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Dairy and Food Sanitation

A Publication for Sanitarians and Fieldmen

- Adequate Milking Systems — The Key to Good Udder Health
- Current Status of Foodborne Disease Problems
- Survey of Farm Milk Tanks in Vermont
- Chip Dips — A Test of Quality



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Survey of Farm Milk Tanks in Vermont¹

K. M. NILSON, J. A. PATRIDGE, A. H. DUTHIE,
JAMES FOX and H. V. ATHERTON

*Department of Animal Sciences
University of Vermont
Burlington, Vermont 05405*

A survey of Vermont farm bulk tanks with capacities in excess of 1,000 gallons was conducted to determine the agitation time necessary for obtaining a proper milk sample for milkfat determination. Results of this survey indicate that 96.6% of all tanks tested gave milkfat tests in accordance with 3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks.

In a separate study, an attempt was made to relate certain defects in milk such as churning, freezing, presence of debris and high ADV's to the type of milk handling system in use. None of these defects could be clearly associated with or seen to be caused by any of the milk handling systems observed.

In recent years, there have been many changes in the dairy industry. One important change has been a trend toward increased sizes of bulk storage tanks due to larger farms and every-other-day pick-up. The ability to obtain a representative sample for milkfat testing within the specified agitation time from these larger tanks has been questioned. Also, the question arises as to how some of the quality problems associated with milk handling may

or may not be attributable specifically to the equipment or methods of handling.

In 1962 Dimick and Atherton (2) gathered information on the agitation time needed to get a representative sample for milkfat determination from farm milk tanks ranging in size from 200 to 1,000 gallons. They showed that 99.4% of the tanks tested yielded a representative sample within three minutes of agitation.

The original scope of the survey was to determine how much agitation was necessary to get a representative sample from 1,000 gallon or larger farm milk tanks. In doing that, however, several farm tanks were discovered which contained milk that was churned or frozen. That launched a second study to determine the extent of the defect.

The first goal was to check agitation time needed to get a representative sample from 1,000 gallon and larger tanks. Seventy-four of 80 farmers contacted gave permission for their tanks to be checked. All the samples were taken with a 1 oz. stainless steel universal dipper stored in an iodine sanitizer until needed. All samples were placed in 13 dram plastic vials and kept between 33° and 40°F in an ice-water bath. A true test sample was taken 10 minutes after the last

milk from the fourth milking entered the tank. The milk was then allowed to cool. After the agitator stopped, the time it took for the milk to form a cream layer was recorded. At the time the milk would normally be picked up, the agitator was turned on and one sample was taken each minute for 15 minutes. The samples were sent to the Federal Milk Market Administration laboratory and tested for butterfat using a Mark III Milkotester (1). Results were then compared against the 3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks (6).

Section D.14 of Number 13-06, Agitators: Means for mechanical and/or air agitation shall be provided that will result in a variation in milkfat content of the product in the tank of not more than plus or minus 0.1 percent as determined by an Official AOAC Milk Fat Test, when the tank is filled to (1) 100 percent of its capacity with product and the agitator has been in operation for 5 minutes if the capacity of the tank is less than 1,500 gallons or (2) 100 percent of its capacity with product and the agitator has been in operation for 10 minutes if the capacity of the tank is 1,500 gallons or larger.

At 39 of the 74 farms, the milk hauler arrived before a cream layer formed or even before the milk had a

¹Vermont Agricultural Experiment Station Journal Article No. 455. This study was supported by Vermont Agricultural Experiment Station project Hatch 289, the Walker Research Fund, and Windham Foundation Fund.

chance to cool properly. Two tanks were found with churned milk, 3 with frozen milk, and one that had problems cooling the milk. This left 29 tanks to sample, ranging in size from 1000 to 3000 gallons. Quiet times for these tanks ranged from 1 to 4 hours.

All but one (96.55 percent) of the tanks tested fell within the 3-A Sanitary Standards. The authors were surprised that 24 tanks (82.75 percent) gave representative samples within two minutes of agitation and 4 more (13.8 percent) in the following 3 minutes. Tanks of various shapes were tested both with and without automatic interval agitation. The tank shape and whether it had automatic agitation didn't seem to affect milkfat test accuracy.

The second goal was to check for possible defects in milk from farm milk tanks. For this, arrangements were made to survey at least ten percent of the farms in Vermont. A technician rode the farm pickup truck and took a sample, recorded the temperature and the weight of the milk from each tank, and noted the condition of the milk and the type of milk-handling equipment used.

The technician took each sample with a three ounce stainless steel

dipper and placed it in a 6 ounce plastic bag in ice-water. Samples were sent to the dairy laboratory where it was tested for acid degree value (ADV) by the Thomas method to determine hydrolytic rancidity (5). It was thought a relationship could be found between some of the milk defects or milk-handling equipment and the ADV's.

Four visual defects of the milk were found. These were foaming, churned or frozen particles and milk that contained debris. The milking systems were categorized as (1) around-the-stable pipeline, (2) parlor, and (3) bucket systems. These were further divided into groups of highline and lowline (or weighjar) systems. Buckets were divided into groups of gravity or manual transfer, vacuum operated dump stations, and pump operated dump stations. Each tank was checked for capacity, shape, manufacturer, agitator speed, and agitator size.

The first and most obvious finding in this part of the survey was that a large number of farm tanks contained defective milk. It was found that 3.76 percent of the tanks had frozen milk, 14.5 percent had foamy milk, 11.8 percent had churned milk and 4.8 percent had debris in them. This meant that 10.8

percent of the tanks had a combination of defects with 45.7 percent of the tanks containing milk with at least one defect (Table 1). No significant differences could be found in the mean ADV's among the groups when the data was analyzed statistically (Tables 1 and 2). It is apparent that milk containing debris has the highest ADV's, which indicates that milking practices are a source of ADV problems. When it was considered that the mean temperature for the milk in the tanks surveyed was 37.5 F, (3.0 C), the authors wondered how many poor sanitation practices are being covered up by modern refrigeration.

Next, the possible relationships between the tank characteristics and the ADV of the milk were studied. The mean ADV were classified by tank manufacturer (Table 3). No significant differences between any two manufacturers were found. The variations in the ADV's are not explained by percent fill of the tanks, capacities, agitator sizes or speeds.

Up to this point no correlations between ADV and other data were found, however, when an analysis of variance was run for ADV classified by milking systems, it was found that here were some significant differences and interesting patterns.

TABLE 1. ADV's vs. Visual Condition of Milk.

Visual Condition	No.	Mean ADV
No Defect	102	1.04
Foaming	26	.98
Churning	22	.88
Freezing	7	.92
Debris	9	1.24
Multiple Defects	19	1.14

TABLE 2. Breakdown of Multiple Defects.

Visual Defects	No.	Mean ADV
Foaming and Churning	3	1.18
Foaming and Freezing	5	1.18
Churning and Freezing	2	.83
Churning and Debris	7	1.10
Debris and Foaming and Churning	1	1.45
Debris and Freezing and Churning	1	1.33

TABLE 3. ADV's vs Tank classified by Manufacturer.

Manufacturer	No.	Mean ADV
Mueller	26	1.01
DeLaval	13	1.17
Darikool	36	.99
Sunset	28	.91
Zero	16	1.03
Cherry-Burrell	9	.89
Solar	15	1.00
Milkeeper	8	.98
Surge	2	1.11
Steinhorst	4	.57
Crepaco	4	1.36
Girton	5	1.58
Mojonnier	5	1.35
Universal	2	1.04
VanVetter	1	.89
Kennebec	1	1.06
Esco	4	1.10
Craft	2	.20
Haverly	2	.71
Wilson	2	1.28
Embee	1	1.59

The data reported in Table 5 show significant differences between around-the-stable pipelines and the other two major groups. These results agreed well with results of other work done by the Vermont Department of Agriculture (3).

When the visual condition of the milk was compared to the four tank characteristics, no significant differences were observed. The tanks with freezing defects were those with the highest mean percent fill, the lowest mean capacity, the smallest mean agitator size, and the slowest mean agitator speed (Table 5). This seemed to indicate a problem of insufficient agitation to either move the milk away from the cooling surface efficiently enough to prevent freezing or to melt the ice formed at previous milkings. The latter possibility presented a question of

how many tanks may have had unobserved ice formation. When a breakdown of visual condition by milking system was considered, it was found that each system had one or two categories with high percentages of defects, but no system could be called a cause of any specific defect (Table 6).

In part one of this study it was found that large bulk tanks were sufficient in their ability to agitate the contents to provide a reliable sample for milkfat testing in 96.6% of the cases. This was encouraging, but observations of improper sampling techniques, of milk being picked up that was stored outside the tank, and of improperly cooled milk being picked up lead the authors to believe there is still room for

improvement in the education of farmer, haulers and field personnel.

In part two the authors tried to relate several common visual milk defects with the type of equipment or system of milk handling. In all cases, with the exception of ADV classified by milking system, it was determined that no blame for visual defects or high ADV could be placed on the design of a specific piece of milk handling equipment.

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TABLE 4. ADV's vs. Type of Milking System.

Type	Mean ADV	
Around the Stable	34	1.26
Parlor (total)	27	1.02
highline	9	.99
lowline	18	1.03
Buckets (total)	124	.94
vacuum	38	.94
pump	20	.87
gravity	52	1.02

TABLE 5. Visual condition vs. tank and agitator characteristics.

Visual Defect	No. of Tanks	Tank		Agitator	
		Percent fill %	Capacity (gallons)	(feet)	Speed (rpm)
No Defect	102	52.87	577.65	2.03	37.15
Foaming	26	51.82	686.00	1.94	53.26
Churning	22	59.19	518.41	1.86	39.48
Freezing	7	65.05	342.86	1.67	34.67
Debris	9	49.94	666.11	2.00	43.22
Multiple Defects	19	63.45	718.42	2.02	55.18

TABLE 6. Distribution of Defects within Milking System Types.

Visual Condition	Around the Barn		Parlor		Bucket	
	(%)	No.	(%)	No.	(%)	No.
No Defects	47.06	16	40.74	11	59.20	74
Foaming	8.82	3	22.22	6	14.40	18
Churning	17.65	6	3.70	1	12.00	15
Freezing	5.88	2	0.00	0	4.00	5
Debris	8.82	3	7.41	2	3.20	4
Multiple Defects	11.76	4	25.93	7	7.20	9
Totals	100.00%	34	100.00	27	100.00	125

NCTR

Testing The Chemicals That Man Hath Wrought

CHRIS LECOS

The National Center for Toxicological Research, located between Little Rock and Pine Bluff, Ark., was once devoted to germ warfare production and has been since described as a facility that voluntarily was transformed from science enlisted to dealing out death to science employed for the provision of life. This is the first of a series of articles on the development and scientific pursuits at this research center.

At a remote, isolated area of central Arkansas, surrounded by forests of oak, sweetgum, and pine trees, a fair distance from the refined environs of a university campus and the hassle of modern, urban life, the conversations are about science and research, monkeys and man, and the terribly difficult problems of scientists and federal regulators in trying to keep up with the thousands of chemicals that are inundating the human marketplace.

The speakers are all scientists with the National Center for Toxicological Research (NCTR), a federally supported research complex that 9 years ago was nothing but a shell, a gutted hangover from this country's now abandoned germ warfare production days. Their new offices and labs are in old, yellow-tiled buildings, and their talk is in this vein:

- Hunched over his desk, puffing thoughtfully on a cigarette, pharmacologist Herbert J. Schumacher speaks

of the complexities of searching for "standards of scientific measurements" for testing chemicals that are potential causes of cancer, mutations, and birth defects in human beings. "We are measured by the standard of the science we produce," he says with a certain finality.

- At a nearby laboratory, Dr. William Slikker—who is using rhesus monkeys and their offspring to study how natural and synthetic estrogens pass from the mother to its fetus—talks of "basic mechanisms" and "metabolic conversions" and how primates are ideal animal models for this kind of research, because the general metabolism of estrogens is very similar between man and monkey.

"There's a reason our body goes through all these metabolic conversions," he continues. "There are reasons for all these things, and although we may not understand them all, you have to look at the endogenous system and say, 'It's doing this for a reason. Let's find out why and then we'll know why this other synthetic agent is going to behave in the same way.'"

- Meanwhile, Dr. Carole A. Kimmel and her two associates have just embarked on a major research project after four arduous years of planning and preliminary experimentation. It involves five other labs around the country to test the "sensitivity" of methods for testing compounds that are known to cause behavior and learning disorders in children. Some day, they point out, enough may be known to predict not only which chemicals will cause malformations but also which will induce a behavior or learning defect in a child. But, for the present, the immediate goal is to develop a reliable, consistent, acceptable way to test the compounds. "This is not a study to answer questions about the compounds,"

Dr. Kimmel stresses. "What we're seeking is information about the methods and their ability to pick up behavior and learning defects. We want to know if our tests (with animals) are sensitive enough to pick them up."

• And, in the confines of his own office, NCTR Director Ronald W. Hart paces the floor and waves his hands for emphasis as he flows from "predictive testing methodology" to somatic and germinal cell research, to "biological markers in vivo," to the growing need for finding faster, cheaper, more predictable—but still reliable—methods for testing a host of potentially toxic chemicals.

Methodology. The word keeps popping up over and over again, from one scientist to another, and it is a key to understanding what is taking place at this research facility that was created to conduct long-term research on chemicals for the Food and Drug Administration and the Environmental Protection Agency. The two agencies jointly fund its operations, although FDA oversees its administration and activities.

