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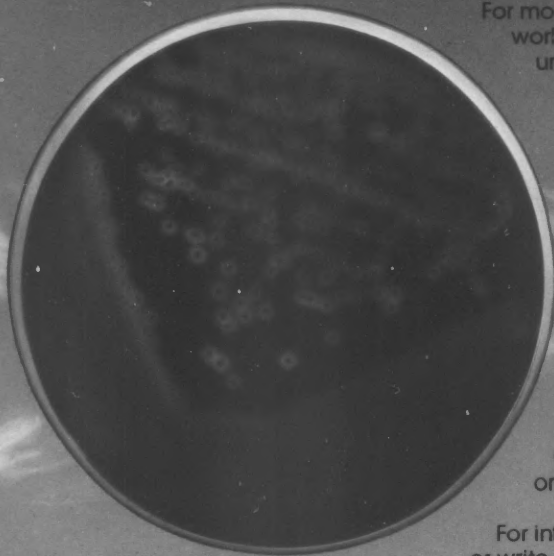


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Animal Waste Problems and Management Techniques -- A review and bibliography

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In both quantitative and qualitative terms, animal waste amounts to a huge challenge to public health environmentalists and agricultural scientists. Intensive rearing of farm animals, including dairy cows in urban areas, and poultry has intensified environmental problems including odors, flies and surface and water contamination. A number of waste management techniques, ranging from methane production to refeeding experiments have been utilized. Refeeding animal waste to farm animals and poultry has raised some health concerns because of the presence of known toxic substances in the manure. Accordingly, research efforts and regulatory mechanisms have been instituted to provide understanding of this new technique and adequate protection of animal and public health.

Because of the huge quantities of animal waste generated worldwide, there is special need for effective utilization and disposal of this material in order to conserve natural resources and maintain the quality of human and environmental health. It is estimated by Wadleigh (99) and Heichel (48) that two billion metric tons of animal wastes are produced each year. Approximately 50 percent of this waste is generated in livestock and poultry confinement operations

(16). The problems resulting from intensive rearing of animals is particularly evident in areas such as the Chino Basin of San Bernardino and Riverside counties (California) where approximately 196,000 cows from 391 dairies are crowded in a relatively small area surrounded by extensive urbanization (10).

ENVIRONMENTAL CONCERNS

Major environmental problems associated with the accumulation of animal wastes include various nuisance aspects and pollution of surface and groundwaters. The most common nuisances identified with animal wastes are odors, dust, feathers, flies, and aesthetics of appearances. Azavedo and Stout (13) and Jones (50) have suggested ideas such as landscaping, rural relocation, or the establishment of an "agribusiness park" to lessen the visual impact of an animal production facility. Dust problems are somewhat more serious, since disease organisms infecting humans and animals may be transported in a dust suspension (13,84). Two effective and reliable means for controlling dust problems are application of water and removal of excess manure (23). Limiting the breeding of flies can be as important as controlling dust levels because of the numerous diseases that are thought to be transferred by flies in contact with the feces and food of both humans and animals (46,13). Methods that have been used to control fly breeding include moisture management (13), fly trapping and biological control (13), and larvacides (1). Odors, which are the most troublesome of animal waste nuisances, are represented by more than forty different

compounds, some of which can be lethal in sufficient concentrations (13,66). The following techniques have been used to control odor: reduction of manure moisture (13,87), aeration (13), use of chemicals and biological treatments (28), and site selection (86).

A concern for the quality of water supplies is even more vital than for nuisance factors, since they serve a multiplicity of uses ranging from industrial activities to human consumption. The need for regulating and monitoring water quality at the national level has led to the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) and publication of associated water quality criteria (38 FR 29646). The regulation of drinking water for human consumption, which is of prime importance, is handled by the Environmental Protection Agency with authority from the Safe Drinking Water Act (P.L. 93-523) and associated drinking water regulations. In California, legislation such as the Dickey Act (enacted 1949) and the Porter-Cologne Act (enacted 1970) provide for the protection of water quality from a number of contaminating sources, including animal wastes. Regional water quality control boards within California, such as the one regulating the Santa Ana Watershed, may have more restrictive guidelines than state agencies due to local differences in physical, economic, and social conditions (61,10).

Pollution of water from animal wastes, which can be responsible for a number of human and animal health problems due to nitrate contamination among other chemicals (99,13,33) may be characterized as emanating from either point (27) or

nonpoint sources (33,10,78). Control of runoff, particularly from concentrated feeding operations, can be achieved through incorporation of five management elements, these being diversion, drainage, debris basins, detention ponds, and disposal (20).

WASTE MANAGEMENT TECHNIQUES

Several waste management techniques are currently being utilized or investigated, including disposal on land, methane gas production, ammonia production, composting, pyrolysis, hydrogenation, substrate for microbial and insect protein synthesis, bedding or litter material, and refeeding. Although many of these methods have attracted increased interest in recent times, land application of wastes remains the most widely utilized technique (71,39). It is estimated that one-half to two-thirds of confinement produced waste is disposed on land. Animal wastes (livestock and poultry) utilized in this manner consist of four types: solids, runoff, slurry-digested, and slurry-undigested (100). Application of these wastes to land surfaces may be accomplished by soil injection (73,76) or surface spreading involving the use of trailers, tanks, sprinklers, and related equipment (56,52).

Animal wastes disposed on land may be beneficial as a fertilizer for crops (13,94,97,102) or as a soil amendment (13,47,102). However, optimum application rates need to be determined, since excessive amounts of manure may create problems (14,70). Some of the problems resulting from high application rates include a buildup of soil salts (69), reduction in crop quality (63), and an adverse effect on the health of animals consuming crops grown with large amounts of manure (85).

In addition to land application, other waste management techniques show promise. For example, approximately eight to nine cubic feet of methane gas may be produced per pound of solid animal waste (13,54,19). According to Umstadter

(95), the waste produced by a 10,000 head cattle feedlot could furnish 600 to 700 Kw of power per day from an on-site gas-fired generator. Schmid, et al. (74) indicate that a valuable fertilizer, ammonium phosphate, may be produced through removal of ammonia from animal wastes processed by an anaerobic digester. The promising techniques of pyrolysis and hydrogenation have been investigated by Corvino, et al. (30) and Dunn, et al. (34). Composting has been shown to be a valuable method for waste utilization, although the possible benefits have not been well exploited (88). Other techniques that show limited promise include the use of manure composts, litters, and animal manures for bedding or litter (13), and the use of animal excreta as a substrate for microbial and insect protein synthesis (21).

REFEEDING AS A NEW MANAGEMENT TECHNIQUE

Perhaps the most recent significant process for utilization of animal wastes is the feeding of these materials, since increased feed costs and a concern for conserving natural resources has focused attention on this valuable method (16,12). As noted by a number of investigators, animal wastes contain a substantial amount of valuable nutrients (e.g., protein, carbohydrate and minerals) (101,7,81). According to Yeck, et al. (103) the potential for using animal wastes as a feed is determined by source, conversion process, target species, and particular function of the ration with which it is incorporated (i.e. maintenance, reproduction, or meat, milk, and egg production).

The chemical composition and nutritional value of poultry wastes and poultry litter have been evaluated by Bhattacharya and Taylor (16) and Cullison (31). Numerous studies have been conducted to determine the efficacy and potential benefits of using poultry waste as feed material for chickens (91,92,29), sheep (77,25), and cattle (38,78).

The nutrient and chemical components of cattle wastes have been investigated by Anthony (4), Azevedo

and Stout (13), and Lamm, et al. (53). Early research by Anthony and Nix (8) and Anthony (3) revealed that cattle manure could be used successfully in beef cattle diets without any harmful effects. Continuing research by Anthony (4,5,6) and other researchers such as [Newton, et al. (65), Smith and Lindahl (80)] has demonstrated the palatability, digestibility, and adequate growth performance for such rations. Commercial methods that are currently used for processing cattle wastes for refeeding are the Cereco, Corral, and Grazon systems (32). Utilizing the Cereco system for dairy wastes produced mixed results in studies by Bell (15), Bishop (17), Prokop (72), and Smith, Calvert and Cross (78).

Unlike studies on feeding of poultry and cattle wastes, research on swine waste refeeding is somewhat lacking. A few researchers have investigated the chemical and nutrient composition of swine wastes, including Tinnimit, et al. (90) and Bhattacharya and Taylor (16). Studies detailing the effects of feeding swine wastes to ruminants and swine have been conducted by Pearce (68) and Overhults, et al. (67).

HEALTH CONCERNS ASSOCIATED WITH REFEEDING

The attractiveness of using animal wastes as feed ingredients must be tempered with caution, because of the presence of potentially harmful substances, including heavy metals, pesticides, industrial contaminants, microorganisms, aflatoxins, hormones, and antibiotics (16,58). Animal health may be adversely affected by exposure to some of these substances. Of equal concern is the health hazard to humans consuming animal food products (meat, milk, eggs) containing residues of these toxic substances. Heavy metals of primary concern, as indicated in analysis studies of dairy waste by El-Ahraf and Willis (36) and Moses (62), include arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc. Other researchers have investigated

the heavy metal content of animal feeds (2) and human foods (51). The potential health impact resulting from ingestion of animal feed or human food containing harmful residue levels of various toxic metals has been detailed by Underwood (96) and Gough, et. al. (43).

Industrial contaminant and pesticide residues have been found in fecal samples (60), animal tissue (37), and animal food products (79). Studies describing the health problems resulting from ingestion of these toxic substances have been conducted by Britton, et. al. (18) and Cecil and Bitman (26).

Concern over the presence of microorganisms in animal wastes used for feeding purposes may be mitigated through proper processing methods (24,58). Bacteria such as *Salmonella* are of primary concern, since they can cause disease in both humans and animals (64,57). Studies conducted to determine the health effects of feeding waste material have indicated no disease problems of a microbiological nature, although studies concerning human health problems are lacking (40,37).

Other microorganisms may not be toxic in themselves, but may produce toxic metabolic substances such as aflatoxins (93). Aflatoxins have been identified in commercial feed and poultry litter (55), and animal food products (11,83). The toxic effects of aflatoxins in animals and humans, especially the suspected etiological role in human primary hepatoma, have been investigated by El-Ahraf (35), Shank (75) and Mertens (59). Methods for the prevention, elimination, and detoxification of aflatoxin-contaminated materials have been reviewed by Goldblatt and Doller (42) and Applebaum and Marth (9).

The presence of feed additives such as hormones and antibiotics in animal wastes have also caused concern for human and animal health. Hormone residues have been detected in animal feces (41,22). Few problems have been reported with feeding hormone containing wastes, although induced abortion in cattle was noted in one study (44). Health problems

resulting from feeding of antibiotic containing waste material are of greater concern, since there is evidence to suggest prolonged exposure to these substances may result in drug-resistant disease-producing organisms (45,98). In addition, there is a possibility that this drug resistance may be transferred to other animals and humans (98,82). However, with proper precautions, antibiotics can continue to be a useful tool in animal production, while insuring the health and safety of humans as well as animals.

REGULATIONS

The regulation of animal wastes used for feed ingredients is handled by the federal Food and Drug Administration under provisions of the Food, Drug, and Cosmetic Act (89). However, in practice, the responsibility for regulating animal wastes has been left to individual states. California, for example, has enacted regulations which specify requirements that govern the licensing for processors of animal waste, standards for nutrient content, and tolerance limits for some harmful substances (49). Proper processing methods and adequate monitoring by appropriate agencies will insure the safety of feeding animal wastes.

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Basic Research With Bacteria Paying Off in a Variety of Ways

ROBERT L. HANEY

TAES Science Writer
Texas A&M University
College Station, TX

Very basic research with bacteria that glow in the dark may pay off with a safer, better method for some medical examinations, according to scientists with the Texas Agricultural Experiment Station at Texas A&M University.

And that's only one of a variety of potential benefits from this very basic research with luminous bacteria, says Dr. Thomas O. Baldwin, associate professor with the department of Biochemistry and Biophysics.

"Bacteria, often called germs or microbes, are single-celled organisms so small they can't be seen without a microscope. One result of their presence can be disease in man or animals.

"The research in our laboratory is aimed primarily at developing an understanding of the structure and related function of proteins and enzymes. The model system we use in our studies is bacterial luciferase, an enzyme which produces light.

"Bacterial luciferase is a plentiful enzyme comprising up to 5% of the soluble protein in the luminous bacteria that possess the enzyme. The enzyme is extremely stable and technically easy to work with.

"Furthermore, the assay for the enzyme, bioluminescence, is exceedingly rapid, sensitive, and accurate. As such, the luciferase system provides a nearly ideal model system for the study of fundamental properties of protein structure and function.

"The research going on in our laboratory is therefore classified as basic science, but one very pleasing aspect of our research is that the results of our experiments are rather steadily and rapidly applicable to many areas of applied research.

"The area of application that is currently receiving the most attention and appears to be, in the long range, the most exciting is the example mentioned earlier of the use of bacterial luciferase as a replacement for radioimmunoassay.

"Radioimmunoassay, as it is currently performed in hospitals and clinical laboratories around the country, and indeed around the world, requires the use of highly radioactive materials.

"As such, radioimmunoassay is a dangerous procedure to both technicians involved and the environment, and is complicated by the short half-life of the radioisotopes in common usage.

"The replacement of the radioactive compounds with bacterial luciferase in this type of assay is thought by many to have the potential of leading to diagnostic analysis being performed in doctor's offices, rather than requiring several days to several weeks to send biological samples to clinical laboratories for analysis.

"It is even possible that these techniques would be developed to the point that, for example, veterinarians would be able to conduct very sophisticated procedures in the field, using portable equipment on large animals.

"Another area in which the bacterial luciferase can be used directly to assay (test) compounds of economic importance is due to its ability to react with, and therefore assay or measure, a vast array of different compounds carrying aldehyde functional groups.

"An example is insect pheromones, or chemical scents. These are thought to be one way insects communicate. The luciferase is potentially useful in the development of tests for insect reproductive cycles.

