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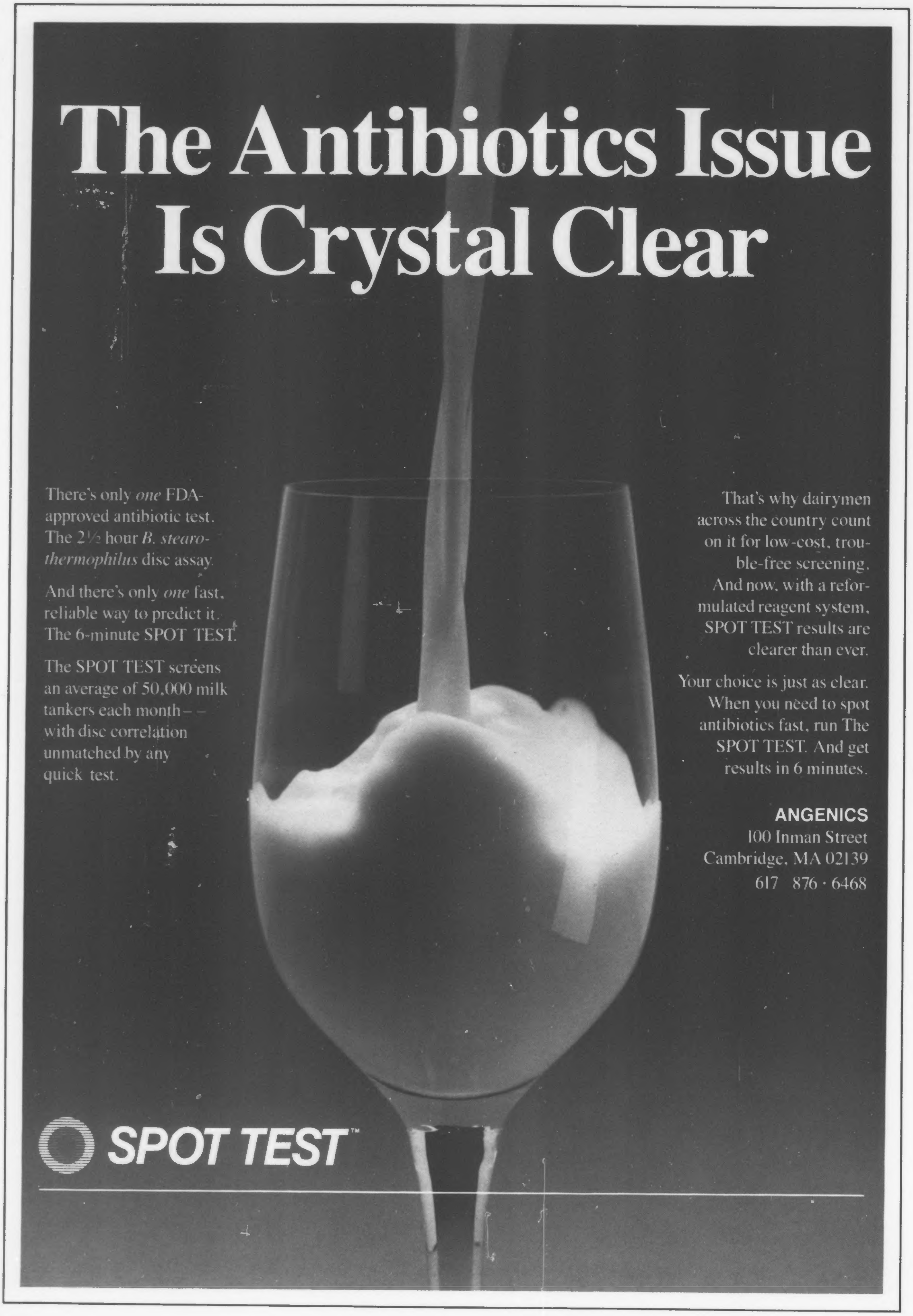
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Dairy and Food Sanitation

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Dairy and Food Sanitation, Vol. 7, No. 9, Pages 452-457 (September 1987)

Radioactivity and its Measurement in Foodstuffs

by Dr. Timothy Twomey
and staff at EG & G ORTEC
100 Midland Rd.
Oak Ridge, TN 37831-0895

Where does radioactivity in food come from?

Radioactivity is, and always has been, present in all foodstuffs to some extent. Only lately, as a consequence of the Chernobyl accident, has public awareness to this been awakened.

There are four possible sources of radioactivity in foodstuffs: one natural and three artificial.

1. **Natural Radioactivity** Potassium is an essential constituent of all cellular tissue, one isotope of which, potassium-40 (^{40}K), is naturally radioactive. Most foodstuffs also contains small quantities of uranium, thorium, and their daughter products. Thus, some irradiation of the body following food intake is inevitable.
2. **Industrial Radioactivity** Effluent and discharges from nuclear power and separation plants, fossil fuel power plants, laboratories, and even hospitals contribute small quantities of radioactivity to the environment which can, in principle, contaminate food.
3. **Weapons Testing** Debris from the atmospheric weapons tests - particularly in the 1960s - caused relatively major contamination of crops and other foodstuffs. Even today some residual activity from these tests can be measured in soil and plants. The cumulative activity from these tests was much greater than that released by Chernobyl.
4. **Accidents Involving Radioactivity** Two obvious examples are the Windscale accident of 1957 when there was much local contamination of herbage and milk, and the Chernobyl reactor fire, in 1986, which has resulted in widespread, but variable, contamination of foodstuffs in Europe and South West Asia.

(The sterilization of foodstuffs by irradiation induces no detectable activity in food.)

How does artificial radioactivity get into food?

Airborne radioactivity can deposit directly onto the ground or be washed out by rain. Thus, both vegetation and soil can be contaminated. Deposited material may become quite strongly attached to leaves and possibly transferred throughout the plant by foliar uptake. In the longer term, activity can be transferred to herbage via root uptake from the soil. Plants will naturally take up trace elements - particularly if they are metabolically essential - and their radioactive isotopes, if present and chemically available, will naturally follow. In addition, contaminated soil may adhere to the plant.

Vegetation, either as fresh food or silage, transfers activity to animals. The subsequent concentration of radioactivity in animal meat depends particularly on the ground grazed. Lactating animals produce radioactive milk. There may be some concentration down this food chain (biomagnification).

Milk products (dried milk, whey, etc.) will contain higher concentrations of activity simply because of moisture removal. There are numerous foodstuffs sold containing mixtures of milk powders and cereals.

Any foodstuffs which are "concentrated" (e.g., fruit juices) will naturally concentrate the activity also.

Oddly enough, tobacco is considered a foodstuff from the point of view of contamination.

Figure 1 provides a graphic representation of the primary mechanisms by which radioactivity enters the food chain.

What isotopes are found in food and at what level?

The most significant and abundant activity in foods following the Chernobyl and Windscale accidents were isotopes and cesium. Iodine-131(^{131}I) has a half-life of only 8 days but nevertheless, entering the grass-cow-milk foodchain it is of great concern in the first days following most nuclear accidents involving operating reactors. In the United Kingdom following Chernobyl, ^{131}I in cow's milk was commonly 50 becquerels/liter (Bq/l) rising to 500 Bq/l in areas of high rainfall. In goat's and ewe's milk levels well in excess of 1000 Bq/l were reported. These animals graze a relatively larger area than cattle.

Another shorter lived isotope, ^{132}I, was also present, but this is of far less significance than ^{131}I.

Cesium activity is important because of its long-lived isotopes that are persistently retained in the top surface of soil. ^{137}Cs (half-life 30 years) has been readily detectable in man and in many foodstuffs during and since weapons testing. Even in early 1986 environmental measurements of fallout cesium could still be made.

^{137}Cs was the major long-lived activity observed in northwest England following the Windscale fire, and it

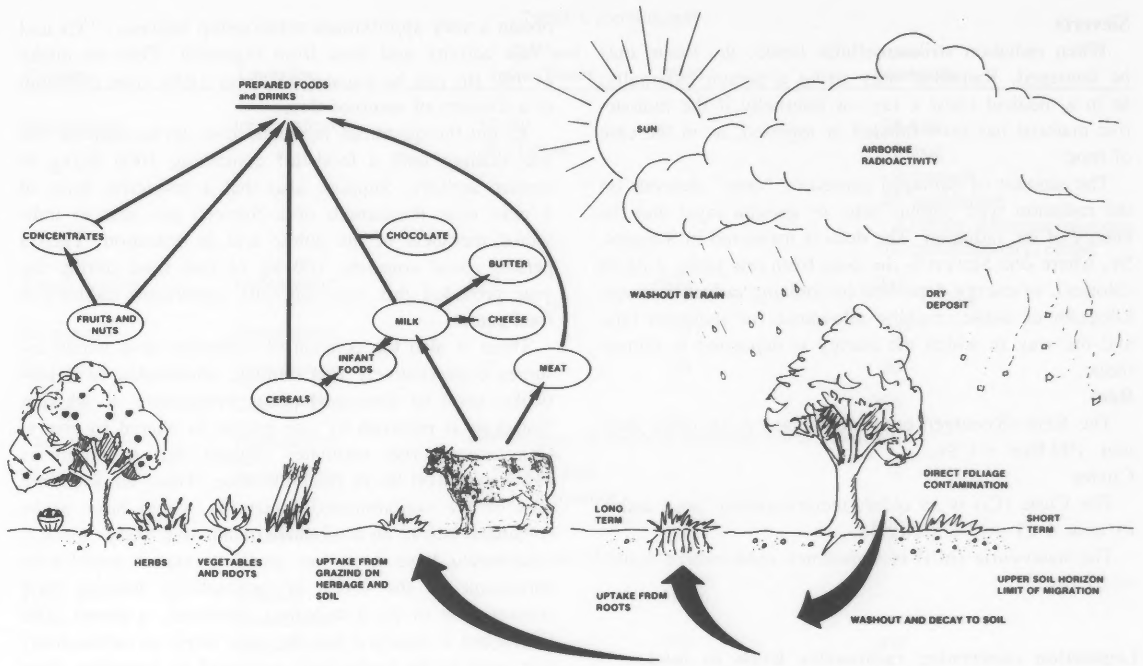

Fig. 1. Routes of Radioactivity to Foodstuffs.

could be detected in milk and milk products for a considerable time later. After the Chernobyl accident, ^{137}Cs contaminated foodstuffs widely in the northern hemisphere and has been the prime nuclide under consideration for legislation controlling the distribution and consumption of food. A second cesium isotope, ^{134}Cs (half-life 2.3 years), has also played a prominent role in activity from Chernobyl.

Cesium activity levels in food following Chernobyl have commonly been tens or even hundreds of Bq/kg. In exceptional cases over a thousand Bq/kg were recorded on some crops such as grain, nuts, and leafy herbs from eastern Europe while high levels in some concentrated milk products have been general. The activity present in lamb meat received much publicity. Recently West German officials discovered 150 railroad cars full of radioactive powdered milk, clearly a legacy of Chernobyl. The radiation came from the grass Bavarian cows grazed on in alpine pastures contaminated by fallout of cesium isotopes. Bremen, Germany health officials said tests showed radiation levels of nearly 6,000 Bq/kg of the powdered milk. That is well above the European Community's maximum permitted level of 370 Bq for milk and dairy products for human concumption and 1,850 Bq for animal feed.

Other activity has been reported from foodstuffs following Chernobyl. Two isotopes of ruthenium (^{103}Ru and ^{106}Ru) have been seen while a silver isotope (^{110}Ag) has been noted in products capable of concentrating this element (e.g., animal liver and mushroom).

Natural potassium activity (^{40}K) is present in virtually all foodstuffs as an essential constituent of cellular material. Typical levels in foodstuffs vary from a few tens of Bq to several hundred Bq/kg in meat, dried milk, and nut kernels.

Small quantities of uranium, and their daughter products are present in foods. A biological quirk raises the level of the radium daughters of uranium and thorium in Brazil nuts to over 50 Bq/kg, but this level is quite low and radium is in an insoluble form.

Half-Life, Becquerels, Sieverts, Rems, and Curies - what do they all mean?

Half-Life

The activity, or rate, of nuclear disintegration of a radioactive source is proportional to the amount that is present. As it decays, there is less left to decay and so the activity decreases. The half-life is the time over which the activity decreases to 50% of its original value. Half-lives vary from seconds to thousands of years. Long half-life nuclides are more of a problem than short half-life emitter.

Becquerels

The Becquerel is an activity of one disintegration per second. It is usual to express specific sample activities in Becquerels per kilogram (Bq/kg) or Becquerels per liter (Bq/l).

Sieverts

When radiation strikes cellular tissue, the tissue may be damaged. Radiation may strike a person externally, as in a medical chest x ray, or internally if the radioactive material has been inhaled or ingested, as in the case of food.

The amount of damaged caused or "dose" depends on the radiation type (alpha, beta, or gamma rays) and the energy of the radiation. The dose is measured in Sieverts, Sv, where one Sievert is the dose from one joule, J (0.24 calories), of energy deposited by ionizing radiation in one kilogram of tissue, making allowance for radiation type and the way in which the energy is deposited in human tissue.

Rem

The Rem (Roentgen equivalent man) is an older dose unit. 100 Ren = 1 Sv.

Curies

The Curie (Ci) is an older, inconveniently large activity unit. 1 Ci = 3.7×10^{10} Bq.

The nano-curie (nCi) is sometimes used, where 1 nCi = 37 Bq.

Legislation concerning radioactive levels in food.

Governments are concerned about limiting radiation doses to populations and have introduced regulations to prevent the distribution of food which exceeds levels of contamination regarded by the Government concerned as significantly detrimental.

The relationship between activity of material ingested and consequent dose is extremely complicated, depending on the biochemical behavior of the element concerned in the body, its chemical form, and the nuclear properties of the active isotope. Cesium however, exhibits very straightforward chemical properties, and it is possible to obtain a very approximate relationship between ^{137}Cs and ^{134}Cs activity and dose from ingestion. Thus an intake of 100 Bq can be equated to about 1μSv (one millionth of a Sievert) of received dose.

To put the quantities in perspective, let us suppose one was dealing with a foodstuff containing 1000 Bq/kg of cesium activity. Suppose also that a restrictive limit of 1 mSv (one thousandth of a Sievert) per year to individual members of the public was in operation. Then a person could consume 100 kg of that food during the year provided this was the only significant radioactive food eaten.

There is also the concept of collective dose which assumes conservatively that damage attributable to a particular level of dose will occur irrespective of whether that dose is received by one person or shared by many. Conventional risk estimates suggest that a fatality is likely with 100 Sv of radiation dose. Thus, ten thousand tons of the contaminated foodstuffs would have to be consumed before an attributable death was likely.

It would have been too much to expect world-wide agreement on the levels of radioactivity limiting food consumption or its distribution. However, a month after Chernobyl it emerged that the only forms of radioactivity that were to be particularly subjected to limitation were isotopes of iodine and cesium. By this tme, virtualy all iodine had decayed! However, the cesium isotopes concerned were - and still are:

Cesium 137 Half-life 30 years

Cesium 134 Half-life 2.3 years

(At the time of the Chernobyl accident the ratio of these two isotopes distributed across Europe was approximately 2:1.)

Variations of proposed limits in different countries arose partly from differing eating habits, but chiefly from differing perceptions of risk. Table 1 shows examples of

Table 1. Examples of Differing Limits Reported Following Chernobyl. (^{137}Cs and ^{134}Cs) in Foodstuffs (Bq/kg)

(Please note that while every effort has been made to cross-check the accuracy of these figures, EG&G ORTEC can take no responsibility for their accuracy.)