NCTR is not a place that produces earthshaking discoveries and headlined "cures." Its cadre of scientists, technicians, and other personnel are engaged in a form of patient, plodding, step-by-step science that does not provide overnight solutions and panaceas but which strengthens the ability of agencies like FDA and EPA to regulate and evaluate the safety and hazards of a wide array of direct and indirect food and color additives, drugs, cosmetic chemicals, pesticides, airborne contaminants, plastics, synthetic fibers, industrial compounds, and many others.

In many of its experiments—there are more than 100 ongoing research projects at the present time—NCTR's scientists are not primarily trying to find out if a chemical is toxic. Often, that is known before an experiment even begins. More often, their goal is to find the best method for testing compounds, understanding how one chemical interacts with others, how the body handles or metabolizes them, what their effects are on genes, what dangers they pose to future generations, how economically important substances may ultimately be made safe or detoxified. Obviously, research that probes the ability of chemicals to cause cancer, or mutations, or deformed or stunted development of a fetus can only be done with animals, but it is from such research that agencies like FDA and EPA try to establish sound guidelines for regulating chemicals that may be a hazard to humans as well as to predict more reliably the degree of risk to people exposed to toxic substances.

Concern over the effects of chemical uses is, of course, not new. The 1906 Pure Food and Drugs Act was passed by Congress to deal with flagrant abuses of food and drug adulteration, the kind that could lead to death or severe injury. When the world entered the modern day

chemical era during and after World War II, more federal legislation was required to keep pace with public health and safety needs. There are more than two dozen federal statutes that, in effect, provide an umbrella of "cradle-to-grave" regulation of chemicals and their effects on air, water, food, the workplace, consumer products, and other common uses.

For scientists, in general, and regulatory agencies, in particular, the task of research and regulation is a staggering one. As NCTR's Director Hart noted: "We can, perhaps, analyze 40 or 50 compounds a year, yet we have something like 500 to 1,000 to analyze, and hundreds more are coming on the line every year. The thing is, how do you keep up? We're getting further and further behind, that what's happening!" There are an estimated 70,000 chemicals in commercial production. According to a 1979 report of the Federal Regulatory Council, some 7,000 compounds have been tested for carcinogenic effects and only about 500 of those have been found capable of causing the disease.

"It's a question of improving our capability, for we don't know the best ways to test for many of these toxic effects, and at NCTR we are trying to develop ways to make our ignorance less," added Dr. Rosa Gryder, associate director for research operations and planning at FDA's headquarters in Rockville, Md. One of her principal tasks is to serve as a liaison between the remotely located NCTR facility in rural Arkansas and the various agencies and bureaus it serves.

By improving capability for testing a wide array of diverse compounds, scientists and regulatory agencies also are strengthening their ability to predict a chemical's toxic potential.

"Everyone agrees we need to understand the mechanisms—the how and why a cancer is produced," Dr. Gryder continued. "When you understand the how and why, then you can predict better. When you understand what the variables are—why you get a cancer in a mouse and not in a rat from the same chemical, or why you get a cancer in the liver of a rat and not in its kidney—when you understand those mechanisms, then we'll be able to make better predictions, which is the ultimate aim of all this testing." Such science also produces sensible and realistic regulation.

"We cannot outlaw the use of everything," Dr. Gryder said. "Because some of the compounds we regulate are animal carcinogens (cancer-causing), or mutagens (damaging to genes), or teratogens (causing birth defects), we cannot say in every case that you cannot use that chemical, we have to set so-called 'safe conditions for use,' which means we need dose response information from animals, from which we can estimate safe levels for human exposure."

Since its inception, FDA and EPA have invested some

\$200 million to develop NCTR into a center of interdisciplinary science. Its scientific pursuits are carried out through its divisions of carcinogenesis, mutagenesis, teratogenesis, biometry, chemistry, chemical toxicology, and microbiology, immunology, pathology, animal husbandry, and diet preparation. And critical to its operations is its ever-expanding computer and data information systems, installed at a cost of around \$9 million.

"We have to be one of the most highly automated toxicology labs in the country," noted Edward B. Fernstrom, a systems analyst for NCTR. "I have not talked to anyone who had this much of an investment in the control and collection of information. In the final analysis, all you've got is the data."

When one tours NCTR's laboratories, watches experiments through closed circuit television monitors, listens to the clickety-clack and purring of its computers, sees employees don sterilized garb to breed and feed thousands of mice and rats that are raised and kept in a so-called "specific pathogen free" environment to protect the animals from outside contamination, and hears scientists talk of the "state-of-the-art" in their work with other highly complicated, sensitive, and expensive equipment, it is easy to forget that 9 years ago this complex was nothing but an assemblage of buildings that had to be decontaminated and then certified as safe and renovated before a single experiment could be launched.

"When we first came here, there were areas we couldn't even get into," recalled Stephen A. Douglas, NCTR's chief of planning and evaluation. "In terms of lab facilities, there was virtually nothing—maybe six substandard animal rooms and some labs good for production and control of microbiological materials, but they didn't lend themselves to toxicological research. They were all gutted and scrapped."

To see it from the outside, NCTR does not look like a research center. It looks like something the Army built. Three tall water towers, a seven-story structure (that once housed stainless steel fermentation tanks three stories high) and a seemingly endless stretch of overhead piping dominate the 100 acres over which its more than 30, low-lying buildings are spread. The production of bacteriological warfare materials was halted on former President Nixon's orders 12 years ago. On January 27, 1971, Nixon ordered the establishment of a National Center for Toxicological Research.

The Army's Pine Bluff Arsenal, which encompasses 15,500 acres of Arkansas countryside, is still NCTR's principal neighbor. NCTR itself occupies a land area of 496 acres with title to the land vested in the old Department of Health, Education, and Welfare (now HHS). Douglas said it took about 8 months to remove and destroy the deadly materials kept there and to decontaminate the complex. HEW finally was able to take title in May 1972.

Through fiscal 1980, nearly \$31 million has been spent for renovation, reconstruction, and new equipment. Even today, NCTR does not look like a science research center simply because its new labs, animal breeding and holding rooms, modern computer facilities, offices, and other work areas are hidden from view by the basically unchanged exteriors of these sturdy 30-year-old structures. Yet today, it is the workplace for a commuting population of 625 people—about 340 of them civil service, the rest employed on a contract basis—who come there daily via large busses, vans, cars, and motorcycles.

NCTR currently has 72 rooms suitable for housing laboratory animals, including 51 experimental holding rooms for ongoing research, 17 for breeding and 4 for quarantining animals (mainly mice and rats). The animals are acquired from outside sources and checked to see if they have any viruses, parasites, or other microbial contaminants that could jeopardize the success of an experiment. Twenty-one of the 72 rooms are in a 35,000-square-foot building called the "A" Barrier. It has a pathogen-free environment, which simply means it is there to safeguard its animal populations from microbiological, viral, and other contamination. Capable of housing up to 85,000 mice, it was built at a cost of \$3 million and was one of the first major renovation projects at NCTR. It was completed in April 1974. (See FDA Consumer, July-August 1979).

Air, water, light, temperature, humidity, and other environmental factors are controlled. Anything entering the barrier—human or animal—is sterilized by steam, heat, gas, or by passing through a decontamination solution. Personnel entering must brush their teeth, gargle, shower, and then wear sterilized work clothes (including a surgeon's mask) before proceeding to any animal room. Its filtering system is capable of capturing virtually all bacterial and viral contaminants in the air as well as dust particles and airborne chemicals. Personnel move from the cleanest areas to progressively less clean ones. There is no retracing of steps.

Joseph A. Tortorich, acting director of the division of microbiology, heads a staff whose principal task is to monitor the people, animals, and environments at NCTR. Employees are given periodic physicals and tested prior to entry into the barrier rooms. Periodic checks also are made on the breeding colonies and animals slated for experiments to be sure that any contaminants they carry are well within acceptable "tolerance" limits.

Such surveillance of microbial intrusions is mandatory, he said, to assure the credibility of the research going on at NCTR. "I don't think anyone should interpret any results until you are sure that you did not have any interference from any microbial agent"—that is, interference from viruses that "could cause false tumors traceable to the virus and not the chemical being tested," he said.

Besides the workers and the animals, NCTR also keeps close microbial tabs on feed, water, cages, and bedding. "We don't care that much about you, we care about the animals," he jested. "Anybody that goes into the barrier—offhand, about a hundred people—are subjected to our checks."

Dr. William F. McCallum, chief of the animal husbandry division, said NCTR currently is holding between 10,000 and 21,000 experimental mice and around 9,000 rats. "That has been the average daily inventory for experimental animals in recent months," he pointed out. Care of the animals on experiment—including checking their weights, food consumption, and growth, and cleaning of cages, removal of animals for pathologic examination, oral injections, etc.—is part of his staff's responsibility.

The preparation of the feed, usually a cereal chow in mash or pellet form, is the responsibility of Bobby J. Gough, chief of diet preparation. A microbiologist and chemist, Gough said that all feeds obtained are checked for their nutritional and contamination levels.

Gough noted that the sharp increase in research activity at NCTR is reflected in the center's outlay for feed alone. For example, NCTR spent \$22,400 for 66 tons of feed in 1977; then \$32,040 for 89 tons the following year; then \$42,560 for 112 tons in 1979; and \$78,000 for 195 tons last year. This year NCTR will spend \$130,000 for about 300 tons of feed. The cost of feed has gone up \$60 a ton in that 5-year period.

Feed and cages in which animals are kept during experiments are major expense items for any research center that has so many experiments underway at the same time. John Hunziker, a 59-year-old equipment development expert, recently designed a new rat feeder that he estimates will cut NCTR's costs for such hardware from \$188,000 to \$36,000 in the first year. He developed and tested his new feeder last year after scientists there complained about the performance of the standard feeders that were being used and obtained from outside commercial sources. A patent is being sought.

Their complaints focused on excess feed waste from spillage and contamination of feed with urine and feces because they either were consuming the feed after it spilled on the floor of the cage, or they were crawling into the feeder compartment, sometimes getting trapped inside, and contaminating it there. The standard feeders also posed a logistics problem: when the feed was consumed, the feeders had to be washed and returned to the diet preparation branch for refilling, then returned in sterile containers to the labs.

What Hunziker designed was a detachable feeder box made of stainless steel that hangs on the inside of the shoebox-shaped, plastic cages. It can hold more feed (from 600 to 700 grams, enough to feed three rats for a

week), and only the box has to be removed when more feed is needed. When he tested his new feeder with 300 rats over 9 weeks last fall, Hunziker said the average spillage was only .8 of 1 percent. No urine was observed in the feeders, and there were only isolated cases of feces deposits. Yet the rats were able to reach virtually all the feed, further assuring consumption and reducing waste. Animals eating from the new feeder have exhibited no difference in growth rate or weight gain over animals feeding on pellets. "Most scientists are willing to put up with below 10 percent spillage," he said.

Like most government bodies, NCTR this year has had to trim its budget and cut back on some of its planned research; yet, Dr. Hart noted, "We are doing more now than ever in our history." Its revised budget for fiscal 1981 called for an outlay of \$21,021,000 with FDA providing \$16,021,000 and EPA the balance. An emerging influence in NCTR's research activities has been the National Toxicology Program that was established in November 1978, and for which \$7 million—or about one-third of the budget—is committed.

One of the objectives of the National Toxicology Program, one in which other research agencies of government also participate, is to provide validated and reliable short-term tests of a carefully selected list of compounds that generally have wide uses and public health implications. NCTR's toxicological evaluations of various compounds—gentian violet, sulfamethazine, caffeine, saccharin, nitrites are just a few examples—also include research into postnatal effects after chemical exposure of the pregnant mother as well as research into genetic hazards from exposure and the ability of chemicals to induce chromosomal and genetic damage.

The pattern of research at NCTR, and the directions it may be heading, closely fit the experience and strategies of the center's director. Hart, 39, who was sworn in as director in January 1980, was a professor of radiology at Ohio State University's College of Medicine and director of its Chemical and Biomedical Environmental Research Group—positions that put him in charge of some 80 scientists and technicians.

Although over the years NCTR's principal focus was on long-term, low-dose testing of single chemicals, Hart now envisions a gradual shift to shorter term studies and the development of toxicological methodology that will allow FDA, EPA, and other agencies to predict effects in animal systems and how different chemicals interact and affect the genetic makeup of animals. "Out of this, FDA and EPA will be able to formulate cost effective guidelines and faster means of getting better, higher quality data," he noted.

Chris Lecos is a member of FDA's public affairs staff.

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CURRENT STATUS OF FOODBORNE DISEASE PROBLEMS

RICHARD W. GILLESPIE

*Training Officer, State Training Branch
 Division of Federal-State Relations,
 EDRO, FDA
 Cincinnati, OH.*

Convincing evidence shows that food protection programs need to be more fully developed in the United States as these programs have not kept up with the food industry's multitude of changes over the last 50 years. Consequently, illness from food-related diseases outnumbers illness from all other environmental factors combined. A multitude of facts and statistical data, explain clearly food disease problems and possible solutions.

"The development of food protection programs that will effectively safeguard the public health and the reputation of the food industries depends on cooperation between government and industry to achieve the following goals in that case."

Food -- an essential component of man's environment, -- is also recognized as a vehicle of disease transmission. More illnesses associated with the consumption of food are reported than are diseases from all other environmental factors combined.

Statistics show that in 1977, there were 436 foodborne disease outbreaks, involving 9,896 persons. Eight deaths were also reported.

Before examining the current status of foodborne disease problems, a few definitions need to be understood.

Foodborne disease -- Any illness associated with or in which the causative agent is carried in food.

Food poisoning -- Illness due to the consumption of food containing microbial toxins or chemical poisons.