"Another development in our laboratory which occurred nearly two years ago was the successful cloning of bacterial luciferase from a luminous marine bacterium into the common enterobacterium *Escherichia coli*.

"This technical maneuver has received substantial attention, not for scientific reasons, but because of the striking observation of seeing *E. coli* glowing in the dark.

"The cloned luciferase has many different potential applications. One of the most exciting and readily developed applications for the cloned luciferase is an assay (test) of toxic substances in water.

"This is an assay which has been worked at some length by scientists at Smith-Kline-Beckman, an industrial laboratory, and it would appear that they should be able to develop a commercially meaningful assay in the very near future.

"Another potential use of cloned luciferase is as a 'marker' gene for study of transfer of other genetic material into plant and animal cells. Since the product of the reaction catalyzed by the bacterial luciferase is light, the successful transfer of the genes and expression of the genes in a new host cell is readily observable merely by turning off the room lights and viewing the subject material.

"This use for the cloned luciferase has received substantial attention from scientists around the country, and we have sent cloned genes to many scientists who are interested in pursuing its use in this format.

"A related but somewhat different use for the cloned luciferase is in the analysis of genetic material which serves a regulatory function.

"By inserting pieces of DNA, thought to have a regulatory function, in front of the luciferase genes, and viewing the effect of this regulatory DNA on the expression of bioluminescence, one has available a very rapid, sensitive and easily quantified parameter (i.e., light) with which to study the regulatory nature of the inserted DNA.

"The history of research in bioluminescence exemplifies the logic followed by such science funding

organizations as the National Science Foundation, the National Institutes of Health, and the State Experiment Stations. For years bioluminescence was viewed as an interesting biological phenomenon with little, if any, practical utility.

"However, scientists interested in the basic science of light emission from biological systems have been working with funding from the NSF, the NIH, and in our case TAES, to develop an understanding of the biochemistry of bioluminescence.

"In recent years, use of radioisotopes in medical and other applications has reached such a level that disposal of the waste has become a serious problem. Fortunately, the solution to this problem is readily available, thanks to basic research started years ago. The large body of data available concerning the bioluminescent systems has allowed the very rapid development of nonradioactive methods to replace the radiotracer procedures.

"This is but one example offered in defense of funding of basic science. It is indeed true that the product of basic science is the knowledge that feeds applied research. Without basic research, applied research would soon die," Baldwin concluded.



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Flavor of Store Purchased Milk Samples

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Flavor is the real measure of quality and consumer acceptance. Primary reasons for the decline in per capita consumption of milk seem to be the rancid flavor of regular milk and the light induced flavor of milk in plastic containers. Purchase of 1,720 milk samples from 599 stores in Pennsylvania showed that rancidity was the most common objectionable flavor, followed by light induced. More than one-third of the samples were of objectionable rancid flavor, followed by light induced and vitamin. Acid Degree Values of about one-third of the samples of regular milk were above 1.00 with the number much higher during late summer.

INTRODUCTION

The real measure of quality products is consumer acceptance and the best judgment of this is flavor. The Pennsylvania Milk Flavor - Quality Program measures consumer acceptance for each of the more than 200 processors three or four times a year. During 1982, 1,720 samples of regular, lowfat and skim were purchased from 599 stores in Pennsylvania. They were purchased in all months of the year and on all days of the week. Support was provided by all segments of the dairy industry - producers and processors.

*Presented at the 70th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, August 7-11, 1983, Marriott Pavilion, St. Louis, Missouri.

PROCEDURE

Samples were purchased from all kinds of stores in all areas of Pennsylvania. When traveling to conduct extension meetings, we took ice chests. Samples were placed in iced, insulated cases, promptly. Date of purchase and open date were noted. Samples were returned to the University Creamery laboratory for testing and tasting within 24 hours of purchase.

Flavor judgments were made by up to three trained dairy product judges. Samples were rated as good, acceptable and poor. You should be concerned about only those samples with objectionable flavor. Criticisms were limited to five categories.

RESULTS AND DISCUSSION

More than one-third of the samples were of poor flavor and more than 50% of those were rancid. See Tables 1 and 2. Note that the off-flavors were not the same silage, barny and high acid of earlier years. These absorbed or bacterial flavors have been replaced by those of chemical origin.

There seem to be three separate off-flavor problems. These have been more difficult to correct than the former problems. Rancidity develops in raw milk on farms and in plants. The vitamin A or medicinal flavor was limited to fortified products and was caused by the addition of vitamin A concentrate in an oil base, which deteriorated with

TABLE 1. 1982 milk flavor - 1,720 samples.

	No.	%
Good to Excellent	476	27.7
Acceptable	621	36.1
Poor	623	36.2

TABLE 2. 1982 milk flavor criticisms - 623 poor samples.

	No.	%
Rancid	359	57.6
Light induced	115	18.5
Unclean	49	7.9
Vitamin	91	14.6
Feed	9	1.4

TABLE 3. Incidence of light induced flavors in 12,751 store purchased milk samples 1967 - 1982.

Container	Samples	LIF	
		No.	%
Plastic jug	734	293	39.9
Paper	9,096	447	4.9
Glass	2,292	364	15.9
Plastic bag	629	89	14.1

TABLE 4. Acid degree values of 736 store purchased whole milk samples, January - September, 1983.

Range	No.	%
Less than .60	81	11.0
.60 - .79	192	26.1
.80 - .99	226	30.7
1.01 - 1.19	140	19.0
1.20 or more	97	13.2

age. The light induced flavor occurred primarily in stores, caused by exposure of milk to sunlight and fluorescent lights, especially in plastic containers.

Almost 50% of samples in gallon and half gallon plastic containers purchased from supermarkets had objectionable light induced flavors. The incidence is much lower when samples in plastic and glass are purchased at farm jug stores. The incidence of light induced flavor of milk in paper containers varies from 2% to 5%, most of these being small sized containers. When looking at plastic containers purchased from all types of stores, the incidence of light induced flavor was about 40% of the 734 samples.

Rancidity has been an increasing problem for more than 10 years. This

seems to be associated with high producing herds, feeding large amounts of corn low in protein, around the barn pipeline milkers, more cows with 365 day lactations, and holding raw milk longer prior to pasteurization.

The soapy, bitter, sour like taste is present in up to 20% of farm samples. In addition to tasting loads, it is necessary to taste samples from farms which have been held for two days after collection.

Since 1978, 21.2% of the 6,941 store purchased samples have been rancid. This includes skim and lowfat which are seldom detected as rancid because of reduced fat content. When considering only samples with objectionable flavor, 57.6% were identified as rancid.

Acid Degree Values of whole milk samples have been determined to support rancid flavor judgments. An ADV is a measure of the free fatty acids present. Although the test measures long chain ones and we detect short chain ones by taste, there is about a 70% correlation. See Table 4 which shows that almost one-third of the whole milk samples had ADV's above 1.00. The peak of rancidity is during August and September.

SUMMARY

Processors and cooperatives need to take steps to prevent rancidity and keep ADV's below 1.00. This off-flavor seems to be one of the primary reasons for the decline in per capita consumption of whole milk and the shift to low-fat. Taste samples of every load as received and every storage tank at the time of processing. Samples from each farm should be tasted monthly. Two general recommendations can reduce the incidence of rancidity. First, be sure that all milk is collected from every farm at least every other day. Then processing plants should process milk within 48 hours of collection and empty and wash every raw milk storage tank each processing day. Additional recommendations for correction and prevention of rancidity are available in a mimeograph and a slide set with cassette tape. See *Dairy and Food Sanitation* 2(8)329, August, 1982 for suggestions for farmers and field staff to correct rancidity.

Solutions to LIF are closed cases with minimal fluorescent light, paper containers, and use of light blocking agents in plastic jugs. To reduce the oily-medicine taste of vitamin A fortified lowfat and skim different concentrate carriers seem to be needed.

Chill Wind Raises Temperature In Frozen Food Markets: Theme for Copenhagen World Congress

Frozen food companies worldwide are moving to protect their investment as rising consumer interest in fresh foods spotlights the supermarket chill counter.

Survival for many of them is seen in the development of specialty meals and entrees and in the kind of low-calorie meals that have given renewed hope to the U.S. market.

In Britain, where frozen food growth has slowed and where the brand leaders of the sixties and seventies are giving share to the newer specialist companies, low-calorie meals and entrees are still on the horizon and, if anything, are rather more in evidence in the chill cabinets. Marks and Spencer, characteristically, are well ahead of the field.

"These issues have forced themselves to the top of the agenda at the IFFEX 84 World Frozen Food Congress in Copenhagen this May (20-23)," says congress director, Graham Kemp. "Worldwide sales of frozen food are in excess of 20 billion British Pounds, but in the more advanced countries, retailers, food distributors and food processors are re-assessing their investment in frozen food and chill technology."

"It is quite conceivable that in the late eighties and nineties, quick-freezing will be used mainly to preserve foods in readiness for distribution outside normal frozen food channels. Fresh food distribution, moreover, may well have improved to such an extent that the basic methods of freezing used today will have been rendered obsolete."

These alternatives will be debated at the Copenhagen World Congress, which has already broken previous records for early registrations. Keynote speaker is Sir Hector Laing, chairman of United Biscuits (Holdings) plc, whose UB Frozen Foods division has developed a number of initiatives in specialty foods for the frozen food and chill cabinets.

Dr. Harold Davidge will review the alternative technologies that threaten quick freezing and he will be countered by Professor Mogens Jul, whose new book on quick-freezing is due to be published shortly. Speakers from the United States, Canada, Denmark, France and Great Britain will consider in detail on the opening day the opportunities still being developed by the frozen food industry.

This fourth World Congress for the international frozen food industries has been strengthened by the addition of an associated exhibition being organized by Industrial and Trade Fairs International Ltd.

For more information contact: Graham Kemp/
Michael Glynn, World Frozen Food Congress,
Mountbatten House, Victoria Street, Windsor,
Berkshire SL4 1HE, United Kingdom.

Nicholas C. Babson named President of Babson Bros. Co.

Only the fifth president in the company's history and a grandson of Gustavus Babson, one of the three founders of Babson Bros. Co., Mr. Babson began with the company in 1973 as a Sales Management Trainee. He later became Divisional Sales Manager and was then tabbed Sales Manager for Latin America and Canada. Most recently, Mr. Babson has been Director of New Product Development for the 78-year-old industry-leading company.

"With the trends in automated herd management and the upgrading of the U.S. dairy industry, we are ideally positioned to enjoy the most exciting growth period in our history," said Mr. Babson.

Originally begun in 1906 as a distributor of Edison talking machines, Babson Bros. Co. began selling milking equipment in 1913, pioneered new technology, grew rapidly, and established itself as the leader in both research and development of milking related equipment, supplies and service. Besides a complete line of dairy farm equipment, Babson Bros. Co. also manufactures dairy sanitation products, milk cooling and energy related equipment and water treatment and conditioning equipment.

1984 AVI Catalog Now Available

The 1984 catalog of all current and forthcoming books from AVI Publishing Company is now available.

The 137-page catalog features a Subject and Title index as well as a page listing 23 new titles to facilitate easy reference.

In addition to familiar titles in the fields of food science and technology, agriculture, foodservice, hospitality, nutrition, biochemistry, and health, the catalog describes additions in new areas for AVI.

New titles in horticulture, botany, travel and tourism, land economics management, landscape architecture, animal science and production, fisheries and aquaculture are included in the expanded new catalog.

The 1984 catalog can be obtained free of charge by writing or telephoning AVI Publishing Company, Inc., 250 Post Road East, PO Box 831, Westport, CT 06881, 203-226-0738. Special brochures announcing book promotions, as well as a 1984 Textbook Catalog listing titles of specific interest to colleges and universities, are also available.

Protein Sources in Calf Starters

Calf starters can be supplemented with many different protein sources. The results are largely the same whether urea, soybean meal, formaldehyde-treated soybean meal, distiller's dried grain, or meat meal are used.

A study at the University of Minnesota's Southern Experiment Station, Waseca, evaluated these protein sources on their ability to efficiently support growth of bull calves.

Animal scientist Kenneth Miller reports that although there were differences between sources when the calves were small, these differences largely disappeared by the time the calves were 13 months old. Heifer calves would probably respond the same, Miller says.

The less soluble proteins (treated soybean meal, distiller's dried grain and meat meal) are more efficient in older calves. They were not better for young calves. Regular soybean meal was even better than treated soybean meal. And distiller's grain was not better than urea for the small calves. Carcass quality and yield grade were not affected.

Distiller's dried grain and meat meal are less palatable than the other sources. Calves fed those two starters consumed about one-third of a pound less feed per day. All supplemental protein sources supported satisfactory growth.

DFISA Announces Award Winners

Dairy and Food Industries Supply Association, Inc., announced and presented awards of excellence for its 6th Competition for Excellence in Sales Promotion at DFISA's Annual Conference at the Maui Marriott Resort, March 19-21, 1984, Maui, Hawaii.

The Annual Competition honors top product/sales literature and trade advertising of suppliers to the

food and dairy industries. This year's competition drew 185 entries from 80 companies.

The Best-Of-Show Award was presented to Marschall Products, Miles Laboratories. The sponsors of the competition, the Public Relations Committee, created the Best-Of-Show award this year to emphasize the contest's goals and to promote the high quality of product literature and trade advertising within the industry.

First place gold awards in five categories of product/service literature were given to: Kusel Equipment Co.; Portion Packaging Co. (2); Cherry-Burrell Corp. and O. G. Hoyer A/S.

Gold awards in five categories of trade advertising were won by: Accurate Metering Systems, Inc.; Alfa-Laval, Inc.; Cherry-Burrell Corp.; Globe Extracts, Inc. and Marschall Products/Miles Laboratories.

Judging for the competition was performed by a 4-member board of judges consisting of two food and dairy processors, a trade publication representative and an advertising professional.

The objectives of the annual competition are to upgrade the effectiveness of food, dairy and beverage supplier's product literature and publication advertising; to provide an advertising forum for suppliers and to recognize superior product literature and trade advertising.