Country	Limitation	Milk and Infant Foods	Meat	Other Foodstuffs
Austria	Consumption	185	—	600
		11.1 (infants)	185 and 600	
Canada	Importation	78		
EEC	Importation	370	600	600
Hong Kong	Importation	370	600	600
Iran	Importation	20		
Kuwait	Importation	143	93	93
Malaysia	Importation	180	540	180 252 cereals 324 fruit/vegetables

Table 1 (continued)

Country	Limitation	Milk and Infant Foods	Meat	Other Foodstuffs
Philippines	Importation	15-22 33 cheese		28 fish 8 fruit 6 cereals 22 vegetables 2 honey, dextrose/glucose 22 confectionary/coffee
Saudi Arabia	Importation	370	600	600
Singapore	Importation	0*	0*	0*
Sri Lanka	Importation	20	20	. 20
Sweden	Consumption			300
Taiwan	Importation	Certification of imports required; limits unknown		
Thailand	Importation	7 liquid milk 20 milk powder	—	6
Tunisia	Importation	100 Certification of imports required	500	500
UK	Internal Distribution	—	1000	—
	Importation	370	600	600
USA	Consumption	370	370	370
USSR				60

*The Singapore limits have been said to be interpreted as 10 Bq/kg. Singapore also requires the same limits on ^{131}I and ^{90}Sr.

different limits reported to have been in operation (though not necessarily currently).

Austria and Malaysia both take note of the relative consumption of foodstuffs. Such is not yet the case generally, and a 600 Bq/kg ban is imposed by the EEC on any foodstuff whether it be grain for bread or bay leaves for flavoring.

Most countries monitor imported food and reject consignments exceeding regulation limits. Some countries (e.g., Malaysia) require a certificate of actual activity level to accompany the consignment.

The restrictions are a serious matter for food exporters, particularly when dealing with such low - almost impossible - limits imposed as in Singapore. In October 1986, there were still certain foodstuffs on the market with activity levels exceeding any limits shown in Table 1.

Problems must arise from food concentration. For example, a quantity of fresh milk may be well inside the regulatory limit. However, when dried and converted to milk powder having only 10% of the liquid, it may then exceed the limit even though the total quantity of activity has not increased.

How can food suppliers measure radioactivity?

The majority of significant radioactivity likely to be encountered in foostuffs emits penetratig gamma radiation. It happens that the energies of the gamma rays are always characteristic of the radioisotope concerned. Thus, if a device is available which measures not only the quantity of activity but the gamma-ray energy of each component in a sample of foodstuffs, then a measure of each radioisotope in the sample can be made. Such a device is a *gamma-ray spectrometer*.

(It is a commonly held belief that a hand-held monitor of the Geiger counter type can be used. This is not so. At these low levels, more sophisticated instruments are required.) A lead shield is also required to screen out (as much as possible) other radiations external to the sample itself. This implies that while a mobile laboratory can be constructed in a truck, it is not possible to build a lightweight portable or backpack type instrument.

Figure 2 is a block diagram showing the components of a gamma-ray spectrometry system.

The system generates a pulse-height spectrum that represents the true energy distribution of radiations striking the detector and can be used to determine the gamma-emitting components of the foodstuffs. The spectrum is displayed on a screen (usually a VDU attached to a computer) as a histogram, and computer software analyzes the distribution, automatically displaying (or printing) the estimated quantity of each isotope within the foodstuff.

Two detector types are available. The first is a sodium iodide scintillation detector system (NaI) that is efficient, robust, and relatively inexpensive. However, its discriminatory powers are limited.

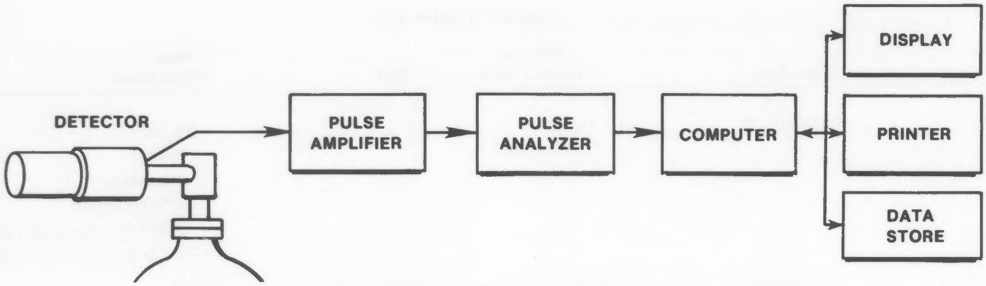

Fig. 2. Block Diagram of a Gamma-Ray Spectrometry System.

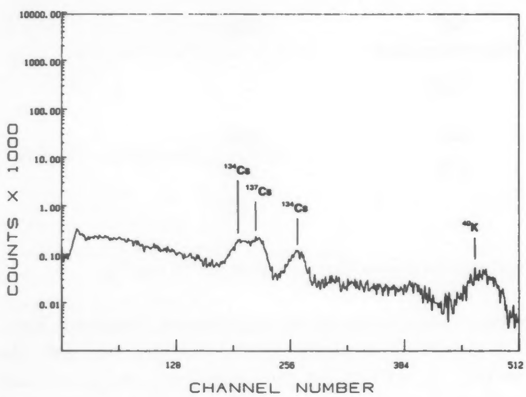

Fig. 3. NaI Detector Pulse Height Spectrum.

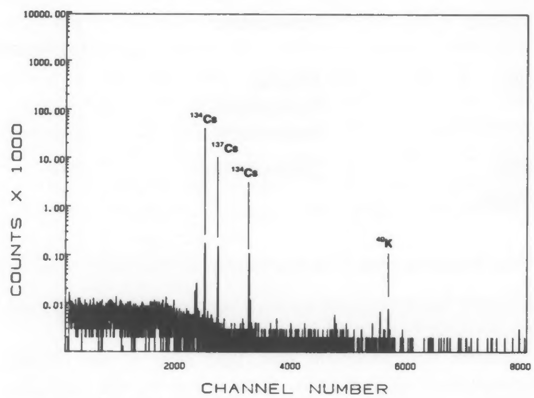

Fig. 4. Germanium Detector Pulse Height Spectrum.

Two detector types are available. The first is a sodium iodide scintillation detector system (NaI) that is efficient, robust, and relatively inexpensive. However, its discriminatory powers are limited.

Figure 3 shows a peak from the natural ^{40}K that is well separated from the cesium isotope. However, the peaks from ^{137}Cs and ^{134}Cs overlap, making it difficult to determine these isotopes separately.

A more sophisticated detector is a solid-state high purity germanium detector system (HPGe). This system is more expensive and requires a higher degree of technical skill to operate. However, it exhibits remarkable discriminatory power and can distinguish hundreds of different gamma-ray energies in one spectrum.

Figure 4 shows the spectrum from a food sample demonstrating not only the well-separated cesium peaks, but a tiny amount of radium.

There are some additional points to consider.

To measure a large food sample as efficiently as possible, the material is contained in a re-entrant vessel (i.e., a Marinelli beaker) which surrounds the detector as much as possible (Fig. 5).

Standard isotopes should be provided to obtain calibration data. These standards should be traceable to a recognized calibration facility, such as Amersham or NBS, to demonstrate to the legislating authority the accuracy of the measurements.

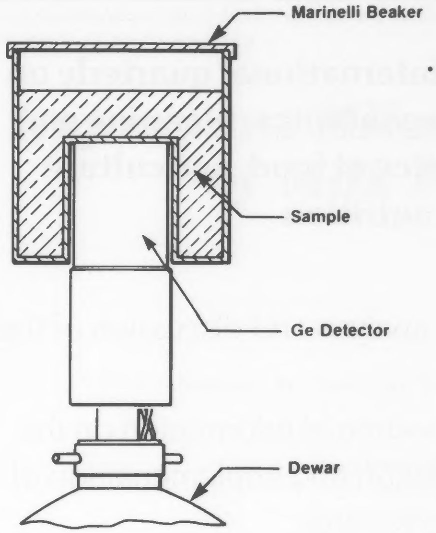

Fig. 5. Marinelli Beaker.

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What is the Future?

Now that the disaster at Chernobyl has occurred, there will be no turning back. Public awareness and concern about the impact of radioactive contamination has reached a high level whch will doubtless lead to new regulations concerning the import, export, and manufacture of foodstuffs in many countries. The food industry can be prepared by the acquisition of the necessary equipment and skills to perform the measurements required.

Dairy and Food Sanitation, Vol. 7, No. 9, Pages 459-462 (September 1987)

Important Milestones in the History of Milk Pasteurization

by

Kathleen M. Knutson, Elmer H. Marth[1] and Mary K. Wagner

Department of Food Science and
The Food Research Institute
The University of Wisconsin-Madison
Madison, Wisconsin 53706

The technical term "pasteurization" honors the work of Louis Pasteur. Today, "pasteurization" is commonly used to describe any heating process employing a temperature below 100°C (6). The main purpose of pasteurizing milk is to kill the most heat-resistant, vegetative, pathogenic microorganisms; also, pasteurization has the added benefit of killing about 99% of the spoilage microorganisms.

The origin of milk pasteurization has been discussed by Rosenau (22), Hammer and Babel (16) and Ayres et al. (5). Table 1 lists some of the important events in the development of milk pasteurization. The history starts in 1782 when Scheele heated vinegar to prevent its spoilage. Then, in 1810 Appert preserved foods, including milk, in closed containers. His work signified the beginning of canning. The work done by Louis Pasteur by the year 1864 is most significant, however, because for the first time, studies were based on the knowledge of the presence of microorganisms and their role in food spoilage. Pasteur heated wine above 50°C to prevent acetic acid bacteria from souring the wine. Later he used the heating process to prevent spoilage of beer.

EVENTS LEADING TO PASTEURIZATION OF MILK

Before the time of pasteurization, milk was distributed directly from producer to consumer. The farmer brought milk to his neighbors, after collecting the day's production in a container called a dip-tank. In describing these tanks, Rosenau (22) said, "Dip-tanks are objectionable because they often are in unsanitary condition and in surroundings that make it difficult to keep them clean. In dipping out the milk, some of it runs back over the hands or pitcher into the tank; in other ways infection and dirt are apt to be introduced." Next, distribution of milk occurred through the corner grocery store, where dip-tanks were common until about 1912.

As cities grew, the distance between producer and consumer increased, and it became necessary to transport milk over greater distances. The first shipment of milk into New York City by rail occurred in 1835. Positions for middlemen had been created; they commingled the milk from many producers into a common tank. In this way, contaminated milk from one producer was distributed to a larger group of consumers than before, and the hazard for widespread disease outbreaks was increased.

The most common disease of the time, attributed to milk, was typhoid fever. The first recorded outbreak in the United States occurred in 1882 at Allegheny City, Pennsylvania (20). Outbreaks of septic sore throat, scarlet fever and diphtheria also were associated with consumption of contaminated milk. Infant mortality was a major concern. Acute gastrointestinal disease was the main cause of infant death. This disease was most prevalent during the summer and thus was termed "summer complaint". It was shown that deaths from gastrointestinal disease remained constant throughout the year for breast-fed infants, and that mortality of bottle-fed infants accounted for the increase during the summer. It is implied that the raw milk used for bottle feeding was the source of pathogens causing the gastrointestinal diseases. At that time, the New York Health Department estimated that bottle-fed infants accounted for 85% of all infant deaths.

The need to heat milk to be consumed by infants was realized by the European chemist, Soxlet. In 1886, he systematized and popularized the heating of milk for infant use by developing special bottles, seals and an apparatus in which milk was heated near boiling for a brief period. Soxlet believed his process sterilized the milk, but later it was realized that the milk contained spores which survived the heating process.

Pasteurization of milk was first implemented by Fjord in Denmark in 1870. In the United States, sporadic attempts to pasteurize milk started in 1878. In 1889, Dr. Abraham Jacobi of New York City advocated the heating of milk for infant use. Heating of Milk was first addressed in American literature in the *Archives of Pediatrics* by Jacobi who made reference to Soxlet's apparatus for this purpose. In 1893, Nathan Straus set up the first facility to pasteurize milk for infants, and it was located in New York City (23). During 1898 at Randall's Island Hospital for Children in New York City, infant mortality was reduced from 42 to 20% with the exclusive use of pasteurized milk for that one year.

The recognized need for quality milk continued. In 1893, Dr. H.L. Coit persuaded the State Medical Society of New Jersey to appoint the Essex County Medical Milk Commission. Stephen Francisco's dairy became the first to be certified when he agreed to produce milk under the supervision of the commission. "Certified milk", the name later was copyrighted by Francisco, was for use by infants and sick-room patients.

Across the country 12 other commissions were appointed by their respective county medical societies. On June 3, 1907, the commissions joined to form the American Association of Medical Milk Commissions (AAMMC). A year later, milk producers formed the Certified Milk Producer's Association of America (CMPAA). Personnel of a medical milk commission included the chairman, secretary-treasurer, veterinarian, bacteriologist, chemist, clinician and sanitarian specializing in dairying. To insure that the principles of the commission would best be upheld, no money was earned by any member, i.e. services were voluntary. The objectives of the commission were to set standards for sanitary inspection of dairy employees, including thorough weekly examinations by a physician; for monthly veterinary inspection of herds, to include a semi-annual tuberculin test; and for bacteriological and chemical examinations of milk. Specifications were written for bottling procedures, equipment, water and feed. Milk was to be cooled to below 7.2°C (45°F) until brought to the consumer. Milkfat was to be at 4% and the bacterial count, checked once a week, could not exceed 10,000 per ml. Both demand for and cost of certified milk were high. In 1926, certified milk represented 2% of the milk sold in the marketplace, and it boasted a record of only two outbreaks of disease (17).

PASTEURIZATION OF MILK

While maintaining the ideal that all milk should be produced under the most sanitary conditions, such as certified milk was, even the AAMMC recognized the need to properly pasteurize milk that was not certified. Pasteurization procedures and ordinances were developed to provide an alternative form of quality milk.

There were two major concerns with the heating of milk. One, if the milk was heated too long and/or too high a temperature, the cream line would be less distinct. This was reportedly seen when milk was heated at 70.0-72.2°C (158-162°F) for 1.5 to 4 min (11). The second concern was related to bacteriological quality. Since pathogens were to be killed, numerous studies were done to determine specifically when *Bacillus tuberculosis* (later renamed *Mycobacterium tuberculosis)* would be killed in the milk since it was thought to be the most heat-resistant nonsporeforming pathogen likely to occur in milk. Variations in data were common and attributed to major differences between equipment. Also, *M. tuberculosis*was believed to survive in the pellicle that formed on milk during heating. By 1924, it was accepted that holding the milk at 60.0° C (140°F) for 15 min would kill *M. tuberculosis*. To provide a margin of safety in the pasteurization process, the temperature was raised to 61.1-62.8°C (142-145°F) and the time was doubled to 30 min.

Thermal inactivation studies done later on the pathogen *Coxiella burnetii* provided that the heat process adequate to destroy *M. tuberculosis* was not sufficient to destroy the more heat-resistance *C. burnetii* (9). Hence, on July 19, 1956 (24) the temperature for low-temperature long-time (LTLT) pasteurization was raised from 61.7°C (143°F) to 62.8°C (145°F), and that for high-temperature short-time (HTST) pasteurization was raised from 71.3°C to 71.5°C (161°F). The time for LTLT and HTST pasteurization of 30 min and 15 s, respectively, remained the same.

