samples for the presence of *Listeria monocytogenes* with Bacto™ Oxford Antimicrobic Supplement and Bacto ™ Oxford Medium Base. This selective medium differentiates *Listeria monocytogenes* which has caused recent outbreaks of food-borne illness resulting in severe illness and death.

Now, more convenient preparation of Oxford Medium is possible using Oxford Antimicrobic Supplement. This supplement is easily rehydrated to eliminate the need to prepare and filter sterilize antimicrobic solutions.

New FDA regulations which require Oxford Medium for *Listeria* testing can be met by adding Bacto Oxford Antimicrobic Supplement to Oxford Medium Base.

The presence of an indicator system within the medium eliminates the need for an oblique-transmitted light source for the detection of typical colonies. *Listeria monocytogenes* isolates are capable of hydrolyzing esculin which results in blackening of the medium around the colonies. Other bacteria capable of hydrolyzing esculin are inhibited by the lithium and antimicrobic supplement which is added to the final medium.

Bacto Oxford Antimicrobic Supplement further extends the line of recommended *Listeria* testing media which are available from Difco Laboratories. Oxford Medium Base, Oxford Antimicrobic Supplement, LPM Agar Base, Listeria Enrichment Broth, McBride Listeria Agar, UVM Modified Listeria Enrichment Broth and Listeria Typing sera are available from leading laboratory distributors.

Difco Laboratories - Detroit, MI

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New Brochure from Ampco Metal, Inc.

Design and application information on centrifugal pumps for corrosive and/or abrasive liquids is presented in a new brochure published by Ampco Metal, Inc.

Feature-by-feature descriptions are provided for eight series of close-coupled and frame-mounted pumps with capacities to 650 gpm and total dynamic heads as high as 350 feet. Alloys of construction include Ampco nickel-aluminum bronze, 316 stainless steel and other special alloys.

The pumps are highly resistant to the damaging effects of aggressive media such as cleaning/sanitizing solutions, salt water, acids and alkalines.

Of special significance is a line of efficiency pumps requiring smaller drives and less power consumption than typical alloy pumps.

For a copy of the 20-page brochure:

Ampco Metal, Inc. - Milwaukee, WI

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Hazardous Material Program Kits

A new Hazardous Material Program Kit for Kitchen Services is available now from Direct Safety Co. This comprehensive kit is designed to help employers of institutional kitchen staff staff to comply with all five of OSHA's Right-to Know requirements: A written hazard communication plan, hazard inventory requirements, labeling requirements, employee training, and provision of easy access to MSDS (material safety data sheets).

A unique feature of the kit is its hazard communication program designed to be easily customized to the user. The kit contains information for the manager about Right-to-Know regulations and training program implementation. It also includes an MSDS binder with easy indexing system, three colorful reference wall charts, and 30 chemical resistant labels. Training materials cover Right-to-Know, label usage, MSDS, spill response, hazmat disposal, first aid, protective equipment, and other safety requirements for hazardous operations.

The Hazardous Material Program Kit for the Kitchen Services is one of four kits available. For more information request a free 1991 Master Catalog from Direct Safety Co.

Direct Safety Co. - Phoenix, AZ

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Magmeter for Food Processing Plants

Sparling Instruments of El Monte, California has a flangeless, electromagnetic flow meter, the Tigermag, that is ideal for food processing facilities.

The Tigermag's ceramic liner and stainless steel electrodes tolerate CIP solutions, steam cleaning and hose-down, with process temperatures of up to 420°F. It carries approval by the 3A Sanitary Council, as well as Factory Mutual and CSA.

Sparling incorporates a unique method of programming and calibration into the Model 625 Tigermag. This microprocessor-based system is called MAG-COMMAND™.

Meter variables are selected and changed from *outside* the meter's explosion-proof enclosure by means of a simple magnetic probe, and two hall-effect sensors which are mounted on the display face of the meter. The Tigermag will not effect the purity of the process.

An innovative menu-driven internal software package leads you through all choices. Parameters are selected by momentarily placing the magnetic probe adjacent to the hall-effect sensor. Each menu step is clearly displayed on the 16 digit alphanumeric readout.

Mag-Command™ makes it unnecessary to remove screws or panels to change program settings.

Some of the menu selections are: Flow rate and total, security lock, selectable engineering units, full scale settings. analog or pulse output, damping, low flow cutoff, self diagnostics and others.

Mag-Command™ can be easily demonstrated at your plant location.

Sparling Instruments Co. - El Monte, CA

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Midwesco Filter Resources Introduces A New Dairy Grade Sonic Horn

Midwesco Filter Resources introduces a new Dairy Grade Sonic Horn made of 304 Stainless steel. All product contact surfaces have a #4 finish and all corners are rounded for sanitary services.

USDA standards require a complete clean up of all contact surfaces after each batch of product is run. The Midwesco Dairy Grade Sonic Horn has been designed specifically to address the clean up problems a conventional sonic horn can represent. This Dairy Grade Sonic Horn is assembled with only six stainless steel wing bolts and can be disassembled quickly and easily. It is supplied with a standard mounting flange installed for vertical or horizontal mounting or can be provided with custom mounting sleeves fabricated to your specifications. Air connections are quick connection, Tri-Clamp® with Gortex® PTFE seals.

Automatic timers, controls and air supply filters can be supplied upon request.

Sonic horns efficiently fluidize compacted solid particles so that they will flow freely.

The sonic energy generated by the horns reduces the accumulation of agglomerated particles on the filter bags and side walls of the baghouse. This means less undergrade product and reduced pressure drop across the filter bags. Similar successes have been discovered when horns are installed in the spray dryer. Installing a sonic horn can result in a substantial savings and return the cost of its installation in just a few months.

Midwesco Filter Resources, Inc. - Winchester, VA

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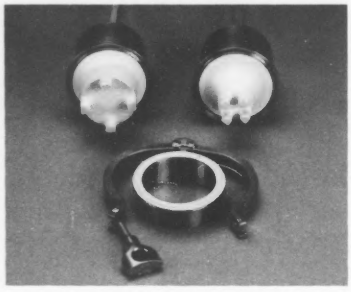

Ongoing Field Testing of BTG Process Control Sensors for Dairy Industry

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Sanitary Design

A Mind Set (Part II)

by Donald J. Graham
Senior Food Technologist
Sverdrup Corp.
St. Louis, MO

Once the site is selected and the necessary site criteria for building a food processing plant are met, the design engineer and the processor must make some basic decisions about the shape and size of the building or buildings to be erected.

Some food processes are better housed in multi-storied buildings, others in single-storied buildings. Deciding which building type to use must take into account the product to be processed, amount of land available and local codes. Some processes that have many components to the process, or a sensitive product, may be better suited to a multi-story plant so that product can be transferred by gravity rather than by conveyers, elevators or other powered mechanical transport systems that have inherent sanitation problems. Other processes and products lend themselves to single-story facilities. Basically, the shape and number of floors in a plant are issues in a business decision since either type of plant can be built to meet sanitary design criteria.

Walls

The outer walls of a food processing facility should be constructed to be rodent proof. Before the walls are erected, the foundation should be designed and constructed to accommodate the rodent proofing required in a food plant. For example, for a slab floor, the footers should be constructed with a rodent flange 24 inches below grade extending 12 inches out at right angles to the foundation. This flange will prevent rats from burrowing under the floor slab and chewing their way through vulnerable places into the plant.

If the building has a basement or cellar, its floor should be tied directly to the solid wall foundation. This will create a solid box that will be an effective pest barrier.

The best walls for a food processing plant are poured concrete that have been troweled smooth to a standard of no more than one 1/8 inch diameter hole per square foot. Poured concrete walls do not have the seams that require caulking that are found in precast or tilt up construction. Poured concrete is more expensive and requires on-site construction of forms and finishing. However, poured concrete in areas where precasting or tilt up construction is not available or feasible may be the only type of concrete wall that can be used.