The CESP is open to all companies who supply equipment, products and services to the food and dairy industries. Rules and entry forms for next year's competition can be obtained from DFISA, 6245 Executive Boulevard, Rockville, Maryland 20852. 301-984-1444.

Pauly Low Sodium Cheese

Swift/Hunt-Wesson Foods, makers of Pauly Cheese products, is taking an aggressive position in promoting their new line of Pauly Low Sodium Cheese to health care professionals.

According to Jay Albert, Product Manager of Swift/Hunt-Wesson's Cheese and Frozen Desserts Group, "Pauly Low Sodium Cheese was developed in conjunction with changing dietary patterns, influenced to a large degree by medical studies warning against sodium intake. We think it's important to inform health care professionals that a product like Pauly Low Sodium Cheese is available and that it can be a nutritious alternative for patients on salt-restricted diets."

For more information contact: Jay Albert, Swift/Hunt-Wesson Foods, Inc., Oak Brook, IL. 800-323-7349.

PROGRAM

Seventy-First Annual Meeting

International Association of Milk, Food and Environmental Sanitarians, Inc.

*In Cooperation with the
Alberta Association of Milk, Food and Environmental Sanitarians
August 5-9, 1984*

Edmonton Inn

Edmonton, Alberta, Canada

REGISTRATION TIME

Sunday, August 5 - 1:00 PM - 5:00 PM
 Monday, August 6 - 8:00 AM - 5:00 PM
 Tuesday, August 7 - 8:00 AM - 5:00 PM
 Wednesday, August 8 - 8:00 AM - 5:00 PM
 Thursday, August 9 - 8:00 AM - 12:00 Noon

REGISTRATION FEES

(All in Canadian Funds)

	Advance	At Door
Registration Fee-Member	\$30.00	\$35.00
Registration Fee-Non-Member	\$40.00	\$45.00
Student	No Chg.	No Chg.
Spouse	\$10.00	\$12.00
Banquet	\$20.00	\$22.00

IAMFES OFFICERS AND EXECUTIVE BOARD

President: A. Richard Brazis, Bellevue, NE
President-Elect: Archie C. Holliday, Richmond, VA
First Vice-President: Sidney Barnard, University Park, PA
Second Vice-President: Roy Ginn, St. Paul, MN
Secretary-Treasurer: Leon Townsend, Frankfort, KY
Junior Past-President: Robert Marshall, Columbia, MO
Senior Past-President: Harry Haverland, Cincinnati, OH
Executive Secretary: Kathy R. Hathaway, Ames, IA
Affiliate Council Chrmn: Helene Uhlman, Hobart, IN

JOURNAL OF FOOD PROTECTION

Editor: Elmer H. Marth, Madison, WI
Associate Editor: Michael P. Doyle, Madison, WI
Managing Editor: Kathy R. Hathaway

DAIRY AND FOOD SANITATION

Editor: Kathy R. Hathaway, Ames, IA
Associate Editor: Suzanne Trcka, Ames, IA

ALBERTA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS

President Harry Jackson
President-Elect Michael Stiles
Treasurer Peggy Marce
Secretary James Steele

AFFILIATE COUNCIL OFFICERS

Chairman: Helene Uhlman
Secretary: Clem Honer

PROGRAM COMMITTEE

IAMFES Chairman Archie C. Holliday

LOCAL ARRANGEMENTS COMMITTEE

<i>Chairman</i>	Don Paradis
<i>Co-Chairman</i>	Lawrence Roth
<i>Finance</i>	Lawrence Roth
<i>Social Program</i>	James Steele
<i>Registration</i>	Peggy Marce
<i>Facilities</i>	Glen Evoy
<i>Companions Program</i>	Karen Erin
<i>Symposia Coordinators</i>	Michael Stiles
	David Schroder
<i>Photographer</i>	Dietrich Wolfram

AFFILIATE REPRESENTATIVES

<i>Representative</i>	<i>Affiliate</i>
Peggy Marce	Alberta
Jack Pollock	California
Dr. Lester Hankin	Connecticut
Dave Fry	Florida
Jaren Tolman	Idaho
Clem Honer	Illinois
Helene Uhlman	Indiana
Jack Schoop	Iowa
John Mitchell	Kansas
John Bruce Mattingly	Kentucky
Roy E. Ginn	Minnesota
Paul M. Rankin	Mississippi
Erwin Gadd	Missouri
David Bandler	New York
Robert Farst	Ohio
Gary Huber	Ontario
Floyd Bodyfelt	Oregon
James R. Barnett	Pennsylvania
Vincent Mattera	Rhode Island
Morris V. Forsting	South Dakota
Ruth Fuqua	Tennessee
Clair Gothard	Texas
W. J. Farley	Virginia
Lloyd Luedecke	Washington
Paul Pace	Wisconsin

SUNDAY - AUGUST 5, 1984

8:00 AM - 5:00 PM	Local Arrangements Committee
1:00 PM - 5:00 PM	Registration
1:30 PM - 5:00 PM	Executive Board Meeting
3:00 PM - 5:00 PM	Council of State Sanitarians Registration Agencies
7:00 PM - 9:00 PM	Early Bird Reception
9:00 PM - 11:00 PM	Executive Board Meeting

MONDAY - AUGUST 6, 1984

8:00 AM - 5:00 PM	Registration
8:00 AM - 4:00 PM	Local Arrangements Committee
8:00 AM - 4:00 PM	Executive Board Meeting
8:00 AM - 4:30 PM	Spouses' Hospitality
8:00 AM - 4:00 PM	Farm Methods Subcommittees
11:00 AM - Noon	Farm Methods Committee
8:00 AM - 4:00 PM	Committee on Communicable Diseases Affecting Man
8:00 AM - 10:00 AM	Food Equipment/Sanitary Standards Committee
8:30 AM - 10:30 AM	Journal of Food Protection Management Committee
10:00 - 11:00 AM	Nominations Committee
10:30 AM - 12:30 PM	Dairy and Food Sanitation Management Committee

MONDAY - AUGUST 6, 1984

Afternoon

1:00 PM - 3:00 PM	Applied Laboratory Methods Committee
1:00 PM - 3:00 PM	Sanitarians Joint Council
1:00 PM - 3:00 PM	Baking Industry Sanitary Standards Committee
1:30 PM - 2:30 PM	Alberta Association of Milk, Food and Environmental Sanitarians Business Meeting
2:30 PM - 4:00 PM	Council of Affiliates
3:00 PM - 4:00 PM	IAMFES Membership Committee
	Companions Program Bus Tours to Heritage Days

MONDAY - AUGUST 6, 1984

Evening

4:30 PM - 10:30 PM	Bar-B-Que and Tour of Fort Edmonton Park
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TUESDAY - AUGUST 7, 1984

Morning - General Session

Archie C. Holliday, Presiding

8:30 AM	DOOR PRIZE
8:35 AM	INVOCATION - Lawrence McKnight, Alberta Agriculture, Edmonton, AB
8:40 AM	WELCOMING ADDRESS-Harry Jackson, Ph.D. Department of Food Science, University of Alberta, Edmonton, AB
8:55 AM	PRESIDENTIAL ADDRESS - A. Richard Brazis, Bellevue, NE
9:25 AM	PREVENTION OF CORPORATE LIABILITY IN PRODUCT CONTAMINATION CASES - Ronald Bernbaum, Fritz, Fox, Vine and Bernbaum, Toronto, ON
	MILK BREAK
10:00 AM	DOOR PRIZE
10:15 AM	ANNUAL BUSINESS MEETING
10:20 AM	- A. Richard Brazis, President
	1. Report of Secretary-Treasurer
	2. Report of Executive Secretary
	3. Committee Reports
	4. 3-A Symbol Council Report
	5. Report of Resolutions Committee
	6. Report of Affiliate Council
	7. Old Business
	8. New Business
	9. Report of Nominating Committee

TUESDAY - AUGUST 7, 1984

Afternoon - Symposium

Modified Atmosphere Packaging of Food

David Schroder, Chairman

- 1:30 PM DOOR PRIZE
1:35 PM MICROBIOLOGY OF MODIFIED ATMOSPHERE PACKAGED MEATS - Allen Kraft, Iowa State University, Ames, IA
2:10 PM INDUSTRIAL APPLICATION OF MODIFIED ATMOSPHERE TO PACKAGED FOODS AND MECHANISMS OF MICROBIAL INHIBITION IN MODIFIED ATMOSPHERE - Patrick Jozon, L'Air Liquide, Paris
2:45 PM MILK BREAK
3:05 PM DOOR PRIZE
3:10 PM SAFETY ASPECTS OF MODIFIED ATMOSPHERE PACKAGED FOODS - Andre Hauschild, Health Protection Branch, Ottawa, ON
3:40 PM DISCUSSION PERIOD
4:30 PM AFFILIATE COUNCIL MEETING

3:20 PM

WHAT CAN BE DONE ABOUT LOW FARM SCORES? - A panel discussion - Sidney Barnard, Moderator; Lloyd Johnson, Dairy Farm Inspection Branch, Alberta Agriculture, Wetaskiwin, AB; William Coleman, Dairy Industries Division, Minnesota Department of Agriculture, St. Paul, MN; James Reeder, Maryland and Virginia Milk Producers Association, Arlington, VA

4:30 PM

AFFILIATE COUNCIL

7:30 PM - 8:30 PM

CRACKER BARREL SESSION MILK SANITATION -

David Bandler, Presiding
BIOTECHNOLOGY DEVELOPMENTS IN ANALYTICAL METHODS FOR FOOD AND MILK INDUSTRY - Y. Fournon, CHEMBIOMED Ltd., University of Alberta, Edmonton, AB

7:30 PM

7:50 PM QUALITY EVALUATION OF FLUORIDATED MILK - Joseph F. Frank * and G. L. Christen, University of Georgia, Athens, GA

8:10 PM

WHAT DAIRY PLANT FIELDMEN THINK OF THEIR WORK AND WHAT SOME ARE DOING ABOUT IT - David Bandler, Cornell University, Ithaca, NY

TUESDAY - AUGUST 7, 1984
Afternoon - Milk Sanitation Session
Leon Townsend, Presiding

- 1:25 PM DOOR PRIZE
1:30 PM THE FIFTEENTH EDITION OF *STANDARD METHODS FOR THE EXAMINATION OF DAIRY PRODUCTS* - Gary Richardson, Utah State University, Logan, UT
2:00 PM IMPEDIMETRIC COLIFORM ESTIMATION IN DAIRY PRODUCTS - Ruth Firstenberg - Eden*, M. L. Van Sise, J. Zindulis and P. Kahn, BACTOMATIC Division of Medical Technology Corporation, Princeton, NJ
2:20 PM FROM DAIRY SPECIALIST TO PRODUCER - Sidney Barnard * and William Folwell, Pennsylvania State University, University Park, PA
2:40 PM MILK BREAK
2:55 PM DOOR PRIZE
3:00 PM CAN A VOLUNTARY INDUSTRY SHELF-LIFE PROGRAM TAKE THE PLACE OF A MANDATORY MILK DATING LAW? D. K. Bandler* and E. T. Wolff, Cornell University, Ithaca, NY

TUESDAY - AUGUST 7, 1984
Afternoon - Food Sanitation Session
Roy Ginn, Presiding

- 1:25 PM DOOR PRIZE
1:30 PM PESTICIDES AND INDUSTRIAL CHEMICALS IN FOODS - Michael Wehr, Laboratory Services Division, Oregon Department of Agriculture, Salem, OR
2:00 PM PSYCHROTROPIC BACTERIOPHAGES FOR BEEF SPOILAGE BACTERIA - G. Gordon Greer, Agriculture Canada, Lacombe, AB
2:20 PM SELF INSPECTION OF FOOD SERVICE IN THE U.S. NATIONAL PARK SYSTEM - Pete Cook, Mammoth, WY
2:40 PM DETECTION OF MOLD IN PROCESSED FOODS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY - H. H. Lin* and M.A. Cousin, Purdue University, West Lafayette, IN

3:00 PM MILK BREAK
 3:15 PM DOOR PRIZE
 3:20 PM COSTS RESULTING FROM
 FOODBORNE DISEASE BE-
 CAUSE OF MISHANDLING IN
 FOOD SERVICE ESTABLISH-
 MENTS - Ewen C. D. Todd,
 Health and Welfare Canada, Ot-
 tawa, ON
 3:40 PM *CAMPYLOBACTER JEJUNI* IN-
 FECTION OF BROILER POUL-
 TRY EGGS - A. G. Clark* and
 D. Bueschkens, University of To-
 ronto, Toronto, ON
 4:00 PM BIOLOGICAL CONTROL IN
 FOOD SAFETY AND SPOIL-
 AGE - David Collins-Thompson,
 University of Guelph, Guelph,
 ON
 4:30 PM AFFILIATE COUNCIL MEET-
 ING
 7:30 PM - 8:30 PM CRACKER BARREL SESSION
 FOOD SANITATION - Helene
 Uhlman, Presiding
 7:30 PM THE USE OF TIME/TEMPERA-
 TURE MONITORS IN FOOD
 SERVICE AND RETAIL - John
 W. Farquhar, Food Marketing In-
 stitute, Washington, DC
 7:50 PM THE MAJ-IK-BOX MOUSE
 STATION BAITING SYSTEM -
 Charles E. Knot*, E. A. Knot*
 and V. Keller, National Institute
 of Pest Management Cape, Girar-
 deau, MO
 8:10 PM COMPARATIVE PROPERTIES
 OF PLASTIC VS. METAL CON-
 TAINERS IN THEIR ABILITY
 TO PROTECT SPICES - Ricardo
 Alvarez* and M. Binder, Tone
 Brothers, Inc., Des Moines, IA