In addition to developing the procedure of pasteurization, there was a strong movement by health officials to pass ordinances requiring milk to be pasteurized and to standarize the milk grading system. In 1918, the *American Journal of Public Health* published a report on milk standards prepared by a committee of the American Public Health Association. The committee advised use of a grading system employing the first three letters of the alphabet. Grade A milk was to be either raw milk, with standards similar to those for certified milk, or pasteurized milk that before pasteurization had a bacterial count not exceeding 200,000 per ml, and at the time of delivery to the customer had a bacterial count no greater than 10,000 per ml. Grade B milk was recommended to be pasteurized milk that at no time before pasteurization had a bacterial count greater than 1,000,000 per ml, and at the time of delivery to the customer had a bacterial count not greater than 50,000 per ml. Grade C milk would have been allowed to have an initial bacterial count in excess of 1,000,000 per ml. The count after pasteurization and at delivery would not have exceeded 50,000 per ml and the milk would have been restricted for use in cooking or manufacturing. All grades of milk would have come from cows free from disease.

The first Federal milk ordinance was written in 1924. In 1926, a uniform milk standard ordinance was adopted for the entire United States. At that time, more than 60 cities were already operating successfully under the ordinance. Three grades (A, B and C) of raw and pasteurized milk were defined. The ordinance was concerned with achieving pasteurization of maximum quantities of milk, improving the quality of raw milk, encouraging consumption of milk and eliciting cooperation of the dairy industry with government (2). Soon after the ordinance was adopted, it was noted that the definitions and enforcement of the ordinance were not satisfactory (12). By 1937 the United States Public Health Service Milk Ordinance contained 18 sections, listed many definitions (including Vitamin D milk and Grade D raw milk) and prohibited the dipping of milk (15). In 1925, it was estimated that 30% of the population consumed pasteurized milk (13). Despite the great strides made toward pasteurization of milk, still in 1938, 25% of all waterborne and foodborne disease outbreaks originated with milk (3).

As milk shipments went from local to interstate levels, the need for uniform standards of inspection and regulation peaked. In 1950, the first National Conference on Interstate Milk Shipments met to consider the interstate movement of milk. Results of this program have been to improve the quality of milk shipped in interstate commerce, uniform interpretation and application of sanitary standards among states, as well as uniform use of laboratory methods for assessing the quality of milk (18).

The name of the Federal ordinance has since been changed to the Pasteurized Milk Ordinance (PMO). The last recommendations were published in 1978. The PMO is voluntarily adopted by state health officials and then is followed by producers of milk products. Products entering interstate commerce must meet at least the standards of the PMO, but a state may require milk products to meet quality standards higher than those of the PMO. Table 2 gives chemical, bacteriological and temperature standards found in the PMO and applicable for Grade A raw milk and Grade A pasteurized milk and milk products.

Many states do not allow the commercial sale of raw milk. However, both the AAMMC and CMPAA still exist [a 1985 count shows 35 members in AAMMC (1)] and certified milk is a definite source of disease outbreaks. One California dairy has produced certified milk believed to be responsible for outbreaks of disease in 1958, 1964, 1971-1974 and 1977-1979 (7).

Recognizing the need for control in the sales of raw milk, the Texas Board of Health has restricted raw milk sale to the premises of the producer dairy. Herds must be proven free from brucellosis and tuberculosis by passing an annual test. The raw milk may not exceed a standard plate count of 20,000 CFU/ml, a direct microscopic somatic cell count of 1,000,000 cells/ml and a coliform count of 10/ml; the milk must test negative for antibiotics (4).

Health claims made for raw milk have not been substantiated scientifically and incorrect information abounds. A comparison of the nutrient content of raw and pasteurized milk shows no meaningful differences. Pasteurization reduces the content of three vitamins: thiamine (B_1) from 0.45 to 0.42 mg/L, cobalamin (B_{12}) from 3 to 2.7 μg/L and ascorbic acid (C) from 2.0 to 1.8 mg/L. Milk is not a major source of these vitamins, and the loss of each does not exceed 10%. Pasteurization makes about 6% of calcium insoluble, coagulates 1% of milk protein and causes a slight disaggregation of fat globules that results in a reduced cream line of whole milk (21). However, reducing the cream line is not an important consideration when commercially-pasteurized milk is homogenized.

Table 1. Events in the development of milk pasteurization.

Year	Event
1810	Appert preserved food through use of heat.
1864	Pasteur reduced food spoilage by heating at temperatures below boiling.
1886	Heating of milk for infant feeding was advocated.
1893	Straus set up facility to pasteurize milk for infants. First medical milk commission was formed to oversee certified milk production.
1907	American Association of Medical Milk Commissions was organized.
1924	Pasteurization at 61.7°C for 30 min was based on heat resistance of *Mycobacterium tuberculosis*. The first federal milk ordinance was written.
1950	National Conference on Interstate Milk Shipments was formed.
1956	Temperature for low temperature — long time pasteurization was raised to 62.8°C based on the heat resistance of *Coxiella burnetii*.
1978	Current Pasteurized Milk Ordinance was published.
1986	Research indicated under certain circumstances *Listeria monocytogenes* may survive high temperature - short time pasteurization of 71.7°C for 15 s (9).

Pasteurization of milk is not mandatory in the United States at the federal level, but pasteurization practices are decided by each state. The advocates of raw milk use their right to freedom of choice to prevent the passing of laws for mandatory pasteurization. However, with the freedom of choice comes the provision of informed consent. Herein lies the responsibility to educate the public about the realities of raw milk versus pasteurized milk.

Policy statements, recommending the pasteurization of milk and milk products for human consumption, have been written by the American Academy of Pediatrics, the Conference of State and Territorial Epidemiologists, and the American Veterinary Medical Association, and the U.S. Animal Health Veterinarians (8). The Food and Drug Administration invited information, data and views

Table 2. Standards for Grade A milk and milk products as found in the Pasteurized Milk Ordinance.

Grade A raw milk for pasteurization

Temperature: Cooled to 45°F (7°C) or less within 2 h after milking, provided that the blend temperature after the first and subsequent milkings does not exceed 50°F (10°C).
Bacterial limits: Individual producer milk not to exceed 100,000 per mL before commingling with other producer milk. Not to exceed 300,000 per mL as commingled milk before pasteurization.
Antibiotics: Individual producer milk-no detectable zone with the *Bacillus subtilis* method or equivalent. Commingled milk - no detectable zone by the *Sarcina lutea* Cylinder Plate Method or equivalent.
Somatic cell count: Individual producer milk - not to exceed 1,500,000 per mL.

Grade A pasteurized milk and milk products

Temperature: Cooled to 45°F (7°C) or less and maintained there at.
Bacterial limits (not applicable to cultured products): 20,000 per mL.
Coliform: Not to exceed 10 per mL-provided that, for bulk milk transport tank shipments, shall not exceed 100 per mL.
Phosphatase: Less than 1 microgram per mL by the Scharer Rapid Method or equivalent.

from the public on consumption of raw and certified raw milk. To this, the Public and Scientific Affairs Board Committee on Laboratory Practices in Microbiology and the American Academy of Microbiology responded that all milk and milk products sold for human consumption be required to be pasteurized (14). Also, resolutions against permitting the sale of raw milk were adopted at recent annual meetings of the American Dairy Science Association and the International Association of Milk, Food and Environmental Sanitarians. Copies of these resolutions were forwarded to the Food and Drug Administration.

Advocates of certified milk have boasted about the lack of outbreaks of illness caused by that product. The quality of certified milk peaked early, but inevitably outbreaks of illness have occurred. On the other hand, the quality of pasteurized milk has greatly improved because of advances in the engineering of pasteurization equipment, in the passing of strict government regulations and in the enforcement of those regulations at the farm, factory and grocery store. Hence, pasteurized milk brings together the best of both worlds; we have the sanitary conditions initiated by the certified milk movement and with proper handling of pasteurized milk we evade milk-borne disease.

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Food Safety in the Skies

by Eric W. Mood, LL.D., M.P.H.
Associate Clinical Professor of Public Health,
Yale University School of Medicine,
member of the ACSH Board of Scientific Advisors.

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The next time you fly in a jumbo jet, look around at the peaceful (but crowded) cabin and the spotless (but limited) rest room facilities. Then consider what might happen if you and a hundred or more of your fellow travelers suddenly developed violent digestive upsets. This scenario is not merely a vacationer's nightmare; it has actually happened. The cause was bacterial food poisoning. Airline officials and public health authorities have done much to reduce the probability of such illnesses occurring, but more needs to be done.

One of the more notable outbreaks of food-borne illness in the air occurred in February 1975 on a jumbo jet carrying 343 passengers and crew of 20 from Tokyo to Copenhagen with an intermediate stop at Anchorage, Alaska, where breakfast was put on board. On this memorable flight 196 passengers and one crew member developed severe gastroenteritis, which resulted in hospitalization of 143 passengers in Copenhagen. The subsequent epidemiological investigation showed that ham and cheese omelettes served at breakfast had been contaminated during preparation by one of the cooks in the flight kitchen in Anchorage. This cook had an unprotected cut on a finger which had become infected with a bacterium called *Staphylococcus aureus*. This particular organism, if present in sufficient numbers, can cause an illness that is notable for its short incubation period - about three hours. The food that had been contaminated by the cook with the cut was held at room temperature for several hours before being placed on the plane. This was sufficient time to allow the bacteria to grow rapidly and to contaminate the food thoroughly.

Another major food-borne disease outbreak occurred in February, 1976, when 694 passengers traveling on several charter flights from the Canary Islands to various destinations in Europe became ill from contaminated egg salad.

Short of brown-bagging it, there is nothing that passengers can do to protect themselves from in-flight food poisoning. The key to preventing illness lies in the actions of food service personnel. The precautions they should take are the same as those that should be taken when handling food on the ground. Food should always be handled in a sanitary way and it should never be kept at temperatures conducive to bacterial growth.

Down-to-Earth Precautions

Some food poisoning outbreaks in the air have been traced to persons who literally were food handlers instead of food service personnel; they actually touched food during preparation or serving with unwashed or unclean hands. In some of the better flight kitchens, all of the personnel engaged in food preparaion wear disposable plastic gloves. A food service worker in one of the flight kitchens at New York's Kennedy Airport recently said, "On the average, I use about one dozen of these gloves each day." She changes the gloves whenever she has touched something unclean.

Cabin attendants, like ground personnel, should handle food properly. Unfortunately, some of them don't. In the past two months, on U.S. domestic flights, I have seen cabin attendants doing the following:

1) filling beverage glasses with bear hands, after having stifled a cough with the same hand;

2) serving unwrapped sandwiches to passengers with ungloved and unwashed hands; and

3) double and triple-stacking ice-filled drinking glasses after touching the bottom of the glass with unwashed hands. (When this practice was called to the attendant's attention, she answered "This is what I was taught to do by my advisor.")

Admittedly, the modern airliner is not equipped to encourage cabin crews to wash their hands as frequently as they should. This is all the more reason why cabin attendants should avoid letting their hands come in contact with food.

As a preventive measure, airline officials should require more training of cabin attendants in proper measures of food service and in hygienic practices. It is not sufficient that these persons be adequately trained before they begin their regular duties. They should also be required to participate regularly in continuing education programs which will stress methods to prevent food-borne illness.

High-Tech Temperature Control

Modern equipment can help to reduce the risk of food poisoning by ensuring that inflight meals are never exposed to temperatures that allow bacteria to grow. The state-of-the-art versions of the modules or containers used for delivery and storage of airline food are so designed and operated that cold foods may be kept for many hours at temperatures below 45°F and hot foods may be kept at temperatures greater than 140°F. These are safe temperatures. The newer containers are also capable of heating or cooling foods at a rapid rate which does not permit appreciable growth of bacteria. Unfortunately, some smaller airlines with limited resources are not yet using this type of equipment.

As a further precaution to ensure good temperature control, public health specialists have advocated that the chief steward or one of the cabin attendants should have a calibrated pocket thermometer to check the temperatures of food as it is placed on the aircraft and immediately before serving. This person should have the authority to reject any food that is at an improper temperature.

Is First Class Worst Class?

Because people tend to assume that taste appeal and sanitary quality go together, it may be supposed by some travelers that the probability of becoming ill after an inflight meal in first class is considerably less than in economy class. However, this is quite untrue. There is a considerably greater possibility that first-class passengers will become ill for two reasons; food served in first class usually requires more steps in preparation and service and usually more people are involved. The possibility of contamination of food increases proportionally as the number of steps in preparing and/or serving the food increases. Similarly, the more people that are involved in preparing and serving food, the greater the probability that a mistake will occur.

What About the Pilots?

Nervous fliers may be wondering what would happen if it was the flight crew, rather than the passengers, that was incapacitated by food poisoning. Fortunately, appropriate precautions are being taken to ensure that this situtation arises only in cheap TV movies, never in real life. All major airlines require that the captain be served a completely different meal from that served to the co-pilot. Some airlines go one step further in that the meals served to the pilot and co-pilot are from different sources. The same principle applies to meals which the pilot and co-pilot eat on the ground prior to takeoff.

Dining in the Friendly Skies

Today's airline passengers have come to expect a smooth, safe, uneventful flight. If a bit more attention is paid to training and supervision of cabin attendants and food handlers on the ground, and if all airlines adopt top-quality equipment, future flights will not be marred by food-borne illness.

IAMFES Secretary Nominations Due for 1988 Elections

Nominations are now being taken for Secretary for IAMFES. This year an industry representative will be elected.

Once all nominations are received by the nominating Committee, two persons will be chosen to run for the office. This is a five year term, moving up yearly until they are President of IAMFES, then serving one year after as Past President. The term of office begins the last day of the 1988 Annual Meeting, this year held at the Hyatt Regency Westshore, Tampa, FL, July 31-August 4, all IAMFES Executive Board Members meet three times a year.

Two people selected are placed on the ballot. The winner is determined by majority vote of the membership through a mail vole, in the spring of 1988.

Please send a biographical sketh and photograph (if available) NO LATER THAN NOVEMBER 1, 1987 to the Nominations Chairperson:

NOMINATIONS CHAIRPERSON
KIRMON SMITH
1100 WEST 49TH ST.
TEXAS DEPT. OF HEALTH
AUSTIN, TX 78756
512-458-7281

Dr. Elmer H. Marth

Top Food Science Award Presented to Elmer Marth

An innovative researcher, prolific author and revered teacher, Elmer H. Marth of the University of Wisconsin, has been awarded the most prestigious honor of the Institute of Food Technologists (IFT).

IFT, the professional society of more than 23,000 food scientists, presented Dr. Marth with its Nicholas Appert Award at its Annual Meeting.

The award, named for the 19th Century French scientist who invented for Napoleon the process leading to modern canning, consists of a medal and a $5,000 honorarium.

A professor of food science and bacteriology, Marth was cited for his many contributions in both the processing of foods and understanding and inhibiting the growth of dangerous food-borne bacteria.

His research continues to illuminate the processes of some of the bacteria which today result in news stories about food-borne diseases: *salmonella, listeria,* and *staphylococci* and the toxin producing mold, *Aspergillus Flavus*.

His work showed, for example, that *salmonella* can survive longer than previously thought in cheesemaking processes (if present in the milk used.) This suggested longer aging for certain cheeses. Marth also showed that lactic acid and a salt, potassium sorbate, could hasten the demise of salmonella in cold pack cheese food.

Listeria was blamed many months ago for several deaths linked to eating certain Mexican soft cheeses. Marth was among the first U.S. scientists to develop a scientific understanding of control of *listeria*. The program was recently expanded.

"Papers by Marth represent the first efforts in the United Stated of understanding the behavior of *Listeria monocytogenes* during processing and storage of foods," the IFT noted.