Precast or tilt up walls have proven to be a rapid and economical way of erecting a food processing plant. Their main disadvantages are the time and expense necessary to adequately caulk all the joints and seams between panels. The caulking must be periodically maintained. A relatively new innovation using notched beams, notched precast wall panels and double-tee precast roof panels is being used successfully on a food processing plant that the Sverdrup Corporation currently has under construction. The technique entails precasting the wall panels and the roof support beams complete with notches large enough to accommodate the precast double tees of the roof panels. When lifted into place the double tees fit into the notches rather than resting on top of the beams or walls. By fitting inside the notch, the dust-collecting flat surfaces on top of the beams or wall panels that are usually associated with this type of construction are eliminated. It is then a simple matter to fill and caulk the spaces around the double tees creating a cosmetically attractive and sanitary structure. Not every precaster is equipped to fabricate notched wall panels but the economics of faster on-site erection, coupled with definite sanitation advantages, should see this type of construction becoming increasingly popular. The same standard for wall smoothness and absence of defects outlined for poured concrete applies to both precast and tilt up walls but is easier to obtain.

A word of caution about precast, tilt up and concrete block should be noted. If a parting agent is used to facilitate the removal of the panel or block from the form then the agent should be tested to make sure it is compatible with any wall covering (epoxy, paint etc.) *before* it is used. If it is not compatible then peeling will result and, as food processors know well, peeling paints are not welcome in food processing plants.

Concrete block is a second choice for wall construction. If block is selected it must be a high density type. Volcanic ash or cinder block are not acceptable for food processing facilities. They are too porous and will absorb moisture and bacteria and may allow them to penetrate directly to the core of the block where they are virtually impossible to dislodge. Nor is low density block recommended since moisture, bacteria and mold can penetrate the surface and also create sanitation problems. However, a good quality sealer can close the pores sufficiently to overcome these disadvantages. Even when sealed in this way, low density walls still require a good maintenance program to remain effectively sealed.

When concrete block is laid, the first course should have the center core filled with mortar to make an effective seal against insects entering through the joint created at the junction with the foundation and so gaining access to the rest of the wall. The top course of block must also be capped off to prevent access by both insects and rodents.

Another common wall material that is used, but not recommended for food plants, is corrugated metal siding. Corrugated metal damages easily and is difficult to make rodent and insect proof. If, however, it is used, the outside corrugation must be blocked and caulked at the foundation and at the top, to prevent access by rodents, insects and other pests. Once inside the corrugations they can roam up and down the walls at will finding openings into the plant making any pest control program extremely difficult.

Plant walls will, at one time or another, require penetrations for access by utilities or for other reasons. These penetrations should be well planned ahead of time and the timing of them coordinated with the utility or other services being taken through the wall. Once the penetration is made, it should be used and sealed the same day, if at all possible. Leaving it open overnight will probably result in one or more pests invading the wall which if it has an exposed, insulated, or hollow core will provide them an excellent home.

Loading Docks/Platforms

Loading docks and platforms are ideal entry points for rodents, insects and birds, especially sparrows.

The docks and platforms should be built at least three feet or the height of a truck bed above the ground. Rodents can jump considerable distances and anything lower may permit them to gain access to the open doorway and into the plant. The underside of the dock opening should also be lined with a smooth material such as galvanized metal or smooth, hard plastic board to prevent rodents from climbing into the building. To repel access by rodents, a twelve inch overhang should be part of the dock or platform.

Insects can be discouraged by the use of truck door seals, rapid open/close doors and air curtains. The truck yard should be paved to prevent dust contamination from entering the plant. Overhangs should be constructed to be free of potential or actual roosting places for birds. Not only will birds use supporting structures to roost and their feces drop on the goods being loaded or unloaded from the trucks but most will also work their way into the plant at the first opportunity. The docks should be constructed or renovated to eliminate canopies and so that trucks are snug against the seals while loading or unloading.

Rail Sidings

Rail sidings should be paved with concrete at the unloading and loading platforms. Unpaved areas are hard to keep clean and can attract pests, especially from spilled material that is hard to clean up completely. The platform should be large enough to temporarily store the dunnage from the rail cars as they are being unloaded. Since rail platforms make ideal locations for access by pests they must be kept clean and uncluttered as possible. Nothing should be stored on them for any length of time.

References

Gould, Wilber, A., 1990. CGMP'S/FOOD PLANT SANITATION. CTI Publications, Inc., Baltimore, MD.

Updates . . .

NCIMS Lowers SCC Level to 750,000

Amended NMC Proposal Accepted

Delegates at the 23rd National Conference on Interstate Milk Shipments (NCIMS), held April 22-26, approved an amended NMC proposal which will lower the actionable somatic cell count (SCC) level from the current one million to 750,000 cells/ml effective July 1, 1993. The original NMC proposal recommended lowering the actionable limit to 500,000 (see *Udder Topics*, February 1991).

The last time the federal SCC standard was reduced was July 1, 1986, when it was lowered from 1.5 million to one million cells/ml. Since then, some states have adopted lower SCC standards. California has the lowest at 600,000.

The other proposal NMC submitted to NCIMS was to establish a state/national program to collect and report bulk tank SCC. Although the original proposal was not approved, a resolution supporting NMC efforts to develop a national SCC data base was adopted by the delegates. The resolution encourages states to voluntarily provide NMC with at least one bulk tank SCC for each dairy herd on an annual basis. This data will enable NMC to monitor the quality of the nation's milk supply as it relates to udder health.

A proposal submitted by the NCIMS Goat Milk Committee to exempt goat milk from a SCC limit of less than one million cells/ml was approved. Research indicates that goat milk SCC is considerably higher than cow milk, even in the absence of intramammary infection. A SCC limit of less than one million would cause the majority of goat herds to be in violation of the federal SCC limit. NMC passed a resolution at the 1991 annual meeting recommending that goat milk SCC standards be maintained at the current level.

The delegates also approved a proposal whereby States shall report electronic SCC's below 100,000 cells/ml as "less than 100,000." The rationale behind this proposal was that SCC's determined electronically may not be accurate below 100,000. This only applies to States - it does not impact the DHI SCC reporting system or industry SCC testing and reporting.

NCIMS meets every other year to consider proposed changes in the Pasteurized Milk Ordinance and allied documents which establish the conditions under which Grade "A" milk is inspected, produced, hauled, processed, stored and packaged. Conference participants include representatives from industry, state/federal agencies and educational institutions. Voting delegates are limited to state rating and enforcement agency representatives. All Conference actions are subject to review and concurrence by the Food and Drug Administration. This review process is currently underway.

Upcoming W. L. A. Meeting

The Wisconsin Laboratory Associations 1991 Annual Education Conference will be held at the Milwaukee Marriott Convention Center in Brookfield, WI on September 12th and 13th.

Sessions will be offered in three categories: Food and Dairy, Water and Wastewater, and Public Health. General Sessions will address Laboratory Computer Networking, the Re-Sampling Syndrome, Lab Fume Hood Safety, and Communicating Science and Technology.

Exhibits of the latest in laboratory equipment and suppliers will be available to demonstrate products and answer questions.

On Friday afternoon, workshops will be conducted. Michael H. Brodsky, Chief of Environoment Bacteriology and Microbiology Support Services with the Ontario Ministry of Health will conduct a workshop entitled "Quality Assurance in the Laboratory: Putting Theory into Practice." George H. Nelson, Professor of Microbiology at the University of Wisconsin-Stout will conduct a workshop entitled "Bacteriology Quality Control Procedures for Laboratory Technicians."

Also on Friday, Certification Exams will be given by the Association Boards of Certification (ABC) for analysts interested in the voluntary wastewater laboratory analyst certification program.

WLA members should expect conference registration materials to arrive in late July. Non members interested in the conference can contact Malin Benicek, WLA President at (414)547-5531 x 250, or write to Wisconsin Laboratory Association, P.O. Box 28045, Green Bay, WI 54304 for more information.

Food and Environmental Hazards to Health

Yersinia enterocolitica Infections During the Holidays in Black Families-Georgia

During the 1988-89 winter holidays (i.e., Thanksgiving through New Year's day), and outbreak of gastroenteritis caused by raw chitterlings (i.e., pork intestines, a traditional winter holiday food in some black families) contaminated with *Yersinia enterocolitica* 0:3 occurred among 15 children in metropolitan Atlanta. All the children were black, and 11 were enrolled in the Women, Infants and Children (WIC) Program. Chitterlings had been prepared in 12 of 13 case households and five of 26 control households ($p<0.001$). The infecting organism was primarily transferred from the raw chitterlings to the children through contact with the hands of the foodhandlers. Of child-caretakers enrolled in the Fulton County (the county where most of the cases occurred) WIC Program, nearly half reported household preparation of chitterlings for a Thanksgiving, Christmas, or New Year's Day meal.