WEDNESDAY - AUGUST 8, 1984

Morning - General Session
Robert Marshall, Presiding

8:25 AM DOOR PRIZE
 8:30 AM INTERNATIONAL FOOD PRO-
 TECTION - Frank Bryan, Center
 for Disease Control, Atlanta, GA
 9:00 AM THE NATIONAL CONFERENCE
 ON FOOD PROTECTION -
 Charles Felix, Single Service In-
 stitute, Washington, DC
 9:30 AM AUDIOVISUAL TRAINING AIDS
 - Robert Gravani, Cornell Univer-
 sity, Ithaca, NY
 10:00 AM MILK BREAK
 10:15 AM DOOR PRIZE

10:20 AM PROFESSIONAL RESPONSIBIL-
 ITY OF REPORTING EN-
 VIRONMENTAL DATA - Ver-
 non Millard, Energy Resources
 Conservation Board, Calgary, AL
 10:50 AM SALT IN THE DIET AND ITS
 RELATION TO HYPERTEN-
 SION - David A. McCarron, Ore-
 gon Health Science University,
 Portland, OR
 11:20 AM *CAMPYLOBACTER* AND PRO-
 TECTION OF WATER SUPP-
 LIES - Martin Blaser, Veterans
 Administration Medical Center,
 Denver, CO

WEDNESDAY - AUGUST 8, 1984

Afternoon - Symposium
Emerging Food Pathogens
Michael Stiles, Chairman

1:30 PM DOOR PRIZE
 1:35 PM THE CURRENT STATUS OF
SALMONELLA - Nelson Cox,
 U.S. Department of Agriculture,
 Athens, GA
 2:00 PM EMERGING PATHOGEN: *CAM-
 PYLOBACTER* - Martin Blaser,
 Veterans Administration Medical
 Center, Denver, CO
 2:25 PM EMERGING FOOD PATHOGEN:
 HEMORRHAGIC *ESCHERICHIA
 COLI* - Michael Doyle, University
 of Wisconsin, Madison, WI
 2:50 PM MILK BREAK
 3:05 PM DOOR PRIZE
 3:10 PM EMERGING FOOD PATHOGEN:
YERSINIA ENTEROCOLITICA -
 Donald A. Schieman, Montana
 State University, Bozeman, MT
 3:35 PM EMERGING PATHOGEN: *KLEB-
 SIELLA PNEUMONIAE* - Michael
 Stiles, University of Alberta, Ed-
 monton, AB
 4:00 PM DISCUSSION PERIOD

WEDNESDAY - AUGUST 8, 1984

Afternoon - Milk Sanitation Session
Sidney Barnard, Presiding

1:25 PM DOOR PRIZE
 1:30 PM UPS AND DOWNS OF COM-
 PUTERIZING REGULATORY
 RECORDS - Kirmon Smith,
 Texas Department of Health, Au-
 stin, TX

2:00 PM USE OF THE 3M PETRIFILM SM METHOD FOR DETERMINING VIABLE BACTERIA COUNTS IN RAW MILK - Roy Ginn*, V. S. Packard, T. L. Fox, Dairy Quality Control Institute, St. Paul, MN

2:20 PM HEAVY METALS IN RAW MILK - Faye J. Feldstein, Environmental System Service, College Park, MD

2:50 PM MILK BREAK

3:05 PM DOOR PRIZE

3:10 PM STORAGE OF REFRIGERATED RAW MILK UNDER N₂ AND CO₂: EFFECT OF ADDITION OF FRESH RAW MILK ON PROTEINASE PRODUCTION BY PROTEOLYTIC PSYCOTROHIC BACTERIA - Brent J. Skura*, K. K. Kwan and R. C. McKellar, University of British Columbia, Vancouver, BC

3:30 PM RAPID METHODS FOR DETECTING ANTIBIOTICS - A panel moderated by Sidney Barnard; Chris Cashman, Smith-Kline, Animal Health Products, Philadelphia, PA; Shirley Charm, Penicillin Assays, Malden, MA; L. Robert Johnson, Angenics, Inc., Cambridge, MA

3:00 PM SANITATION IN FOOD CONFECTION PROCESSING - Austin Kraft, Hershey Chocolate Company, Hershey, PA

3:30 PM IMPROVED BACTERIAL RECOVERY BY MEMBRANE FILTERS IN THE PRESENCE OF FOOD DEBRIS - J. M. Farber* and A. N. Sharpe, Health and Welfare Canada, Ottawa, ON

3:50 PM RAPID ENUMERATION OF ENTEROTOXIGENIC *STAPHYLOCOCCUS AUREUS* COLONIES ON MEMBRANE FILTERS BY ENZYME-LINKED ANTIBODY TECHNIQUES - Pearl I. Peterkin* and A. N. Sharpe, Health and Welfare Canada, Ottawa, ON

4:10 PM INHIBITION OF OCHRATOXIN PRODUCTION BY SORBATE - Lloyd B. Bullerman, University of Nebraska, Lincoln, NE

WEDNESDAY - AUGUST 8, 1984

Evening

6:00 PM- 7:00 PM RECEPTION

7:00 PM - 9:00 PM ANNUAL AWARDS BANQUET

PRESIDING - A. Richard Brazis

INVOCATION - Ivan Parkin

INTRODUCTIONS

PRESENTATION OF AWARDS - Harry Haverland, Awards Chairman

1. Norman F. Sherman Award, Sponsored by National Institute for the Food Service Industry.
2. Certificate of Merit Awards
3. Honorary Life Membership
4. C. B. Shogren Memorial Award
5. Citation Award
6. Harold Barnum Industry Award, Sponsored by NASCO
7. Educator Award, Sponsored by Milking Machine Manufacturer's Council of the Farm and Industrial Equipment Institute
8. Sanitarian's Award, Sponsored by Klenszade Products, Division of Economics Laboratories; Wyandotte Corporation, Inc.; Monarch Chemicals, Division of H. B. Fuller

INSTALLATION OF OFFICERS

Past President's Award

WEDNESDAY - AUGUST 8, 1984
Afternoon - Food Sanitation Session
Harry Haverland, Presiding

1:25 PM DOOR PRIZE

1:30 PM EFFECT OF N₂, CO, AND CO₂ ON MICROBIAL PROTEASE, DECARBOXYLASE AND LIPASE IN MEAT PRODUCTS - B. Pichard, J. A. Zee*, R. E. Simard, C. Bouchard, Universite' Laval, Ste-Foy, Quebec

1:50 PM BULK MERCHANDISING OF FOODS - Ken Blom, Barons-Eureka-Warner Health Unit, Coaldale, AL

2:20 PM USE OF NISIN AS AN ANTI-MICROBIAL AGENT IN BACON - D. L. Collins-Thompson*, C. Calderon, D. Wood and R. Osborne, Guelph, ON

2:40 PM MILK BREAK

2:55 PM DOOR PRIZE

THURSDAY - AUGUST 9, 1984

Morning

7:30 AM IAMFES EXECUTIVE BOARD
BREAKFAST MEETING

UHT PROGRAM

Cherise Foster, Presiding

9:00 AM Depart Hotel for Palm Dairies
9:30 AM Tour of Palm Dairies
11:00 AM MILK BREAK
11:10 AM TECHNICAL CONSIDERATIONS
OF UHT PROCESSING - Pavel
Jelen, University of Alberta, Ed-
monton, AB
11:30 AM MARKETING ASPECTS OF
UHT PRODUCTS - Stan McDoug-
all, Palm Dairies, Ltd., Calgary,
AB

ENTERTAINMENT

Members and Companions

SUNDAY - AUGUST 5, 1984

7:00 PM - 9:00 PM EARLY BIRD RECEPTION

MONDAY - AUGUST 6, 1984

4:30 PM - 10:30 PM BAR-B-QUE AND TOUR OF
FORT EDMONTON PARK

TUESDAY - AUGUST 7, 1984

7:00 AM KLONDIKE BREAKFAST
6:00 PM - 8:30 PM PAST PRESIDENT'S DINNER
8:30 PM - 9:30 PM SLIDE SHOW - by Mr. and Mrs.
Ivan Parkin

WEDNESDAY - AUGUST 8, 1984

6:00 PM - 7:00 PM RECEPTION
7:00 PM - 9:00 PM AWARDS BANQUET

COMPANIONS' PROGRAM

MONDAY - AUGUST 6, 1984

BUS TOURS TO HERITAGE DAYS

TUESDAY - AUGUST 7, 1984

9:00 AM - 11:00 AM ALBERTA GEMSTONE PRE-
SENTATION
11:15 AM - 4:00 PM LUNCHEON AND TOUR OF
ALBERTA WILDLIFE PARK
4:00 PM - 5:00 PM DEMONSTRATION ON COOK-
ING WITH KAHLUA

WEDNESDAY - AUGUST 8, 1984

9:00 AM - 11:00 AM TOUR MUTTART CONSER-
VATORY
11:15 AM - 3:00 PM SHOPPING AT WEST EDMON-
TON MALL

Letter to the Editor

More on the name of the Association

DEAR EDITOR:

I was quite pleased with the decision reached by the Executive Board of the International Association of Milk, Food and Environmental Sanitarians to take no action on the proposed name change to "International Association of Food Protection". I believe that the Board acted responsibly and wisely.

A review of the list of sustaining members indicates a high degree of support from the dairy industry, at both the producer and processor levels, as well as from dairy equipment, supply, and related enterprises. The proposed name appears to downgrade the importance of milk and dairy products within the organization - not to mention environmental sanitation - and unnecessarily offends an industry that has been loyal and devoted to the organization and generous with its talents, efforts, and financial support.

The International Association of Milk, Food and Environmental Sanitarians has a proud history of achievement in many areas of interest to sanitarians. Does it really serve any purpose to limit the organization's emphasis to "food protection", as inferred by the proposed name? I seriously doubt that such a change would have a positive effect on the future growth of an organization whose concerns should include the many aspects of public health sanitation.

Kirmon C. Smith
Division of Milk and Dairy Products
Texas Department of Health
1100 West 49th Street
Austin, Texas 78756

NOTICE TO MEMBERS OF IAMFES

Due notice is hereby given that amendments to the Constitution and Bylaws of the International Association of Milk, Food and Environmental Sanitarians will be considered at the Annual Meeting of the Association in Edmondton, Alberta, Canada on August 7, 1984. Watch your June issue of this Journal for particulars.

Food Science Facts

For The Sanitarian



Robert B. Gravani
Cornell University
Ithaca, NY

STAPHYLOCOCCUS FOOD POISONING

According to the Center for Disease Control, the bacterium *Staphylococcus aureus* was responsible for approximately 19% of the confirmed foodborne disease outbreaks between 1975-1979.

HABITAT

This troublesome bacterium is especially important since it is so common and comes primarily from humans and animals. Staphylococci are round in shape and are found:

- 1) in the noses of 30-50% of healthy people
- 2) on hands of 20% of people surveyed
- 3) in the throat, in feces, on hair, and in infections of man and animals
- 4) in skin abrasions, pimples and boils.

When given the proper conditions, *Staphylococcus aureus* produces a toxin that causes food poisoning.

FOODS INVOLVED

Staphylococci grow well in foods that contain protein and are also capable of growing in foods with high levels of salt or sugar. Foods such as custards, cream filled bakery products, meat and meat products (like sliced roast beef and ham) and milk products have caused most outbreaks. Other foods such as salads, puddings, and pies have also been involved. These foods and others that permit the growth of food poisoning bacteria are called "potentially hazardous foods." Any food that requires a great deal of hand preparation is a possible source of *Staphylococcus* food poisoning.

THE DISEASE

Staphylococcus food poisoning is one of the most common types of bacterial foodborne disease. It is referred to as a food intoxication because the bacteria produces

a toxin that causes the poisoning. The symptoms usually appear about 2-4 hours after eating food containing the bacterial toxin. The most common symptoms are violent nausea, vomiting and diarrhea, while abdominal cramps, headache, sweating, chills and prostration may also occur.

The duration of the illness is brief -- usually 1 to 2 days. Recovery is complete and the death rate is low.

TRANSMISSION OF THE DISEASE

The following conditions are necessary for a *Staphylococcus* food poisoning to occur:

- 1) Source of bacteria - *Staphylococcus aureus* must come in contact with the food;
- 2) Food - the food must permit the bacteria to grow and produce toxin;
- 3) Temperature - the temperature must be favorable for the growth of *Staphylococcus aureus* --between 45 and 140 degrees Fahrenheit;
- 4) Time - enough time must elapse for bacteria to grow and produce toxin; and
- 5) Ingestion - an unsuspecting person must consume the food that contains the toxin.

The toxin produced by *Staphylococcus aureus* is colorless, odorless and tasteless, so there is no way to tell whether a food will cause illness without laboratory testing. This toxin is very resistant to heat, cold and chemicals.

PREVENTION AND CONTROL

The prevention of *Staphylococcus* food poisoning is the job of everyone who works with food. Persons who process and prepare food should practice good sanitation to minimize bacterial contamination.

There are three areas of sanitation that should always be practiced:

- 1) Prevent contamination
- 2) Inhibit growth
- 3) Kill microorganisms.

Prevent Contamination

- * Practice good personal hygiene - bathe or shower regularly;
- * Always work with clean hands; wash hands often and especially after going to the toilet, smoking, eating or handling raw foods;
- * Keep hands away from the mouth, nose, hair and skin infections;
- * Use clean and sanitized utensils to mix foods; never use hands;
- * Cover coughs and sneezes;
- * Wear clean and sanitary plastic or rubber gloves especially when there is a cut or wound and change them when they become soiled;
- * Don't use cooking utensils or fingers to taste food while cooking or serving; and
- * Clean and sanitize equipment after every use.

Inhibit Growth

- * Keep potentially hazardous foods below 45 degrees Fahrenheit or above 140 degrees Fahrenheit;
- * Don't allow foods to remain at room temperature for long periods of time;
- * Move foods through the temperature danger zone (between 45 and 140 degrees Fahrenheit) quickly; and
- * Cool foods in shallow pans.

Kill Microorganisms

- * Cook foods thoroughly; and
 - * Use a good quality, accurate thermometer to check for desired temperature in the thickest part of the food.
- By following these simple principles of good sanitation, Staphylococcus food poisoning can be prevented.