With the *staphylococci,* Marth was the first to demonstrate how acids inhibit their growth and injure some without killing them. This is important to scientists who test foods for these disease organisms.

Marth's research program on mycotoxins was termed "pioneering" in showing how to use sulfites to degrade the poison (toxin), aflatoxin, which is potentially cancer-causing and is produced by aspergilli.

In his 30-year career, Marth has authored or co-aurthored some 450 scientific publications. For 19 years, he has been editor of the internationally recognized *Journal of Food Protection,* a key publication on food safety.

In food processing, Marth co-invented a technique to increase yields of cottage cheese up to 10 percent, and double its shelf-life. Currently, he is researching ways to use barley malt enzymes to speed up the ripening of certain other cheese.

He regularly teaches three courses at the University of Wisconsin, and lectures in several others. He is continually rated at "excellent" by his students.

Marth became a faculty member (associate professor) at the Madison campus in 1966, following nine years of work in research and development with Kraft, Inc. He was promoted to professor in 1971. He earned all three of his degrees in bacteriology at the University of Wisconsin, Madison, ending with the Ph.D. in 1954.

He holds numerous awards from several technical societies, including the Pfizer (1975), Dairy Research Foundation (1980), and Borden (1986) Awards from the American Dairy Science Association; the Educator (1977) and Citation (1984) Awards from the International Association of Milk, Food and Environmental Sanitarians; the Nordica Award (1979) from the American Cultured Dairy Products Institute; and citations for meritorious service (1977, 1983) from the American Public Health Association. Marth was named a fellow of IFT in 1983, and is a Registered Sanitarian in Wisconsin.

Dairy Industry Studies Focus on Foodborne Illness Cause

Eight new research proposals on *Listeria monocytogenes* have recently been approved by funding boards in the dairy industry's effort to examine detection methods, sanitation practices and behavior of the bacteria. This research is administered as part of Dairy Research Foundation's (DRF) Directed Research Program and will begin this summer.

Research projects included in the prgram have an accelerated timetable because they focus on very specific objectives. In the new Directed Research Program, DRF receives proposals, submits them for research peer review and recommends funding within a period of time considered "short" in the research discipline, usually less than six months.

"We developed the directed research program because we want immediate answers to critical questions facing the dairy industry." said Joseph A. O'Donnell, Ph.D., vice president of DRF. "This program allows us to obtain reliable answers in a shorter time frame compared to our ongoing competitive research grants program."

The eight new projects are in addition to five that are ongoing, for a total of 13 *Listeria* projects managed by DRF. The 13 *Listeria* studies are being funded by various dairy groups including Wisconsin Milk Marketing Board (WMMB), National Dairy Promotion and Research Board (NDPRB), Milk Industry Foundation (MIF) and private industry for an investment of more than $1 million.

The funding was based on recommendations of DRF's Science Advisory Committee, a group of prestigious researchers representing academia, regulatory agencies and the dairy industry.

In evaluating the projects, DRF met with representatives of the U.S. Food and Drug Administration (FDA), U.S. Department of Agriculture (USDA), Center for Disease Control (CDC), dairy industry organizations and private industry to determine how much was already known about *Listeria* and to set priorities for research without duplication of existing programs.

Four priorities were determined:

- determining the number of bacteria that constitute an infectious dose for the disease, Listeriosis,in animals.
- developing improved detection methods for the bacteria.
- examining sanitation practices and environmental sources to eliminate the bacteria in dairy processing plants.
- determining growth and inhibition factors of the bacteria in dairy products.

In addition to DRF's efforts, MIF and International Ice Cream Assocation (IICA) have conducted five nationwide educational workshops on *Listeria*.

For more information, contact Mary Payne, United Dairy Industry Association, Dairy Center, 6300 North River Road, Rosemont, IL 60018. 312-696-1860.

John E. Kinsella

Babcock-Hart Award goes to John E. Kinsella

John E. Kinsella of Cornell University has won the Institute of Food Technologists 1987 Babcock-Hart

Award for "contributions which have improved public health through some aspect of nutrition or more nutritious food."

Co-sponsored by the International Life Sciences Institute--Nutrition Foundation, the award consists of an embossed plaque and $3,000.

Kinsella, who has authored some 250 scientific papers on food and nutrition, received the award at the Annual Meeting of the 23,000 member professional society of food scientists.

Nutrient dat developed by Kinsella and his colleagues has been "widely used in the industry for new food product formulation, calorie reduction and labelling purposes," the award citation notes.

Since the early 1970's, much of his work has been on fatty acids. Recently, some of them have been found to offer healthful effects such as the so-called "omega-3 fatty acids" found in ocean fish oils. Scientists now believe these can reduce the incidence of heart disease and may be helpful in such illnesses as arthritis, asthma and--possibly-- certain cancers.

Kinsella and his group carried out extensive research on these food components, their role in foods, and their impact on nutrition and health. Some such research was to find how health-flavoring compounds could be substituted for fats in food without sacrificing flavor, in which fats play a key role.

More recently, Kinsella's research has been directed toward developing a means of extracting the health-promoting "omega-3 fatty acids" from fish oils. Such a development would permit their concentration and perhaps substitution for other fats.

Kinsella was appointed to the Cornell faculty in 1967. A native of Ireland, he earned his B.Sc. from the National University of Ireland in 1961, and his Ph.D. from Pennsylvania State University in 1967.

IFT Award to J.Ian Gray: Top Food Technology Teacher

J. Ian Gray of Michigan State University has won the 1987 William V. Cruess Award of the Institute of Food Technologists for excellence in teaching food science or technology.

The award, presented at IFT's Annual Meeting, consists of $3,000 and a bronze metal. IFT is the professional society of the food sciences.

Among other contributions, Gray was cited because he "transforms the classroom into a dynamic learning atmosphere in which the student is caught up in and becomes part of the learning process."

His MSU department notes the mandatory student evaluations of faculty perenially rank Dr. Gray among the highest.

J. Ian Gray

Student comments supporting his nomination bear this out. "Probably the best professor I've had here," one noted. Another credits Gray with enticing him into graduate studies in Gray's field.

Although he regularly teaches undergraduate courses to 50-300 students a term and guides 8-10 graduate students, both present and former students cite Gray's genuine concern for the individual. "Few other professors have more compassion or understanding." the IFT citation reads.

Former students also note that Gray "challenges his students to think independently and apply the concepts presented in class."

Another said that Gray provided her with "vivid examples of food chemistry seen every day (like why baking breads results in golden brown crusts)."

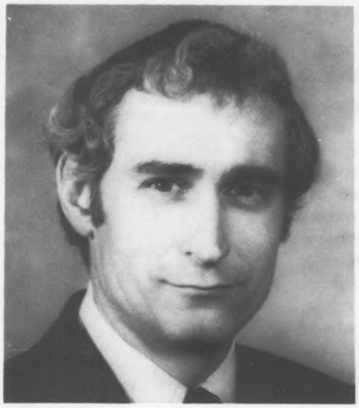
Born and education in Northern Ireland, Gray earned his B.S. degree with first class honors from Queens University, Belfast, later taking his doctorate there.

Before teaching at Michigan State University, Gray taught at the University of Guelph, in Ontario, Canada.

He was a member of the National Academy of Sciences--National Research Council Committee on Nitrites in Foods. Currently a member of the American Association of Oil Chemists, as well as IFT.

Doyle Wins IFT Prescott Award for Pathogen Detection Work

A research scientist who, before he was 35, developed several faster tests to detect illness-causing bacteria in foods has won a top prize from the Institute of Food Technologists.



Dr. Michael P. Doyle

Dr. Michael P. Doyle received the Samuel Cate Prescott Award for reserach from IFT, the professional society for the food sciences, at its annual meeting.

The Prescott Award, consisting of an embossed plaque and $3,000, is presented annually to an IFT member 36 or younger for "outstanding ability in research in some area of food science and technology."

Dr. Doyle is an associate professor at the University of Wisconsin-Madison and a scientist at its Food Research Institute, the world's largest non-government laboratory for food safety research.

The bacteria Doyle concentrates his reserach on reads like a "who's who" of pathogens causing ever wider outbreaks of food-borne diseases and hundreds of deaths. His work has been instrumental in helping government and industrial food safety officials quickly identify these "bugs" and understand better how to control them.

• *Campylobacter jenjuni*: This is one of the most common causes of acute intestinal illnesses in humans, and careless handling of foods are often to blame. Only a tiny number of such bacteria--as small as 500--can cause severe illness. Doyle developed a rapid procedure for isolating small numbers from the larger numbers of other, harmless kinds of bacteria found in food, thus helping public health officials to pinpoint the source of this organism. Food laboratories throughout the world have since adopted Doyle's procedure.

• *Yersinia enterocolitica:* These bacteria which produce infections that can cause severe abdominal pain sometimes mistaken for appendicitis, and are blamed for several recent, large food-associated illnesses in the United States. Doyle developed a procedure to detect these bacteria which takes only one to three days, instead of the two to three weeks formerly required.

• *Enterohemorrhagic Escherichia coli: E. coli* are common inhabitants of the human intestine, but some of them recently have been found to cause severe intestinal bleeding. The pathogen is found in ground beef, pork, poultry and lamb. Doyle discovered that these *E. coli* produce toxins which cause the bleeding, and used this characteristic to develop a test to detect them. The U.S. Center for Disease Control has frequently called upon Doyle to help with food sample tests to identify sources of *E. coli* disease outbreaks.

• *Listeria monocytogenes*: More than a hundred deaths of particularly susceptible persons have resulted recently from outbreaks of listeriosis. Previously, methods for isolating listeria from foods required as long as two to three months. Doyle and his associates developed a procedure that is more effective in finding these bacteria in food and feces, and which requires only 24 hours. His work also showed that these pathogens could survive normal pasteurization of milk, and spurred research throughout the world to improve heat treatments to eliminate this dangerous organism from milk products.

Among his other research results, Doyle shows that mayonnaise in salads retards--rather than, as was popularly believed, promotes--the growth of pathogens in salads.

A native of Madison, Wisconsin, Doyle stayed home to earn three degrees from the University of Wisconsin, earning his Ph.D. in food microbiology in 1977.

He left Wisconsin for two years to do research on mushrooms for a major food company before returning to Madison in 1980 to take up his faculty position.

Olive Oil May Be Beneficial to Health, Study Indicates

STANFORD - A group of men who participated in a Stanford research project appeared to benefit from relatively large concentrations of the main component of olive oil, monounsaturated fats.

In a study published in the June 19 issue of the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, the researchers concluded that higer intakes of monounsaturated fats were associated with lower blood pressure - proven in many other studies to benefit the heart - without producing ill effects.

But Dr. Stephen P. Fortmann, assistant professor of medicine and associate director of the Stanford Center for Research in Disease Prevention, cautioned against drawing any widespread conclusions from the study, which involved 76 healthy men aged 30 to 55.

Con't. on p. 474

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

Hercules Announces New Drum Handler

• New design and lighter weight construction has allowed Hercules Industries to a develop most cost-effective drum handling attachment todate.

This unit handles 55 gallon steel drums with a capacity of 1,500 lb., *yet still ships via U.P.S.*. Total weight of drum handler only 58 lbs. Fastens to forklift by chains. No parallel arm reaction - arms work independently of one another.

For further information contact: Vanessa Weedman, Hercules Industries, 2933 Armory Drive, Nashville, TN 37204.

Please circle No. 241 on your Reader Service Card

Hazardous Materials Labeling

• Industrial Training, Inc. has just completed development of an audio visual safety program entitled "Hazardous Materials Labeling." The program is designed to increase safety awareness through an understanding of the various hazard warning labels that appear on containers of chemicals or other materials.

"Hazardous Materials Labeling" includes the DOT labeling system as well as several other labeling systems in use today. The program was developed for distributors, users, emergency personnel or anyone who may handle containers of hazardous materials. It introduces the labeling system, gives examples of each and explains the hazards represented by the labels.

The training package is available in either slide/cassette or video tape and comes complete with visuals, a synchronized audio narration, and a complete instruction guide. The instruction guide includes lesson plans, performance objectives, testing materials, and a complete script.

A free 10 day preview of this program and a brochure listing other programs available may be obtained by contacting Industrial Training, Inc., PO Box 7186, 2023 Eastern Avenue, Grand Rapids, MI 49510.

Please circle No. 242 on your Reader Service Card

New Catalog Introduces Over 50 New Products for Photoelectric Controls

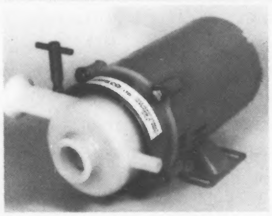
• Opcon's new complete catalog of photoelectric controls includes over 50 newly introduced products. Fiber optic cables, photoelectric sensors, and accessories designed to enhance the flexibility of Opcon's photoelectric products are among the new products introduced with the catalog.

The catalog also includes specifications and other important information on Opcon's complete familty of photoelectric controls. Self contained, remote sensor and fiber optic based controls are explained with accompanying applications and selection information.

A "basics" section provides all the information needed for understanding the operation, selection, and application of photoelectric controls. Topics such as excess gain, range, and contamination are covered in detail. A seperate section contains 24 specific photoelectric applications with setup and suggessted product selection included.

To obtain a copy of the new catalog, contact: Opcon, Inc., 720 - 80th St. S.W., Everett, WA 98203. Call toll free (800) 426-9184.

Please circle No. 243 on your Reader Service Card



Sanitary Connections for PVDF Pump

• SERFILCO now offers an injection molded PVDF (Kynar®) pump with 1 1/2" sanitary connections. The PVDF is 100% pure, natural color and free of all fillers, binders, pigments and leachables which could reduce product integrity.

The sanitary connections provide a clean, leak-free and quickly serviceable assembly which meets Federal regulations for pharmaceutical and dairy applications.

Maximum pump flow rate is 81 GPM, and maximum discharge head is 51 Ft. The pump provides non-metallic solution contact with a carbon/ceramic mechanical seal and Viton elastomers. Stainless steel clamp ring at pump casing allows unlimited selection of 360° direction of discharge.

Additional information and pricing available from SERFILCO, Ltd., 1234 Depot St., Glenview, IL 60025.

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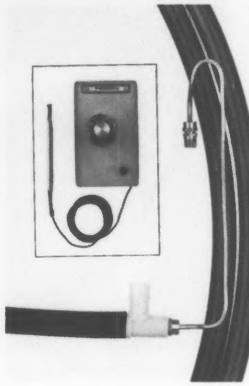


In-Pipe Heating Cable by Pyrotenax[R] Allows Winter Use of Water Supply By Preventing Water Line Freeze-up

• James Martin, Vice President of Marketing for Pyrotenax USA, Inc., has released new product information and literature on the firm's cable for the prevention of water supply freeze-up during winter weather. The primary applications for the Pyrotenax product are water pipes supplied by lakes, ponds and wells that are subject to freezing in winter temperatures and for protection of water lines from wells. Described as ideal for year 'round use of camps and cottages, the rural markets have also been responsive to the concept. The in-pipe cable is UL listed, and has been proven in successful use for 20 years in Canada.

Unlike conventional heating cables that are wrapped around the exterior of water pipes, the system by Pyrotenax is a thermostatically controlled cable that is encased within the pipe. Tampering or accidental dislodgement are, therefore, avoided. Installation involves the thermostat, the appropriate length of heating cable and pipe, and a "T" connection to the water source. Burying pipes under rock strata or other extensive excavations are unnecessary, so much expense and effort are eliminated. Pipes do not need to be insulated and in-pipe heating cable by Pyrotenax operates reliably at any exterior temperature when installed according to instruction.