Food intoxication -- Food poisoning caused by bacterial toxins, the by-products of bacteria.

Food infection -- Illness due to an organism (infectious agent) such as bacteria, rickettsia, virus or parasites. The

organism itself causes illness rather than does the by-product.

Psychosomatic food illness -- Illness caused by the mind. A person gets sick or ill at the sight of another person getting sick or the sight of a foreign object, as an insect in a food product.

Foodborne disease outbreak -- (1) Two or more persons experiencing a similar illness, usually gastrointestinal, after eating a common food, and (2) epidemiologic analysis which implicates food as the source of illness.

Food service establishments -- Any place where food is prepared and served - restaurants; cafeterias; institutions including colleges, prisons, hospitals; snack bars. Other foodservice establishments include food vending operations, caterers, delicatessens, food service operations and mobile food service.

The food industry has seen many changes over the last 50 years, several of which affect the foodborne disease problem. Many foods that were once grown or produced locally and prepared at home are now obtained from far parts of the world, mass-produced by novel methods, and nationally distributed. Prepared in either partially or completely prepared forms, neither the consumer nor local health agencies have any direct control over the quality and safety of preparation methods. Food establishments have rapidly increased in size, number, type and complexity to meet the needs of an increasing population and changes in the socio-economic standards in America. Statistics show that today 53 billion meals are served annually in one million restaurants.

Advances in food technology, changes in processes and methods, and distribution and marketing techniques have brought on new problems in food protection. U.S. food industries have done an outstanding job of providing an abundant, wholesome and varied food supply, but competitive economic interests do not always coincide with good public health practices in food production and processing.

Food is prone to microbial and chemical contamination from soil, water, air, surfaces, animals and people. Special precautions must be taken to exclude or eliminate these contaminants.

Animal reservoirs of foodborne illness have been shown by recent surveys to carry pathogenic microorganisms, usually of animal origin. *S. aureus* is present in most pooled supplies of raw milk and in about 20% of the cheddar cheese. *C. perfringens* can be isolated from more than half of all red meat.

It is also found that the majority of people carry some kind of pathogenic organisms which can be spread through food. *S. aureus* is present on the mucous membrane or skin of 30-50% of the population. *C. perfringens* is carried by at least 80% of the population.

Studies show food accounts for 80-90% of all human exposure to most chemicals from environmental sources. These include heavy metals, pesticides and radionuclides.

Current trends toward stabilization of non-sterile food through freezing, chilling, drying, salting, irradiation, pasteurization and exclusion of air require that special precautions be taken to eliminate pathogenic microorganisms and toxic chemicals.

Technological changes in food production, processing and distribution have also introduced an array of biochemical problems. Some examples: Nutrient quality may be altered by agricultural practices and by processing; chemical residues, additives and the interaction between some foods or food and drug combinations may affect health in ways which are not always easily detected. Other examples include: specific alterations of the diet may be necessary to compensate for inherited metabolism disorders, such as phenylketonuria: supplementation of diets to satisfy ordinary nutritional requirements may be needed to allow full development of physical and mental potential.

Rapid population growth and competitive demands for public health resources have prevented governmental agencies from keeping pace with changes in the food industry. The majority of food protection programs were developed 30 to 50 years ago and they are still emphasizing visual inspection and licensing. Laboratory and epidemiological resources are also inadequate to monitor the food supply and to properly investigate the prevalence of food borne diseases.

In fact, it can be said control of foodborne microbial

diseases has not improved during the last 20 years. Though the incidence of foodborne disease is unknown, 5 to 10 million cases of gastroenteritis, including an estimated 200,000 to one million cases of salmonellosis, occur annually in the U.S. National projections indicate over one million people each year get sick as a result of mishandled food products in foodservice establishments.

Nearly 60 percent of 200 foodborne outbreaks reported yearly are of undetermined etiology. Salmonellosis, staphylococcal food poisoning, botulism, *C. perfringens* poisoning, infectious hepatitis, and certain protozoan infestations are well-known to be transmitted through foods. A number of other diseases can also be spread through food. Those foods most frequently implicated in outbreaks tend to be of animal origin-poultry, eggs, meat, fish and dairy products. A wide variety of home-cooked and commercially prepared foods have been implicated as well.

Reporting of foodborne diseases is grossly inadequate. Detection of outbreaks is hindered by: • the reluctance of patients to admit their involvement, • failure of physicians to report nonfatal gastroenteritis, • fear of financial loss and legal action on the part of the food industry and • difficulty of obtaining evidence that is not reported voluntarily to the health department.

Investigation of suspected outbreaks is hampered by these same difficulties and by limited resources for study of the outbreaks by specialists in epidemiology, sanitation, microbiology and clinical medicine. Thus, reporting of outbreaks is incomplete and often inaccurate because • investigations are not carried far enough to reveal all pertinent facts • information is suppressed for economic or political reasons and • responsible agencies are sometimes unwilling to release data for publication.

Constant improvement of food protection programs is necessary for two reasons: they must keep pace with the rapid technological advances in the food industries; and they must reflect changes in eating habits of the growing US population, which has doubled since World War I.

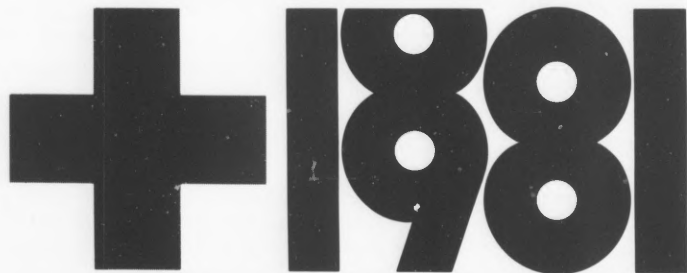
Most food protection programs were organized about 50 years ago. They were established to protect the consumer from unsanitary practices associated with

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traditional methods of local production, processing, distribution and preparation of perishable products such as milk, meat and bakery products.

Visual inspection and licensing alone can no longer provide effective protection. Technological developments have led to centralized manufacture and distribution of prepared foods made of raw materials from far away, outside the jurisdiction of local and even national government.

A team approach to food protection is needed. This should involve not only inspection and enforcement, but cooperation among specialists employed by government and industry to evaluate potential hazards, detect illness and monitor the food supply for pathogens or other problems of public health significance.

The development of food protection programs that will effectively safeguard the public health and the reputation of food industries depends on cooperation between government and industry to achieve the following goals:

1. Advance knowledge about the relation of food to health. Basic research is needed to better recognize and understand the complex microbiological, nutritional and toxicological phenomena associated with food. Specialized training of industry and government employees is needed to ensure proper application of sanitation, dietary and food preservation practices. Education of children and adults is needed to improve understanding and support of food protection practices.

2. Technical knowledge of health hazards and nutritional quality of food supply is needed to guide food control programs.

Product surveillance is needed to identify potential hazards before extensive health problems occur. Improved investigations and reporting of foodborne disease outbreaks is also needed to identify the causes and circumstances requiring correction.

3. Development of meaningful criteria for microbiological and chemical evaluation of foods will lead to improved control over foods that cannot be inspected during production and processing.

Standard methods of sampling and testing food products are essential. Acceptable limits of contamination, nutrient quality and product stability must be

established to stimulate good practices throughout the food industry.

4. Continuing revision of food programs already in practice is necessary to keep abreast of industrial practices.

Knowledge of advancements in production, harvesting and storage techniques is required to evaluate the quality and safety of raw materials. Acquaintance with design, construction and operation of food equipment provides a basis for exercising control over processing, preservation and packaging of food products.

Information on distribution and serving conditions in markets, institutions and restaurants is important in maintaining good sanitation. Appreciation of the vulnerability of food products to contamination will help establish reasonable safeguards against food poisoning and foodborne illness. Willingness to seek more effective procedures for food protection is essential in maintaining an up-to-date program.

5. Surveillance of food products, new and old is needed to identify potential hazards before extensive health problems occur.

Self-inspection for quality assurance personnel and a team inspection approach for inspection specialists should be used. Hazard analysis and critical control point techniques should also be used. If manpower shortages exist, foodservice inspection criteria should be established. This can be developed by type of establishment, risk (whether in compliance or not) and type of inspection to be made.

The foodservice industry ranks fourth in size among all U.S. industries, with an estimated annual expenditure of 145 billion dollars. Further, the average American family spends one-fourth of its income on food. These facts, coupled with the evidence of widespread foodborne disease, presents convincing evidence that food protection programs must be strengthened and constantly updated.

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Adequate Milking Systems – The Key to Good Udder Health

BARRY J. STEEVENS

State Dairy Specialist

It is a well known fact that milking machines can cause mastitis. The milking system stresses the teat end twice daily and most all mastitis infections begin when bacteria enters the teat orifice. It is important that milking equipment be functioning correctly to allow cows to be milked out rapidly, imposing the least amount of stress.

If milking takes six hours daily, the milking system operates over 2,200 hours a year, and should be maintained and serviced accordingly.

Milking Equipment

The milking machine is a mechanical device with two functions: •to provide controlled vacuum to the teat end and •to alternately massage the teat. Generally adequate milking systems provide a stable milking vacuum of not more than 15 inches mercury. Preferably, there will be 11 to 12 inches vacuum at the teat end. It is recommended that milking systems operate with a 50:50 to 60:40 milk rest ratio pulsating at 45 to 60 pulsations per minute. The milking system is made up of a number of components, all which need to operate together correctly. They include:

1. *Vacuum pump* - Adequate vacuum reserve is essential to provide vacuum stability. Insufficient vacuum may result in considerable vacuum fluctuation, causing improper milking and possible mastitis problems. Some of the symptoms of vacuum insufficiency include slow milking, excessive unit fall off and liner slip, teat end irritation and uneven milk flow, severe kicking of milk hoses, milker unit falling off on test day, and slow recovery to operating level from an air leak.

A simple method of estimating vacuum capacity even before requesting the dealer to examine the system in the 5-3 test. Allow air to enter the system through an open stallcock for 5 seconds or allow the vacuum level to drop 5 inches from set point; whichever occurs first. Shut off air source and the system should recover within 3 seconds. If it does not, the pump may be inadequate or there may be excessive leaks in the system. Be sure to contact the dealer for further service.

Approximate guide for vacuum capacity is 10 cubic feet per minute (CFM) American Standard (ASME) per milking unit. This guide line will tend to overestimate vacuum requirements for larger systems with 12 units or greater. A more specific guide line currently being suggested includes 2 CFM (ASME) per milker unit plus 1 CFM per milk meter, plus base level of 7 CFM for system leaks, plus vacuum regulator requirement, (specific for each brand of regulator) plus 30 CFM for first operator and 10 CFM for each additional operator.

If vacuum capacity is insufficient, some of the vacuum pump problems may be as follows: pump too small, plugged air filter, too small main vacuum line, plugged vacuum lines, excessive leaks, (be careful with plastic pipe to make sure all joints are well sealed and supported), improper oiling and excessive wear and belt slipping.

2. *Regulators* - The regulator is one of the most important parts of the milking system. Regulators should be sensitive enough to respond to within ½

inch vacuum change. It is important that regulators be located in a clean environment. Some of the common problems with regulator failure are that it may be: (1) dirty and sticky; (2) an improper size with respect to pump capacity; (3) in an improper location; (4) improperly designed and never performed adequately in the first place.

3. *Vacuum gauge* - The vacuum gauge should be located in the parlor where it can be observed easily during milking. Vacuum gauges tend to corrode and need to be checked with a mercury gauge or by

the dealer or replaced often. Nothing is worse than a vacuum gauge giving a false reading. Observe vacuum gauge when starting up the system and if the vacuum tends to be unstable, be suspicious of a sticky regulator.

4. *Milk lines* - Milk lines of adequate size (Table 1) are essential to prevent flooding. A low line type milking system is preferred in milking parlors. It is desirable that the milk line be looped and that lines be adequately sloped (1½ inches per 10 foot). If weigh jars are used, they should be located as low as conveniently possible and the top should be no higher than the floor of the cow's udder. In-line milk filters should not be used in traditional type milking systems.

TABLE 1. *Minimal milk line sizes.*

No Units/Slope	Milk line size (inches)
2	1½
4	2
6	2½
9	3

5. *Milk claws and hoses* - The milk claw should be of adequate size and have some means to observe milk flow. The milk claw should have an air vent unless vented inflations are used, in which case the claw vent should be shut. The milk claw should have a vacuum shut off valve in order to shut off vacuum before removing all four teat cups at the end point of milking. Milk hoses should be kept to minimal length (less than 8 feet) and be free of restrictions that may result in vacuum fluctuation.

Teat cup liners or inflations should be changed after 800 to 1200 cow milkings, depending on the type of rubber. Liners should be changed more often if they are not rotated weekly. Never allow milk to dry inside the liners. Liners tend to accumulate fat and bacteria with age. They tend to lose their elasticity and do not massage teats adequately during the milking process.

6. *Pulsation system* - It is important the pulsators provide an uniform massage to the teat. Suggested pulsation range is 45 to 60 pulsations per minute, providing a 50:50 to 60:40 milk rest ratio. Alternating pulsation tends to even the milk flow in

marginal systems. Pulsators need to be kept clean and maintained regularly.

7. *Milking procedures* - Good milking procedures are as important as an adequate milking system. Good milking procedures are outlined below.