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Dairy Quality

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

METHODS USED FOR MONITORING THE MICROBIOLOGICAL QUALITY OF RAW MILK

PART I - Discussion of Conventional Methods for Raw Milk Evaluation

With today's demand for high quality finished dairy products with long shelf life, there is an increasing need for high quality raw milk. Several parameters control the quality of raw milk, including time and temperature of storage, presence of absorbed off flavors, non-microbial induced off flavors, foreign materials, nutritional attributes, public health concerns, presence of bacterial heat stable enzymes, microbially induced flavors, psychrotrophic spore forming bacteria and other factors can all cause quality defects in dairy products. There is universal agreement within the dairy industry that high quality raw milk is essential. Also, there is an increasing awareness of the need for aesthetically pleasing conditions of production. However, how best to measure the microbial quality of raw milk is a question asked by many dairy industry people. This month's article is not an exhaustive discussion of microbial methods used to determine the microbiological quality of raw milk, however, it discusses some of the more frequently utilized methods and some of the advantages and disadvantages of these methods. Next month's article will discuss more recently proposed methods of evaluating the microbiological quality of raw milk.

An ideal test to determine raw milk microbiological quality would include the following factors: 1) a test that is rapid, 2) economical and 3) a test that would reflect the total number of organisms in the milk sample, the number of psychrotrophic organisms, conditions of production on the farm and the time and temperature of storage of the raw milk. Obviously, it would be very difficult for one test to reflect all of these parameters.

The regulatory agencies have used the Standard Plate Count (SPC) as a means of measuring raw milk quality. However, many dairy scientists, field men, and others agree that the SPC does not accurately measure the conditions of production or the psychrotrophic content of the

milk. Many argue that increased refrigeration on the farm makes it difficult to reflect the true conditions of production with SPC. Recent reviews by Hartley et al (2) indicate that the SPC rarely is closely correlated with production conditions. Johns (3) points out several possible reasons for this lack of correlation: 1) a dilution effect due to increased production on the farm, 2) lower storage temperatures, 3) low ambient temperatures of soiled equipment on the farm, 4) an incubation temperature that is too high for the SPC. However, the SPC may indicate whether milk has been temperature abused and will give results in a relatively short time and it is quite economical and rapid to run.

Another test frequently used to indicate microbial quality of raw milk is the Lab Pasteurized Count (LPC). This count will give an index of the number of thermophilic bacteria (which will survive pasteurization) in the milk supply. These bacteria will contribute significantly to the initial SPC of fresh pasteurized fluid milk products. However, this test does not reflect the number of gram negative psychrotrophic organisms in that milk supply, which are significant in controlling microbially induced off-flavors. Historically the test is considered a means of reflecting the condition of milking equipment on the farm, however, recent studies by Hartley et al (2) indicated poor correlation between the LPC and conditions of production. Other difficulties with the LPC is that methods used to simulate the time and temperatures of the HTST have not been perfected, the test does not reflect the total microorganisms in the milk supply, and abused storage temperatures. While the LPC will reflect the thermophilic organisms in raw milk, it will not indicate whether these thermophilic organisms are capable of growth at refrigeration temperatures causing shelf-life problems after processing.

Another test historically used to determine raw milk quality is Direct Microscopic Cell Count (DMC). The DMC in recent years has been losing popularity primarily due to increases in raw milk quality. Poor correlation between DMC's and viable cell counts have led to a decrease in popularity of this testing method. However, the DMC is capable of indicating microbiological quality in

15 to 20 minutes. In this regard, the method can be a useful tool in acceptance or rejection of suspect tanker loads at the processing plant. *Standard Methods* (1) mentions some inherent problems with DMC including inaccuracy of measurement of the .01 ml quantity used for slide preparation, faulty preparation and staining of slides, failure of bacteria to stain, the minimal amount of milk examined in the counting procedure, irregularities in distribution of bacteria, failure to count sufficient number of fields and inconsistencies and inaccuracies in the microscopic technique.

Other methods that have lost popularity in recent years are dye reduction methods. The methylene blue and re-sazuring tests have proven to show poor correlation with viable cell counts. As *Standard Methods* (1) points out, this is primarily due to 1) differences in reducing activities of bacterial species 2) failure of some bacteria to reduce dyes, 3) variability in the proportion of bacteria in the cream layer, 4) dye reducing activity of bacteria cells is diminished by clumping and 5) presence of inhibitory substances in the sample. With improved raw quality and general reduction of total organisms in raw milk, the popularity of dye reduction tests has decreased. However, the test does have the advantage of rapid testing of incoming raw milk supply.

There is general agreement that the Psychrotrophic Bacteria Count (PBC) is the most reliable method of indicating conditions of production on the farm. Research (4) has shown that aseptically harvested milk contains very few, if any psychrotrophic bacteria. Therefore, any psychrotrophs found in the milk originate from unclean equipment or other environmental sources. The PBC (incubation of plates for 10 days at 45 °F) can be used to enumerate the psychrotrophic organisms in raw milk supplies. Unfortunately, the disadvantage to this method is that it is timely and costly. It is the belief of many dairy scientists that the PBC can best reflect raw milk microbiological quality, since many psychrotrophs found in raw milk are usually gram negative bacteria capable of producing heat stable enzymes and microbial off flavors prior to processing. Also these organisms are the most significant in reflecting conditions of production. Therefore, many tests have been proposed for determining raw milk quality based on rapid determination of psychrotrophic organisms in raw milk. These methods will be the subject of next month's article.

- 1) American Public Health Association, 1979. *Standard Methods for the Examination of Dairy Products*, 14th edition. American Public Health Association, New York, NY.
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- 3) Johns, C.R. 1971. Bacteriological testing of milk for regulatory purposes-usefulness of current procedures and recommendations for change. II Bacteriological testing of raw milk for regulatory purposes. *J. Milk Food Technol*.
- 4) Morse, Pamela J. et al., 1968. Investigation of factors contributing to the bacterial count of bulk tank milk. II Bacteria in milk from individual cows. *J. Dairy Science* 51:1188-1191.



N.M.C.

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California Mastitis Test

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A veterinarian can culture the milk sample to determine what caused the increased somatic cell count, and if the problem is due to mastitis, what type of bacteria is responsible.

Direct Microscopic Somatic Cell Count

This is a quantitative laboratory test in which stained milk films are examined under the microscope and the number of somatic cells is counted. Bulk tank milk with more than one million cells per milliliter of milk suggests that at least 40% of the cows in the herd have mastitis.

For counts of less than one-quarter million, no more than 10% of the cows should score CMT 2 or over.

Electronic Cell Counting

Several electronic instruments have been developed for counting somatic cells in milk and are being used in DHI programs and by marketing organizations.

Somatic cell testing is a key management practice in controlling mastitis. Establishing a routine testing program is key to a successful management program.

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3-A Sanitary Standards for Milk and Milk Products Filters Using Single Service Filter Media

Number 10-03

Formulated by

*International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee*

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Milk and milk product filter specifications heretofore and hereafter developed which so differ in design, material, fabrication, or otherwise, as not to conform to the following standards, but which in the fabricator's opinion are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A. SCOPE

A.1

These standards cover sanitary aspects of enclosed filtration equipment which use single service filter media for filtering milk and milk products.

A.2

In order to conform with these 3-A Sanitary Standards, filters shall comply with the following design, material, and fabrication criteria.

B. DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

Filter: Shall mean enclosed filtration equipment which uses single service filter media during the transmission of milk and milk products.

B.3

Product Contact Surface: Shall mean all surfaces that are exposed to the product, or from which liquid may drain, drop or be drawn into the product.

B.4

Non-Product Contact Surface: Shall mean all other exposed surfaces.

C. MATERIALS

C.1

Product contact surfaces shall be of stainless steel of the AISI 300 series 1/ or corresponding ACI 2/ types (see Appendix, Section E), or metal which

under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types, and is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for gaskets, sealing applications and parts having the same functional purposes. These materials shall comply with the applicable provision of the 3-A Sanitary Standard for Multiple-Use Rubber and Rubber-like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00;

C.1.2

Plastic materials may be used for gaskets, sealing applications and parts having the same functional purposes. These materials shall comply with the applicable provision of the 3-A Sanitary Standards for Multi-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-13.

C.1.3

Cotton, linen or synthetic materials may be used for single service filter media. These materials shall be non-toxic, non-shedding, relatively insoluble and shall not impart a flavor to the product.

C.2

Non-product contact surfaces shall be of corrosion-resistant material, relatively non-absorbent, durable and cleanable.

D. FABRICATION

D.1

Product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as

¹The data for this series are contained in the following reference: *AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-19. Available from: American Iron & Steel Institute, 1000 16th Street, NW, Washington, D.C. 20036*

²Steel Founders' Society of America, *Cast Metals Federation Bldg., 455 State St., Des Plaines, IL 60016.*

pits, folds and crevices in the final fabricated form (See Appendix, Section F).

- D.2 Permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 finish on stainless steel sheets free of imperfections such as pits, folds and crevices.
- D.3 Product contact surfaces shall be easily accessible for cleaning and inspection. Removable parts shall be readily demountable.
- D.4 Product contact surfaces shall be self-draining except for normal clingage.
- D.5 Pipeline connections in product contact surfaces shall conform to 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17, Rev.
- D.6 Gaskets having a product contact surface shall be removable.
- D.7 Gasket retaining grooves in product contact surfaces shall be no deeper than their width.
- D.8 Internal angles on product contact surfaces shall have radii of not less than 1/16 inch. The radii in grooves for standard 1/4 inch O-rings shall be not less than 3/32 inch and for standard 1/8 inch O-ring shall not be less than 1/32 inch.
- D.9 There shall be no threads on product contact surfaces.

- D.10 Any coil spring having product contact surfaces shall have at least 3/32 inch openings between coils, including the ends when the spring is in a free position.
- D.11 Perforations in the filter medium support shall be not less than 3/32 inch in diameter and shall be readily accessible for cleaning.
- D.12 Non-product contact surfaces shall have a smooth finish, be free of pockets, crevices, and be readily cleanable.

APPENDIX

E. STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are covered by ASTM³ specifications A296-68 and A351-70.

F. PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D.1 herein.

These standards shall become effective September 9, 1984 at which time the 3-A Sanitary Standards for Milk and Milk Products Filters Using Single Service Filter Media, Number 10-00 as amended by 10-01 and 10-02 is rescinded and becomes null and void.

³Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

The 3-A Sanitary Standards For Non-Coil Type Batch Processors For Milk and Milk Products

Number 25-01

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Batch Processor specifications heretofore and hereafter developed which so differ in design, material and fabrication or otherwise as not to conform to the following standards, but which, in the fabricator's opinion, are equivalent or better, may be submitted for joint consideration of the IAMFES, USPHS, and DIC at any time.

A. SCOPE

A.1

These standards cover sanitary aspects of non-coil type batch processors used to heat process milk, fluid milk products, or frozen dessert mixes. Batch processors may be either of the atmospheric or closed type. The latter may be operated at pressures from below to above that of the atmosphere.

A.2

In order to conform with these 3-A Sanitary Standards, non-coil type batch processors shall comply with the following design, material, and fabrication criteria.

B. DEFINITIONS

B.1

Batch Processor: Shall mean a jacketed tank or vat provided with a heating and/or cooling jacket and agitation for the mixing and heat processing of milk, fluid milk products, or frozen dessert mixes.

B.2

Product: Shall mean milk, fluid milk products and frozen dessert mixes.

B.3

Surfaces:

B.3.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop, or be drawn into the product.

B.3.2

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.4

Lining: Shall mean all surfaces used to contain the product, including the ends, sides, bottom and top.

B.5

Shell: Shall mean the material covering the exterior of the insulation and/or heat exchange jacket.

B.6

Breast: Shall mean that portion of the metal used to join the top of the lining to the top of the shell.

B.7

Bridge: Shall mean a cover on an open top type tank which is open on both sides and is permanently attached to the lining on opposite sides of the tank. It may be used to support a removable or nonremovable main cover(s) and accessories.

B.8

Mechanical Cleaning or Mechanically Cleaning: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

B.9

Alcove-Type Processors: Any closed-type processor located outside of a processing area for the processing of milk or milk products.

B.10

Control Area(s): Shall mean the area(s) in which all appurtenances for the operation of the processor are located and vent lines terminate, except as provided in subsection D.17.2.1 and shall be a part of one or more of the following:

B.10.1

A processing area.

B.10.2

An area in the plant at least the equivalent of a processing area.

B.11

Alcove(s): Shall mean an extension of the control

area(s) in which appurtenances and vent line openings are located.

C. MATERIALS

C.1

Product contact surfaces, including the breast, shall be of stainless steel of the AISI 300 series¹ or corresponding ACI² types (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types, and is non-toxic and non-absorbent except that:

C.1.1

Rubber and rubber-like materials may be used for measuring devices (except measuring sticks), slinger or drip shields, agitator seals on vacuum and/or pressure processors, agitator guides, protective caps for openings (other than manhole) and/or sanitary fittings, scraper blades, gaskets, seals and parts having the same functional purposes.

C.1.2

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Rubber and Rubber-like Materials, Number 18-00.

C.1.3

Plastic materials may be used for bearings, measuring devices (except measuring sticks), slinger or drip shields, agitator seals on vacuum and/or pressure processors, agitator guides, protective caps for openings (other than manhole) and/or sanitary fittings, sight and light ports, scraper blades, gasket, seals and parts having the same functional purposes.

C.1.4

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple Use Plastic Materials, Used as Product Contact Surfaces for Dairy Equipment, Number 20-13.

C.1.5

Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.6

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be non-toxic.

C.1.7

Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon and/or ceramic materials may be used. Carbon and/or ceramic materials shall be inert, non-porous, non-toxic, non-absorbent, insoluble, resistant to scratching, scoring and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.8

Glass may be used in sight and/or light openings and when used shall be of a clear heat-resistant type.

C.1.9

Single service sanitary type gaskets may be used on parts which must be disassembled for cleaning.

C.2

Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. All non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D. FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section F).