The new in-pipe product by Pyrotenax installed in plastic pipe or as a kit for installation in existing pipes is now available to the home owner or rural resident through hardware stores, farm and home outlets and plumbing supply houses. For more information, contact: Pyrotenax USA Inc., 6501 Basile Rowe, East Syracuse, New York 13057.

Please circle No. 245 on your Reader Service Card

Triangle® 8 Added to Fort Dodge Laboratories' Triangle® Line

• Triangle® 8, the latest addition to the popular and proven line of Triangle® bovine vaccines, is now availble from Fort Dodge Laboratories.

Triangle 8 protects against the major viruses that causes reproductive failures and abortion: IBR virus, BVD virus and 5 Lepto strains as well as the major viruses that cause respiratory diseases, including PI-3 virus. It has been shown that calves infected with PI-3 virus fail to start gaining weight for a period of 50-60 days, even though feed consumption is normal. With or without shipping, it is desirable to immunize calves against the PI-3 virus through vaccination before weaning to avoid the losses associated with the disease, especially failure to gain weight.

Triangle 8's BVD antigen contains the highly antigenic Singer Strain which is shown to produce high levels of soluble antigen necessary for fast, dependable protection from Bovine Virus Diarrhea. Plus, it also cross-protects against other BVD strains as proven by New York I Strain Challenge Studies.

Because all eight antigens contained in Triangle 8 are killed, it's SAFE and will not cause post-vaccinal reactions associated with the use of modified live vaccines.

Triangle 8, available in 50 ml and 250 ml vials, combines all eight antigens in a 5 ml dose with the same proven efficacy as Triangle® 3 and Ultilep® 5 vaccines.

For more information on Trianble 8, contact your veterinarian or Dr. William E. Ryan, Director of Communications, Fort Dodge Laboratories, 800 5th Street N.W., Fort Dodge, IA 50501.

Please circle No. 246 on your Reader Service Card

Toxic Substance Detection Kits

• Spectrochrom, Ltd. has been formed to provide technology transfer of modern analysis to the public sector. One of the first tasks undertaken is to make and market kits and provide technology necessary to provide a means for testing for natural toxins, pesticides, xenobiotics and drug residues. The system uses extraction, solid phase cleanup and planar chromotography to analyze for these substances.

The analytical readout is by using fluorescence quenching (short wave length uv), flourenscence (long wave length uv) and visible color development for each analyte. Qualitative and quantitative results may be obtained from the tests.

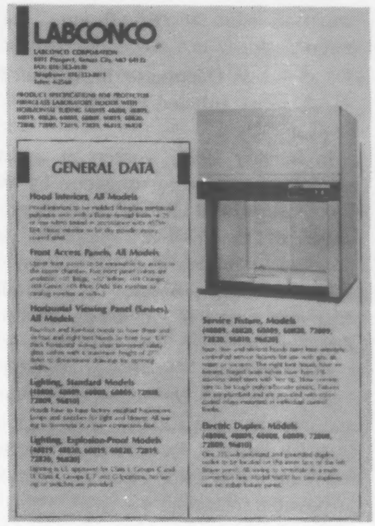
The mycotoxins targeted for the kits are aflatoxin, T-2 toxin, vomitoxin, zearalenone and ochratoxin. Sulfas and particular sulfamethazine will be the focus of the first drug residue kit. Organophosphorus and carbonate pesticides will be featured in the third kit. The principles of the system can be used for virtually any analyte.

Target prices for volume analysis is dollars per test. The kits will be composed of consumable and reusable parts in the basic kit. Hardware options, which are a one time investment, are available in options.

Volume discounts are available with price breaks at 10, 30, 100 and 1000 units.

For more information, contact: H.M. Stahr, Toxic Substance Detection Kits, Spectrochrom, Ltd., ISIS Building, Ames, IA 50011-2130.

Please circle No. 247 on your Reader Service Card



Labconco Releases New Specifications Brochure for Laboratory Hoods with Horizontal Sliding Sashes.

• Labconco Corp., Kansas City, Mo., introduces their NEW Specifications Brochure for Laboratory Hoods with Horizontal Sliding Sashes. This 8-page catalog features general data, specifications and dimensions on Protector Fiberglass Hoods with Hortizontal Sashes. Labconco recently added new 4-, 5- and 6-foot models to their offering of 8-foot Protector hoods with horizontal sashes. The horizontal sash design is popular because it uses less room air, thus reducing energy costs. In addition, the horizontal sliding sashes can be used as safety shields for protection.

In the introductory section of the new brochure, general data is detailed for hood interiors, front panels and horizontal viewing panels. Lighting for both standard and explosion-proof models is described along with electrical features of Labconco's Protector Hoods. Specifications and dimensional data are then detailed for the 4-, 5-, 6- and 8-foot Protector Hoods with Horizontal Sliding Sashes.

Labconco fume hoods are available through major laboratory dealers worldwide. For a free copy of the new brochure, call Labconco at 1-800-821-525.

Please circle No. 248 on your Reader Service Card

Occupational Asthma From Inhaled Egg Protein — Iowa

In January 1984, workers at an Iowa egg processing plant requested an investigation by the National Institute for Occupational Safety and Health (NIOSH) of the causes of "asthma-like" symptoms (wheezing, shortness of breath, tightness in chest) believed to be work-related. This plant daily processes up to a million and a half raw eggs into powdered whole egg or powdered egg yolk and liquid egg white.

After an initial site visit in March 1984, NIOSH investigators returned in August 1984 for an environmental and questionnaire survey. They sampled for total and respirable dust and for several chemicals because the original request had listed cleaners, sanitizers, and germicides as possible irritants.

Results showed employees' levels of exposures to dust near the American Conference of Governmental Industrial Hygienists' guideline of 10 mg/m3 for total dust. Dust samples had a 50% protein content and an amino acid composition resembling egg yolk protein.

Ninety-four employees completed a screening questionnaire covering demographics, occupational history, personal habits, past medical history, and symptoms suggestive of asthma. Based on self-reporting, respondents were divided into two groups: Group 1 was made up of employees (23) experiencing at least one of the following symptoms — wheezing shortness of breath, or tightness in the chest — in the preceding month; Group 2 was made up of employees (71) who had not experienced any of these symptoms.

In March 1985, NIOSH conducted a follow-up medical evaluation consisting of pulmonary function tests, skin-stick tests for sensitivity to egg protein, determinations of serum IgE and IgG antibodies to egg protein (whole egg, egg yolk, egg white and egg fractions), and physical examinations and clinical histories by a physician trained in internal and occupational medicine. Because of attrition and relectance of some employees to participate, only 19 employees - 10 in Group 1 and nine in Group 2 - underwent full examination.

Based on medical examinations and clinical histories showing temporal association with workplace exposures, the physician diagnosed five employees as having occupational asthma. All five were in Group 1. Results of antibody and skin-stick tests were consistent with these diagnoses. Three of the five employees were nonsmokers, and the other two each had a smoking history of <5 pack-years; one had a history of atopy. Based on the medical examinations and clinical histories of the other five employees in Group 1, the physician judged their symptoms as nonasthmatic; this was also consistent with laboratory results. Using a modified case definition of "wheezing temporally related to work", the investigators identified five additional cases from a re-examination of the questionnaires (overall prevalence of 10/94{10.6%}).

NIOSH made specific recommendations for local exhaust ventilation to control egg dust during plant operations and recommended appropriate medical therapy for selected individuals. They also reported the problem to all other plants producing dried egg products in the United States, to the trade association representing the companies, and to major trade unions representing the workers.

Editorial Note: Chicken white is a common allergen; ingestion may provoke pruritus in atopic individuals and exacerbation of atopic dermatitis, rhinitis, urticaria, angioedema, and bronchial asthma. Egg yolk also contains proteins antigenically related to proteins in egg white. A previous report of allergy to inhaled egg protein involved eight of 13 bakery workers who developed respiratory symptoms from spraying meat rolls with a 25% mixture of egg white and yolk in water. Four of these workers were atopic with increased total serum IgE levels; one had changes in pulmonary function consistent with reversible airway obstruction. The current investigation, by contrast, identified five asthmatic individuals at the egg-processing plant: four were nonatopic; all had evidence of IgE-mediated allergic reactions to egg protein; and only one had an elevated total serum IgE level.

Liquid egg products are dried at 23 plants in the United States. An estimated 1,600 workers may be exposed to powdered egg dust in this industry. Currently, no standard exists for occupational exposure to egg protein, and no generic standard has been established for occupational exposure to dust of organic origin. The only enforceable standard applicable to this situation is the Occupational Safety and Health Administration's nuisance dust standard of 15 mg/m3. By definition, nuisance dusts are presumed to be biologically inert. Consideration must be given to developing a strategy for controlling adverse health effects from exposure to powdered egg dust in this industry.

MMWR 1/23/87

Restaurant — Associated Botulism from Mushrooms Bottled in-House- Vancouver, British Columbia, Canada

Eleven suspected cases of botulism were reported in Vancouver, British Columbia, between February 18 and February 22, 1987. Five of the patients have been hospitalized; three of these are on respirators. All of the persons involved ate in the Five Sails Restaurant of the Pan Pacific Hotel on the Vancouver waterfront on February 13, 14, or 16. A case-control study using 32 controls demonstrated a highly significant correlation with eating chantarelle mushrooms bottled in-house (odds ratio {OR} infinite, p = 0.000057) or a lobster and red snapper meal that contained the mushrooms (OR = 31, p = 0.0057). Toxin has not yet been identified in sera from the patients; one specimen of liquid from the bottled mushrooms has yielded Type A botulinal toxin. Three bottles of the mushrooms were estimated to have been used between February 13 and 16; restaurant records revealed that 31 persons had been exposed to the mushrooms between February 12 and 17. The restaurant was closed on February 18; active case-finding is continuing in Vancouver and surrounding regions.

Editorial Note: Although restaurants are not frequently identified as the location of botulism outbreaks, they represent a risk of widespread public exposure to contaminated foods. While foods served in restaurants were associated with 4% of botulism outbreaks in the United States between 1976 and 1984, they resulted in 42% of the cases during that period. In addition, restaurant-associated outbreaks in major centers of transit such as Vancouver may result in widely-distributed cases which may therefore not be recognized for a substantial period of time. Patients with neurologic illness resembling botulism should be asked about recent travel to Vancouver. Clinicians in the United States can report any suspected associated cases to their state epidemiologist. Cases outside Canada and the United States can be reported to the Communicable Disease Division, Bureau of Epidemiology, Laboratory Center for Disease Control, Ottawa, Canada.

MMWR 2-27-87

Pathogen Contamination In Milk Plants

Several months ago, FDA issued a preliminary report on their observations from the expanded check ratings in milk plants. This report included some general recommendations to help control environmental contamination in milk plants.

The pathogenic bacteria involved in recent illnesses (Salmonella, Campylobacter, Listeria and Yersinia) are often found in dairy farm environments. Therefore, the presence of people in dairy plants who have recently visited farms, such as fieldmen and bulk tank drivers, is of particular concern.

Certified Milk inspectors having an office in a milk plant or take samples to a plant lab should review movements within the plant very carefully. Some of the factors to be considered included:

1. What is your route of travel when entering the plant? Consider the route you take to reach your office, your Supervisor's office, the plant lab, restrooms, etc. Do you pass through a pasteurizing or packaging area to reach any of these places? If you do, can you take an alternate route to avoid these areas?
2. If you go into a milk plant, try to visit the plant first, before starting your farm visits. If you are going in to a plant directly after farm work, footwear must be CLEANED and SANITIZED. Rubber footwear is preferable since thorough cleaning is necessary before sanitizing. Changing footwear or putting on rubbers reserved only for plant use may also be done. If clothing has been soiled during farm visits, either postpone your return to the plant until you can change clothes or have a lab coat or coveralls with you which are used only within the plant.

NYSMFS Newsletter March '87.

Trichinosis — Hawaii

In January 1986, three cases of trichinosis were reported to the Hawaii Department of Health. The cases occurred among persons who had eaten wild boar meat given to them by a local Hawaiian who had killed the animal. Because the meat had been distributed among several family members and friends of the hunter, an investigation was conducted to determine the extent of the outbreak.

Among all of those who had received some of the wild boar, health officials identified 28 persons who had eaten the meat. Seven of them were not available for follow-up; the remaining 21 persons were interviewed on February 21 and 22, 1986. Seven (33%) of these had illnesses that met the standard case definition for trichinosis. All seven patients had at least four of the following symptoms: myalgia (7), malaise (7), fever (6), headache (6), diarrhea (4), nausea (4), periorbital edema (4), vomiting (2), and trunk and limb edema and cutaneous rash (1). The patients ranged from 13 to 55 years of age (mean = 32 years); five (71%) were male. All were of Hawaiian or Asian decent. Dates of ingestion ranged from January 9 to January 22; dates of onset of symptoms ranged from January 31, to March 1. The median incubation period was 26 days, and the median duration of illness was 14 days. One patient was hospitalized; three were treated with mebendazole, and two were treated with thiabendazole. All patients recovered.

Serum was drawn from all seven patients during a time period that ranged from 50 and 81 days after ingestion of the implicated meat. There was serologial evidence of infection in five of these patients (titers >40 by the bentonite flocculation test). Laboratory studies of four patients seen by a physician during acute illness revealed eosinophilia ranging from 8% to 55%.

Samples of the implicated wild boar meat were sent to the Centers for Disease Control for study. An artifical digestion procedure performed on the meat revealed from two to none Trichinella larvae per gram of the frozen meat.

Four of the 21 persons interviewed ate the meat after it had been microwaved at high heat for 2 minutes; the remaining 17 persons ate the meat fried. All four of those eating microwaved meat beame ill, and three (18%) of those who had eaten fried meat became ill ($p = <0.01$, $RR = 5.7$). Inadequate recall and incomplete responses prevented investigators from looking at dose response for illness. However, the two people with the most severe illness had eaten the largest amounts of wild boar meat.

All remaining portions of the wild boar meat were confiscated. In addition, all persons who had eaten the meat were instructed in the proper handling and preparation of pork products.

Editorial Note: Trichinella spiralis continues to be a persistent public health problem in the United States. During the period 1975-1985, pork (including wild boar) was implicated in 78.7% of the reported cases in which the implicated meat item was identified. Other wild animal meat was implicated in 13.8% of the reported cases, and ground beef, in 6.7%. During the same time period, only 19 (1.6%) of the reported cases of trichinosis were associated with wild boar meat. Hawaii reported nine cases, eight of which were associated with consumption of wild boar meat.

In the present outbreak, three cases were associated with fried wild pork sausage that was undercooked. Four cases were associated with wild pork sausage prepared in a microwave oven; however, the procedures used were not compatible with those generally recommended by microwave oven manufacturers or pork interest groups for safe microwave cooking of pork. The U.S. Department of Agriculture has recommended cooking pork in a microwave oven until it attains a temperature of 76.7 C (170 F) throughout. Improper cooking of meat in a microwave can result in variability of internal temperatures in the meat, with the result that there will not be proper inactivation of bacteria and other potentially disease-producing organisms.

MMWR 1-23-87.

News and Events, *con't. from p. 469*

"The study clearly doesn't send us a message: 'go out and consume as much olive oil as you can'," he said. "However, the work might appropriately encourage someone to select olive oil over an alternative oil not high in monounsaturated or polyunsaturated fats," Fortmann added.

The study, which involved studies of food records kept by volunteers for three consecutive days, did not identify the mechanism for the apparent favorable relationship between monounsaturated fats and both kinds of blood pressure, diastolic and systolic.