- Handle cows gently
- Wash teats and udder with warm sanitizing water
- Dry teats and udder with single use towels
- Remove foremilk
- Attach unit approximately 15 to 60 second after

"It is a well known fact that milking machines can cause mastitis. The milking system stresses the teat end twice daily and most all mastitis infections begin when bacteria enters the teat orifice. It is important that milking equipment be functioning correctly to allow cows to be milked out rapidly, imposing the least amount of stress."

start of stimulation (attach unit to a dry, full teat)

- Correctly position unit, which may include the use of a hose support arm to maintain correct position
- Minimize machine stripping - (be careful to not allow liner slippage)
- Remove unit when cow is done milking. (Shut off vacuum first)
- Jerking teat cups off the teats while the unit is still under vacuum at endpoint of milking is extremely harmful to the cow's teat and is a factor in causing mastitis problems
- Dip teats with an approved teat dip
- Dry cow treat all cows. This is a time proven benefit in assuring a clean, healthy udder for the next lactation

A major goal in good milking procedures is to milk a clean, dry teat. Excessive water on the udder results in dirty water running down and contaminating the teat and allowing entrance of microorganisms during milking, especially if there is any liner slippage. During the winter cows should leave the parlor with a dry teat after using a teat dip.

Research data indicates that the teat end may be open for up to 2 hours post milking. It is important that cows stand and feed after milking. The cow should not lie down immediately after milking as bacteria may enter the teat orifice.

CHIP DIPS — A TEST OF QUALITY

LESTER HANKIN, DONALD SHIELDS, and J. GORDON HANNA

*Connecticut Agricultural Experiment Station, New Haven, CT.
Dairy Division, Connecticut Department of Agriculture, Hartford, CT.*

Chip dips are popular at any time of the year, but particularly during holiday season. They were tested for contents, safety, and quality. The dairy-based dips were generally found to be of better microbial quality than were the non-dairy dips. Only two dairy dips were excessively high in total number of aerobic bacteria, but five of the non-dairy dips were excessively high, when considering general regulations for similar products.

A dip is, according to Webster's New International unabridged dictionary, a liquid or semiliquid flavoring or savory sauce into which solid food is dipped or which is served, especially on a dessert or pie."

Most people think of chip dips as flavored products made with a dairy product base into which potato chips, crackers, or raw vegetables are dipped and consumed as a snack or with a beverage. Different flavorings of dips accommodate a variety of tastes.

Many chip dips are prepared at home from cultured dairy products, usually sour cream, cream cheese, or yogurt. Onions, chives, clams, bacon, horseradish, blue cheese, and more exotic materials may be added for flavoring.

For those who do not prepare their own dips, a wide variety of flavored chip dips are sold from refrigerated cases at food stores. Cream cheese, usually whipped, with added flavoring such as chive, or lox, is also sold for use as a dip or spread.

Though there are no specific standards which regulate chip dips, they must comply with general Connecticut regulations (6). This means they must be prepared from wholesome ingredients, and additives must conform to levels established by the Federal Food and Drug Administration. Labeling must be in compliance with state regulations, and must show the major ingredient

first, followed by all other ingredients in order of decreasing concentration.

Dips made of cream cheese must contain at least 33% milk fat in the cheese used and at least 27% in the finished food. Moisture content cannot be more than 60% (1).

In an effort to determine the ingredients in and quality of chip dips offered for sale in Connecticut, thirty-eight samples of chip dips and six cream cheese spreads were collected at food stores during the quarter, October through December 1980. The collection, microbiological and chemical analyses and calculations are described in previous *Dairy and Food Sanitation* articles on quality of yogurt (2), juice drinks (3), cottage and ricotta cheese (4), and egg nog (5).

Types of dips and additives: No attempt was made to collect every flavor made by each manufacturer; instead, a random selection was obtained from each manufacturer. Fifteen samples were onion-flavored and four others contained onion in combination with another flavor. Seven samples were bluecheese flavored, six were clam or lobster flavored, and five were flavored with bacon and horseradish.

Retail chip dips fall into two distinct groups: those with a milk fat base and those with a vegetable oil base. One sample contained Neufachtel cheese as the base and one contained cream cheese as the base. Other dairy products including non-

fat milk solids, cream and skim milk, were used in some dips. In some, cheese was used as flavoring; primarily blue cheese. In all cases, however, a dairy product containing milk fat was the first ingredient listed on the label, thus indicating it is the most plentiful in the product.

Non-dairy dips had a base of vegetable oil which had been hydrogenated to make it semi-solid, as many edible vegetable oils—soy, corn and cottonseed—are usually liquid. Water was the first ingredient listed on the label of many of these non-dairy dips. Some, however, listed skim milk first. A few non-dairy dip labels listed cream, nonfat milk solids, sodium caseinate, or whey solids; all products are, of course, derived from milk. The only other dairy ingredient listed was cheese for flavoring. Nonfat milk solids and sodium caseinate add solids, but are probably used primarily to give the dip a dairy (white) appearance.

All dips except one declared on the label that stabilizer or thickener was used. Stabilizers used included flour, gelatin, starch, vegetable gums, tapioca, pectin, carrageenan, and cellulose gum. All non-dairy dips indicated on the label use of an emulsifier—lecithin or mono- or diglycerides—to help keep fat dispersed. Eleven of the 18 dairy dip labels stated that an emulsifier was used.

Dairy dips with sour cream or cream cheese as a base use a naturally fermented dairy product for that base. Non-dairy dips usually do not use fermented dairy products so flavoring is added. The label on one dip stated that cultured skim milk was one ingredient. Only one dairy dip package but 13 of the non-dairy dips, declared use of

artificial flavor. Labels on fifteen of the 20 non-dairy dips, but only one dairy dip, listed use of artificial color.

Interestingly, four of the dairy dip labels declared vegetable oil in addition to milk fat. Three of these were bacon - horseradish - flavored. Monosodium glutamate (MSG), a flavor enhancer, was listed as an ingredient in 28 of the dips.

Some labels stated that an acidifier, likely to make the product more tart, was used. Although all but two of the non-dairy dips indicated an acidifier as an ingredient, only seven of the dairy dips labels listed this ingredient. In dairy dips most of the acidity or tartness is provided by the fermentation products in the dairy product used as the base. In non-dairy dips the acidity is provided by added lactic acid, lemon juice, citric acid, or vinegar (acetic acid).

Hydrolyzed vegetable protein was indicated as an ingredient in 19 dips. This material, presumably added to provide a heavier consistency, also increases the protein content. Some form of sweetener was declared on the label of 26 dips. Sweeteners included sugar and corn syrup solids (hydrolyzed corn starch).

All of the non-dairy dips and seven of the dairy dip labels listed the preservative sorbate. However, only two of the dairy dips and six of the non-dairy dips were found to contain it. A possible reason for sorbate not being found where it was listed is that it may have been degraded by bacteria present in the sample. None of the labels on the cream cheese spreads declared sorbate and none was found.

The labels on six cream cheese spreads listed few additives. All declared use of a stabilizer; three, an

acidulant; two, a sweetener; and two, hydrolyzed vegetable protein. Analysis showed that all complied with fat and moisture content requirements.

The number of days from purchase to last day of sale stamped on the carton ranged from 2 to 187 days. Thus, some chip dips and cream cheese dips are dated over 6 months from day of manufacture.

Microbial quality: In general, the dairy dips were of better microbial quality than the non-dairy dips. The analysis for total number of aerobic bacteria per gram showed that, overall, the dairy dips contained fewer contaminating bacteria than the non-dairy dips. Only two dairy dips were excessively high in total number of aerobic bacteria, but five of the non-dairy dips were excessively high, when considering general regulations for similar dairy products. Yeast and mold contamination among the dairy dips was minimal, but there was considerable yeast contamination among the non-dairy dips. Less than 10 molds per gram (the lower limit of detectability by the test used) were found in all samples except for one which had 100 molds and another which had 38 molds. The 100 molds per gram in the one sample are not significant since this is a blue cheese dip and live organisms could have been used to help develop the blue cheese flavor. Samples with a large number of coliform bacteria, more than 10 per gram, provided an indication of unsatisfactory packaging techniques, and were about evenly divided between dairy and non-dairy dips.

In dips not using a fermented dairy product, the number of acid-producing bacteria can give an indication of potential keeping quality, while excessive growth of acid

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producers which are contaminants in a pasteurized non-fermented product could make the dip too tart. Relatively few acid producers were found among all samples except for one. Since dips are kept refrigerated, probably for a long time, psychrotrophic bacteria, those able to grow at refrigeration temperatures, can be important to keeping quality. Many of the psychrotrophic bacteria are gram negative bacteria. Thus tests were run for gram negative bacteria able to degrade fat (lipolytic) and protein (proteolytic), the major ingredients in dips. All samples contained fewer than 1,000 per gram, with many less than 100 per gram. It is not intended to imply however, that 1,000 bacteria per gram are unimportant since dips are expected to have a long shelf life and psychrotrophic bacteria over a long period of time can grow and produce compounds which can give an off-flavor to the product.

All the cream cheese spreads were generally of good microbial quality.

All samples had a satisfactory flavor when purchased. However, flavor and consistency varied considerably from brand to brand and in the same flavor among brands. Personal taste and cost enters into choice of purchase and, therefore, no attempt was made to rate the dips or spreads on flavor.

Nutrient quality: The amount of fat in the dairy dips ranged from 9.0 to 23.3%, with an average of 17.3%. The non-dairy dips averaged 14.7% fat with a range from 8.9 to 17.7%. The cream cheese spreads contained considerably more fat, averaging 30.0%.

The average protein content of dairy dips was 3.9% and for non-dairy dips 3.4%. Cream cheese

spreads averaged 7.7% protein. Carbohydrates in dairy dips averaged 5.0%, non-dairy dips 6.0%, and cream cheese spreads 4.0%.

The caloric content of the dairy and non-dairy dips was similar. The average for the dairy dips was 53 calories per 28.4 grams, one ounce or about 2 tablespoons, and for non-dairy dips, 47. The cream cheese spreads were much higher, averaging 88 calories per 28.4 grams. For comparison, 28.4 grams of creamed cottage cheese contains about 27 calories and lowfat cottage cheese about 20 calories.

Many persons need to restrict their salt intake, therefore the dips were analyzed for sodium content. The dairy dips averaged 589 milligrams of sodium per 100 grams, but the range was wide, from 243 to 888. The non-dairy dips also showed a wide range in sodium content, from 110 to 805 milligrams per 100 grams, with an average of 410 milligrams. Thus, on the average, the non-dairy dips contained about 30% less sodium than the dairy dips. The cream cheese spreads averaged 507 milligrams of sodium per 100 grams. The average amount of sodium in cottage cheese was 472 milligrams per 100 grams (4).

Both types of dips had, on the average, about the same acidity, although a few samples were more acid. One cream cheese spread was extremely tart.

A final word . . .

Two types of chip dips are offered for sale in food stores in Connecticut. One type has a milk fat base, usually sour cream, a fermented dairy product. The second type contains a non-milk fat base, hydrogenated vegetable oil. Flavored cream cheese

is also used as a dip or spread. The labels of the dairy dips in general declared fewer additives and were generally of better microbial quality than the non-dairy dips. Seven samples of dips contained excessive numbers of aerobic bacteria. All samples were of satisfactory flavor when purchased.

Dairy dips contained more fat, an average of 17.3%, than the non-dairy dips, average of 14.7%, but the range in fat content was considerable. Caloric content was essentially the same for both types of dips; about 50 calories per 28.4 grams. The cream cheese spreads contained more calories than the chip dips; 88 calories per 28.4 grams.

Only two of seven dairy dips and six of 20 non-dairy dips declaring use of sorbate were found to contain this preservative. The sodium content of dairy dips average 589 milligrams per 100 grams and the non-dairy dip averaged 410 milligrams.

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LEADERSHIP AT WORK

“Is a manager a leader? Some are and some unfortunately aren’t, but they all should think of themselves as leading the people who work under them. Here, some thoughts about leadership in business and everywhere else. . .”

No form of social organization has ever existed without leaders. To have someone in charge is as natural as the birds and the bees, the former with their pecking orders, the latter with their queens. In human affairs, even those who reject traditional leadership structures find a need for leaders themselves; anarchist parties dedicated to the destruction of the state regularly elect slates of officers. The Bolsheviks who strove for the dictatorship of the proletariat wound up with the pure and simple dictatorship of one man.

Like cream, it seems, leaders naturally rise to the surface. But unlike cream, they are not necessarily the best part of the whole. The wizardry of popular leadership has been applied at least as much to evil as to good over the course of history. The example of Adolph Hitler springs to mind—a charismatic leader whose ability to muster a mass following for his twisted visions brought immense suffering to mankind.

There are those who would argue, however, that dictators like Hitler and Stalin were not really leaders. They may once have led in a demagogic fashion, but they turned into tyrants when the absolute corruption of absolute power took hold. “A leader and a tyrant are polar opposites,” wrote James MacGregor Burns, the award-winning American political scientist. In his 1978 book *Leadership*, Burns drew a strict line between those who lead and those who wield blunt power.

This may seem like an overly idealistic view of the question, since so many so-called leaders are demonstrably quick to force people to do their bidding. But it does fit in with the theory, if not always the practice of democratic rule. The democratic system tries to guard

against excessive power and its attendant corruption. In the Watergate affair the world witnessed the system in action when no less a personage than the president of the United States was driven from office for abusing his power.

One of the reasons for the restraints on power is to control ambition. The democratic system recognizes that ambition always has been and always will be a vital force in human affairs. It seeks to harness this force to the best interests of the people. Similarly, the private enterprise economy, with its rewards for performance and risk-taking, pools the efforts generated by personal ambition into a general effort to produce an endowment in which everyone shares.