To increase community awareness about the potential risk for acquiring yersiniosis from raw chitterlings, particularly among WIC Program participants, a supplementary lesson plan was developed and incorporated from October 1989 to January 1990 into an existing Fulton County WIC Program group nutrition education program. The lesson included a lecture and discussion that informed mothers, grandmothers and other child-caretakers about 1) the signs and symptoms of yersiniosis in children; 2) the transmission of *Y. enterocolitica* infections to children through direct and indirect contact with contaminated raw chitterlings; 3) the need for special care when handling raw chitterlings because of potential contamination with bacteria; and 4) the prevention of *Y. enterocolitica* infections. Means of preventing illness discussed with each group included 1) careful handwashing by persons cleaning chitterlings before touching a child or anything used by a child (e.g., a toy or bottle) and 2) not allowing children to touch raw chitterlings. All WIC Program enrollees who attended classes or obtained vouchers during the winter holidys were also given an educational flyer summarizing key points of the lesson plan; enrollees were encouraged to share the flyer with other household foodhandlers.

Editorial Note: *Y. enterocolitica* causes an enteric infection with fever, diarrhea, and abdominal pain. The recent emergence of *Y. enterocolitica* 0:3 infections in the United States appears to have been accompanied by the establishment of a widely distributed swine reservoir: chitterlings from many regions of the country harbor *Y. enterocolitica* 0:3 (1). Because chitterlings are a common traditional food in some black households, particularly during the winter holidays, they probably represent an important vehicle for transmitting infections to children.

Yersiniosis should be suspected in black infants and children with febrile diarrheal illnesses during the winter holidays. During the winter, hospitals with large black pediatric populations should consider routinely culturing all stool specimens on cefsulodin-irgasan-novobiocin (CIN) agar, a medium selective for *Yersinia.*

Cleaning raw chitterlings is a labor-intensive and time-consuming process that may expose household members to potentially infectious agents. Because the potential for transmission of the agent is strongest from foodhandlers to children, someone other than the foodhandler should care for the children while chitterlings are being prepared.

The efforts of the Fulton County Health Department indicate that educational messages can be incorported into existing WIC educational programs; these messages can provide information to child-caretakers about transmission and prevention of *Y. enterocolitica* infections due to contaminated chitterlings. Information on the lesson plan and a copy of the educational flyer is available from the WIC Program Office, Fulton County Health Department; telephone (404) 730-1441.

MMWR 11/16/90

Laboratory-Acquired Meningococcemia - California and Massachusetts

Although *Neisseria meningitidis* is commonly isolated in clinical laboratories, laboratory-acquired infection is rare. This report describes two fatal cases of meningococcal infection in laboratory workers; both of these cases probably were laboratory acquired.

Case 1. On March 8, 1988, a clinical laboratory bacteriologist in California became ill with influenza-like symptoms and nausea. During the next 24 hours, she developed fever, myalgias, arthralgias, diarrhea, skin lesions and confusion. Her husband informed ambulance personnel that she had had a mishap in the laboratory approximately 1 week earlier with a type of organism that causes meningitis.

When hospitalized at 10 p.m. on March 9, she was hypotensive with numerous petechial and purpuric lesions on her face, neck, trunk and extremities; she died 6 hours later. The final autopsy diagnosis was "clinical acute intractable shock, consistent with acute meningococcemia." Blood cultures and cerebrospinal fluid studies were negative. Serum was positive by a bivalent (groups C and W135) latex agglutination test for *N. meningitidis.* A throat culture grew *N. meningitidis.*

No mishap had been reported at the hospital laboratory where the patient worked, nor could the patient's co-workers recall any episode; no additional information regarding a mishap could be discovered. During the previous 3 months, the patient worked with only one known *N. meningitidis* isolate, which was obtained from the blood of a patient with acute meningitis and cultured by the affected laboratory worker 5-6 days before onset of her symptoms. Both the workplace isolate and the laboratory worker's nasopharyn-

geal isolate were identified as *N. meningitidis* serogroup C by the Microbial Diseases Laboratory of the California Department of Health services.

CDC performed isoenzyme testing on the laboratory worker's nasopharyngeal isolate, the workplace isolate and 14 other unrelated but recently isolated group C strains from throughout northern California. The isoenzyme type of the laboratory worker's isolate and the workplace isolate were identical and rare. They differed from the 14 northern California isolates and from a collection of 256 group C meningocci isolated between 1986 and 1989.

Case 2. On the morning of September 6, 1988, a microbiology technician at a teaching hospital in Massachusetts presented to the hospital's employee health clinic with a history of several days of rhinorrhea, sore throat and myalgias. She was sent home at 1 p.m. with a diagnosis of viral syndrome. Twelve hours later, she presented to the emergency room semiresponsive, hypotensive, dyspneic, and with petechial and purpuric skin lesions. A gram stain of the buffy coat of her blood showed gram negative diplococci. Despite antibiotic therapy, she died 6 1/2 hours later. Blood cultures grew *N. meningitidis* group B.

For several days before her hospitalization the patient had been working in the bacteriology laboratory at the teaching hospital despite her upper respiratory infection symptoms. The laboratory had not isolated *N. meningitidis* during the 3 weeks before the patient's illness. On September 3 and 4, the patient worked in the bacteriology laboratory of another hospital. She had been observed using gloves to subculture an *N. meningitidis* isolate, and she had extensive rhinorrhea.

Both the workplace isolate and the patient's blood culture isolate were identified as *N. meningitidis* serogroup B. Isoenzyme testing performed by CDC on the patient's blood isolate, the workplace isolate and nine other unrelated but recently isolated group B strains from Massachusetts demonstrated that the isoenzyme pattern of the patient and workplace isolate were identical. They differed from the nine other Massachusetts group B isolates.

Editorial Note: Laboratory-acquired infection with *N. meningitidis* is rare. Three previous case reports describe infections in persons working in research laboratories who handled meningocollal organisms frequently and in large volumes; two of these occurred before the availability of effective vaccines and antibiotic therapy.

Although *N. meningitidis* was never isolated from the blood of the laboratory worker in California, other evidence supports the conclusion that she had laboratory-acquired meningococcal infection. The worker in Massachusetts may have been at increased risk for meningococcal infection; several studies suggest that concurrent viral infection increases the risk of developing invasive meningococcal infection.

These cases represent the first reports of meningococcal infection acquired in the clinical laboratory setting. Although laboratory workers frequently handle specimens and cultures containing meningococci, the labofatory workers probably are not at increased risk of infection when standard microbiologic practices are followed.

Meningococci may be present in specimens of pharyngeal exudates, cerebrospinal fluid, blood and saliva. Laboratory workers may be exposed to organisms by inoculation, ingestion and droplet or aerosol exposure of the mucous membranes. Guidelines for laboratory workers who handle meningococci include use of protective gloves and laboratory coats and decontamination of all infectious wastes. A class II biological safety cabinet should be used when mechanical manipulations that have high aerosol potential are performed. Work involving high concentrations or large quantities of organisms should be performed in a biosafety level 3 laboratory; laboratory workers in this setting should be immunized with the tetravalent meningococcal polysaccharide vaccine that includes serogroups A, C, Y and W135 but does not include serogroup B, currently the most common serogrop in the United States. In the event of any incident or exposure involving meningococci, workers should seek prompt medical attention. Persons with percutaneous exposure to meningococci should receive chemoprophylaxis with penicillin; those with mucosal exposure should be treated with rifampin.

MMWR 1/25/91

Malaria in Tourists To The Dominican Republic

The Dominican Republic has become a popular vacation site for Canadians. Currently, malaria prophylaxis is only recommended for the rural areas in the Dominican Republic; the provinces bordering on Haiti are considered to be at especially high risk. The coastal tourist areas are not considered to be of risk for exposure to malaria and, therefore, prophylaxis is not recommended when travelling to these areas. In May 1990, 2 Canadians with falciparium malaria acquired in Costa Ambar, just east of Puerto Plata in the north coast tourist area, were seen at the McGill University Centre for Tropical Diseases. The 2 cases were residents of Montreal vacationing in their country home in Costa Ambar.

Case 1. This was a 59-year-old male who presented to Montreal General Hospital on 26 May, 1990, 14 days after having returned from a 1-week visit to his country home in the Dominican Republic. He complained of a 4-day history of spiking fevers and left flank pain. He had started visiting the Dominican Republic 2 years earlier when he bought a beach house in Costa Ambar. In December 1989, March 1990 and May 1990, he had stayed there, and in December 1989 he also took a side trip to Santiago. This is the only time that he had travelled from the coastal region. At no time had he travelled in documented malarious provinces. His past history was non-contributory.