Also shown by the researchers was that polyunsaturated oils, which include such products as safflower oil, did not necessarily lower blood pressure when other factors were taken into account. Polyunsaturated oils are generally considered healthier, particularly in relation to such factors as blood cholesterol, than such saturated fats as lard.

Dr. Paul T. Williams, a biostatistician and principal author of the current report, said this study may be one of the first times that the effects of monounsaturated fats on blood pressure have ever been studied in the context of the American diet. Previous efforts have shown a lowering of blood pressure on Indians on a very low fat diet, and a lowering of blood cholesterol in clinical trials. Also, Mediterranean populations where olive oil is a major dietary factor have low incidences of heart disease.

Monounsaturated fats make up 75 percent of olive oil, making that commercially available product the most concentrated source of monounsaturated cooking oil. Peanut oil contains 46 percent and sesame seed oil contains 40 percent monounsaturated fats. The various forms of fat differ in their chemical structure.

Other researchers contributing to the JAMA article include Richard B. Terry, SCRDP research associate, Susan C. Garay, nutritionist, Karen M. Vranizan, biostatistician, Nancy Ellsworth, nutritionist, and Dr. Peter D. Wood, SCRDP associate director.

For information contact: Mike Goodkind, Stanford University Medical Center, Stanford, California 94305. 415-725-5376 or 415-723-6911.

In recognition of his service as president of the Tennessee Association 1986-87, Bob Demott, left, received a plaque from Dennis Lampley, Secretary-Treasurer of the group.

Tennessee Association of Milk Water Food Protection held June 4-5, 1987

The Tennessee Association of Milk Water Food Protection held its eighth annual meeting at the Ramada Inn, Nashville on June 4-5, 1987. Session topics included: Control of Pathogens in Dairy Products - Richard L. Bakka, Dairy Product Regulatory Analysis Update - Dr. Bill Bryne, Research of Predicting Milk Quality - Dr. Genevieve Christen, and FDA Food Service Inspection Program - Carroll Sellers.

Affiliate Calendar

1987

September 14-15, 1987 ASSOCIATED ILLINOIS MILK, FOOD, AND ENVIRONMENTAL SANITARIANS in a joint conference with the Cooperative Extension Service of the University of Illinois, to be held at the Chancellor Inn, Chicago, IL. For more information contact: Dr. Clem Honer, Sec AIMFES, Gorman Publishing Co., 8750 Bryn Mawr, Chicago, IL 60631. 312-693-3200 or Dr. Gary Harpestad, Extension Dairymen, U of IL, 315 Animal Sciences Lab., 1207 W. Gregory Dr., Urbana, IL 61801. 217-333-0510.

September 15-16, 1987 ANNUAL CONVENTION OF THE SOUTH DAKOTA STATE DAIRY ASSOCIATION, to be held at Howard Johnson's, Sioux Falls, SD. For more information contact: Shirley W. Seas, South Dakota State Dairy Association, University Dairy Building, Brookings, SD 57007. 605-688-5420.

September 17-18, MINNESOTA SANITARIANS ASSOCIATION ANNUAL MEETING, to be held at the Earle Brown Center, Univ. of Minnesota, St. Paul Campus. For more information contact: Roy E. Ginn, Dairy Quality Control Inst., 2353 N. Rice St., Room 110, St. Paul, MN 55113. 612-484-7269.

September 21-23, NEW YORK STATE ASSOCIATION OF MILK & FOOD SANITARIANS ANNUAL MEETING, to be held at the Sheraton Inn Syracuse, (Liverpool, NY). For more information contact: Paul J. Dersam. 716-937-3432.

September 22-24, INDIANA ENVIRONMENTAL HEALTH ASSOCIATION EDUCATIONAL CONFERENCE, to be held at the Holiday Inn, Terre Haute, IN. For more information contact: Helene Uhlman. 219-942-7636.

September 30-October 2, KANSAS ASSOCIATION OF SANITARIANS ANNUAL MEETING, to be held at the Holidome in Lawrence, Kansas. For more information contact: John M. Davis. 316-268-8351.

October 20-22, IOWA ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANSwill hold it's annual meeting at the Ramada Inn, Waterloo, IA. For more information contact: Dale Cooper. 319-927-3212.

Bob Demott, right, out-going president, congratulates David Mayfield, president for 1987-88.

New Officers of the Tennessee Association: left to right: Ruth Fuqua, Archivist; David Moss, Vice President; David Mayfield, President; Dennis Lampley, Secretary-Treasurer; and Charlotte Thornton, President Elect.

Roger Sebby, owner of S & W Labs of Knoxville, was presented a plaque in recognition of his outstanding service to the Tennessee Association. Dennis Lampley, secretary of the Association, made the presentation.

A plaque, in recognition of outstanding service to the Dairy Industry of Tennessee, was presented to Mr. Harold Rose, left. Dannis Lampley congratulates Mr. Rose on behalf of the Tennessee Association.

IAMFES Secretary Nominations Due for 1988 Election

Nominations are now being taken for Secretary for IAMFES. This year an industry representative will be elected.

Once all nominations are received by the nominating Committee, two persons will be chosen to run for the office. This is a five year term, moving up yearly until they are President of IAMFES, then serving one year after as Past President. The term of office begins the last day of the 1988 Annual Meeting, this year held at the Hyatt Regency Westshore, Tampa, FL, July 31-August 4, all IAMFES Executive Board Members meet three times a year.

Two people selected are placed on the ballot. The winner is determined by majority vote of the membership through a mail vole, in the spring of 1988.

Please send a biographical sketh and photograph (if available) NO LATER THAN NOVEMBER 1, 1987 to the Nominations Chairperson:

NOMINATIONS CHAIRPERSON
KIRMON SMITH
1100 WEST 49TH ST.
TEXAS DEPT. OF HEALTH
AUSTIN, TX 78756
512-458-7281

RENEW

IAMFES MEMBERSHIP CARDS...

ARE AVAILABLE FOR 1988. PLEASE RENEW BY December 31, 1987. You will receive your 1988 IAMFES Membership Card in February along with your ballot to cast your vote for the new 1988 IAMFES Secretary of the Executive Board.

RENEW BY DECEMBER 31, 1987...it saves you from receiving your journals late and saves YOUR association money.

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Dairy and Food Sanitation Instructions for Authors

Nature of the Magazine

Dairy and Food Sanitation is a monthly publication of the International Association of Milk, Food and Environmental Sanitarians, Inc. (IAMFES). It is targeted for persons working in industry, regulatory agencies, or teaching in milk, food and environmental protection.

The major emphases include: 1) practical articles in milk, food and environmental protection, 2) new product information, 3) news of activities and individuals in the field, 4) news of IAMFES affiliate groups and their members, 5) 3-A and E-3-A Sanitary Standards, amendments, and lists of symbol holders, 6) excerpts of articles and information from other publications of interest to the readership.

Anyone with questions about the suitability of material for publication should contact the editor.

Submitting Articles

All manuscripts and letters should be submitted to the Editor, Kathy R. Hathaway, IAMFES, P.O. Box 701, Ames, Iowa 50010.

Articles are reviewed by two members of the editorial board. After review, the article is generally returned to the author for revision in accordance with reviewer's suggestions. Authors can hasten publication of their articles by revising and returning them promptly. With authors' cooperation articles are usually published within three to six months after they are received and may appear sooner.

Membership in IAMFES is not a prerequisite for acceptance of an article.

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Types of Articles

Dairy and Food Sanitation readers include persons working as sanitarians, fieldmen or quality control persons for industry, regulatory agencies, or in education. *Dairy and Food Sanitation* serves this readership by publishing a variety of papers of interest and usefulness to these persons. The following types of articles and information are acceptable for publication in *Dairy and Food Sanitation*.

General Interest

Dairy and Food Sanitation regularly publishes nontechnical articles as a service to those readers who are not involved in the technical aspects of milk, food and environmental protection. These articles deal with such topics as the organization and application of a milk or food control program or quality control program, ways of solving a particular problem in the field, organization and application of an educational program, management skills, use of visual aids, and similar subjects. Often talks and presentations given at meetings of affiliate groups and other gatherings can be modified sufficiently to make them appropriate for publication. Authors planning to prepare general interest nontechnical articles are invited to correspond with the editor if they have questions about the suitability of their material.

Book Reviews

Authors and publishers of books in the fields covered by *Dairy and Food Sanitation* are invited to submit their books to the editor. Books will then be reviewed and published in an issue of *Dairy and Food Sanitation*.

Preparation of Articles

All manuscripts should be typed, double-spaced, on 8½ by 11 inch paper. Side margins should be one inch wide.

The title of the article should appear at the top of the first page. It should be as brief as possible and contain no abbreviations.

Names of authors and their professions should follow under the title. If an author has changed location since the article was completed, his new address should be given in a footnote.

Illustrations, Photographs, Figures

Wherever possible, submission of photos, graphics, or drawings to illustrate the article will help the article. The nature of *Dairy and Food Sanitation* allows liberal use of such illustrations, and interesting photographs or drawings often increase the number of persons who are attracted to and read the article.

Photographs which are submitted should have sharp images, with good contrast.

Examples of Proper Bibliographic Citations

Paper in a journal

Alderman, G. G. and E. H. Marth. 1974. Experimental production of aflatoxin in citrus juice and peel. J. Milk Food Technol. 37:308-313.

Paper in a book

Marth E. H. 1974. Fermentations. pp. 771-882. In B. H. Webb, A. H. Johnson, and J. A. Alford (eds.) Fundamentals of dairy chemistry (2nd ed.), AVI Publishing Co., Westport, CT.

Book

Fennema, O. R., W. D. Powrie, and E. H. Marth. 1973. Low-temperature preservation of foods and living matter. Marcel Dekker, Inc., New York. 598 p.

Patent

Hussong, R. V., E. H. Marth, and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U.S. Pat. 3,117,870. Jan. 14.

Book Review

Milk and Dairy Products in Human Nutrition by Edmund Renner

In reading the preface to *Milk and Dairy Products in Human Nutrition* by Edmund Renner, one is struck by the statement that several thousand scientific papers were consulted for the lectures which served as a basis for this book. The first reaction to this statement is one of disbelief, but on reading the book and scanning the references for each chapter, one realizes the number of papers consulted is no exaggeration. In fact, 166 pages of this 450 page book are devoted to listing the references cited. This comprehensive reference list alone would make this a valuable book, but the author has gleaned much information from these references and presents it in an easy to follow way.

The content of the book can be separated into two topic areas. The first and major portion of the book deals with the components of milk. The second part is devoted to a discussion of various milk products as they relate to nutrition and health.

Six chapters deal with the components of milk, namely lipid, protein, lactose, minerals, vitamins and enzymes, hormones and organic acids. Each chapter first details the individual constituents of the components under discussion. For example, the chapter on lipids enumerates the various lipid compounds found in milk including the different fatty acids found as part of the triglyceride material. The chapters then discuss human milk which allows the reader to compare this source of milk with cow's milk. The remainder of a given chapter addresses the important nutritional aspects of each component. For lipids the discussion centers on the digestability of milkfat, cholesterol, unsaturated fatty acids and milkfat in the diet of infants. With respect to milk proteins, the diet of infants and protein needs of the elderly are discussed. Immunological concerns and protein intolerances are also considered. Lactose intolerance is the focus of the discussion of this component. Vitamins and minerals found in milk and how these relate to health and well being is the central theme of the chapters devoted to them. The chapter on enzymes, hormones and organic acids ties together what is known about these items as they relate to nutrition.

The other main part of this book concentrates on the role of dairy products to nutrition. Topics covered include the effect of processing, especially heating, on the nutrient quality of milk products, cultured products, cheese, whey, and various concentrated products, such as evaporated and dried milks.

The book is written in a manner that makes it easy to follow the author's thoughts. However, it must be pointed out that the book is quite detailed and may bore the casual reader. Overall, this book could serve as a valuable resource to a person interested in the nutritional aspects of milk and milk products.

David E. Smith
Department of Food Science and Nutrition
University of Minnesota

Vibrios in the Environment edited by Rita R. Colwell

John Wiley and Sons have produced another excellent monograph in their environmental science and technology series. *Vibrios in the Environment* brings together current literature and research concerning the Vibrionaceae family of bacteia. The editor, Rita Colwell, has done an excellent job of presenting a diverse series of technical articles that will not only challenge the established researcher but also stimulate the student.

Thirty-nine separate articles in the monograph are grouped into six major headings: Epidemiology and Serology; Pathogenesis; Molecular Genetic Aspects of Vibrios; Methods for Isolation, Characterization, and Identification; Ecology; and Implications for the Seafood Industry. The series of articles focused on Pathogenesis should be of particular interest to most public health professionals. While most public health workers would have a general knowledge of the transmission and prevention of Vibrio cholerae, *Vibrios in the Environment* will provide a better understanding and recognition of the pathogenic potential of other members of the Vibrionaceae family.

Even though the target audience for this publication may not be general public health workers, the series of articles on Ecology and Implications for the Seafood Industry are a must for sanitarians with responsibility for managing shellfish sanitation programs. The publisher should consider editing articles included in these two major headings into a "What the Sanitarian Should Know about Vibrios" handbook.

Vibrios in the Environment may currently be the most definitive text for those involved in the study of Vibrionaceae. It will prove a useful addition to libraries of schools of public health and environmental science. Instructors will find the text suitable for a current problems course. It is highly recommended for sanitarians working in the shellish sanitation industry. John Wiley and Sons, with the help of superb editing by Rita Colwell, have again produced a scholarly text dedicated to furthering our knowledge of man and his environment.

Homer C. Emery, Ph.D.
Environmental Science Officer
Brooke Army Medical Center
Fort Sam Houson, Texas

Colloids in Foods by Eric Dickinson and George Stainsby

Colloids in Foods authored by Eric Dickinson and George Stainsby and published by Applied Science Publishers is not for the casual reader. While an understanding of colloids is not needed, the reader should have a basic foundation in physical chemistry principles. The book would serve as a valuable asset for the graduate student or researcher involved with colloidal food systems.

The book contains 533 pages and is divided into nine chapters. The first chapter serves to acquaint the reader with various terms and concepts associated with colloidal systems. Items such as protein structure and the thermodynamics of dilute macromolecular solutions are dealt with in this chapter. Chapters two through seven deal with colloids from the model or defined system point of view. Chapter two discusses electrostatic factors which help to stabilize colloids. Concepts such as the dispersing forces between two molecules as well as the attraction two spheres have for one another are covered. More theoretical ideas about the stability of the colloidal system are also addressed, i.e. Lifshitz theory and Gouy-Chapman theory of diffuse double-layer. While chapter two dealt with forces to keep the colloidal materials separated, the next chapter covers adsorption of colloids and concepts such as floculation and coagulation. The fourth chapter discusses ideas related to a more complex colloidal system than previously covered in this book, namely the emulsion. The point of reference for the discussion is the interface between the oil and aqueous phases and the forces which work to stabilize or destabilize it. The final part of the chapter discusses foams and methods to induce emulsification. Chapter five serves to give an overview of many of the methods used to study colloidal systems. Typically, a method is described and then some discussion of how the data obtained can be used to gain some insight into colloidal systems. The topic of chapter six is the adsorption of protein. While adsorption was discussed in a general way in a previous chapter, here the behavior of the protein molecule is the focal point. Chapter seven not only presents the reader with the basic concepts of rheology, but also discusses how the behavior of colloidal systems can be understood by measuring rheological parameters. The final two chapters present data on colloidal food systems. Because it is a very complex colloidal system and also quite well studied relative to other foods, chapter eight is devoted to a case study of milk. The final chapter covers important aspects of other food systems, such as egg proteins and cake batters.