When viewed in the light of ambition, Burns’s distinction between tyrants and leaders stands out vividly. The tyrant’s ambition is for himself alone; he may use other people to gain it, but they are no more than his tools. In contrast, the leader is ambitious not only for himself, but for a cause which he shares with his following. Rightly or wrongly, he believes that his followers will be better off when and if they reach their common goal. (Neither leaders nor tyrants are exclusively males, of course; the masculine gender is used throughout in a generic sense.)

It is the presence of a following that compels leaders to act responsibly. They occupy their positions only by others’ consent. Responsibility is the lynchpin of leadership in a democratic society. A prime minister is responsible to the electorate; a general to the civil authority; a chief executive officer to the shareholders of his company. And every leader is responsible to those who follow him, no matter how many or how few.

It would be naive to suppose that this system precludes autocratic behaviour. There will always be those who love power for its own sake, and who will short-circuit the system to put their own ambition first. A tyrant refuses to work for a common cause, and is pathologically afraid of rivals. He “suppresses every superiority, does away with good men, forbids education and light, controls the movements of the citizens, and, keeping them in perpetual servitude, wants them to grow accustomed to baseness and cowardice. . .” That was written by Aristotle in the 3rd century B.C., but such tactics linger on today.

Yet if tyrants continue to carve out places for themselves in offices, on shop floors and elsewhere, they are no less vulnerable to overthrow than their counterparts in palaces. They may be mistaken for leaders, which they often believe themselves to be. But they are not because they force people to go along with them instead of *bringing* them along with them. They

bully and blackmail and manipulate; they do everything but lead.

Unfortunately, leadership is very often confused with something else, its antithesis included. Burns cited a study in which people attributed 130 different meanings to the word. His own definition was the product of years of research and thinking about the subject. It is that leadership is a symbiotic relationship between those who lead and those who are led.

The art of the possible in business leadership

"Leadership is inseparable from the followers' needs and goals," Burns declared. His theory takes on flesh and blood when you think of what happens in democratic politics. Each party leader vies for followers by attempting to create a symbiosis—a feeling that "we need each other." Any intelligent leader will attempt to adjust his needs and goals to those of his potential followers within the limits that principle allows.

"Leaders are essentially politicians and must deal with political forces," wrote psychologist Harry Levinson in his excellent *Levinson Letter*. He was referring to managers in business and other organizations, who, he insists, should think of themselves as leaders ahead of anything else. Apart from having to gain and hold a constituency, manager/leaders must practice the political art of conciliation. They are subject to pressures from above, below, and sometimes on the same level from other departments. It takes political acumen to smooth these pressures out.

No one is exempt. The chief executive officer must be mindful of the disparate interests of directors, other shareholders, employees, consumers, governments, and the general public. "Middle managers" might ruefully conclude that they are in the middle like the ham in a sandwich as they try to cope with demands from on high for more production while the union is insisting on adherence to work rules. The foreman must try to meet his schedule on days when his crew seems to be all thumbs, one of the machines is down for repairs, and the shop steward is raising hell over a grievance. If politics is the art of the possible, it is never more so than in the leadership of a business concern.

Using routine as a block to stop needed changes

It should be stressed, though, that the politics of leadership is quite a different thing from what is commonly called "office politics." Political intrigue within the organization is usually counter-productive, and greater productivity is the ultimate goal of a leader with the best interests of the organization at heart.

"Leading does not mean managing," wrote organizational expert Warren G. Bennis in his 1976 book *The Unconscious Conspiracy*. By definition, a leader's mission is to make progress; those who manage but do

not lead are mired in the *status quo*. Office politicians generally fall into this category. The routine in which they take such delight may be the wrong routine; it may be outmoded or useless in the first place. But they are adept at using routine to block off needed changes. They also tend to be empire builders, and the bigger the empire, the harder it is to change.

They will sometimes accept change, but only when it suits their own purposes. This clearly makes them non-leaders from Burns's point of view. They are thinking of themselves first, not of the good of the organization or the people who work with them. Their ambition—and it is often intense—is aimed at a personal, not a collective, goal.

But even those who genuinely want to lead frequently find themselves managing the *status quo* against their own wishes. Their schedule is jammed with daily chores, interspersed with trouble-shooting current crises. Very little time is left over for leadership functions such as planning and maintaining staff morale.

A case of running as fast as you can to stay where you are

In a study of the working days of five top U.S. executives, management scientist Henry Mintzberg found that they rarely had time to think about anything except the question immediately before them. Half of the activities they carried out lasted less than nine minutes, and only 10 per cent lasted more than an hour. They "met a steady stream of callers and mail from the moment they arrived in the morning until they left in the evening," Mintzberg recorded. "Coffee breaks and lunches were inevitably work related, and ever-present subordinates seemed to usurp any free moment."

Nor was this frenetic regimen confined to the executive suite. A study of 160 British managers, mostly in the middle ranks, found that they were able to work for a half-hour or more without interruption only once every three days or so. The working lives of foremen were even more fragmented. A study of 56 foremen in the U.S. showed that they averaged an astonishing 583 activities, or one every 48 seconds, per eight-hour shift.

It would seem to be a case of running as fast as you can to stay where you are. How, in such conditions, can anyone afford to function as a leader? The first answer would seem to be to ask whether you might not be using routine as a subconscious excuse to avoid more difficult, long-term activities. "I think that all of us find that acting on routine problems, just because they are the easiest, often blocks us from getting involved in the bigger ones," Warren Bennis observed.

It may call for a considerable reordering of priorities to pay more attention to leadership, but it rightly should be at or near the top of the priority list for any manager. "Free time is made, not found, in the manager's job; it is forced into the schedule," wrote Mintzberg. Time should be made with determination to plan, to introduce needed

changes, to appeal to the motivation of the staff, and to develop people's potentialities if leadership is to be accorded the importance it deserves.

There are various ways of eliminating routine, including the greater employment of specialists to present managers with well-thought-out priorities and alternatives for decision. The way that fits best with good leadership is the delegation of authority and tasks. Delegation often requires forbearance on the part of the superior, who may be able to handle work better and more easily than his deputy. There is always a temptation when watching an inexperienced person go through the trials and errors of an unfamiliar exercise to do or redo it yourself.

But it is foolish to believe that your way is the only way of doing something; the method is less important than getting the work done satisfactorily. When things go wrong with delegated work, a conscientious leader will point out the mistakes in the hope that they will not go wrong the next time around. Delegation should be used to bring forth new leaders by training them in an ever-broadening range of experience and responsibility. Many leaders fail to give sufficient weight to the continuity of leadership in the positions they occupy. In a sense, they should be working themselves out of their present jobs by preparing others to take over. Delegation is a method of doing just that.

Certainly it would seem to be the right approach for dealing with the present and coming generations of working people. They are better educated, more assertive and more skeptical than ever before. Changes in values in the past two decades have brought a variety of fresh forces to bear on the leadership of all types of institutions. In 1958 Robert Tannenbaum and Warren H. Schmidt published a paper in the *Harvard Business Review* entitled "How to Choose a Leadership Pattern." In 1973 they felt called upon to write an addendum to it in the light of the social changes that had taken place in the meantime—the rise of the youth, civil rights, ecology and consumer movements, and concern with the quality of life in the workplace and everywhere else.

They concluded that all this called for more sensitivity and flexibility in management. "Today's manager is more likely to deal with employees who resent being treated as subordinates, who may be highly critical of any organizational system, who expect to be consulted and to exert influence, and who often stand on the edge of alienation from the institution that needs their loyalty and commitment," they explained.

Employees today are not easily scared or fooled

The social atmosphere has cooled down somewhat since that was written in the early 'seventies, but that does not change the fact that a distinctly new breed of workers has emerged. They have been brought up in

their homes and schools to expect a say in decisions that affect them. They are downright suspicious of institutional motives as a result of media muckraking into the sins of the "Establishment," some of it valid, some of it not. They are jealous of their rights, real or perceived. They are forward in making demands for a fair share of rewards and recognition. They demand to be treated as individuals. They are not easily scared or fooled.

Some walk around in T-shirts exhorting: "Question Authority!" Though they stop short of displaying their sentiments on their chests, the majority would subscribe to Arthur Schlesinger Jr.'s view that "authority is entitled only to the respect it earns, and not a whit more." No longer does a title on a door or a carpet on a floor command automatic deference.

With the rise of the new worker, leadership has become a matter of eliciting co-operation rather than commanding obedience. Co-operation means a willing effort on both sides; the first definition of the word in the Oxford Concise Dictionary is "working together to same end." This brings us back full circle to Burns's definition of leadership as a relationship in which the leader and followers share the same goals and needs. Nowadays, their needs are apt to be similar. Recent studies show that modern workers are highly concerned with personal autonomy, appreciation of their efforts, and a chance to realize their potentialities. If they cannot fulfil at least a portion of these needs at work, the energy generated by the drive to meet them is the organization's loss.

In the present setting, management scholar Douglas McGregor has suggested that "the essential task of management is to arrange organizational conditions and methods of operation so that people can achieve their own goals *best* by directing *their own* efforts toward organizational objectives." For the manager, this implies a thorough understanding of the individual personalities of the people he is called upon to lead. It also implies the exercise of some of the finest human values—respect for the individual, justice, consideration and understanding. The old-fashioned boss accustomed to the servant-master system might protest that this approach can only lead to slackness. But given that bosses must get tough at times, it would seem that people will respond to toughness more positively when they know that it is justified by a record of fair play.

In the final analysis, leaders can expect their decent treatment of others to be reciprocated. It is this reciprocation that makes the difference between an outstanding and an adequate job, and inspires people to pitch in with an extra effort when the going gets rough. Lao-Tse was a poet and philosopher, not a management consultant, and he lived almost 2,500 years ago. But he showed that the principles of leadership are timeless when he wrote: "Fail to honour people, and they will fail to honour you; but a good leader, who talks little, when his work is done, his aim fulfilled, they will say, 'we did this ourselves'."

News and Events

Harold Barnum, 1902-1981

Harold Barnum, long active in IAMFES and a past president of the Association, died in late October in Ft. Atkinson, WI. Born in Steamboat Springs, CO, he graduated from Kalispell, MT high school. He received a degree in dairy manufacturing from Montana State College, and went on for a Master's degree in dairy chemistry at Michigan State University.

Harold started work in quality control in the dairy and food industries, beginning with operation of his own laboratory in Michigan. He became head of the Dairy Health Department at Ann Arbor, MI, a position he held until 1947. Then there was a move back to Colorado where he became head of the dairy division of the Health Department of the City of Denver. He held this position for more than 20 years, until his retirement in 1969.

He served IAMFES in many ways, including as its President, 1952-53, and received the "Sanitarian's Award" in 1957. He served in numerous leadership positions in the industry, including in the National Conference on Interstate Milk Shipments and National Mastitis Council. He was also involved in the Dairy and Food Industry Supply Association.

He and his wife Margaret celebrated their fiftieth wedding anniversary earlier this year. Survivors, in addition to his wife, include a daughter, Beatrice Shenkenberg, Alexandria, VA, a son, James, McLean, VA, and three grandchildren.

Harold was eulogized this way by Art Nesbitt, "A famous man once asked the secret of success, and he replied, 'That you can sum it all up in three little words and they are...and then some.' He said, 'Top people do what is expected of them...and then some.' Harold Barnum did just that."

A memorial fund has been established in his name through IAMFES. Persons who wish to contribute to that fund, which will be used to support the industry portion of the IAMFES Industry-Education Award each year, should send their contributions to the Barnum Memorial Fund at the following address: Arthur W. Nesbitt, President, Nasco International, Inc., PO Box 69, Ft. Atkinson, WI 53538, 414-563-2446.



Kansas Association of Sanitarians' Officers for 1982 include, front row, 1 to r, Jolene Johnson, Second Vice-President; and David Rodriguez, First Vice-President; and back row, 1 to r, John Mitchell, Secretary-Treasurer; Larry Starr, President; and Dave Blevins, Past President. Shown at right is Dale Wing, Kansas Sanitarian of the Year.



Health Issues of Great Bend Flood Discussed at KAS Meeting

It was an interesting and varied program that was provided to those who attended the Annual Conference of the Kansas Association of Sanitarians in Concordia, KS, October 7-9.

"Health Problems During the Great Bend Flood," was discussed by Lily Akins, Health Officer, Barton County Health Department. "Lots of people were playing in the water, even though we provided warnings for them not to," Akins said. The flood water was considered by some Great Bend residents to be a recreational outlet, despite the danger it presented, she said. Other problems which occurred with the flood, for example, were that no disaster plan had been set up prior to the disaster, and a condition of "who's in charge---the state or the county?" developed, she said. Recordkeeping, and a duplication of

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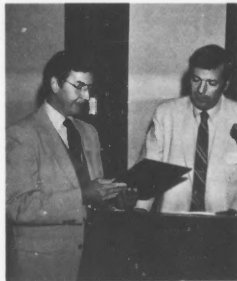
Time Management' a Featured Session at Minnesota Meeting

An excellent session on time management, "In Pursuit of the 60-Minute Hour-Time Management," was a featured presentation of the Sanitarians' Conference held in Late September at the University of Minnesota.

John Hoyt, Jr. conducted the time management session and emphasized a number of ways time can be saved and tasks delegated. He highlighted, in general, ways to "work smarter, not harder."

Additional program sessions at the meeting included "Testing for Antibiotics---A New Ball Game," by Roy Ginn; "Energy and the Dairy Farm," by Greg Peterson and Joe Ball; "A 'New' Look at Staphylococcal Food Poisoning," by Sita Tatini; and "A 'Sticky' Concern about Cleaning and Sanitation," by Edmund Zottola.