At presentation, the 4 days of spiking fevers, headaches, myalgias and 1 day of flank pain led to the diagnosis of a urinary tract infection (UTI). He was not considered to have been in a malarious area. He was treated with Septra® double strength (DS) bid. He was sent home, and he returned the following day, 27 May, with persistent fevers. A malaria smear revealed a number of distorted thin ring forms con-

sistent with falciparum malaria (1% parasitemia). Initial laboratory work included 2 blood cultures-negative, urine culture-negative, hemoglobin-normal, and platelets decreased to 57 x 10^9/L. Urinalysis revealed few cellular casts, 1 red cell cast, 1g/L of protein, and a few red blood and epithelial cells. He was treated with chloroquine phosphate and defervesced within 2 days. Malaria serology (indirect immuno-fluorescent antibody test with *Plasmodium falciparum* on 13 June (22 days after onset of symptoms) was 1:1000 (normal 1:128).

Case 2. His 51-year-old wife was in the Dominican Republic from 29 April to 14 May vacationing in the same place. She was not ill there and has had no other international travel, or significant past medical history and was taking no medication.

On 15 May, 1 day after returning to Canada, she developed a spiking fever to 40°C, headaches, myalgias and some loose bowel movements. Four days after the onset of symptoms, she was seen by a physician who prescribed Septra® DS bid x 10 days for a presumed UTI based on a urine dipstick positive for nitrites. Five days after starting Septra®, the fevers disappeared.

In retrospect, with her husband's diagnosis, her malaria serology was done 13 June (one month after onset of symptoms) and was positive at 1:2000. Malaria responding to Septra® DS, was considered the most likely diagnosis.

These 2 cases of malaria, in a supposedly malaria-free area, are of concern, especially in light of the high number of tourists who frequent this region. The delay or lack of a diagnosis was at least partially due to the understanding that malaria was not considered a risk in this area. The authors suggest that diagnosis of all cases of malaria in this area be vigilantly reported, that malaria be seriously considered in anyone with fever vacationing or returning from this area, and that a re-assessment of the areas in the Dominican Republic where malaria transmission occurs be expanded to include the coastal tourist regions.

Can. Dis. Weekly Report, 11/10/90

Federal Register

Receipt of Permit Application for Release into the Environment of Genetically Engineered Organisms

Agency: Animal and Plant Health Inspection Service, USDA.
Action: Notice

Summary: We are advising the public that an application for a permit to release a genetically engineered organism into the environment is being reviewed by the Animal and Plant Health Inspection Service. The application has been submitted in accordance with 7 CFR part 340, which regulates the introduction of certain genetically engineered organisms and products.

Availability of Environmental Assessments and Findings of No Significant Impact Relative To Issuance of Permits to Field Test Genetically Engineered Organisms

Agency: Animal and Plant Health Inspection Service, USDA.
Action: Notice

Summary: We are advising the public that five environmental assessments and findings of no significant impact have been prepared by the Animal and Plant Health Inspection Service relative to the issuance of permits to allow the field testing of genetically engineered organisms. The assessments provide a basis for the conclusion that the field testing of these genetically engineered organisms will not present a risk of the introduction or dissemination of a plant pest and will not have a significant impact on the quality of the human environment. Based on these findings of no significant impact, the Animal and Plant Health Inspection Service has determined that environmental impact statements need not be prepared.

Federal Register/Vol. 56. No. 129/Friday, July 5, 1991/ Notices.

Food Labeling; Nutrition Labeling of Raw Fruit, Vegetables, and Fish; Guidelines for Voluntary Nutrition Labeling of Raw Fruit, Vegetables, and Fish; Identification of the 20 Most Frequently Consumed Raw Fruit, Vegetables, and Fish; Definition of Substantial Compliance

Agency: Food and Drug Administration, HHS.
Action: Proposed rule.

Summary: The Food and Drug Administration (FDA), in response to the Nutrition Labeling and Education Act of 1990 (the 1990 amendments), is proposing: (1) To implement a different scheme than it presented in its July 19, 1990 proposal (55 FR 29487) for the nutrition labeling of raw fruit, vegetables, and fish; (2) to identify the 20 most frequently consumed raw fruit, raw vegetables, and raw fish in the United States; (3) to establish guidelines for the voluntary nutrition labeling of these foods; and (4) to define "substantial compliance" with respect to the adherence by food retailers to those guidelines. FDA is requesting comments on these proposed regulations and on the proposed guidelines.

Federal Register/Vol. 56, No. 127/Tuesday, July 2, 1991/Proposed Rules.

Affiliate News

Tennessee Association of Milk, Water and Food Protection Holds Its 12th Annual Meeting

The 12th Annual Meeting of the Tennessee Association of Milk, Water and Food Protection was held June 5, 1991 at the Ramada Airport, Nashville, TN with 53 members and guests in attendance. President Hugh Wilson presided.

Ernest Yates of Malone & Hyde Dairy, Nashville, served as morning session chairman. Tennessee Commissioner of Agriculture, L. H. "Cotton" Ivy, gave the group a welcome.

John Sanford of Tennessee Department of Agriculture, gave an update on the 1991 IMS Conference. Emily McKnight of TDA, gave a talk on Tennessee's Dairy Lab Certification program.

Earl Morgan of TDA gave the Invocation and a buffet luncheon was served.

Patty Musgrave of TDA, served as afternoon chairwoman.

Dr. W.C. Morris of UT Knoxville, gave a talk on Current Trends in the Fruit and Vegetable Industry.

Mike Knox of Monarch Chemical, Kingsport, gave a presentation on Dairy Plant Sanitation program.

Hugh Wilson presided over the business meeting. The financial report was given by Dennis Lampley. Tom Herbert gave the Audit Committee Report. Mary Lou Hopper gave the Membership Committee Report. Ronnie Wade gave the Nominating Committee Report.

New officers elected:

President ..... Ed Miller, Lewisburg
President Elect ..... Dr. Ann Draughon, Knoxville
Vice President ..... Dave Simmler, Memphis
Secretary/Treas. ..... Dennis Lampley, Bon Aqua
Archivist ..... Ruth Fuqua, Mt. Juliet
Board Member at Large ..... Wayne Crabtree, Athens
Past President ..... Hugh Wilson, Athens

President Hugh Wilson was presented a plaque for outstanding service by Dennis Lampley. Jerry Baggett served as door prize chairman. Grand prize won by John Sanford.

Upcoming IAMFES Affiliate Meetings

1991

SEPTEMBER

•**12, Mississippi Association of Sanitarians, Inc.** will hold a mini-conference in Tupelo, MS. For further information contact Greg Geno, MS State Department of Health, 101 First Street, Booneville, MS 38829.

•**16-20, Wyoming Public Health Sanitarians Association** will hold their Annual Meeting at the Holiday Inn, Cheyenne, WY. For further information contact Terry Carlile, Box 1182, Laramie, WY 82070; (307)742-3611.

•**24-25, California Association of Dairy and Milk Sanitarians** will hold their Annual Conference at the Sacramento Hilton, Sacramento, CA. For more information contact Jack Coppes, P.O. Box 9234, Whittier, CA 90608, (213)699-4313.

•**24-26, New York State Association of Milk and Food Sanitarians Annual Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.

•**25-26, Wisconsin Association of Milk and Food Sanitarians , Wisconsin Environmental Health Association and Wisconsin Dairy Plant Fieldmen's Association Joint Education Conference** will be held at the Maritime Inn, Manitowoc, WI. For further information contact Neil M. Vassau, Publicity Chairman, P.O. Box 7883, Madison, WI 53707; (608)267-3504.

OCTOBER

•**2-4, South Dakota Environmental Health Association** will hold its Annual Meeting at the Howard Johnson Hotel, Rapid City, SD. For more information call Dave Micklos, SD State Department of Health, (605)773-3364.

•**15, Associated Illinois Milk, Food and Environmental Sanitarians Fall Seminar** will be held at the Woodfield Hilton Hotel, Arlington Heights, IL. For more information contact Bob Crombie at (815)726-1683.

•**16-17, Iowa Association of Milk, Food and Environmental Sanitarians, Inc. 50th Anniversary Annual Meeting** will be held at the Ramada Inn, Waterloo, IA. For more information contact Dale Cooper (319)927-3212.