Overall the book is well referenced and indexed. It will serve as a valuable reference to one working in the field of food colloids if the reader has the proper background.

David E. Smith
Department of Food Science and Nutrition
University of Minnesota

Functional Properties of Food Macromolecules. by J. R. Mitchell and D. A. Leonard, Elsevier Science Pub. Co., New York.

This book is composed of nine chapters written by experts on the physical and chemical properties of proteins and polysaccharides. The focus is on how these substances affect foods. It is a key reference for workers in the field.

To understand much of the material one must have a strong background in physics and calculus. However, portions are valuable to persons working in the applied aspects of food rheology.

Following a highly math oriented chapter on viscosity of polysaccharide solutions is an excellent chapter on the viscosity of proteins. The chapter on gelatin of polysaccharides explains models for gelation of alginates, pectin, agarose, carrageenan and starch. Gelatin is treated in a chapter by itself.

Clark and Lee-Tuffnel present an insightful introduction to their chapter on gelation of globular proteins then provide a thorough and well organized review of research that centers on heat-setting of these proteins. Muscle proteins are not discussed.

The water- and fat-holding capacities of gels is less mathematically oriented than most chapters. It contains numerous helpful electron photomicrographs. Relationships between structure and fat-holding properties are discussed for comminuted meat products but not for dairy products.

Stainsby's chapter on foaming and emulsification recognizes that proteins dominate in this function. His discussion is oriented to mechanisms that promote foaming and emulsification. Tests for functionality are briefly discussed.

The chapter on texturization of proteins (Lillford) is particularly useful for its treatment of edible spun fibers although it discusses other processes.

Finally the difficult task of discussing protein-polysaccharide mixtures is left to the Russian scientist Tolstoguzov. This important subject has received less attention by researchers than most others discussed in this book. The chapter is well organized but numerous acronyms reduce the readability.

Overall this book is an important contribution to food science.

Dr. Robert T. Marshall
University of Missouri
Columbia, MO

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Abstracts of papers in the September Journal of Food Protection

To receive the* Journal of Food Protection *in its entirety each month call 1-800-525-5223, ext. A or 515-232-6699, ext. A in Iowa.

Addition of Cocoa Powder, Cane Sugar, and Carrageenan to Milk Enhances Growth of *Listeria monocytogenes*, Eileen M. Rosenow and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin, Madison, Madison, Wisconsin 53706

J. Food Prot. 50:726-729

Previously we found that under similar conditions *Listeria monocytogenes* achieved populations in chocolate milk that were 10 times greater than those in other fluid milk products. The current studies were undertaken to determine why the bacterium grew so well in chocolate milk. Autoclaved samples of milk with 2% milkfat, 2% milk + sugar, 2% milk + cocoa, and 2% milk + sugar + cocoa were inoculated with one of two strains of *L. monocytogenes* and incubated at 13°C. Carrageenan was also added to one-half of all samples containing cocoa. Growth curves were derived and generation times and maximum populations were calculated for each combination of product and strain of the bacterium. Strain V7 grew faster than strain CA in all products, with most rapid growth occurring in samples containing cocoa (with or without added sugar). Addition of carrageenan further reduced the generation time of this strain. Overall, growth rates ranged from 3 h 55 min (V7 in 2% milk + sugar + cocoa + carrageenan) to 4 h 53 min (CA in 2% milk + cocoa). Product type was primarily responsible for differences in maximum populations achieved by *L. monocytogenes*. In each instance, final numbers reached were at least 10^8 cells/ml with highest levels in samples containing all ingredients. The data suggest that sugar, cocoa and carrageenan when added to milk contributed to enhancing growth of *L. monocytogenes*.

Potential Role of Refrigerated Milk Packaging in the Transmission of Listeriosis and Salmonellosis, John T. Stanfield, Clyde R. Wilson, Wallace H. Andrews and George J. Jackson, Division of Microbiology, Food and Drug Administration, Washington, DC 20204

J. Food Prot. 50:730-732

Cultures of three *Listeria monocytogenes* serotypes and three *Salmonella* spp. were applied to the exterior surfaces of waxed cardboard or plastic milk containers. Contamination sites were sampled with premoistened cotton swabs during 14 d of refrigeration. Unstressed cells of *Listeria* survived up to 14 d on the surfaces of waxed (1 serotype) and plastic (3 serotypes) containers. Heat-stressed cells of all three serotypes of *Listeria* survived for 2 d on both types of containers. One serotype survived for 4 d, but only on plastic containers. Unstressed cells of all three *Salmonella* strains survived up to 14 d on both types of containers. Heat-stressed *Salmonella* strains survived up to 2 d (waxed containers) and 4 d (plastic containers).

Growth of Aerobic Psychrotrophs and Color Changes of Precooked Beef Slices as Affected by Packaging Procedure, T. P. Carr and J. A. Marchello, Department of Animal Sciences, University of Arizona, Tucson, Arizona 85721

J. Food Prot. 50:733-736

Precooked beef slices from top round roasts were used in replicate trials to determine the effects of packaging treatment upon shelf-life characteristics (microbial growth and color attributes) during retail storage. Roasts were dry-roasted to an internal temperature of 60°C, cooled for 1 h, then sliced (3-4 mm). Slices were packaged in: *(a)* vacuum; *(b)* 15% CO_2, 40% O_2, 45% N_2; *(c)* 15% CO_2, 20% O_2, 65% N_2; or *(d)* 15% CO_2, 10% O_2, 75% N_2 and held at 4°C for up to 18 d. Enumeration of microorganisms and determination of color attributes were done at 0, 3, 6, 9, 12, 15, and 18 d of storage. Psychrotrophic counts were higher ($P<.05$) on slices stored 9-18 d in atmospheres containing ambient (20%) oxygen level as compared to the other packaging treatments. Vacuum packaging exhibited a greater lag phase for psychrotrophs. Vacuum packaged slices maintained a superior cooked beef color for 18 d and had greater ($P<.05$) chroma readings, indicating a greater color intensity.

Resistance and Sensitivity of Meat Lactic Acid Bacteria to Antibiotics, Carmen Ametrano Vidal and D. L. Collins-Thompson, Department of Environmenal Biology, University of Guelph, Guelph, Ontario N1G 2W1, Canada

J. Food Prot. 50:737-740

Sixty-seven strains of lactic acid bacteria (LAB) isolated from raw ground pork and beef were studied. Morphological and biochemical studies enabled the strains to be classified in four broad groups. These were atypical streptobacteria, *Lactobacillus plantarum*, *Lactobacillus brevis* and *Leuconostoc mesenteroides*. Antibiotic resistance/sensitivity patterns of these strains to 17 common antibiotics are reported. All 67 strains were sensitive to penicillin, ampicillin, cephaloridine and erythromycin. Most strains were resistant to cloxacillin, methicillin, gentamicin, kanamycin, neomycin, streptomycin, tetracycline, polymyxin B, colistin, novobiocin, and bacitracin. Most strains were sensitive to chloramphenicol and rifampin. MIC studies on tetracycline and chloramphenicol resistant strains showed them to be highly resistant. Population studies of LAB in raw meat were shown to vary in tetracycline resistance (12-58% of total LAB as measured by MRS).

Evaluation of Swab and Tissue Excision Methods for Recovering Microorganisms from Washed and Sanitized Beef Carcasses, M. E. Anderson, H. E. Huff, H. D. Naumann, R. T. Marshall, J. Damare, R. Johnston, and M. Pratt, United States of Agriculture, Agricultural Research Service, Room 105, Eckles Hall, University of Missouri, Columbia, Missouri 65211 and Department of Food Science and Nutrition, University of Missouri-Columbia, Columbia, Missouri 65211

J. Food Prot. 50:741-743

Samples taken from dressed beef carcasses by swabbing surfaces or excising tissues were plated to produce counts of aerobic bacteria, *Enterobacteriaceae*, and *Escherichia coli*. Counts were compared to determine efficiencies of the two sampling methods. Excised tissues produced much higher counts than did swabs, especially when washed and sanitized carcasses were sampled. Percentages recovered by swabbing appeared to be influenced by characteristics of the area sampled on the carcass. Numbers of *Enterobacteriaceae* and *E. coli* recovered by swabbing washed and sanitized carcasses were usually too few to be countable, whereas excision usually produced countable plates. The excision sampling method permitted differentiation among treatment effects of washing and sanitizing.

Casein, Fluorescein Isothiocyanate as a Substrate for Measuring Protease Production by Psychrotrophic Bacteria, Genevieve L. Christen and M. Senica, Animal and Dairy Science Department, University of Georgia, Athens, Georgia 30602

J. Food Prot. 50:744-749

Fluorescein isothiocyanate-labelled casein was evaluated as a substrate for measuring bacterial protease activity in milk. Using protease from *Bacillus amyloliquefaciens*, effects of substrate type, pH, temperature and enzyme concentration were determined. The procedure was sensitive to .012 unit of enzyme activity. The procedure was then used as a method to detect protease production by psychrotrophic bacteria growing in pasteurized skim milk at 7°C for 5 d. Three psychrotrophic bacteria were added at three different initial populations. Bacterial population, protease activity and cumulative free amino groups were monitored daily. Bacterial populations were not correlated with either protease activity or cumulative free amino groups. Protease activity and cumulative free amino groups were correlated ($r=.46$, $p=.001$). Both protease activity and cumulative free amino groups peaked as the microorganisms entered the late log phase (approximately 10^8 colony forming units per ml). This occurred after incubation for 2 d at 7°C in two replications. and after 3 d in the third. Both values decreased with continued storage.

Effects of Potassium Sorbate Alone and in Combination with Sodium Chloride on Growth of *Staphylococcus aureus* MF-31, Kathleen A. Larocco and Scott E. Martin, Department of Food Science, 569 Bevier Hall, University of Illinois, 905 South Goodwin Avenue, Urbana, Illinois 61801

J. Food Prot. 50:750-752

Effects of potassium sorbate alone and in combination with 2 or 3% sodium chloride on growth of *Staphylococcus aureus* MF-31 were examined. Growth studies were done in tryptic soy broth (final pH, 6.3) at 22°C for 15 d and 35°C for 48 h without shaking. A dual plating procedure was used to monitor growth (tryptic soy agar) and development of injury in the cell population (tryptic soy agar + 7% NaCl). At both storage temperatures, sorbate alone and in combination with 2 or 3% NaCl had only minimal effects on growth inhibition. Presence of NaCl did not appear to enhance effectiveness of sorbate in cell inhibition under these conditions. No injury was observed in the cell population.

Reduction of Mutagen Formation in Fried Ground Beef by Glandless Cottonseed Flour, K. S. Rhee, K. C. Donnelly and Y. A. Ziprin, Meats and Muscle Biology Section, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 50:753-755

Pan-frying ground beef patties at 200°C to an extremely well-done state produced mutagens detectable by *Salmonella* strain TA98 with metabolic activation. Defatted glandless cottonseed flour (GCF) added at the 5% level of meat weight significantly reduced mutagen formation in fried beef patties. The magnitude of mutagenicity reduction by GCF tended to be much greater than the meat dilution effect by the non-meat additive.

Rapid Quantitative Determination of Trimethylamine using Steam Distillation, P. Malle and S. H. Tao, Ministere de l'Agriculture, Direction de la Qualite, Laboratoire d'Inspection des Produits de la Peche, Service Veterinaire d'Hygiene Alimentaire, rue Huret Lagache, 62200 Boulogne-Sur-Mer, France and Ministere de l'Agriculture, Direction de la Qualite, Laboratoire Central d'Hygiene Alimentaire, 43, rue de Dantzig, 75015, Paris, France

J. Food Prot. 50:756-760

A simple, rapid and inexpensive method is proposed for determination of trimethylamine (TMA) in fish muscle. This procedure includes a deproteinization step with trichloroacetic acid (TCA) followed by blocking of primary and secondary amines using formaldehyde at alkaline pH and finally steam distillation of TMA. No statistically significant differences were found between this new optimized procedure and either the Conway microdiffusion method or the colorimetric method. Using the technique proposed here it is possible to assay both the total volatile basic nitrogen (TVBN) and the TMA in less than 30 min.

Thermal Resistance of *Aeromonas hydrophila*, S. A. Palumbo, A. C. Williams, R. L. Buchanan and J. G. Phillips, U.S. Department of Agriculture, Eastern Regional Research Center, 600 East Mermaid Lane, Philadelphia, Pennsylvania 19118

J. Food Prot. 50:761-764

Thermal resistance of five strains of *Aeromonas hydrophila* (three clinical and two food isolates) was studied at 45 to 51°C in saline solution and raw milk. In addition, effects of growth temperature and growth phase on thermal resistance of the cells were also studied. Survivors after various heat treatments were plated on starch phenol red agar; colonies were counted after 24 h at 28°C. Cells heated at 48°C and 51°C exhibited a diphasic response and the data presented are from the initial and final linear phases. Data were expressed as D- and z-values. Most variables caused small but statistically significant changes in D-value of the initial linear phase. At 48°C, D-values for stationary phase cells heated in saline solution ranged from 3.49 to 6.64 min; for cells heated in raw milk, the D-values ranged from 3.20 to 6.23 min. At 48°C, D-values for log-phase cells heated in saline solution ranged from 2.23 to 3.73 min, and z-values ranged from 5.22 to 7.69°C. These results indicate that *A. hydrophila* should be killed by many of the heat treatments given foods during processing. The thermal resistance of *A. hydrophila* appears similar to that of other gram-negative bacteria associated with food.

Iodine in California Farm Milk: 1985-1986, John C. Bruhn, Antoine A. Franke and T. Wyatt Smith, Departments of Food Science and Technology and Animal Science and Cooperative Extension, University of California, Davis, California 95616

J. Food Prot. 50:765-768

Iodine has been measured in 1572 California farm milk samples, representing 2,725,000 gallons of milk, or about 54% of daily production. The mean iodine concentration in the analyzed samples was 173.3 μg/kg milk, with a standard deviation of 115.8 μg/kg. The volume-corrected mean iodine concentration for all samples was 188.3 μg/kg. Of the farms examined, 13% used neither an iodine teat-dip or backflush; the milk iodine concentration on these dairy farms averaged 147.8±90.2 μg/kg. Of the farms examined, 73% used iodine teat-dip only; milk iodine concentrations averaged 166.7±109.4 μg/kg. Less than 1% of the farms used iodine only in their backflush systems; their milk iodine concentrations averaged 202.3±107.2 μg/kg. Thirteen percent of the farms used both iodine teat-dip and iodine in their backflush systems; their milk iodine concentrations averaged 251.3±153.9 μg/kg. While the concentration difference between farms using iodine in both the teat-dip and backflush system and farms in the other three groups was statistically significant, the mean concentration was still well below the maximum limit of 500 μg/kg imposed by health agencies in some countries. Overall, 30.7% of samples measured has less than 100 μg iodine/kg; 70.1% had less than 200 μg/kg; 88.8% had less than 300 μg/kg; 94.4% had less than 400 μg/kg; and 98.1% had less than 500 μg/kg.

Plasticizers in Food, C. S. Giam and M. K. Wong, Department of Industrial Environmental Health Sciences, University of Pittsburg, Pittsburg, Pennsylvania 15261

J. Food Prot. 50:769-782

Plasticizers are widely used in the manufacturing of plastic materials, and are now found everywhere in our environment. Most previous reviews have focused on leaching of plasticizers from medical devices and toxicity of these leachates to humans and animals. There are fewer studies on the distribution of plasticizers in foods. This review surveys the various analytical methods for analysis of plasticizers in foods. The problems and solutions involved in the analysis of foods are discussed. Methods are compiled chronologically; some typical analytical procedures are presented. The concentrations of plasticizers in various foods as reported in the literature are tabulated. Efforts to improve the quality of the packaging plastic materials to reduce migration or leaching of plasticizers are included in this review.