D.2

Permanent joints in metallic product contact surfaces shall be continuously welded. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets free of imperfections such as pits, folds and crevices.

D.3

Processors having an inside height of more than 96 inches shall be provided with means for mechanical cleaning.

D.4

Processors that are to be mechanically cleaned shall be designed so that the product contact surfaces of the processor, including the product contact surfaces of the opening for a vertical mechanical agitator, and all non-removable appurtenances thereto can be mechanically cleaned and are accessible for inspection.

D.5

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning and inspection either when in an assem-

¹The data for this series are contained in the following reference: AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-19. Available from American Iron and Steel Institute, 1000 16th Street, N.W., Washington, D.C. 20036.

²Steel Founders' Society of America, Cast Metals Federation Bldg., 455 State St., Des Plaines, IL 60016.

- bled position or when removed. Removable parts shall be readily demountable.
- D.6
Gaskets:
- D.6.1
Gaskets having a product contact surface(s) shall be removable or be bonded.
- D.6.2
Bonded rubber and rubber-like gaskets and bonded plastic gaskets shall be bonded in such a manner that the bond is continuous and mechanically sound and when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the rubber and rubber-like material or the plastic material does not separate from the base material to which it is bonded.
- D.6.3
Grooves in gaskets shall be no deeper than their width and the minimum radius of any internal angle shall not be less than 1/8 inch unless the gasket is readily removable for cleaning.
- D.7
Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 inch in depth and, except those for standard O-Rings smaller than 1/4 inch, shall be at least 1/4 inch wide.
- D.8
Shell: All seams and openings in the shell shall be effectively sealed against the entrance of moisture and extraneous material.
- D.9
Radii
Internal angles of 135° or less on product contact surfaces shall have radii of not less than 1/2 inch, except that:
- D.9.1
Minimum radii for fillets of welds in product contact surfaces may be 1/8 inch where the thickness of one or both parts joined is less than 3/16 inch.
- D.9.2
The radii in agitator shaft bottom support of guide and in gasket grooves or gasket retaining grooves for removable gaskets, except those for standard 1/4 inch and smaller O-Rings, shall not be less than 1/8 inch.
- D.9.3
The radii in grooves for standard 1/4 inch O-Rings shall be not less than 3/32 inch and for standard 1/8 inch O-Rings shall be not less than 1/32 inch.
- D.9.4
The radii of covers and agitator assemblies shall be not less than 1/4 inch.
- D.10
The lining shall remain in a relatively fixed position within the shell or body of the processor and shall be so constructed that it does not sag, buckle, or become distorted in normal use. The bottom of the lining shall have a minimum pitch of 3/8 inch per foot toward the outlet.
- D.11
There shall be no threads on product contact surfaces.
- D.12
Appurtenances having product contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.
- D.13
Sanitary fittings and connections shall conform to the applicable provisions of (1) the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17, Rev. and/or (2) and 3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-00, except that materials conforming to C.1.1 or C.1.3 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings, or vents.
- D.14
The breast shall be integral with or continuously welded to the lining and shall be sloped so that drainage is away from the lining. The junction of the breast and the shell shall be continuously welded.
- D.15
Covers:
- D.15.1
Main Covers for Atmospheric Type Processors:
Main covers (1) shall be of a type which can be opened and maintained in an open position, (2) shall be sufficiently rigid to prevent buckling, (3) shall be self-draining in the closed position, (4) shall be provided with an adequate, conveniently located and durable handle(s) of sanitary design, which is welded in place or formed into the cover materials, (5) shall have downward flanges not less than 3/8 inch along all edges and (6) shall be close fitting. The design shall be such that when raising the cover(s) any liquid on the top will not enter the processor. When the cover(s) is in its fully opened position, the drops of condensate formed on the underside of the cover(s) shall not drain into the processor.
- D.15.2
Bridges and Fixed Covers for Atmospheric Type Processors:
Bridges and fixed covers shall pitch to the outside edge(s) of the processor for complete drainage, and shall have a raised flange not less than 3/8 inch in height where the edge(s) meets the main cover(s). The bridges and fixed covers shall be integral with or continuously welded to the lining, and shall be installed so the underside is accessible for cleaning and inspection without completely entering the processor.

D.15.3

Manhole Covers for Closed Type Processors:

Covers for manholes in the side walls and/or ends shall be either the inside or outside swing type. If the cover swings inside, it shall also swing outside away from the opening. Threads or ball joints employed to attach the manhole cover(s) and its appendages shall not be located within the lining. Covers for manholes in the top of processors shall be of the outside swing type and shall have downward flanges not less than 3/8 inch along all edges and shall be close fitting.

D.16

Openings:

D.16.1

Openings in the lining or in fixed covers or in bridges, or main covers of atmospheric type processors, except those for agitators, openings with permanently attached sanitary pipeline fittings and thermometers that remain in place while product is in the processor shall be provided with removable covers which are designed to make close contact with the upper edges of the opening or cover surface. When the main cover is in an open position, the removable cover(s) shall remain in position.

D.16.2

The edges of openings in the top enclosure, main cover, or bridge shall extend upward at least 3/8 inch or be fitted with a permanently installed sanitary pipeline fitting. Openings that extend outward, generally horizontal, shall be fitted with a permanently installed sanitary pipeline fitting.

D.16.3

All openings in the processor lining shall be within a control area except as provided in D.17.2.1 for a top entering agitator. Openings for cleaning, overflow and/or vent line(s) shall terminate in a control area. When the re-vent line method is used to prevent siphonage, the terminal ends of the cleaning, overflow and/or vent line(s) in the control area shall be arranged or means provided to prevent liquids or objects being drawn up in the re-vent line. Sanitary vacuum relief valve(s), vent, re-vent or overflow line(s) terminating in a control area shall be provided with a perforated cover having openings not greater than 1/16" diameter or slots not more than 1/32" wide. This cover(s) shall be designed so that parts are readily accessible and easily removable for cleaning. Woven wire mesh shall not be used for this purpose.

D.16.4

Agitator openings: Agitator shaft openings through the bridge or top enclosure shall have a minimum diameter of one inch on processors which require removal of the agitator shaft for cleaning, or be of a diameter that will provide a 1-inch minimum annular cleaning space between the agitator shaft and the inside surface of the flanged opening on proces-

sors which do not require removal of the agitator for cleaning.

D.16.5

Manhole opening: A manhole(s) shall be provided in closed type processors. If there is more than one control area, there shall be a manhole accessible from the lowest control area. The inside dimensions of the manhole(s) opening shall not be less than 15 by 20 inches oval, 12 by 27 inches elliptical or 18 inches in diameter. The sleeve or collar of a manhole opening for an inside swing type of manhole cover shall be pitched so that liquids cannot accumulate. Processors with a capacity of 300 gallons or less may have top opening manholes having a diameter of not less than 16 inches.

D.16.5.1

A hand grip shall be mounted externally on the processor near the manhole in order to afford easy access to the processor interior.

D.16.6

Sight and light openings: Sight and light openings, when provided, shall be in the top enclosure and shall be of such design and construction that the inner surfaces drain inwardly and the glass or plastic may be removed for cleaning. If the processor is designed for mechanical cleaning, the inner surface of the glass or plastic shall be relatively flush with the inner surface of the lining. The inside diameter of the opening(s) into the lining shall be not less than 3 3/4 inches.

D.16.7

Instrument Connections:

Connections or openings shall be located in the top enclosure, cover, bridge, bottom or through a sidewall. Thermometer wells may be used. Connections shall conform to the applicable fitting or connection defined in the 3-A Sanitary Standards for Instrument Fittings and Connections Used on Milk and Milk Products Equipment, Number 09-07.

D.16.7.1

When thermometers are installed through the side wall, the location shall be such that the thermometer(s) is easily readable. Thermometer connections and/or openings shall be located so that the thermometer is not influenced by the heating or cooling medium.

D.17

Outlet and Outlet Valve:

D.17.1

The inside diameter of the outlet passage of processors shall not be less than the nominal inside diameter of a 1-1/2 inch (1.402 inches) 3-A Sanitary Fittings. The outlet shall be in a position that will provide complete drainage of the processor. The top of the terminal end of the outlet passage shall be lower than the lowest point of the lining. The outlet and the outlet valve shall be so designed that either a single service or a multiple use gasket can be used.

D.17.2

The outlet valve for a processor shall conform to the design and construction provisions of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17, Rev. The outlet valve shall be removable for cleaning. The outlet valve shall be considered removable when secured by not more than four hex nuts.

D.17.3

The outlet and the outlet valve shall be of such design and construction that the combined length of the valve inlet passage in the valve shell and of any passage of corresponding diameter shall not exceed the limits in drawings 3A-100-20, 3A-100-21, and 3A-100-29, respectively, in the 3-A Sanitary Standards for Fittings, Number 08-17, Rev.

D.18

Agitators:

Agitators, if not designed for mechanical cleaning, shall be readily accessible for manual cleaning and inspection either in an assembled position or when removed. A seal for the agitator shaft, if provided, shall be of a packless type, sanitary in design and durable with all parts readily accessible for cleaning. A sanitary seal for the agitator shaft shall be provided for a side or bottom entering agitator.

D.18.1

When a sanitary seal is not provided, an umbrella or drip shield of sanitary design that can be raised or dismantled, to permit cleaning of all of its surfaces, shall be provided to protect against the entrance of contaminants into the processor through the space around the agitator shaft.

D.18.2

The means for agitation shall be one of the following:

D.18.2.1

Top entering, non-removable type: There shall be a space of not less than 1/2 inch between the non-removable agitator and the bottom of the lining, unless the agitator is mounted on a hinged-type cover. A bottom guide support, if used, (1) shall be welded to the lining (2) shall not interfere with drainage of the processor, (3) shall have radii of not less than 1/8 inch on internal angles and (4) there shall be adequate clearance to allow the guide, guide support and the portion of the agitator shaft in the guide to be effectively cleaned by mechanical cleaning. The agitator shaft shall not have a bottom cavity. When the opening in the lining and the top mounted agitator is located outside the control area, a positive rotary sanitary type seal shall be required.

D.18.2.2

Top entering, removable or demountable type: This type of agitator shall be provided with an easily ac-

cessible readily demountable coupling of either a sanitary type located within the lining or a coupling located outside of the lining provided that it is above the shield provided to protect the annular space around the shaft. All product contact surfaces of the agitator shall be visible when the agitator is removed. A bottom guide support, if used, shall be welded to the lining, shall not interfere with drainage of the processor and shall have radii of not less than 1/8 inch on internal angles. When the agitator shaft has a guide cavity, the diameter of the cavity shall be greater than the depth. The agitator and guide shall be easily demountable for cleaning of the guide, guide support and shaft cavity.

D.18.2.3

Side or bottom entering type: This type of agitator and shaft and its complete seal shall be readily demountable for manual cleaning. Non-removable parts having product contact surfaces shall be designed so that the product contact surfaces are readily cleanable from the inside of the processor.

D.18.3

Agitator Driving Mechanism Mounting:

The driving mechanism shall be securely mounted in a position that will provide a minimum distance of 4 inches measured from the driving mechanism housing, excluding bearing bosses and mounting bosses, to the nearest surface of the processor; and in such a manner that all surfaces of the processor under or adjacent to the driving mechanism shall be readily accessible for cleaning and inspection.

D.19

A pressure or level sensor, if provided shall comply with the applicable provisions of the 3-A Sanitary Standards for Pressure and Level Sensing Devices, Number 37-00. If the processor in which it will be used is designed for mechanical cleaning, the product contact surface of the device shall be relatively flush with the inner surface of the processor.

D.20

Supports

The means of supporting a processor shall be one of the following:

D.20.1

With legs: Adjustable legs shall be of sufficient number and strength and so spaced that the filled processor will be adequately supported. Legs shall be smooth with rounded ends and have no exposed threads. Legs made of hollow stock shall be sealed. Legs shall be of a length that will provide a clearance (1) between the floor and the bottom of the processor or (2) between the floor and the lowest point of the agitator or the agitator drive on processors having bottom entering agitators, of at least 6 inches if the processor is 72 inches or less in diameter or width or at least 8 inches if the processor is more than 72 inches in diameter or width.

D.20.2

The base of the processor may be mounted on a

slab or island and shall be such that it may be sealed to the mounting surface (see Appendix, Section G). Cone bottomed processors and processors with bottom mounted agitators shall not be mounted on a slab or an island.

D.21

Guard:

A guard(s) required by a safety standard that will not permit accessibility for cleaning and inspection shall be designed so it (they) can be removed without tools.

D.22

Non-Product Contact Surfaces:

Non-product contact surfaces shall be smooth, free of pockets and crevices and be readily cleanable and those to be coated shall be effectively prepared for coating. All seams and openings shall be effectively sealed against moisture and vermin.

D.23

Information Plate:

Processors shall have an information plate permanently affixed in juxtaposition to the name plate giving the following applicable information or the information should appear on the name plate:

D.23.1

If the vessel is a processor at the time of manufacture.

D.23.2

The maximum operating pressure and/or vacuum under which a closed type processor may be safely operated.

D.24

The control area and alcove, or if there is more than one, the lowest shall be at an elevation that will include the lowest vertical portion of the processor. Alcove(s) shall be fabricated of stainless steel with the lower portion pitched for adequate drainage and be of sufficient size for access to all fittings and accessories located within the alcove(s) control areas.

APPENDIX

E.

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI¹ for wrought

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products, or by ACI² for cast products, should be considered in compliance with the requirements of Section C.1. Where welding is involved the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. These cast grades are covered by ASTM³ specification A296-68 and A351-70.

F.

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D.1.

G.

SLABS OR ISLANDS

When the processor is designed to be installed on a slab or island, the dimensions of the slab or island should be such that the base of the processor will extend beyond the slab or island at least 1 inch in all horizontal directions. The slab or island should be of sufficient height so that the bottom of all product connections are not less than 4 inches above the floor. The surface of the slab or island should be coated with a thick layer of waterproof mastic material, which will harden without cracking. The junction of the processor base and the slab or island should be sealed.