NOVEMBER

•**13-14, Alabama Association of Dairy & Milk Sanitarians Annual Meeting** will be held in Birmingham, AL. For more information call or write Tom McCaskey, Department of Dairy Science, Auburn University, Auburn, AL 36849; (205)844-1518.

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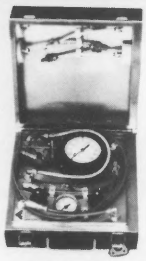

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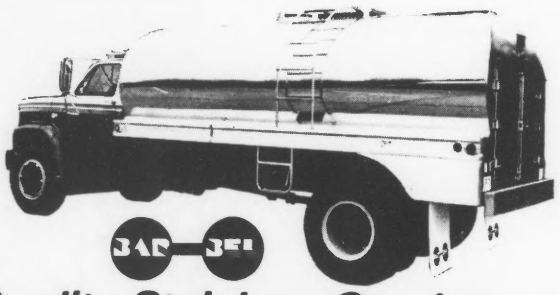

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Dairy, Food and Environmental Sanitation, Vol. 11, No. 8, Pages 468-478 (August 1991)

Holders of 3-A Symbol Council Authorization on August, 1991

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Walter F. Laun, Administrative Officer 3-A Symbol Council, 4403 First Avenue, Suite 404, Cedar Rapids, IA 52402 (319) 395-9151.

01-06 Storage Tanks for Milk and Milk Products

115 A-L Stainless Inc. (9/28/58)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

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

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

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

02-08 Pumps for Milk and Milk Products

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

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

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

29R Cherry-Burrel Corp. (10/3/76)
Fluid Handling Division
611 Sugar Creek Road
Delavan, WI 53115

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

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

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

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

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

492 A. Gusmer Inc. (1/15/87)
Mfg. by Philip Hilge GmbH
27 North Avenue East
Cranford, New Jersey 07016

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

502 INOXPA, S.A. (4/27/87)
(not available in USA)
c/. Telers, 54
17820 Banyoles (Verona) Spain

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

603 Johnson Pumps (UK) Ltd (8/16/90)
325 Highfield Industrial Estate (8/16/90)
604 Edison Road, Eastbourne (8/16/90)
East Sussex, England BN23 6PT
U. S. REP: Johnson Pump of America, Inc.
4825 Scott Street, Suit 306
Schiller Park, IL 60176

373 Luwa Corporation (12/27/82)
(Mfg. by MAAG Gear, Switzerland)
P.O. Box 16348
Charlotte, North Carolina 28297-6348

400 Netzsch Incorporated (8/15/83)
119 Pickering Way
Exton, Pennsylvania 19341-139

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

241 Puriti, S.A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

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

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

568 Shanley Pump & Equipment, Inc. (5/15/89)
(Mfg. by Allweiler, West Germany)

2255-1 Lois Dr.
Rolling Meadows, Illinois 60008

507 Sine Pump (7/21/87)
Division of The Kontro Co., Inc.
500 West River Street
Orange, Massachusetts 01364

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

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

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

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

175R Universal Dairy (10/25/56)
11100 N. Congress Ave.
Kansas City, Missouri 64153

329 Valex Products Corp. (6/10/80)
6080 Leland Street
Ventura, California 93003

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

408 Westfalia Systemat (10/18/83)
(Mfg. by Westfalia, West Germany)
1862 Brummel Drive
Elk Grove Village, Illinois 60007

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

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

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

309 APV Rannie, Inc. (7/19/78)
(Formerly Niro Atomizer Food & Dairy, Inc.)
445 Etna Street
Suite 57
St. Paul, Minnesota 55106

247 Alfa-Laval (4/14/73)
8400 Lake View Parkway
Suite 500
Pleasant Prairie, Wisconsin 53158

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

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

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

486 Fowler Products Company (11/18/86)
150 Collins Industrial Blvd.
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70R Brenner Tank, Inc. (8/5/57)
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Fond du Lac, Wisconsin 54936

45 The Heil Company (10/26/56)
1125 Congress Pkwy.
P.O. Box 160
Athens, Tennessee 37303-0160

40 Hills Stainless Steel & Equipment Co., Inc. (10/20/56)
505 W. Koehn Street
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66 Kari-Kool Transports, Inc. (5/29/57)
P.O. Box 538
Beaver Dam, Wisconsin 53916

201 Paul Krohnert Mfg. Ltd. (4/1/68)
(not available in USA)
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Milton, Ontario, Canada L9T 2Y3

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

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

189 A & L Tougas, Ltee (10/3/66)
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Iberville, Quebec, Canada

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

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

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

08-17 Rev. 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. (08-17 A&B) (5/21/75)
100 South CP Avenue
Lake Mills, Wisconsin 53551

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

380 Allegheny Bradford Corp. (3/21/83)

P.O. Box 200 Route 219 South
Bradford, Pennsylvania 16701

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

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

82R Cherry-Burrell Corp. (12/18/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, WI 53115

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

509 Fitting Speciality (8/7/87)
1303 35th Street
Kenosha, Wisconsin 53140

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

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

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

369 IMEX, Inc. (11/3/82)
(Mfg. by Lube Corp., Japan)
4040 Del Ray Ave. Unit 9
Marina del Rey, California 90292

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

287 Koltek, Inc. (1/14/77)
Div. of Alfa Laval
(Mfg. Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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

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

601 Nave Gmbh (6/15/90)
Am Rotboell 5
6108 Weiterstadt 2
Germany

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

602 Process Systems Company (8/15/90)
1610 South Maple Street
Ottawa, Kansas 66067

242 Puriti, S A. de C.V. (9/12/72)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

424 Robert-James Sales, Inc. (8/31/84)
250 Ramsdell Ave.
Buffalo, New York 14216

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

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

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

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

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

589 Titan Industries (12/27/89)
11121 Garfield Ave.
South Gate, California 90280

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

278 Valex Products Corp. (8/30/76)
6080 Leland Street
Ventura, California 93003

304 VNE Corporation (3/16/78)
1415 Johnson St.
Janesville, WI 53545

08-17A Compression Type Valves

533 APV Crepaco, Inc. (5/21/75)
100 S. CP Ave.
Lake Mills, Wisconsin 53551

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

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

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

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

555 Cherry-Burrell Corp. (12/11/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, WI 53115

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

376 Defontaine, Inc. (1/25/83)
(Mfg. by Defontaine, France)
563 A.J. Allen Circle
Wales, Wisconsin 53183

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

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

607 Kammer Valve, Inc. (9/25/90)

510 Parkway View Drive
Pittsburgh, Pennsylvania 15205

559 Koltek, Inc. (1/6/89)
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255 Great Arrow Ave.
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483 On-Line Instrumentation, Inc. (10/15/86)
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93 Utility Court
Rohnert Park, California 94928

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

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

467 Tuchenhagen North America Inc. (1/13/86)
(Mfg. by Otto Tuchenhagen, West Germany)
4119 W. Greentree Road
Milwaukee, Wisconsin 53209

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

584 Valvinox Inc. (11/27/89)
654 1ere Rue.
Iberville-QUE-Canada J2X 3B8

86R Waukesha Specialty Co., Inc. (12/20/57)
P.O. Box 160, Hwy 14
Darien, Wisconsin 53144

08-17B Diaphragm-Type Valves

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

615 AsepCo (1/4/91)
170 State Street, Suit 200
Los Altos, CA 94022

617 Defontaine, Inc. (2/1/91)
563 A. J. Allen Circle
Wales, WI 53183

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

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

494 Saunders Valve, Inc. (2/10/87)
15760 W. Hardy, #440
Houston, TX 77060

544 Valex Corp. (8/30/76)
6080 Leland St.
Ventura, California 93003

08-17D Automatic Positive Displacement Sampler

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

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

08-17E Inlet and Outlet Leak-Protector Plug Valve

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

556 Cherry-Burrell Corp. (12/12/57)
Fluid Handling Division
611 Sugar Creek Road
Delavan, WI 53115

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

08-17F Tank Outlet Valve

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

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

08-17G Rupture Discs

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

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

08-17H Thermoplastic Plug Type Valves

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

08-17I Steam Injected Heaters

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

09-08 Instrument Fittings and Connections Used on Milk and Milk Products Equipment

32 ABB Kent-Taylor Inc. (10/4/56)

A Subsidiary of Asea Brown Brveri, Inc.
(Formerly Taylor Instruments)
95 Ames Street
P.O. Box 110
Rochester, New York 14692