Foodborne Gram-Negative Bacteria and Atherosclerosis: Is There a Connection? Douglas L. Archer, Division of Microbiology, Center for Food Safety and Applied Nutrition, Food and Drug Administration, Washington, DC 20204

J. Food Prot. 50:783-787

There is some evidence that endotoxin-containing bacteria may contribute to atherogenesis. The degree to which bacterial insults contribute to the total body burden of atherosclerotic lesions cannot be determined at this time. It is important to realize that there are other potential sources of injury to the vascular endothelium, mechanical, chemical, immunologic and biological, which may initiate formation of an atherosclerotic plaque. It must also be remembered that the process of atherogenesis is extremely complex and involves many factors other than the initial injury to endothelium. The suggested role for endotoxin, particularly endotoxin from degrading bacteria in macrophages, in concert with the inflammatory factors induced by endotoxin from endothelium and vascular smooth muscle cells, is an attractive hypothesis for several reasons. First, dampening of inflammatory responses by effects of N-3 polyunsaturated fatty acids (omega-3s) is explained, particularly their direct influence on monocyte functions. Second, the hypothesis provides a model system in which the first step in atherogenesis may be studied prospectively, while other factors may be varied to determine their influences on later stages in the process of plaque formation. Recombinant DNA techniques and sophisticated immunologic tools are available to study the entire process, as are animal models in which to conduct studies with relevance to the human. Although at present, the link between foodborne gram-negative bacterial pathogens and atherosclerosis is largely unproven, the possible role of such organisms warrants more research. Additionally, should the link be firmly established, it would further underscore the importance of food safety in the biological sense.

***Shigella* as a Foodborne Pathogen,** J. L. Smith, U.S. Department of Agriculture, Eastern Regional Research Center, 600 East Mermaid Land, Philadelphia, Pennsylvania 19118

J. Food Prot. 50:788-801

Shigellosis is classically thought of as a waterborne disease; however, public health data suggest that foodborne outbreaks are a significant, if not the major cause of the disease in the United States. The role of *Shigella* as a foodborne pathogen is reviewed, including discussions of taxonomy, epidemiology, virulence factors, growth and survival in foods and model systems, and methods for detection/identification in food products.

1987

September 14-15, ASSOCIATED ILLINOIS MILK, FOOD, AND ENVIRONMENTAL SANITARIANS FALL SEMINAR AND ANNUAL MEETING, a joint conference with the Cooperative Extension Service of the University of Illinois. For more information, contact: Dr. Clem Honer, Secretary Associated Milk, Food and Environmental Sanitarians, Gorman Publishing Co., 8750 W. Bryn Mawr, Chicago, IL 60631. 312-693-3200 or Dr. Gary Harpestad, Extension Dairyman, Univ. of Illinois, 315 Animal Sciences Lab., 1207 W. Gregory Dr., Urbana, IL 61801. 217-333-0510.

September 14-17, AOAC TO HOLD 101ST ANNUAL INTERNATIONAL MEETING, to be held at The Cathedral Hill Hotel, in San Francisco. For more information, contact: the AAOAC office at 1111 N. 19th St., Suite 210, Arlington, VA 22209. 703-522-3032.

September 14-18, FOOD MICROBIOLOGY SHORT COURSE, sponsored by the University of California and University Extension. To be held at the Department of Food Science and Technology, Cruess Hall, UC Davis Campus. For further information, contact: Kathryn J. Boor, Food Science and Technology, University of California, Davis, CA 9516. 916-752-1478.

September 15-16, 1987 ANNUAL CONVENTION OF THE SOUTH DAKOTA STATE DAIRY ASSOCIATION, to be held at Howard Johnson's, Sioux Falls, SD. For more information, contact: Shirley W. Seas, South Dakota State Dairy Association, University Dairy Building, Brookings, SD 57007. 605-688-5420.

September 17-18, WISCONSIN LABORATORY ASSOCIATION ANNUAL EDUCATION CONFERENCE, to be held at the Holiday Inn, Fond du Lac, WI. For more information, contact: Sharon Kluender, 616 1/2 Garfield Ave., Wausau, WI 55401. 715-848-1406.

September 17-18, MINNESOTA SANITARIANS ASSOCIATION ANNUAL MEETING, to be held at the Earle Brown Center, Univ. of Minnesota, St. Paul Campus. For more information, contact: Roy E. Ginn, Dairy Quality Control Inst., 2353 N. Rice St., Room 110, St. Paul, MN 55113. 612-484-7269.

September 20-23, NATIONAL DAIRY COUNCIL OF CANADA 70TH ANNUAL CONVENTION, to be held at the Quebec Hilton, Quebec, Canada. For more information, contact: Dale A. Tulloch, 141 Laurier Avenue West, Ottawa, Ontario, Canada K1P 5J3.

September 21-23, NEW YORK STATE ASSOCIATION OF MILK & FOOD SANITARIANS ANNUAL MEETING, to be held at the Sheraton Inn Syracuse, (Liverpool, NY). For more information, contact: Paul J. Dersam. 716-937-3432.

September 24-25, SWEETENERS IN FOODS: SENSORY, PROCESSING AND HEALTH ASPECTS, to be held at Kansas State Union, Kansas State University, Manhattan, KS. For more information, contact: Dr. Carol Setser or Dr. Karen Penner, Department of Foods and Nutrition, Justin Hall, Kansas State University, Manhattan, KS. 913-532-5508.

September 28-29, SEMINAR ON "CONTEMPORARY QUALITY ASSURANCE," jointly sponsored by the International Dairy Federation and USNAC. To be held in McCormick Place, Chicago, IL. 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 30-October 2, KANSAS ASSOCIATION OF SANITARIANS ANNUAL MEETING, to be held at the Holidome in Lawrence, Kansas. For more information, contact: John M. Davis. 316-268-8351.

October 5-9, 13TH INTERNATIONAL SYMPOSIUM OF THE IUMS-ICFMH & FECS-WPFC, "Toxins in Foodborne Disease" and "Microbiology of Drinking Water," to be held in Halkidiki, Greece. For more information, contact: Prof. J. A. Papadakis, Omirou 24, 10672 Athens, Greece.

October 10-15, 1987 30TH ANNUAL NATIONAL EDUCATIONAL CONFERENCES AND EXPOSITION OF THE ENVIRONMENTAL MANAGEMENT ASSOCIATION AND ITS SUBSIDIARIES, to be held at the Clarion Hotel, St. Louis, MO. For more information, contact: Registrar, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

October 12-14, BIOTECHNOLOGY PROCESSING ENGINEERING CENTER THIRD ANNUAL SYMPOSIUM, to be held at the Massachusetts Institute of Technology, Cambridge, MA 02139. For more information, contact: Diana Kenney, MIT, Room 20A-207, Cambridge, MA 02139. 617-253-0805.

October 18-21, CORNELL SYMPOSIUM ON CHEESE BIOTECHNOLOGY AND INTERNATIONAL FOOD DEVELOPMENT, to be held at Cornell University, Ithaca, NY. For more information, contact: Richard A. Ledford, Chairman, Department of Food Science, Cornell University, Ithaca, NY 14853-7201. 607-255-7616.

October 19-21, DESCRIPTIVE ANALYSIS, to be held in Palo Alto, California. Preregistration required. For more information, contact: Herbert Stone, President, Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833 or Telex WUI 6502215776 (access MCI).

October 19-21, BIOTECHNOLOGY PROCESSING ENGINEERING CENTER THIRD ANNUAL SYMPOSIUM, to be held at the Massachusetts Institute of Technology, Cambridge, MA 02139. For more information, contact: Diana Kenney, MIT, Room 20A-207, Cambridge, MA 02139. 617-253-0805.

October 20-22, AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE CLINIC, to be held in Minneapolis, MN. For more information, contact: Dr. C. Bronson Lane, ACDPI, PO Box 547813, Orlando, FL 32854-7813.

October 27-28, MISSOURI DAIRY FIELDMEN'S AND SANITARIAN'S EDUCATIONAL CONFERENCE, to be held at the Days Inn-University Center, formerly Holiday Inn West, Columbis MO. For more information, contact: R.T. Marshall, Eckles Hall, University of Missouri, Columbia, MO 65211. 314-882-7355.

1 November, CANADA'S AMFES ANNUAL MEETING, to be held in Edmonton, Alberta. For more information, contact: Jim Eisen. 451-0817.

November 8-11, DAIRY INSTITUTE OF CALIFORNIA ANNUAL FALL MEETING, to be held at The Lodge, Pebble Beach, CA. For more information, contact: Robert D. Boynton, Suite 718, 1127 - 11th Street, Sacramento, CA 95814.

November 10 12, BASIC PASTEURIZATION COURSE, to be held in Texarkana, Texas. Location to be announced. For more information, contact: Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, Texas 78613-2363. 512-458-7281.

November 15-18, SOUTHERN ASSOCIATION OF DAIRY FOOD MFRS., INC. 73RD ANNUAL CONVENTION, to be held at Colonial Williamsburg Foundation, Williamsburg, VA. For more information, contact: John E. Johnson, P.O. Box 10506, Raleigh, NC 27605

November 17-19, INTERNATIONAL CATERERS' SHOW AND CONFERENCE (ICS), to be held at the Merchandise Mart Expo Center, Chicago, IL. For more information, contact: Helen Brett Enterprises, 220 S. State St., Suite 1416, Chicago, IL 60604. 312-922-0966.

November 30-December 3, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hyatt Regency, New Orleans, LA. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

November 30-December 4, THE FIRST LATIN AMERICAN CONGRESS ON FOOD MICROBIOLOGY AND THE I ARGENTINE SYMPOSIUM ON PRESERVATION OF FOODS, to be held in Buenos Aires, Argentina. For more information, contact: Dr. Ricardo Sobol, Secretary General, Bulnes 44 P.B. "B", 1176 Buenos Aires, Argentina. Additional information: Dr. Fernando Quevedo, 525 Twenty Third St., N.W., Washington, D.C. 20037.

December 8-11, WORKSHOP IN INSTRUMENT SERVICE AND REPAIR, to be held at the Anderson training facility and dairy processing plant in Fultonville, NY. For more information, contact: Michael D. Cunningham, Anderson Instrument Company, Inc., R.D. 1, Fultonville, NY 12072. Telephone: 518-922-5315.

1988

January 20-23, FOURTH INDUSTRY-WIDE U.S. DAIRY FORUM, sponsored by the Milk Industry Foundation and International Ice Cream Association. To be held at the Innisbrook in Tarpon Springs, FL. For more information, contact: Joe Dugan, 888 Sixteenth Street, N.W., Washington, DC 20006. 202-296-4250; TELEX 150185.

February 10-11, DEPARTMENT OF FOOD SCIENCE & NUTRITION DAIRY & FOOD INDUSTRY CONFERENCE, to be held at the Fawcett Center for Tomorrow, Ohio State University, Columbus, OH. For more information, contact: John Lindamood, 2121 Fyffe Road, Columbus, OH 43210-1097.

February 12-14, DAIRY PRODUCTS INSTITUTE OF TEXAS ANNUAL CONVENTION, to be held at the Hershey Hotel, Corpus Christi, TX. For more information, contact: Glenn R. Brown, 201 Vaughn Building, Austin, TX 78701.

February 21-24, SWEETENER USERS GROUP, INTERNATIONAL SWEETENER COLLOQUIUM, to be held at Innisbrook Resort, Tarpon Springs, FL. For more information, contact: Constance E. Tipton, 888 16th Street, NW, Washington, DC 20006.

March 6-8, OHIO DAIRY PRODUCTS ASSN., INC. ANNUAL CONVENTION, to be held at Dayton Marriott Hotel, Dayton, OH. For more information, contact: Don Buckley, 1429 King Ave., 210, Columbus, OH 43212.

March 6-9, TEXAS PUBLIC HEALTH ASSOCIATION, 63rd Annual Meeting to be held at the Hilon Palacio del Rio in downtown San Antonio. For more information, contact: James O. Allen, Jr., Texas Public Health Association, PO Box 4246, Austin, Texas 78765.

March 13-16, DAIRY & FOOD INDUSTRIES SUPPLY ASSN. ANNUAL CONFERENCE, to be held at Americana Canyon Resort, Palm Springs, CA. For more information, contact: Bruce D'Agostino, 6245 Executive Blvd., Rockville, MD 20852.

March 21-25, DEPARTMENT OF FOOD SCIENCE & NUTRITION, MID-WEST WORKSHOP IN MILK & FOOD SANITATION, to be held at Fawcett Center for Tomorrow, Ohio State University, Columbus, OH. For more information, contact: John Lindamood, 2121 Fyffe Road, Clumbus, OH 43210-1097.

April 10-13, MILK INDUSTRY FOUNDATION, INTERNATIONAL ICE CREAM ASSOCIATION, MARKETING & TRAINING INSTITUTE SPRING BOARD MEETING, to be held at The Ritz Carlton, Laguna Niguel, CA. For more information, contact: John F. Speer, Jr., 888 16th Street, NW, Washington, DC 20006.

April 18-21, AMERICAN DAIRY PRODUCTS INSTITUTE ANNUAL MEETING & TECHNICAL CONFERENCE, to be held at Chicago O'Hare Marriott Hotel, Chicago, IL. For more information, contact: Warren S. Clark, Jr. 130 N. Franklin Street, Chicago, IL 60606.

May 22-24, GEORGIA DAIRY PRODUCTS ASSOCIATION ANNUAL CONVENTION, to be held at Callaway Gardens, Pine Mountain, GA. For more information, contact: Pat Hamlin, P.O. Box 801, Macon, GA 31208.

July 31-August 4, IAMFES 75th ANNUAL MEETING, to be held at the Hyatt Regency Westshore, Tampa, FL. For more information contact Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 800-525-5223, in Iowa 515-232-6699.

September 11-13, NATIONAL DAIRY COUNCIL OF CANADA ANNUAL CONVENTION, to be held at the Winnipeg Convention Centre, Winnipeg, Manitoba. For more information, contact: Pat MacKenzie, 141 Laurier Avenue West, Ottawa, Ontario, Canada K1P-5J3.

September 11-14, SOUTHERN ASSOCIATION OF DAIRY FOOD MANUFACTURERS, INC. 74TH ANNUAL CONVENTION, to be held at the Boca Raton Hotel & Club, Boca Raton, FL. For more information, contact: John E. Johnson, P.O. Box 1050, Raleigh, NC 27605.

September 21-22, UNITED DAIRY INDUSTRY ASSOCIATION ANNUAL MEETING, to be held at the Hyatt Regency Minneapolis, Minneapolis, MN. For more information, contact: Edward A. Peterson, 6300 N. River Road, Rosemont, IL 60018.

October 9-13, AACC ANNUAL MEETING, to be held at the Hotel InterContinental San Diego, in San Diego, California. For more information, contact: Raymond J. Tarleton, American Assoc. of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121. 612-454-7250.

October 15-19, MILK INDUSTRY FOUNDATION & INTERNATIONAL ICE CREAM ASSOCIATION ANNUAL CONVENTION & SHOW, to be held at Marriott's Orlando World Center, Orlando, FL. For more information, contact: John F. Speer, Jr., 888 16th Street, NW, Washington, DC 20006.

November 28-December 1, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hilton, Anaheim, CA. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

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