Also on the program were "Minnesota DHI Somatic Cell Count Program," by Jeff Reneau; "Olmstead County Mastitis Control Project," by Bob Appleman; and "Bulk Tank Milk as an Indicator of Mastitis Problems," by Ralph Farnsworth.



Roy Ginn, left, receives the Minnesota Sanitarians' Achievement Award from James Rolloff at the Awards Banquet, far left photo. Don Berg, Past President, presents the President's gavel to Harold Johnson, right photo.



"Manager Certification for Restaurant Owners and Operators," was handled in three sessions: "Voluntary Program for Hennepin County," by Paul Rivituso; "Mandatory Program for the City of Moorhead," by Donald Lawrence; and "Mandatory Program for the City of Roseville," by Walter Jopke.

The Awards Banquet was held at the Olympia Brewing Company's "Rathskellar in the Sky," and Roy Ginn was presented the Association's Achievement Award.

Kansas Meeting, *con't. from p. 521*

efforts due to poor recordkeeping in the early stages of the flood, were also problems. Akins noted that another important aspect of the post-flood period was the need for identification of officials. "Some people went places under the guise of being health department personnel," she said, when perhaps they were looters, or just relatives who were concerned about flood victims.

A "Coors Sanitation Seminar," was presented by Jerry Frakes, General Manager, Junction City Distributors. "We train retailers away from their own environment," he said. This is because in a new environment retailers

are more likely to see the overall sanitation picture, to see all aspects of a sanitation program than they are in their own shop where they're aware of their current practices and habits.

Brace Rowley, Kansas Dairy Commissioner, highlighted "Raw Milk Problem at Wichita," while Maggie Baggs, of the Bureau of Water Supply discussed "Trihalomethane Reduction at a 2-MGC Plant."

The 1981 Kansas Sanitarian of the Year named at the Awards Banquet is Dale Wing, Hays, Kansas. New officers include: Larry Starr, President; David Rodriguez, First Vice-President; Jolene Johnson, Second Vice-President; John Mitchell, Secretary-Treasurer; and Dave Blevins, Past President.

One Last Word . . .

It's never easy to put your "baby" up for adoption---I understand that now. But it's time to move on to other things, and we've found a good person to be the next Editor of *Dairy and Food Sanitation* and Associate Executive Secretary of IAMFES. She's Kathy Hathaway, and there will be a short biography of her in the January, 1982 issue.

In any case, I've very much enjoyed working at IAMFES, and I will miss it, and so many of you.

Through this Association I've had opportunities I wouldn't have had elsewhere, and I'll always be grateful for that. Keep in touch. Many of us will cross paths again, I'm sure.

Best wishes to each of you. . . and make the most of your opportunities through IAMFES. It's a great organization that's only going to get better.

Jan Richards

1981 Officer Candidates



Roy Ginn

*Ginn, Termunde
Run for Secretary-
Treasurer*



Dale Termunde

Roy E. Ginn is General Manager and Director of Dairy Quality Control Institute, Inc.

Roy was born in Pennsylvania and graduated from Pennsylvania State University with a B.S. degree in dairy science in 1951. After graduation from Penn State he spent a year with the Federal Milk Market Administrator in Philadelphia. From 1952 to 1959 he worked for Sealtest Foods, Inc., Pittsburgh, PA as laboratory director, production supervisor and production superintendent. In 1959 he purchased Pittsburgh Control Laboratory and was owner and director until 1965 when he moved to Minnesota and was hired by the Quality Control Committee of the Twin City market.

In 1970, he designed and moved into a new laboratory facility and was instrumental in incorporating Dairy Quality Control Institute, Inc. This organization does the quality work for approximately 5,000 milk producers in Minnesota and Wisconsin. During this period he has been involved in applied research on new methodology in cooperation with the University of Minnesota and has authored or coauthored 26 papers on new methods such as butterfat testing, somatic cell counting, and antibiotic testing.

Roy is a past president of the Pennsylvania Laboratory Directors Association, the Western Pennsylvania Sanitarians Association, the Minnesota Sanitarians Association, and the Minnesota Dairy Technology Society. For the past eight years he has been secretary-treasurer of the Minnesota Sanitarians Association, Inc. and received the Association's Certificate of Achievement Award at its 1981 Annual Meeting. He is a member of the Affiliate Council of the International

Dale Termunde is Assistant Vice President, Babson Bros. Co. He graduated from Iowa State University and is a veteran of 26 years with Babson Bros. Co. He previously held the management positions of District Manager, Divisional Sales Manager, Regional Sales Manager, Product Manager for the Chemical and Water Treatment Divisions, and Director of Consumer Affairs. Dale also serves as liaison between Babson Bros. Co. and the United States Governmental Agencies of FDA, EPA, USDA, and the Canadian FDA.

An active and supportive member of IAMFES for over 20 years, he is Chairman of the Farm Methods Committee of IAMFES for the past 14 years with numerous Farm Methods Committee reports being completed and published under his leadership. Dale is also Chairman of the Sustaining Membership Committee and was one of the key individuals instrumental in developing this support program of IAMFES.

In addition to chairing these two committees, he has also worked closely and in liaison with the Executive Board of IAMFES in developing advertising, literature and in helping coordinate planning and meeting functions and activities at numerous annual international meetings.

Dale, married with three grown children, is involved in church and local affairs and holds active and participating membership in the Illinois Association of Milk, Food and Environmental Sanitarians Association, National Mastitis Council, Soap and Detergent Association, Society of American Oil Chemists, American Dairy Science Association, and is a registered sanitarian for the State of Illinois.

New Product News

• A new 2-way ball valve, which meets all FDA requirements, was recently introduced by American Sanitary Equipment. The firm produces and handles a line of stainless steel sanitary fittings and valves. It also provides custom fabricating and polishing as well as installation and repair services. The valve will not cause the product to stagnate. And although the valve is a heavy-duty unit, its light "in-line" weight makes it easy to install and service. The valve also features low friction for easy on-off positioning as well as infinite throttling action and a full 90-degree turn from full "on" to off. For additional information, contact: American Sanitary Equipment Corp., 84-22 101st Ave., Ozone Park, NY 11416, 212-835-3737.



• "Sanitation and Hygiene: Why the Importance?" and "Sanitation and Hygiene: Basic Rules," two new motion pictures from NEM, emphasize key principles of sanitation and hygiene. These 10-minute color/sound motion pictures use close-up photography and practical examples to demonstrate the need for good sanitary practices to protect public health and meet governmental regulations and guidelines.

For further information, contact National Educational Media, Inc., 21601 Devonshire Street, Chatsworth, CA 91311, 213-709-6009. (Proven sanitation/hygiene techniques are demonstrated in kitchen backgrounds to give viewers practical examples of sanitary practices they can adopt in the work environments.)

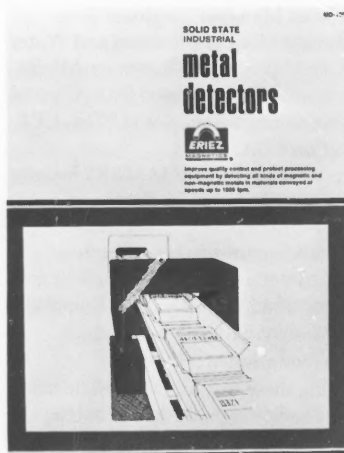
These programs illustrate the key role food-service workers play in creating a sanitary, successful foodservice operation. They encourage personnel to perform at professional levels as important contributors to the establishment's overall success.

• FMC Corporation's Phosphorus Chemicals Division has been granted a patent (U.S. 4,282,260) for the use of sodium hypophosphite to replace sodium nitrite as an inhibitor of botulism toxin production in smoked meat products. Laboratory studies sponsored by FMC earlier indicated that total or partial replacement of nitrite with sodium hypophosphite inhibits the production of botulism toxin in bacon as effectively as nitrite at its currently used levels. Hypophosphite is one of FDA's ("Generally Recognized As Safe") compounds. Its use as a replacement for some or all of the nitrites in smoked meat products would help reduce the potential for nitrosamine formation.

• Enercol, Inc. of Red Bank, NJ has released a new innovative technology and the related new equipment. The process rapidly oxidizes many high-strength organics in water waste streams. The method is highly adaptable for the pre-treatment of industrial organic wastes such as proteins and sugars, as well as sewage, digester and activated sludges, toxics, septic wastes, and also organic leachates. The TOC or COD reductions of organics to carbon dioxide and water occur in one to fifteen minutes. The system can be designed so the effluent can meet discharge standards. The systems are fully guaranteed and easily serviced or expanded due to completely modular construction. Contact Enercol, Inc., PO Box 785, Red Bank, NJ 07001, 201-842-6360.



• A new stainless steel scale for use in the processing industries - food, chemicals, meat and pharmaceuticals - is now available from The A. H. Emery Co. The scale, a product of Emery's exclusive Hytronic technology, combines the durability and ruggedness of hydraulics with the precision of electronics. Since washdown or corrosive materials can't hurt the scale, it is designed for use where sanitation and protection from corrosives are mandatory. The scale, available in capacities to 2,000 pounds and platform sizes from 18 x 18 inches up. For more information and a copy of a brochure, write The A. H. Emery Co., P.O. Box 608, New Canaan, CT 06840.



• A line of solid-state metal detectors that signal the presence of ferrous and nonferrous metals in materials conveyed at speeds of 15 to 1000 fpm is described in a new 6-page brochure from Eriez Magnetics. Eriez metal detectors are designed for industrial applications such as detecting metals in bagged or packaged goods, dry bulk materials, and wet process and slurries. For more information on industrial metal detectors write Eriez Magnetics, Asbury Road At Airport, Erie, PA 16514.



• *Jiffyfoam®* has been judged by the FDA and USDA to be acceptable for use in packaging of all food items at temperatures below 65°C (150°F), which are prepared under Federal Inspection. Jiffyfoam® is a white polyethylene foam cushioning material. Jiffyfoam® is currently used in food product applications to interleave trays of apples, protect cakes and bakery goods during transit and to cushion bulk shipments of cookies and meat.

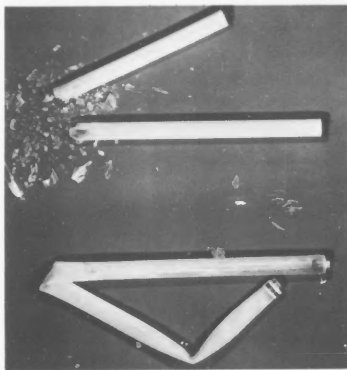
For further information contact: Jiffy Packaging, 360 Florence Ave., Hillside, NJ 07205, 201-688-9200.

• A new odorless, tasteless silicone hose for food processing applications demanding greater durability than conventional rubber or plastic hose is being introduced by Chase-Walton Elastomers, Inc. of Hudson, MA.

The hose is odorless, tasteless, and withstands repeated sterilization without degrading. Resistant to vegetable oils, lard oil, aqueous foods, sticky food build-up, and detergents, it meets FDA, USDA, NSF, and other applicable standards. Chase-Walton Silicone Food Processing Hose is offered in single or multi-ply nylon-reinforced sizes from 1/4" to 6" ID (neutral core with green covering); and non-reinforced sizes from .032" to 1" ID (transparent, neutral, or white). Custom sizes can be supplied. For more information contact: Chase-Walton Elastomers, Inc., Thomas S. Moroney, Vice President, 29 Apsley Street, P.O. Box 1, Hudson, MA 01749, 617-485-5600.



• *University Micro Reference Labs, Inc.* supplies standard and custom cultures to educational, clinical, industrial and veterinary laboratories. UMRL manufactures, quality controls and markets bacterial cultures which are dispensed as unknowns. Over 100 cultures routinely used by medical and industrial labs are available, as well as specialized custom cultures and controls for microbiological testing. Operating under GMP and GLP standards, each culture is quality controlled for identity, viability, and uniformity to assure consistency and reproducibility from lot to lot. Contact: University Micro Reference Labs, Inc. at 7885 Jackson Road, Suite 4, Ann Arbor, MI 48103, 313-426-5052.

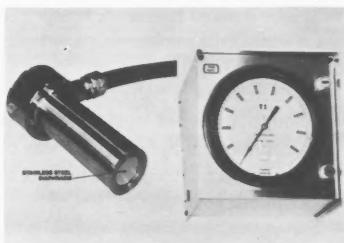


• A *shatter-proof fluorescent bulb* that reduces hazards wherever food products are processed and handled is now available from Permalux Lighting of Maple Shade, NJ. It eliminates the hazard from falling lamps because virtually all of the glass fragments, phosphors and mercury remain within the bulb's safety coating.

For further information, write Permalux Lighting, P.O. Box 351, Maple Shade, NJ 08052, 800-257-8282.



• A new, *hygienically-white udder wipe* that absorbs about 40 percent more cleaning solution than other products has been introduced to the dairy industry by Scott Paper Co. The new Scott "Sani-Prep" udder wipes cost less than 3/4 of a cent each. "Sani-Prep" dairy towels come boxed and a plastic-covered wire rack is available for additional convenience.



• The *Tank Mate by Monitor sanitary pneumatic tank gauging system* features a stainless steel diaphragm that will not harden and rupture under daily steam cleaning. This eliminates the need to maintain large inventories of diaphragms as has been standard practice when elastomeric diaphragms are used. The 3A certified stainless steel diaphragm is secured in the sanitary level sensor so that it can be CIP cleaned along with the tank. For more information, contact: Monitor, PO Drawer AL, Elburn, IL 60119.

Case History:

A Backsiphonage Incident

MORRIS FORSTING

South Dakota District 3 Sanitarian

A strong recommendation at the 1981 IAMFES Annual Meeting was that the "Case History" section of Dairy and Food Sanitation be expanded. We begin that with this issue, and look forward to including

in future issues documented case histories from your experiences. Let us know, through an inquiry letter, of cases you'd like to submit. Or, feel free to send the documented case, itself, for editing and inclusion in a future issue. Let's hear from you!