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

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

586 Beta Technology, Inc. (12/14/89)
105 Harvey West Blvd.
Santa Cruz, California 95060

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

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

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

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

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

418 Niro Hudson (4/2/84)
(Formerly Niro Atomizer Food & Dairy)
1600 County Road F
Hudson, Wisconsin 54016

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

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

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

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

32 Taylor Instrument (10/4/56)
Combustion Engineering, Inc.
400 West Avenue, P.O. Box 110
Rochester, New York 14692

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

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

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

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

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

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

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

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

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

11-04 Plate-type Heat Exchangers for Milk and Milk Products

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

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

17 Alfa-Laval Food & Dairy Co. (7/28/82)
(Div. of Alfa-Laval Inc.)
8400 Lake View Parkway
Pleasant Prairie, Wisconsin 53158

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

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

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

468 GEA Food and Process Systems Inc. (2/2/86)
8940 Route 108
Columbia, Maryland 21045

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

326 Karbate Vicarb Inc. (2/4/80)
(Mfg. by vicarb, France)
21945 Drake Rd.
Strongsville, Ohio 44136

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

491 On-Line Instrumentation, Inc. (1/2/87)
P.O. Box 541
Hopewell Junction, New York 12533

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

575 Pro Sales, Inc. (10/13/89)

107 2nd Street NW
Auburn, Washington 98001

279 The Schlueter Company (8/30/76)
(Mfg. by Samuel Parker, New Zealand)
216 Center Ave.
Janesville, Wisconsin 53547

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

12-05 Tubular Heat Exchangers for Milk and Milk Products

614 Alfa-Laval Food & Dairy (12/27/90)
(Manufactured by Spiraflo Indus.
Australia)
8400 Lake View Parkway, Suite 500
Pleasant Prairie, WI 53158

628 Alfa-Laval Food & Dairy Company (5/2/91)
8400 Lakeview Parkway
Suite #500
P.O. Box 500
Pleasant Prairie, WI 53158

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

632 Yula Corporation (6/4/91)
330 Bryant Avenue
Bronx., NY 10474

13-08 Farm Milk Cooling and Holding Tanks

49R A-L Stainless Inc. (12/5/56)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

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

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

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

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

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

311 GEA Food and Process Systems Inc. (8/28/79)
(Mfg. by Gebruder, West Germany)
8940 Route 108
Columbia, Maryland 21045

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

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)
(Mfg. by Stork, Holland)
P.O. Box 1258/Airport Parkway

Gainesville, Georgia 30503

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

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

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

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)
(Mfg. by Jagenberg, West Germany)
4800 Roberts Rd.
Columbus, Ohio 43228

324 Conoffast (11/29/79)
(Mfg. by ERCA, France)
1600 Harvester Road
West Chicago, Illinois 60185

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

352 GMS Engineering (1/12/82)
1936 Sherwood St.
Clearwater, Florida 34625

619 Hassia Verpackungsmaschinen GmbH (2/22/91)
6479 Ranstadt 1/Hessen Germany
(Hassia USA, Inc. 39 Plymouth St.
Fairfield, NY 07007)

473 International Paper Company (6/12/86)
Extended Shelf Life Division
4020 Stirrup Creed Drive Bldg. 200
P.O. Box 13318
Research Triangle Park, North Carolina 27709

220 Tetra-Pak EquipUS (4/24/71)
2285 University Avenue
St. Paul, MN 55114
(formerly Liquipak)

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

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

137 Pure-Pak, Inc. (10/17/62)
850 Ladd Road
Walled Lake, Michigan 48088

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

511 Remy Division (8/14/87)
(Mfg. by E. P. Remy, France)
2096 Gaither Road, Suite 119
Rockville, Maryland 20850

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

351 Tetra Pak Inc. (1/7/82)
(Mfg. by A. B. Tetra, Italy)
889 Bridgeport Ave.
P.O. Box 807
Shelton, Connecticut 06484-0807

211 Twinpak, Inc. (Canada) (2/4/70)
(Not available in USA)
1840 Route Trans-Canada
Dorval, Quebec, Canada H9P 1J8

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

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

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

286 O. G. Hoyer, Inc. (12/8/76)
(Mfg. by O. G. Hoyer A/S, Denmark)
201 Broad Street
Lake Geneva, Wisconsin 53147

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

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

412 Sani Mark, Inc (11/28/83)
2020 Production Drive
Indianapolis, Indiana 46241

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

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

262 A-L Stainless Inc. (11/11/74)
113 Park St., South
Peterborough, Ontario, Canada K9J 3R8

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

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

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

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

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

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

460 Niro Atomizer Food & Dairy, Inc. (11/5/85)
1600 Country Road "F"
Hudson, WI 54016

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

503 Ripley Stainless Ltd. (5/1/87)

(Not available in USA)
RR #3, Site 41
Summerland, British Columbia V0H 1Z0

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

536 Stainless Fabrication, Inc. (7/14/88)
620 N. Prince Lane
Springfield, Missouri 65802

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 Crepaco, Inc. (9/28/65)
Filling & Wrapping Systems Div.
1303 Samuelson Road
Rockford, Illinois 61109

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

499 Fords Holmatic, Inc. (3/19/87)
1750 Corporate Dr., Suite 700
Norcross, Georgra, 30093

222 Fort Howard Packaging Corporation (11/15/71)
P.O. Box 19130
Green Bay, Wisconsin 54307-9130

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

626 Klockner Bartelt, Inc. (4/2/91)
5501 N. Washington Blvd.
Sarasota, FL 34243-2283

447 Mateer-Burt Co., Inc. (7/22/85)
(Mfg. by Trustpak, England)
436 Devon Park Drive
Wayne, Pennsylvania 19087

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

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

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

519 Feldmeier Equipment, Inc. (10/22/87)
6800 Town Line Road
P.O. Box 474
Syracuse, New York 13211

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

564 Precision Stainless, Inc. (2/27/89)
3300 E. Pythian
Springfield, Missouri 65801

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

520 Stainless Fabrication, Inc. (12/8/87)
633 N. Prince Lane
Springfield, Missouri 65802

202 Walker Stainless Equip. Co., Inc. (9/24/68)
618 State St.
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

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

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

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

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

176 Sprout-Bauer Inc. (1/4/66)
(Subsidiary of Combustion Engineering)
Muncy, Pennsylvania 17756

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

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

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

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

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

476 Stone Container Corporation (7/17/86)
1881 West North Temple
Salt Lake City, Utah 84116-2097

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

28-01 Flow Meters for Milk and Milk Products

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

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

518 Bailey Controls Company (10/16/87)
29801 Euclid Avenue
Wickliffe, Ohio 44092

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

469 Endress + Hauser, Inc. (3/3/86)
2350 Endress Place
Greenwood, Indiana 46142

599 Euromatic Machine & Oil Co., Ltd (4/26/90)
P.O. Box 297
St. Helier
Jersey C.I. UK

540 EXAC Corporation (8/12/88)
6410 Via Del Oro
San Jose, California 95119

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

477 Flowdata Inc. (7/31/86)
1784 Firman Drive
Richardson, TX 75081

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

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

562 Great Lakes Instruments, Inc. (2/6/89)
8855 North 55th Street
Milwaukee, Wisconsin 53223

630 Halliburton Services (5/28/91)
Drawer 1431
Duncan, OK 73536-0602

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

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

474 Hydril Production (6/30/86)
Technology Division
330 North Belt East
Houston, TX 77032-3411

535 Invalco, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

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

475 Koltek, Inc. (7/15/86)
Div. of Alfa Laval
(Mfg. Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

529 Krohne America, Inc. (5/18/88)
(Mfg. by Altometer, Holland)
One Intercontinental Way
Peabody, Massachusetts 01960

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

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

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

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

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

270 Taylor Instrument (2/9/76)
Combustion Engineering, Inc.
400 West Avenue, P.O. Box 110
Rochester, New York 14692

265 Tokheim Automation (3/10/75)
P.O. Box 38269
Dallas, TX 75238
(formerly Emerson Elec. Co.)

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

29-00 Air Eliminators for Milk and Fluid Milk Products

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

485 Koltek, Inc. (11/18/86)
Div. of Alfa Laval
(Mfg. by Koltek, Finland)
100 Pinnacle Way, Suite 165
Norcross, Georgia 30071

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

30-01 Farm Milk Storage Tanks

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

31-01 Scraped Surface Heat Exchangers, as Amended

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

To receive information on membership with IAMFES Circle 360 on this card

IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc

DFES
8/91

Reader requests for information are sent to the appropriate company. Follow-up on reader requests are the responsibility of the company advertising.