H.

ACCESS

Means should be provided for access to a manhole and a sight and/or light glass when one or both are provided.

I.

PLACEMENT

If the processor is not in a processing area or in an area in the plant at least the equivalent of a processing area or adjacent to the outside wall of one of these areas, a hallway should be constructed at least 7 feet high and 5 feet wide to provide easy access to the control area. Extension through the roof is permissible.

These standards shall become effective September 9, 1984, at which time the 3-A Sanitary Standard for Non-Coil Type Batch Processors for Milk and Milk Products, Number 25-00 is rescinded and becomes null and void.

Abstracts of papers in the May Journal of Food Protection

To receive the Journal of Food Protection in its entirety each month call 515-232-6699, ext. A.

Detection of Sterol Epoxides in Foods by Colorimetric Reaction with Picric Acid, Ken Lee, Anne M. Herian and T. Richardson, Department of Food Science, 1605 Linden Drive, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 47:340-342

Picric acid (2, 4, 6-trinitrophenol) was reacted with sterol epoxides to form a chromophore with absorption maxima at 350 and 410 nm, which follow Beer's law. Linearity was obtained up to 0.2 mg/ml with a sensitivity of 2 µg of cholesterol α-epoxide/ml. Optimum conditions included a 24-h reaction at 23°C, a 150+ M/M excess of picric acid over sterol epoxide and a picrate removal step. Both cholesterol α-epoxide and cholesterol β-epoxide were synthesized and purified for analysis. The α-epoxide was seven times more reactive than the β-epoxide. Cholesterol and sitosterol α-epoxides had the same reactivity with picric acid. Epoxides were detected in commercially available french fries, but quantification required further purification.

Incidence of Salmonellae in Clams, Oysters, Crabs and Mullet, M. B. Fraiser and J. A. Koburger, Food Science and Human Nutrition, University of Florida, Gainesville, Florida 32611

J. Food Prot. 47:343-345

Sixty samples each of oysters (*Crassostrea virginica*), clams (*Mercenaria mercenaria*), striped mullet (*Mugil cephalus*), and blue crab (*Callinectes sapidus*) were analyzed for the presence of salmonellae within 4 h of harvesting from an east and west coast location in Florida. Mullet was the only seafood from which salmonellae were not recovered. Clams from the west coast location had the highest incidence (43%) of salmonellae. Eleven serotypes of *Salmonella* were recovered and identified from the samples. In quantitative MPN studies, the number of salmonellae present in west coast oysters was 2.2 organisms per 100 g of oyster meats. The variety of serotypes isolated, coupled with consistent recoveries throughout the year, suggests that salmonellae may represent a portion of the natural background flora in these seafoods rather than recent single source contamination.

Transmission of Light Through Pigmented Polyethylene Milk Bottles, Kurt H. Nelson and William M. Cathcart, Analytical Sciences, Corporate Research Center, International Paper Company, P.O. Box 797, Tuxedo Park, New York 10987

J. Food Prot. 47:346-348

Light transmissions through white and yellow pigmented polyethylene milk bottles were measured in the 350- to 800-nm region. The bottles were opaque below 400 nm. Light transmission at 550 nm was 13 and 17% for the white and yellow pigmented bottles, respectively, compared to 72 and 2% for an unpigmented polyethylene bottle and a paperboard milk carton, respectively. The 400- to 550-nm wavelengths, which apparently are harmful to milk quality, were not entirely blocked by the pigmented bottles. A plastic sleeve for fluorescent tubes in dairy cases was opaque below 385 nm and had 92% transmission in the 440- to 800-nm region.

Impedance Measurements to Detect Bacteriophage Problems in Cheddar Cheesemaking, G. M. Waes and R. B. Bossuyt, Government Station for Research in Dairying, Brusselsesteenweg 370, B9230 Melle, Belgium

J. Food Prot. 47:349-351

A simple method is described to detect, within 2 h, complete failure of the starter due to bacteriophages in the manufacture of Cheddar cheese. This method is based on the observation that about 10^5 disturbing bacteriophages per ml, which cause complete failure of the starter, inhibit the normal impedance decrease brought about by growth of lactic starter bacteria, as recorded in the Bactometer 32 Microbial Monitoring System.

Effect of Storage and Consumer Handling on Staphylococcal Counts of Dried Beef and Dried Fish, A. A. Adesiyun, Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria

J. Food Prot. 47:352-353

Changes in staphylococcal counts of dried beef and dried fish during storage and while exposed to prospective buyers in a Nigerian market were investigated. The mean staphylococcal counts in dried beef and dried fish were 9.9×10^5 and 4.6×10^6 colony-forming units (CFU)/g and the mean aerobic plate counts were 2.0×10^7 and 1.2×10^8 CFU/g, respectively. Over a 28-d storage period at room temperature, the mean staphylococcal count declined about 100-fold for both products, i.e., from 9.9×10^5 to 3.0×10^3 CFU/g in dried beef and 4.6×10^6 to 2.2×10^4 CFU/g in dried fish. The decline in aerobic plate counts were from 2.0×10^7 to 6.5×10^4 CFU/g for dried beef and 1.2×10^8 to 1.4×10^5 CFU/g for dried fish, about a 1000-fold decline. Market samples of both products, though from the same batch but exposed to handling by prospective buyers, consistently showed higher staphylococcal contamination over the study period. Consumption of these products repeatedly exposed to human handling in the market for long periods may be a health hazard, particularly those that are ready-to-eat.

Role of Lactic Acid Bacteria, Curing Salts, Spices and Temperature in Controlling the Growth of *Yersinia enterocolitica*, M. Raccach and E. C. Henningsen, Division of Agriculture, The Food Quality Program, Arizona State University, Tempe, Arizona 85287

J. Food Prot. 47:354-358

Growth of *Yersinia enterocolitica* 0:3 and 0:8 (10^3 CFU/g) in cured meat at 35°C was controlled (inhibition of 3.9 to 4.0 \log_{10} CFU/g) by each one of the lactic acid bacteria (LAB) *Pediococcus pentosaceus*, *Pediococcus acidilactici* and *Lactobacillus plantarum*. The pH of the meat was reduced by LAB to 4.9 to 5.1. At 27°C, growth of *Y. enterocolitica* 0:3 and 0:8 (10^3 CFU/g) in cured meat was almost totally controlled with or without LAB. This inhibition of growth was observed with populations of *Y. enterocolitica* up to 10^6 CFU/g of meat. In plain meat (devoid of any additive) at 27°C, LAB inhibited (by 1.9 to 2.7 \log_{10} CFU/g) the growth of *Y. enterocolitica* 0:3 and 0:8 (10^3 CFU/g). No change in pH of the meat was observed. Sodium chloride (3.0%) and sodium nitrite (156 mg/kg) were also observed to play an important role in the inhibition (2.3 to 3.6 \log_{10} CFU/g) of growth of *Y. enterocolitica* 0:3 and 0:8. Sodium nitrite (156 mg/kg), at a concentration about 200 times lower than that of sodium chloride (3.0%), was as efficient an inhibitor to *Y. enterocolitica* as sodium chloride. Dextrose was slightly inhibitory to *Y. enterocolitica* 0:3 only. Spices, garlic powder and white pepper did not control the growth of either serotype of *Y. enterocolitica*. A temperature of 27°C in combination with either curing salts or LAB played an important role in controlling the growth of *Y. enterocolitica* in meat thus contributing to the safety of the product.

Safety Evaluation of Glucose Isomerase Derived from *Flavobacterium arborescens* and Used in Production of High Fructose Corn Syrup, Michael C. Porter, Ralph E. Hartnagel Jr., Robert L. Kowalski, George R. Clemens, Venkatanaryana Jasty, James J. Bare and George Boguslawski, Department of Toxicology and Biotechnology, Miles Laboratories, Inc., Elkhart, Indiana 46515

J. Food Prot. 47:359-371

Flavobacterium arborescens is a common rod-shaped, gram-negative bacterium which, when cultivated in a nutrient medium, is an efficient source of glucose isomerase (GI). GI is then used in the production of high fructose corn syrup. Studies were conducted to assure product safety and establish GRAS status for GI derived from *F. arborescens*. A viable cell suspension of *F. arborescens* and the cell-free medium in which the organism was cultured were administered i.v. to rats and rabbits. For feeding studies, the cells were immobilized using polycationic polymers and a crosslinking agent (i.e., chitosan, polyethylenimine and glutaraldehyde). GI, in the whole cell immobilized form, was offered at concentrations of 0, 1.5, 3.0 or 5.0% (wt/wt) of the diet to dogs for a minimum of 90 consecutive days and to rats over three generations. Animals were observed daily for signs of toxicosis; body weight and food consumption were monitored; biochemical tests, hematologic determinations, and urinalyses were done on blood and urine samples; and thorough gross and microscopic tissue examinations were performed at terminations. There were no signs of

infection or toxicosis following i.v. administration of *F. arborescens* or the cell-free supernatant fluid. This, and the lack of toxicity in dogs and rats which received daily dietary concentrations of GI many times above the projected highest possible human exposure level, suggest that there should be virtually no risk of toxicity associated with the consumption of food and beverages containing high fructose syrup produced by GI derived from *F. arborescens*.

Recovery of *Campylobacter jejuni* from Fresh and Frozen Meat and Poultry Collected at Slaughter, Norman J. Stern, Stanley S. Green, Nitin Thaker, Douglas J. Krout and Joseph Chiu, Food Safety Inspection Service, U.S. Department of Agriculture, Washington, D.C. 20250

J. Food Prot. 47:372-374

Approximately 800 fresh and frozen meat and poultry samples collected at the point of slaughter were analyzed for *Campylobacter jejuni*. *C. jejuni* and *C. coli* isolates were never discriminated. Isolation levels of *C. jejuni* from fresh tissues were 5-fold higher (12.1%) than those from frozen tissues (2.3%). The prevalence of *C. jejuni* in fresh tissues was also higher when results were compared by animal species rather than by individual tissues.

Increased Sensitization of Shrimp Microflora to Hypochlorite following a Sodium Bisulfite Dip, Maria L. Pyle and John A. Koburger, Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida 32611

J. Food Prot. 47:375-377

Various concentrations of hypochlorite (12.5 to 200 ppm) and sodium bisulfite (0.15 to 2.50%) applied singly and as successive dips were compared for their effect on the microbial flora of shrimp. It was found that sodium bisulfite exhibited antimicrobial activity at all concentrations tested, with a 50% reduction in bacterial numbers at a concentration of 2.5%. Hypochlorite reduced the bacterial load 75% at a concentration of 200 ppm. Under certain conditions a sequential treatment of shrimp with bisulfite, followed by a hypochlorite dip, significantly increased the antimicrobial effectiveness of the hypochlorite. This synergistic effect, however, was not apparent on shrimp following 24 h of iced storage.

Histamine Production by Psychrotrophic *Pseudomonads* Isolated from Tuna Fish, Elliot T. Ryser, Elmer H. Marth and Steve L. Taylor, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 47:378-380

Sixty isolates of psychrotrophic bacteria obtained from raw tuna fish were identified as *Pseudomonas fluorescens*, *Pseudomonas putida* and non-fluorescent *Pseudomonas* sp., and were tested for their ability to produce histamine. Following incubation in modified histidine decarboxylase broth, 28% of *P. putida*, 21% of *P. fluorescens* and 62% of the non-fluorescent *Pseudomonas* sp. isolates produced histamine. The maximum amount of histamine produced by a single isolate was 3.2 mg/100 ml, far below the minimum level of 50 mg/100 g believed necessary to induce symptoms of histamine toxicity.

Comparative Studies of Casein Breakdown in Cheddar Cheese Manufactured from Lactose-Hydrolysed Milk, S. H. Ridha, R. J. M. Crawford and A. Y. Tamime, The West of Scotland Agricultural College, Department of Dairy Technology, Auchincruive, Ayr, KA6 5HW, Scotland, U. K.

J. Food Prot. 47:381-387

Scottish Cheddar cheese (12 trials) was produced from full-fat milk and from the same milk treated with different preparations of β -D-galactosidase. Appreciable hydrolysis of the casein fractions was evident in 6-month old Cheddar cheese using lactose hydrolysing enzyme containing a high level of natural protease. Lactose hydrolysis of milk up to 60% slightly accelerated the ripening process of Cheddar cheese, but greater judge preference of the enzyme-treated cheese was reported by the taste panelists as compared with the control.

Rapid Detection of *Salmonella* in Certified Raw Milk by Using Charge-Modified Filters and Felix-01 Bacteriophage, Dwight C. Hirsh and Lori D. Martin, Department of Veterinary Microbiology and Immunology, School of Veterinary Medicine, University of California, Davis, California 95616

J. Food Prot. 47:388-390

A method is described whereby less than 5 *Salmonella* cells/ml of certified raw milk could be detected within 24 h of sample collection. *Salmonellae* were removed from milk by filtration through electropositive large-pore filters and then eluted into an enrichment broth containing brilliant green dye. Following incubation for 18 h, of 28 strains of *Salmonella* tested (7 serotypes represented) all but one (a strain of *Salmonella dublin*) grew to detectable numbers. *Salmonellae* were detected following growth in the enrichment broth by using the salmonella-specific Felix-01 bacteriophage. This bacteriophage produced lacunae within 6 h on lawns of salmonellae grown in the enrichment broth containing brilliant green dye.

Preincubation Test to Rapidly Identify Post-Pasteurization Contamination in Milk and Single Cream, J. D. Phillips, M. W. Griffiths and D. D. Muir, Department of Milk Utilization, Hannah Research Institute, Ayr, Scotland KA6 5HL, U. K.

J. Food Prot. 47:391-393

A test involving preincubation of samples at 21°C for 25 h in the presence of a mixture of nisin:penicillin:crystal violet to prevent growth of gram-positive organisms was used to identify post-pasteurization contamination of milk and single cream. This test (P-INC test) could successfully predict the level of contamination after storage at 6°C for 7 d in 85% of milk samples and 86.1% of cream samples studied. A *Bacillus* sp. which was resistant to the inhibitors used in the test was isolated from only cream samples. However, growth of this organism did not significantly affect accuracy of the test.