Early the afternoon of October 5, 1978, in Beresford, SD, the Tri County Farmer's Union was filling a herbicide crop sprayer. The water source was a hydrant on the west side of the shop. The hose was extended down into the herbicides.

Meanwhile, a well-drilling crew drilled for water behind the building. The main water line was broken and backsiphonage was created at the complex. The herbicide was drawn into water lines although not into the well system due to two check valves.

The backsiphonage wasn't noticed until Al Stevens, manager of the Farmer's Union, went into the men's restroom fifteen minutes after the main was broken. When he washed his hands he noticed the water came out a white milky color with a petroleum odor. This was due to LV-4 (2-4-D ester) mixed with water.

LV-4 + Petroleum Solvents = White H₂O and odor.

Though it was not legal to fill the sprayer with water from commercial hydrants, "it was only going to be a quick fill," but fifteen minutes was all it took for the backsiphonage to occur.

Stevens called Cennex who called Dow Chemical of New York. Dow Chemical called Stevens back to suggest flushing the lines with pure water. The restaurant was shut down at 1:30 p.m. and water lines were flushed with pure water from 2:00 p.m. until 5:00 a.m. the next day.

At 3:00 p.m. the day of the backsiphonage incident, Stevens called Morris Forsting, District 3 Sanitarian of the State Health Department, to inform the Department of the problem and ask for suggestions. Forsting suggested a shut down, which Stevens had done and also testing of the flushed water lines until safe amounts of chemical residues were reached.

Forsting called the State Health Laboratory and talked to Cheryl Kjar, State Microbiologist, who suggested a

contact be made with the State Chemistry Laboratory in Vermillion, SD as the State Health Laboratory was not set up to do the needed testing. Forsting called the Chemistry Laboratory and talked to Don Frasc, Assistant State Chemist, who said they were not set up to do the necessary testing either. Frasc suggested that a call be made to the Station Biochemistry Laboratory in Brookings, SD. Forsting called the Biochemistry Laboratory and talked to Barb Dohman, Assistant State Chemist, who suggested the following:

- Sample the water with a clean glass quart jar with the lid lined with aluminum, but no rubber contact. Do this right before bringing the samples to Brookings.
- Bring the samples in by 8:00 a.m. on October 6, 1978.
- Run as much as possible on Friday and get the results back to Stevens.

Stevens drew the samples at 5:00 a.m. on October 6, 1978, and took the samples to Bio-Chem Laboratory. Barb Dohman and Yvonne Greichus, Assistant Chemists, ran the analysis and called Stevens at the complex at 10:30 a.m. to indicate concentrations were too high. They could not recommend using the water.

To add to the problem, several mobile homes were located near the complex to house some of the employees. A question arose as to whether these mobile homes were on the same water line as the complex. Only one employee had worked at the complex when the well system had been installed. He knew the trailers were on a separate system by looking at the blue prints that were found.

After receiving the analysis results from Brookings, Stevens called Howard Hutchings, Director of the Sanitation and Safety Program, State Health Department, at 1:00 p.m. the day after the backsiphonage occurred. Stevens relayed the analysis to

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Calendar

Jan. 7-9, 1982---ANALYTICAL AND
 QUALITY - CONTROL TECHNIQUES,
 Manhattan, KS. Course sponsored by Ameri-
 can Association of Cereal Chemists, 3340 Pilot
 Knob Road, St. Paul, MN 55121.

Jan. 25-28---FOOD IRRADIATION:
 STATE OF THE ART, Shortcourse, Davis,
 CA. Sponsored by Dept. of Food Science and
 University Extension, University of California,
 Davis. Course fee: \$350. Contact: Jim Lapsley,
 University Extension, UC Davis, Davis, CA
 95616.

Feb. 9-10---FOOD PROCESSORS SANI-
 TATION WORKSHOP. Mission De Oro
 Santa Nella, CA. Presented through coopera-
 tion of sanitation organizations, industry
 trade associations and University of California
 Cooperative Extension. Contact: Paulette De
 Jong, Food Science and Technology, Uni-
 versity of California, Davis, CA 95616, 916-752-
 1478.

Feb. 10-11---DAIRY AND FOOD IN-
 DUSTRY CONFERENCE. The Ohio State
 University. Contact: John Lindamood, Dept.
 of Food Science and Nutrition, 2121 Fyffe
 Road, The Ohio State University, Columbus,
 OH 43210.

March 15-24---UNIVERSITY OF MARY-
 LAND 32nd ANNUAL ICE CREAM SHORT
 COURSE. College Park, MD. Contact: Dr.
 Joseph Mattick, Dept. of Dairy Science,
 Animal Sciences Center, College Park, MD
 20742, 301-454-3926.

March 22-26---MID-WEST WORKSHOP
 IN MILK AND FOOD SANITATION. The
 Ohio State University. Contact: John Lindamood,
 Dept. of Food Science and Nutrition,
 2121 Fyffe Road, The Ohio State University,
 Columbus, OH 43210.

Mar. 22-26, 1982---MICROANALYTICAL
 SANITATION SERIES II (Intermediate
 Quantitative Interpretive), Melbourne, FL.
 Course sponsored by American Association of
 Cereal Chemists, 3340 Pilot Knob Road, St.
 Paul, MN 55121.

March 25---UNIVERSITY OF MARY-
 LAND 32nd ANNUAL ICE CREAM CON-
 FERENCE. Center of Adult Education,
 College Park, MD. Contact: Dr. Joseph
 Mattick, Dept. of Dairy Science, Animal
 Sciences Center, College Park, MD 20742,
 301-454-3926.

March 31---NINTH CNA/IFT/ISMS NU-
 TRITION SYMPOSIUM, "Current Issues
 Facing Food, Nutrition and Health Pro-
 fessionals." Ramada O'Hare, Des Plaines, IL.
 Sponsored by Chicago Nutrition Association,
 Chicago Section of Institute of Food Tech-
 nologists, and Illinois State Medical Society.
 Contact: Chicago Nutrition Association, CNA/
 IFT/ISMS Symposium, PO Box 87664,
 Chicago, IL 60680 or Theresa M. Gargano,
 312-998-3576.

April 22-23---PACIFIC NORTHWEST
 FOOD SCIENCE AND TECHNOLOGY
 CONFERENCE. "Electronic Control in the
 Food Industry---Microprocessors to Com-
 puters." Tye Inn, Olympia, Washington.
 Contact: Jean Canfield, WSU Conference
 Assistant, 4525 Libby Rd., NE, Olympia, WA
 98506, 206-754-6870.

Apr. 26-30, 1982---MICROANALYTICAL
 SANITATION SERIES III (Advanced Quali-
 tative Interpretive), Melbourne, FL. Course
 sponsored by American Association of Cereal
 Chemists, 3340 Pilot Knob Road, St. Paul,
 MN 55121.

Committee Reports

PRECOOLING RAW MILK ON THE DAIRY FARM SUBCOMMITTEE

In many dairy operations the milk cooling equipment is inadequate because of changes in cooling requirements, increased milking rates, loss of efficiency in the condensing unit (s) and/or milk in refrigerated milk tanks. Consequently, the dairyman is faced with a decision to install a complete new milk cooling system or to improve his existing system.

Every year an increasing number of dairymen choose the latter alternative and install a precooler. As the name implies, a precooler cools the milk before it enters the milk tank. Sanitary heat exchangers designed to clean in-place with the milking system cool the milk in the portion of the pipeline used to convey the milk to the tank. The heat exchanger may be designed to remove a small portion of the heat from the milk or to cool it to a safe storage temperature. The amount of cooling accomplished is usually determined by the need (how bad is the existing system) and/or the amount of coolant available.

Precoolers are not limited to retro-fitting. Large producers find it possible to reduce the operating cost of

milk cooling systems if part of cooling is accomplished in a precooler. The reduced load on the milk tank condensing unit (s) permits the use of smaller condensing units. The reduced cost of the smaller condensing unit (s) and/or the reduced running time will, in part, offset the cost of the precooler.

Although a precooler cannot improve the quality of the milk being cooled, two problems associated with refrigerated milk tanks, churning and rancidity, are minimized because cooling is rapid and without agitation.

Sanitary heat exchangers using well water as the cooling medium serve a dual purpose. The well water is "preheated" enroute to conventional water heating equipment. The resulting cost reduction is partially responsible for the increasing popularity of precooling milk and "preheating" of water on dairy farms.

In an ideal situation, no water is wasted. The heat exchanger is sized to gain maximum cooling based on the normal water flow during the milking.

DEFINITIONS

Precooler

A heat exchanger that partially cools the milk before it enters the tank. May be employed when the existing cooling equipment lacks the needed capacity for maintaining the desired temperatures or to reduce the load on mechanical refrigeration equipment. Also used as a means of tempering water.

Instant Cooler

A heat exchanger designed to cool milk to a safe storage temperature (38°F or lower) before it enters the tank. In large dairy operations instant coolers may be used in preference to conventional methods due to the increased capacity.

Combination Cooler

A heat exchanger using a booster cooling section and an instant cooling section.

Milkway

The portion of a heat exchanger that conveys milk.

Waterway

The portion of a heat exchanger that conveys the cooling medium.

TYPES OF EQUIPMENT

Plate Type Heat Exchanger

Plate type heat exchangers have been used in milk receiving situations, processing plants and on large dairy farms for many years. New compact designs that lend themselves to wall or floor mounting account for their increased use.

Cooling is accomplished by pumping milk through very narrow milkways between two gasketed stainless steel plates, the opposite sides of which have coolant moving in a counterflow direction.

Tubular Type Heat Exchangers

Milk is pumped or allowed to drain by gravity through milkways (tubes) inside a shell or concentric tube carrying coolant in the opposite direction. The milking system pump is usually sufficient for pumping the milk through the tubes.

Other (To Be Developed)

COOLING MEDIUM

Refrigerant

Heat exchangers using direct expansion to cool the milk must be equipped with

refrigerant controls designed to maintain a temperature of 32°F (minimum) to avoid freezing the milk. This is often accomplished by using a by-pass valve that admits high pressure vapor directly into the low side.

Well Water

Heat exchangers using well water are the most common. Small amounts of water counterflow the milk producing efficient heat transfer. The water is not wasted. In a Stanchion Barn the water may be piped directly to the drinking cups. In a parlor operation the water may go to the prep stalls, flush tanks or hose stations. In some cases the water may return to the water system by means of a storage tank and a second pump. A dairyman who is using warm water during his milking operation receives the greatest benefit from precooling. He saves cooling costs and also water heating costs. Savings can be substantial.

Chilled Water

This method requires the use of an instant chiller or ice bank capable of providing 32°F water. The chilled water is returned to the ice builder for recirculation permitting the use of a storage tank without additional cooling and the use of a much smaller condensing unit operating over a longer period.

Glycol

Food grade propylene glycol may be added to the ice builder to reduce the chilled water temperature. A 6% solution will not interfere with ice formation and will provide 29°F water leaving the ice builder. If an instant chiller is used, food grade propylene glycol must be added to prevent ice formation in the chiller passages.

FABRICATION

3-A Approved Equipment Only

INSTALLATION GUIDELINES

1. Openings to the heat exchanger should be in the

milkroom for adequate environmental protection for cleaning, sanitizing and drainage.

2. Heat exchangers should be installed so that adequate space is provided for disassembly and inspection.
3. Milkways shall be self-draining following the cooling cycle.
4. Waterways in tubular heat exchangers shall be self-draining following the cooling cycle to prevent lowering of cleaning solution temperatures.
5. Milk filtering shall be between the milk receiver group and the heat exchanger.
6. Tubular or plate heat exchangers must be installed in a manner that permits ease of disassembly for visual inspection of the milkways. (Milkways designed for cleaning in-place are not required to be accessible for visual inspection if the milkway is cleaned as a continuous tube.)
7. The refrigeration unit(s) used on tanks in connection with a precooler may be sized so that the *combined* cooling effect of the precooler and the refrigeration unit(s) meets or exceeds applicable cooling requirements.
8. It is recommended that recording thermometers be used with refrigerated milk tanks that are equipped with minimum refrigeration and with holding tanks that have no refrigeration. (It is recommended that all raw milk holding tanks have sufficient refrigeration for maintaining the milk at safe storage temperatures).
9. In lieu of built-in refrigerated surface in milk holding tanks, it is recommended that means be provided for recirculating milk through the precooler.

Subcommittee members:

Richard Ayres
Clarence Luchterhand
Alvin Tesdal
Aubrey Wisdom
B. J. Demott
Raymond Lock
Marshall Cooper
Darl Evans [Chairman]

DAIRY & FOOD SANITATION VOLUME 1

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Case History, *con't. from p. 526*

Hutchings and said Brookings wouldn't sample on Saturday. Hutchings suggested calling Frasch at the Vermillion Chemistry Laboratory to ask for his suggestions and to see if he would analyze the water.

At 2:00 p.m. Stevens called Frasch. He recommended flushing the system as follows:

- Flush 800 gallons of H₂O + 6 gallons emulsifiable detergent for 45 minutes.
- Flush 800 gallons of H₂O + 4 gallons chlorine for 45 minutes.
- H₂O flush for two hours.