The Advertisements included herein are not necessarily endorsed by the International Association of Milk, Food and Environmental Sanitarians, Inc.

Name _____ Title _____

Company _____

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City _____ State/Prov. _____

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Please send information on items circled below: Deadline 60 days from issue date

101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

This second Reader Service Card is provided to allow co-workers to also respond to companies of interest.

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105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
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112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

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Ames, Iowa 50010

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

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

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

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

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)
S. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

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

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

33-00 Polished Metal Tubing for Dairy Products

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

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

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

368 Rodger Industries Inc. (10/7/82)
(Not available in USA)
P.O. Box 186, RR1
Blenheim, Ontario
Canada N0P 1A0

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

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

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

35-00 Continuous Blenders

578 ACT Laboratories, Inc. (11/3/89)
P.O. Box 1107
McMurray, Pennsylvania 15317

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

526 Bepex Corp./Schugi (3/15/88)
(Mfg. by Lelystad, Netherlands)
333 Taft St. NE
Minneapolis, MN 55413

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

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

464 Dairy Service Mfg., Inc. (12/12/85)
4630 W. Florissant Ave.
St. Louis, Missouri 63115

36-00 Colloid Mills

608 Kinematica (10/17/90)
170 Linden Street
Wellesley, Massachusetts 02181

293 Waukesha Pumps (8/25/77)
(A Unit of AMCA Int'l., Inc.)
1250 Lincoln Ave.
Waukesha, Wisconsin 53186

37-01 Liquid Pressure and Level Sensing Devices

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

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

525 Caldwell Systems Corporation (3/4/88)
2450 Armstrong Street
Livermore, CA 94550
(Formerly Zantel Instruments)

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

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

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

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

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

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

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

629 Intrinsic Safety Equipment of Texas (5/20/91)
907 Bay Star

Webster, TX 77598-1531

598 Invalco, Inc. (3/22/90)
P.O. Box 556
Tulsa, Oklahoma 74101

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

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

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

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

627 Milltronics Process Measurements (4/12/91)
709 E. Stadium Drive
Arlington, TX 76011

419 Niro Hudson (4/2/84)
(Formerly Niro Atomizer Food & Dairy)
1600 County Road F
Hudson, Wisconsin 54016

597 NUOVA FIMA S.p.A. (3/20/90)
(not available in USA)
Via C. Battisti 59
28045 - INVORIO (N0) Italy

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

554 Par Sonics, Inc. (11/30/88)
P.O. Box 1127
State College, Pennsylvania 16804

563 PI Components Corp. (2/13/89)
10825 Barely Lane, Suite H
Houston, Texas 77070

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

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

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

498 Statham Division of Solartron Transducers (3/5/87)
2230 Statham Blvd.
Oxnard, California 93033

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

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

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

600 Weksler Instruments Corporation
800 Mill Rd
Freeport, NY 11520-0808

38-00 Cottage Cheese Vats

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

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

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

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

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

453 MikroPul Corporation (9/4/85)
10 Chatham Road
Summit, New Jersey 07901

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

41-00 Mechanical Conveyors

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

42-00 In-Line Strainers

606 Cherry-Burrell/Superior Stainless (9/18/90)
Fluid Handling Division
611 Sugar Creek Road
Delavan, Wisconsin 53115

44-00 Air Driven Diaphragm Pumps

624 Granzow, Inc. (4/1/91)
Manufactured by KWW-DEPA in Germany
2300 Crown Point
Executive Drive
Charolette, NC 28227

Coming Events

1991

September

•**5-6, USDA Extension Servi ce and Food Safety Inspection Service, the Food and Drug Administration, and the Poultry Science Association** are co-sponsors of a National Symposium - Perspectives on Food Safety to be held at the Holiday Inn Crowne Plaza Hotel, 300 Army-Navy Drive, Arlington, VA. For more information contact Richard Reynnells at (202)447-4087, or Gary Stefan at (301)443-0830.

•**9-13, Basic Food Microbiology Short Course**, sponsored by the University of California, will be held at the Food Science and Technology Department, Cruess Hall, UC Davis Campus. For further information contact Robert J. Price, Food Science and Technology, University of California, Davis, CA 95616-8598; (916)752-2194.

•**10-11, Marketing Development Seminar** will be held at The Registry, Denver, CO. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**10-11, Food Plant Sanitation Workshop**, sponsored by the American Institute of Baking, will be held in Chicago, IL. For more information contact AIB at (913)537-4750 or (800)633-5137.

•**10-12, Texas Association of Milk, Food and Environmental Sanitarians** will hold a seminar entitled "Special Problems in Milk Plants" at the Howard Johnson, Plaza South, IH 35 at Woodward, Austin, TX. For more information contact Janie Park of TAMFES at (512)458-7281.

•**10-12, Western Packaging Exposition** to be held at the Anaheim Convention Center, Anaheim, CA 92802. For more information contact Debra Lee, Public Relations Manager, at (203)352-8297.

•**12, Mississippi Association of Sanitarians, Inc.** will hold a mini-conference in Tupelo, MS. For further information contact Greg Geno, MS State Department of Health, 101 First Street, Booneville, MS 38829.

•**12-13, Wisconsin Laboratory Association** will hold its 15th Annual Education Conference at the Milwaukee Marriot in Brookfield, WI. Contact Conference Committee Chairman, Gary Bergquist at P.O. Box 28045, Green Bay, WI 54304 for more information.

•**16-20, Wyoming Public Health Sanitarians Association** will hold their Annual Meeting at the Holiday Inn, Cheyenne, WY. For further information contact Terry Carlile, Box 1182, Laramie, WY 82070; (307)742-3611.

•**19-21, The New Jersey Dietetic Association, Inc.** will hold its 59th Annual Meeting, "Navigating the Nineties", at the Ocean Place Hilton Resort and Spa in Long Branch, New Jersey. For more information contact NJDA at 180 Township Line Road, Belle Mead, NJ 08502 or call (908)359-1184.

•**23-25, ASI, The Food Safety Consultants**, will present **"Sanitation and Safety for the 90's"** at the Embassy Suites, St. Louis, MO. For more information and/or registration materials, contact Nancy Sullivan toll-free at (800)477-0778 or, in Missouri, (314)725-2555, or write ASI, P.O. Box 24198, St. Louis, MO 63130.

•**24-26, New York State Association of Milk and Food Sanitarians 68th Annual Conference** will be held at the Sheraton Inn, Liverpool, NY (Syracuse). For more information contact Paul Dersam at (716)937-3432.

•**24-25, California Association of Dairy and Milk Sanitarians** will hold their Annual Conference at the Sacramento Hilton, Sacramento, CA. For more information contact Jack Coppes, P.O. Box 9234, Whittier, CA 90608, (213)699-4313.

•**25-26, Wisconsin Association of Milk and Food Sanitarians, Wisconsin Environmental Health Association and Wisconsin Dairy Plant Fieldmen's Association Joint Education Conference** will be held at the Maritime Inn, Manitowoc, WI. For further information contact Neil M. Vassau, Publicity Chairman, P.O. Box 7883, Madison, WI 53707; (608)267-3504.

•**25-27, BIOTECH USA '91** will be held at the Philadelphia Civic Center, Philadelphia, PA. For more information contact Gina Amatruda at (203)852-0500, ext. 266.

•**29-Oct. 4, 8th World Congress of Food Science and Technology**. The Westin Harbor Castle, Toronto, Canada. For further information, please write 8th World Congress, (IUFOST), 3340 Orlando Drive, Mississauga, Ontario, Canada L4V 1C7; or FAX (416)678-1229.

October

•**1-2, Food Plant Sanitation Workshop**, sponsored by the American Institute of Baking, will be held in Toronto, Ontario, Canada. For more information contact AIB at (913)537-4750 or (800)633-5137.

•**1-4, Canadian Institute of Public Health Inspectors Annual Conference**. For further information contact John Foruna, Public Health Inspector at Hamilton-Wentworth Regional Department of Public Health Services, P. O. Box 897, Hamilton, Ontario, Canada, L8N 3P6; (416)546-3570 or FAX (416)521-8093.