Comparison of Brands of Media for Isolating Bacteria from Poultry, Beef and Shrimp, H. S. Lillard, N. A. Cox, J. S. Bailey and J. E. Thomson, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 47:394-397

Five brands of media (BBL, Difco, Gibco, Oxoid and Scott) were evaluated for enumerating microorganisms by the aerobic plate count and by *Enterobacteriaceae*, *Escherichia coli*, and coliform counts, and for determining *Salmonella* incidence. Microbiological evaluations were done on raw chickens, raw beef and raw shrimp, except that *Salmonella* incidence was not determined on shrimp samples. There were statistically significant differences in total plate counts (with chicken, beef and shrimp), *Enterobacteriaceae* counts (with shrimp) coliforms (with chicken) and *E. coli* counts (with chicken) by the five brands of media, but these differences were too small to be of practical significance. It was concluded that no differences of practical significance were found among the five brands of media.

Effect of Water Uptake by Poultry Tissues on Contamination by Bacteria During Immersion in Bacterial Suspensions, C. J. Thomas and T. A. McMeekin, Department of Agricultural Science, University of Tasmania, GPO Box 252C, Hobart, Tasmania, Australia 7001

J. Food Prot. 47:398-402

Effects of water-induced changes in poultry tissue microtopography on numbers of bacteria retained by pieces of tissue immersed in saline suspensions of test organisms were examined. Skin and muscle fascia, not previously exposed to water, retained more bacteria following extended dips in these suspensions compared to a control 15-s dip. Nonmotile bacteria were retained equally as well as motile test strains. Scanning electron microscopy revealed significant changes in tissue microtopography occurred during the course of the immersion experiments. Also shown by this technique was bacteria neither attached nor accumulated at any specific site on the surface of the tissue sample examined under the experimental conditions used. These results suggested contamination of poultry tissues by bacteria during immersion in aqueous fluids, was related to changes in tissue microtopography.

Applications of Descriptive Analysis, M. Gillette, McCormick & Co., Inc., Corporate Research & Development Laboratories, 202 Wright Avenue, Hunt Valley, Maryland 21031

J. Food Prot. 47:403-409

Descriptive Analysis is a method of sensory evaluation that identifies, describes and quantitates the sensory attributes of a

product. Descriptive Analysis is a valuable tool for providing information on appearance, aroma, flavor and/or texture of food products, and is used effectively for product and process development, shelf life studies, product improvement, quality assurance and control, and sensory-objective correlations in the food and flavor industry. Each application is discussed with examples.

Measuring Flavor Changes with Vapor Sampling and GLC Analysis, R. Bassette, Department of Animal Sciences and Industry, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 47:410-413

A review of headspace gas chromatographic analysis including its use in qualitative and quantitative analysis, and some sources of errors and limitations of this method is presented. Special emphasis is given to combining headspace gas sampling with salting-out procedures to enrich vapors, steam distillation coupled with headspace gas chromatographic analysis, and subtractive techniques for identification.



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

May 21-23, PREVENTIVE SANITATION AND FOOD & DRUG COMPLIANCE WORKSHOP including EPA/FIFRA and Pesticide Updates seminar to be held in St. Louis, MO, Holiday Inn - Riverfront by the Huge Company, Inc. and its division, the American Sanitation Institute. For more information call 800-325-3371. In Missouri call 800-392-0855 or 314-725-2555.

May 27-30, THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY'S 27TH ANNUAL CONFERENCE. Hyatt Regency Vancouver Hotel, 655 Burrard St., Vancouver, B.C. 604-687-6543. For more information contact: Jerry Hedding, Publicity Chairman, Qwest Food Ltd., 260 E. 5th Ave., Vancouver, B.C. V5T 1H3. 604-873-2647.

June 3-6, BBEX (British Baker International Baking Exhibition). At the Conference and Exhibition Centre, Harrogate, England. For more information contact: Tom Webb, British Trade Development Office, 212-593-2258.

June 10-14, 50th ANNUAL EDUCATIONAL CONFERENCE of the Canadian Institute of Public Health Inspectors. For more information contact: J. Dunlop, CPHI (C), 1984 National Educational Conference Committee, Canadian Institute of Public Health Inspectors, 444 Sixth St., N.E., Medicine Hat, Alberta, Canada T1A 5P1.

June 11-12, TEXAS ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS ANNUAL MEETING. For more information contact: Ron Richter, Animal Science Department, Texas A&M University, College Station, TX 77843.

June 11-13, TECHNICAL SESSIONS AND EXHIBITS, Association of Official Analytical Chemists, Leamington Hotel, Minneapolis, MN. For more information contact: Raymond H. Bowers, General Mills, Inc., 9000 Plymouth Ave. N., Minneapolis, MN 55427.

June 24-27, 30th ANNUAL FANCY FOOD & CONFECTION SHOW, Washington, D.C. For more information contact: Dennis Raveneau, Show Manager, International Fancy Food & Confection Show, PO Box 3833, Stamford, CT 06905. 203-964-0000.

June 24-27, NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION'S ANNUAL EDUCATIONAL CONFERENCE to be held in Grand Rapids, MI. For more information contact: NEHA, 1200 Lincoln, #704 Denver, CO 80203. 303-861-9090.

July 14-21, WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY, at Kansas State University, Manhattan, KS. Dr. Daniel Fung, Dr. Nelson A. Cox and Dr. Millicent C.

Goldschmidt will present lectures. The course will carry 7.2 Continuing Education Credits for the American Society for Microbiology. For more information contact: Dr. Daniel Fung, Call Hall, Kansas State University, Manhattan, KS 66506. 913-532-5654.

July 29-August 2, 24TH ANNUAL MEETING OF THE HOSPITAL, INSTITUTION AND EDUCATIONAL FOOD SERVICE SOCIETY (HIEFSS), at the Riviera Hotel and Convention Center in Las Vegas, Nevada. The HIEFSS Expo '84 will be open on July 31 and August 1. For more information contact: Carolyn Isch, Asst. Exec. Dir., HIEFSS 4410 W. Roosevelt Rd., Hillside, IL 60162. 800-323-1908 or 312-440-2770.

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

August 6-10, BIOTECHNOLOGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND INGREDIENTS, a Massachusetts Institute of Technology one week course. For more information contact: Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

September 12-13, The FIFTH ANNUAL JOINT EDUCATIONAL CONFERENCE of the Wisconsin Association of Milk and Food Sanitarians, the Wisconsin Environmental Health Association, The Wisconsin Dairy Technology Society and the Wisconsin Association of Dairy Plant Field Representatives will be held at the Elizabeth Inn at Plover (Stevens Point), Wisconsin. *Please note that this is a change of location.* For more information contact: Ron Buege, West Allis Health Department, 7120 West National Ave., West Allis, WI 53214. 414-476-3770.

September 15-21, 68th ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, Prague, Czechoslovakia. For more information contact: Harold Wainess, Secretary U. S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

September 20-21, MINNESOTA SANITARIANS ASSOCIATION, INC. ANNUAL MEETING to be held at the Earl Brown Center for Continuing Education on the St. Paul Campus of the University of Minnesota. For more information contact: C. B. Schneider, President, Minnesota Sanitarians Association, Inc. 612-623-5335.

September 30-October 4, 69TH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS to be held at the Hyatt Regency and Amfac Hotels in Min-

neapolis, MN. For more information contact: Raymond J. Tarleton, AACC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121. 612-454-7250.

October 9-10, DAIRY INDUSTRY CONFERENCE, Hyatt/Long Beach, Long Beach, CA. For more information contact: John C. Bruhn or Shirley Rexroat, Dept. of Food Science & Technology, University of California, Davis, CA 95616. 916-752-2191.

October 14-17, LONDON INTERNATIONAL FROZEN FOOD TRADE FAIR. For more information contact: Sandra Paul, 212-752-8400.

October 15-17, ISSUES IN SENSORY EVALUATION - STABILITY AND QUALITY CONTROL - Palo Alto, California. Attendance is limited and there is a fee. For more information and registration contact: Tragon Corporation, 750 Welch Road, Suite 210, Palo Alto, CA 94304.

October 19-25, FOOD SANITATION INSTITUTE 27TH ANNUAL NATIONAL EDUCATIONAL CONFERENCE & EXPOSITION, Holiday Inn Surfside, Clearwater Beach, FL. For more information contact: Jean M. Day, Executive Director, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

November 22-24, 14TH ANNUAL SYMPOSIUM ON THE ANALYTICAL CHEMISTRY OF POLLUTANTS, 3rd International Congress on Analytical Techniques on Environmental Chemistry-Expoquimia, Barcelona, Spain. For more information contact: Av. Reina Ma. Christina Palacio No. 1, Barcelona-4 Spain.

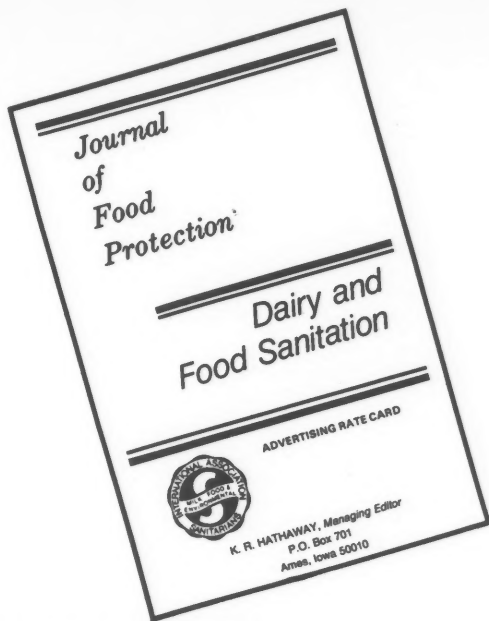
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May 20-23, FOODANZA '85, joint convention of the Australian and New Zealand Institutes of Food Science and Technology. To be held at the University of Canterbury, Christchurch, New Zealand. For more information contact: D. R. Hayes, Convention Secretary, 394-410 Blenheim Road, PO Box 6010, Christchurch, New Zealand.

August 25-30, 9TH SYMPOSIUM OF WAVFH. The World Association of Veterinary Food Hygienists (WAVFH) will hold their 9th Symposium in Budapest, Hungary. For more information contact: 9th WAVFH Symposium, Organizing Committee, Mester u. 81, H-1453 Budapest Pf 13, Hungary.

1986

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



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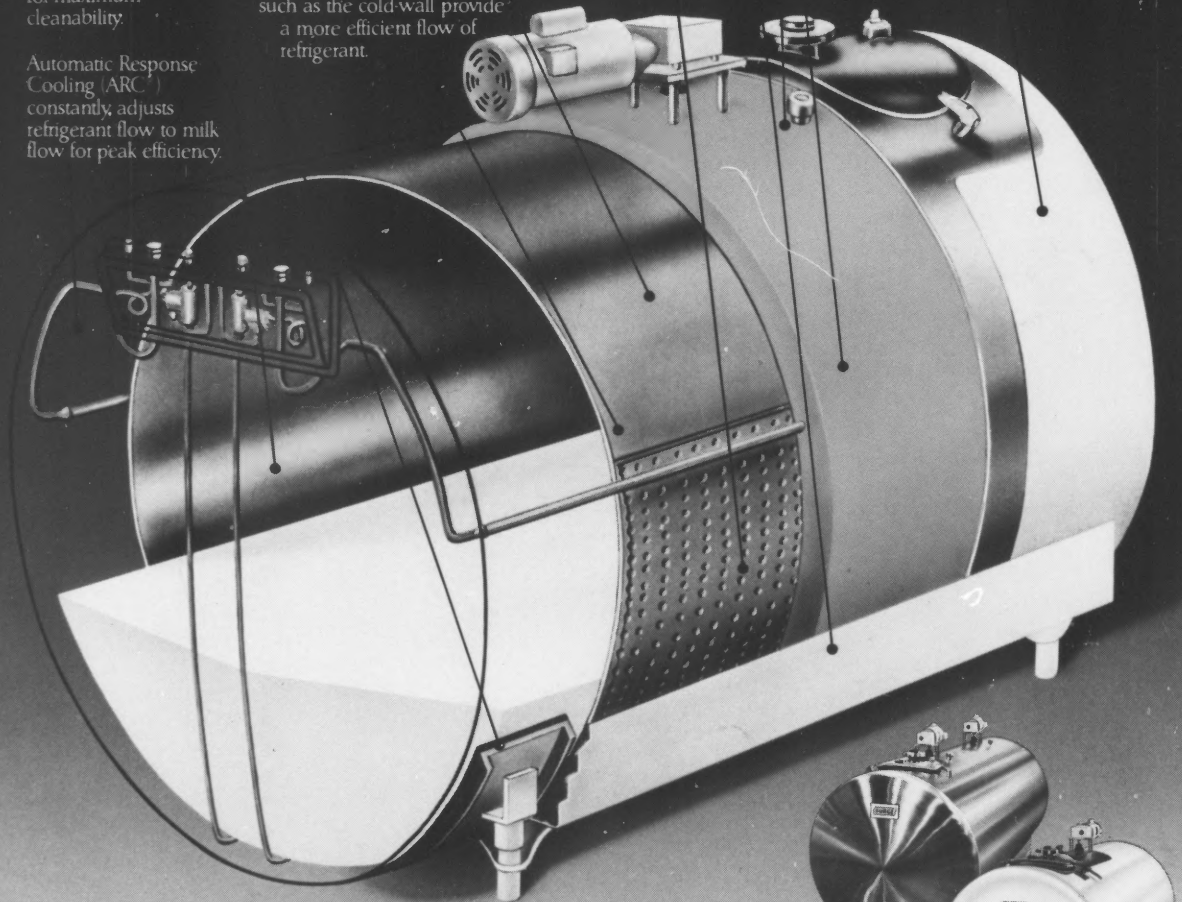
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