•**2-4, South Dakota Environmental Health Association** will hold its Annual Meeting at the Howard Johnson Hotel, Rapid City, SD. For more information call Dave Micklos, SD State Department of Health, (605)773-3364.

•**2-5, National Society for Healthcare Foodservice Management's Third National Conference** will be held at the Washington Court Hotel on Capitol Hill, Washington, DC. For more information call or write the National Society for Healthcare Foodservice Management, 204 E. Street, NE, Washington, DC 20002; (202)546-7236.

•**2, National Automatic Merchandising Association's Pre-Convention Early Education Sessions**, Chicago, IL. For further information contact NAMA Convention Department at (312)346-0370.

•**3-5, National Automatic Merchandising Association's** National Convention, Trade Show and Education Sessions for

Vending/Foodservice Management, will be held at the McCormick Place, Chicago, IL. For further information contact NAMA Convention Department at (312)346-0370.

•**6-9, Annual Meeting and Convention: Milk Industry Foundation and International Ice Cream Association** will be held at the Marriott River Center, San Antonio, TX. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**6-9, The 1991 National Frozen Food Convention and Exposition**, sponsored by The National Frozen Food Association and the American Frozen Food Institute, will be held in Orlando, FL. For more information contact the National Frozen Food Association, 4755 Linglestown Road, Suite 300, Harrisburg, PA 17112, (717)657-8601, or the American Frozen Food Institute, 1764 Old Meadow Lane, Suite 350, McLean, VA 22102, (703)821-0770.

•**16-17, Iowa Association of Milk, Food and Environmental Sanitarians, Inc. 50th Anniversary Annual Meeting** will be held at the Ramada Inn, Waterloo, IA. For more information contact Dale Cooper (319)927-3212.

•**16-17, Annual Conference of the North Central Cheese Industries Association** will be held at the Earle Brown Center, University of Minnesota, St. Paul. For further information contact E. A. Zottola, Executive Secretary, NCCIA, P. O. Box 8113, St. Paul, MN 55108.

•**16-17, Cheese Symposium and California Dairy Food Research Center Annual Conference** will be held at the University of California, Davis, CA. For more information please contact Bob Pearl/Sharon Munowitch, University Extension, University of California, Davis, CA 95616 or call (916)757-8899.

•**26-30, Food & Dairy Expo 91,** sponsored by Dairy & Food Industries Supply Association, to be held at the McCormick Place, Chicago. For more information contact DFISA, 6245 Executive Boulevard, Rockville, MD 20852-3938 (301)984-1444.

•**29-30, Dairy Food Processors' Symposium** will be held at the Palmer House, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**30-Nov. 2, National Fisheries Institute 46th Annual Convention** will be held at the New Orleans Marriott, New Orleans, LA. Contact the NFI at (703)524-8881 for more information.

November

•**4-7, The Science of Ice Cream Manufacturing**, sponsored by the University of California, will be held at the Food Science and Technology Department, Cruess Hall, UC Davis Campus. For further information contact James Lapsley, Program Director, University of California, Davis, CA 95616-8598; (916)757-8692.

•**6, Food Industry Sanitation and Food Safety Workshop,** presented by the University of California Cooperative Extension, will be held at the Anaheim Plaza Resort Hotel, 1700 S. Harbor Blvd., Anaheim, CA. For more information contact Heidi Fisher, Food Science and Technology, University of California, Davis, CA 95616; (916)752-1478.

•**6-9, The Fundamentals of Selling & Merchandising** will be held at the Holiday Inn, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•**11-14, Industrial Refrigeration Workshop West**, sponsored by the University of California, will be held at the Food Science and Technology Department, Cruess Hall, UC Davis Campus. For further information contact James Lapsley, Program Director, University of California, Davis, CA 95616-8598; (916)757-8692.

•**13-14, Alabama Association of Dairy & Milk Sanitarians Annual Meeting** will be held in Birmingham, AL. For more information call or write Tom McCaskey, Department of Dairy Science, Auburn University, Auburn, AL 36849; (205)844-1518.

•**15-17, National Automatic Merchandising Association Financial Management Seminar** will be held at the Las Vegas Hilton Hotel, Las Vegas, NV. For further information contact NAMA Convention Department at (312)346-0370.

•**18-20, International Association of Biological Standardization (IABS)** will hold its 22nd Congress and Exposition on "Characterization and Standardization of Purified Biologicals" in San Francisco, CA. For more information, contact Crest International, 940 Emmett Avenue, #14, Belmont, CA 94002. Telephone (415)5955-2704 or outside California (800)222-8882, and by fax, (415)595-3379.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

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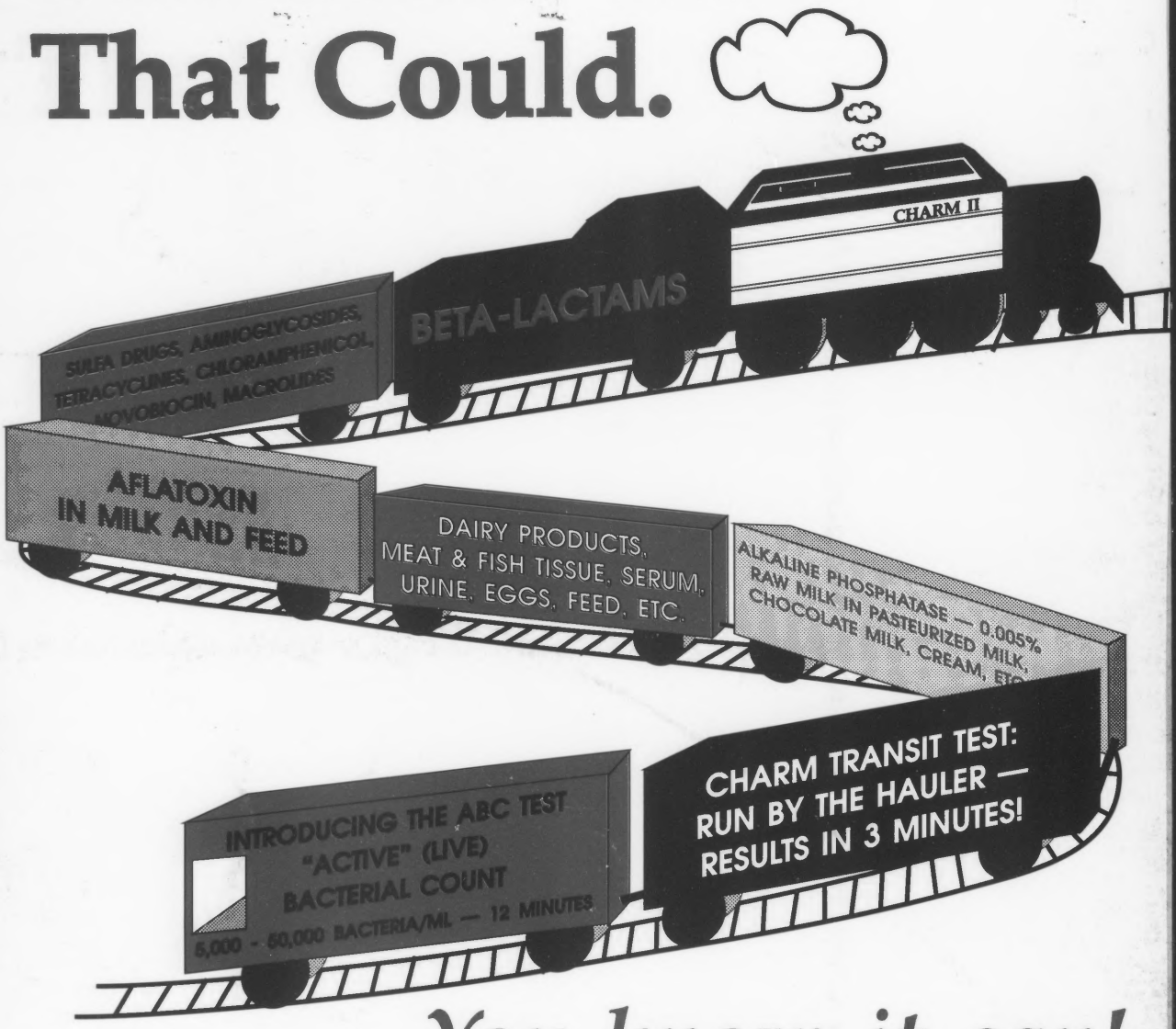

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