At 2:30 p.m. the flushing began and Stevens called

Hutchings again. Stevens asked for whether it would be safe to assume the water pipes lines were clean after this flushing procedure and could be reopened. Hutchings suggested that the lines not be reopened until test results proved they were okay. At 3:00 p.m. Stevens called Frasch back to see if analysis could be run. Frasch said if the samples were pulled and in by 6:00 p.m. the next day, he could run the samples. Stevens got the samples to Vermillion and Frasch ran the analysis from 7:00 p.m., October 6 till 4:00 a.m. the next day. Frasch called at 4:30 a.m. to tell Stevens that the water lines were safe for operation.

The restaurant did not reopen until 6:00 a.m. on October 9, 1978, because there was additional work management wanted to complete, including changing the water pipe line system. The old system had a 3,000 gallon cistern which was well-filled and there was just one pressure system for the complex. Two pressure systems and two separate water lines now serve the complex. One line goes to the restaurant; and one goes to the service station. There are two check valves on each line to prevent backsiphonage to the cistern.

Among Stevens comments were:

- The complex management was concerned about the public, so immediately shut down.
- Restaurant employees were concerned because the restaurant was not open and all had to go home, but Harold and Michael Conklin, managers of the restaurant realized the higher priority of the hazard to the public and agreed to shut the restaurant down.
- Who should they call to initiate some action? Stevens felt the State Health Department and State Assistant Chemists were very cooperative and very informative and all worked together well.
- Management was concerned the public might not accept their word once the incident was over that the pipe lines were safe.
- After reopening, the gross income of the complex did not fluctuate.

JFP Abstracts

Abstracts of papers in the December Journal of Food Protection

A Rapid Psychrometric Procedure for Water Activity Measurement of Foods in the Intermediate Moisture Range, H. H. Wiebe, R. N. Kidambi, G. H. Richardson and C. A. Ernstrom, Departments of Biology and of Nutrition and Food Sciences, Utah State University, Logan, Utah 84322

J. Food Prot. 44:892-895

Commercial vapor pressure thermocouple psychrometers (hygrometers) are now generally accepted for measuring water activity, a_w , (water potential) in plants and soils, and commercial instruments are available. We have adapted them for a_w measurements in the 0.99 to 0.60 range using a two-step procedure. Water is first condensed on the thermocouple; then the sample is inserted in the thermocouple chamber and the psychrometric cooling of the wet thermocouple measured. The procedure is calibrated with a series of saturated salt slurries of known a_w values. Typical a_w values (with standard deviations) for a variety of foods were: Cheddar cheese, 0.95 ± 0.03 ; Parmesan cheese, 0.76 ± 0.03 ; milk powder, 0.75 ± 0.02 ; milk chocolate, 0.60 ± 0.04 ; luncheon meat, 0.96 ± 0.03 ; bread, 0.95 ± 0.03 ; dried raisins, 0.82 ± 0.02 ; corn syrup, 0.60 ± 0.02 ; and orange juice concentrate, 0.80 ± 0.03 . The coefficients of variation ranged from 1.9 to 5.8%. When compared with published values obtained by other methods, these figures were within the standard errors of measurement. The thermocouple detector did not foul since it had only vapor contact with the sample. An economical sample chamber and instrument is described. Analysis time is 4 to 8 min. The procedure is accurate, convenient and rapid.

Production of Botulinum Toxin in Inoculated Pack Studies of Foil-Wrapped Baked Potatoes, H. Sugiyama, Margy Woodburn, K. H. Yang and Colleen Movroydis, Food Research Institute and the Department of Bacteriology, University of Wisconsin, 1925 Willow Drive, Madison, Wisconsin 53706 and Department of Foods and Nutrition, Oregon State University, Corvallis, Oregon 97331

J. Food Prot. 44:869-898

Idaho Russet Burbank potatoes were surface or stab inoculated with 10 to 10^5 spores of *Clostridium botulinum* type A strain, overwrapped in aluminum foil, baked at 204 C for 50 min or 96 C for 3 h and then held at 22 or 30 C. The shortest incubations resulting in the first botulinogenic potatoes were inversely related to spore doses and ranged from 3 to 7 days; potatoes inoculated with 10 spores were toxic after 5 to 7 days. Total toxin in individual potatoes incubated 3 to 5 days were 5×10^3 to 5×10^5 mouse mean lethal doses. Toxin was not found at distances greater than 1.6 cm from the spore inoculation site. Results indicate that left-over, foil-wrapped, baked potatoes are a perishable food that must be refrigerated.

Heat Inactivation and Reactivation of Alpha Toxin from *Clostridium perfringens*, Maria Babajimopoulos and E. M. Mikolajcik, Department of Food Science and Nutrition, Ohio Agricultural Research and Development Center and The Ohio State University, 2121 Fyffe Road, Columbus, Ohio 43210

J. Food Prot. 44:899-902

Crude and purified preparations of commercial alpha toxin from *Clostridium perfringens* were heated in physiological saline and in fractions separated from proteose peptone (Difco, 0120). Heating temperatures ranged from 55-95 C for 6-18 min. Alpha toxin remained active at temperatures ≤ 85 C when heated in the presence of a fraction of proteose peptone having a MW $\geq 50,000$. At 95 C, some destruction was observed with a D-value of 444 min. In saline or a proteose peptone fraction having a MW $< 50,000$, heat inactivation of alpha toxin occurred at 65 C. Gel filtration revealed that heat protection was associated with complex formation of the alpha toxin with proteose peptone. Alpha toxin heat-treated in saline was reactivated when proteose peptone was added after heat treatment and the toxin was subsequently incubated in hemolysin indicator plates at 37 C for 24 h. Reactivation of alpha toxin was not observed when saline was added after the toxin was heat-treated and then incubated in hemolysin indicator plates at 37 C for up to 48 h.

Salmonella Sensitivity in a Sorbate/Modified Atmosphere Combination System, Philip H. Elliott and Rodney J. H. Gray, Department of Food Science and Human Nutrition, University of Delaware, Newark, Delaware 19711

J. Food Prot. 44:903-908

The response of *Salmonella enteritidis* was examined on exposure to a combination treatment of potassium sorbate and modified atmosphere at 10 C. Atmospheres employed were 100, 60 and 20% CO₂; vacuum and an air control. The organisms were exposed to these atmospheres on tryptic soy agar containing 0.0, 0.5, 1.5 or 2.5% potassium sorbate at pH 6.5, 6.0 or 5.5. In the absence of sorbate, only the 100% CO₂ atmosphere inhibited growth; the vacuum and 20 and 60% CO₂ atmospheres were in fact stimulatory. In combination with sorbate, all atmospheres were inhibitory. The combination treatment was increasingly effective with decreasing pH and increasing CO₂ and sorbate concentrations.

Prevention of Salmonella Infection in Chicks by Treatment with Fecal Cultures from Mature Chickens (Nurmi Cultures), H. Pivnick, B. Blanchfield and J.-Y. D'Aoust, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 44:909-916

Chicks (*Gallus domesticus*) were treated per os with 24-h-old anaerobic cultures of feces from mature chickens 1 day after hatching, challenged with *Salmonella typhimurium* in the drinking water 2 days later, and sacrificed on day 11 or 12; then the lower third of the intestinal tract was examined for salmonellae. Cultures of feces inoculated directly into the crop or added to the drinking water, even after holding at -70 C for 21 days, protected chicks against infection by *S. typhimurium*. Cultures serially subcultured daily up to four times were protective, and dilution to 1:80 in drinking water containing 4% skim milk powder did not decrease their protective effect. Treated chicks were about 1000-fold more resistant to infection by *Salmonella* than untreated chicks.

Reduction of *Salmonella* Excretion into Drinking Water Following Treatment of Chicks with Nurmi Culture, A. Stersky, B. Blanchfield, C. Thacker and H. Pivnick, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 44:917-920

Day-old chicks (*Gallus domesticus*) were treated with cultured feces of adult chickens according to the Nurmi concept and were challenged 2 days later with *Salmonella typhimurium*. Treated chicks were less susceptible to infection than untreated chicks (16% vs. 79% infected). Those treated chicks that did become infected, contaminated their drinking water with fewer *Salmonella* than the untreated chicks (maximum of 10^4 /ml vs. $\geq 10^7$ /ml). Fecally contaminated water may be a major source for spreading *Salmonella* infection within a flock.

Dairy Herd Mastitis Quality Control Program, Douglas L. Park and Dee Morgan, Safeway Stores, Inc., Milk Department, Landover, Maryland 20785 and Safeway Stores, Inc., Dairy Division, Department of Quality Control and Research, Oakland, California 94660

J. Food Prot. 44:921-922

Milk from 34 dairy herds was tested over a 12-month period using a mastitis evaluation program in which *Streptococcus agalactiae*, *Staphylococcus aureus* and leucocytes were counted. There was a significant decrease in the total mastitic bacterial count (*S. agalactiae* plus *S. aureus*) over the testing period; however, the curve was bimodal, showing high points in the winter and summer months. The leucocyte count alone was not a good indicator of the mastitic condition of the herd. In approximately 12% of the test results, there was a high bacterial count with a low leucocyte count or a high leucocyte count with a low bacterial count.

Packaging of Beef Loin Steaks in 75% O₂ plus 25% CO₂. I. Physical and Sensory Properties, J. W. Savell, G. C. Smith, M. O. Hanna and C. Vanderzant, Meats and Muscle Biology Section, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 44:923-927

U.S. Choice boneless beef strip loins from four suppliers were used to determine the effect of using previously vacuum-packaged beef subprimals and the effect of using subprimals at different storage intervals--0, 14 or 28 days--after arrival at our laboratory on the retail appearance of steaks packaged in 75% O₂ + 25% CO₂. After packaging, steaks were stored for 9 days in the dark in a 1 ± 1-C refrigerated cooler and displayed under 1030 lux of incandescent light in a retail case for 4 days at 2 ± 2 C. Selected subprimals were repackaged and held at 1 ± 1 C for 9 days in the dark and steaks were removed and packaged in polyvinyl chloride (PVC) film and displayed for 4 days to serve as display controls. With regard to surface discoloration, overall appearance and off-odor scores, modified gas atmosphere (MGA)-packaged steaks from strip loins fabricated at Day 0 were not different (P>.05) from PVC-packaged steaks, however, MGA-packaged steaks from strip loins fabricated at Day 14 or Day 28 were less desirable (P<.05) than PVC-packaged steaks or steaks that were MGA-packaged on Day 0. When comparisons of retail appearance characteristics were made among loins from different suppliers, the results were mixed; data from steaks that were MGA-packaged at Day 14 revealed (P<.05) differences among loins from different suppliers in surface discoloration and off-odor while data from steaks that were MGA-packaged at Day 28 revealed no (P>.05) differences among loins from different suppliers in surface discoloration or overall appearance. Data indicate that modified gas atmosphere packaging of beef loin steaks can be successful if very fresh subprimals are used; however, extended vacuum-storage of beef subprimals (14 or 28 days) did not provide raw material that was amenable to subsequent storage-display in modified gas atmosphere packages.

Packaging of Beef Loin Steaks in 75% O₂ Plus 25% CO₂. II. Microbiological Properties, M. O. Hanna, C. Vanderzant, G. C. Smith and J. W. Savell, Meats and Muscle Biology Section, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 44:928-933

Numbers and types of bacteria were determined on steaks after refrigerated storage (1 ± 1 C) in 75% O₂ plus 25% CO₂ for 9 days in the dark plus display at 2 ± 2 C for 4 days under simulated retail conditions. Steaks were prepared from strip loins (IMPS #180) as received from the supplier (trial 1) and

also from the same or similar loins that were vacuum-packaged at day 0 (trial 1) and then stored under refrigeration for 14 (trial 2) or 28 days (trial 3). Initially (day 0, trial 1), the microflora of steaks consisted primarily of *Micrococcus* and *Moraxella-Acinetobacter* sp. Following refrigerated storage in vacuum packages for either 14 or 28 days, *Lactobacillus* and *Leuconostoc* sp. became dominant. Refrigerated storage and display of steaks in 75% O₂ plus 25% CO₂ shifted the microbial population in favor of *Leuconostoc* sp. Initial log counts of steaks (day 0, trial 1) ranged from 0.88 to 2.02. Counts of steaks stored for 9 or 13 days in 75% O₂ plus 25% CO₂ nearly always exceeded 10⁶ per cm² when steaks were prepared from loins which had been stored in vacuum packages for either 14 or 28 days. The pH values of steaks prepared from loins which had been stored under refrigeration for 14 days were lower (0.27-0.56) than those of steaks prepared from comparable loins as they were received from the supplier (day 0, trial 1). Refrigerated storage of vacuum-packaged loins for an additional 14 days did not cause marked changes in pH of the steaks. No consistent differences in microbial flora were detected between green- and normal-pigmented areas of steaks prepared from vacuum-packaged loins which had been stored refrigerated for 14-28 days.

Food Safety Evaluation: Acute Oral and Dermal Effects of the Algae *Scenedesmus acutus* and *Spirulina platensis* on Albino Rats, M. K. Krishnakumari, H. P. Ramesh and L. V. Venkataraman, Central Food Technological Research Institute, Mysore-570013, India

J. Food Prot. 44:934-935

The algae *Scenedesmus acutus* and *Spirulina platensis* have been considered for use as a supplementary protein in feed and food. This Institute has developed the technology of production and utilization of such algae. It is essential to demonstrate their safety in view of their public health aspects, the interest of the producers and image of these new sources of foods. Both these

algae, when in pure form and administered to rats orally up to the dosage of 800 mg/kg of body weight, did not exert any toxic action. No alterations were found in either body or organ weights in the treated animals. The vital organs showed normal histology. Application of both algae onto the skin of albino rats, up to 2000 mg/kg of body weight, did not elicit any skin allergy. All the animals were normal.

Microorganisms as Food Additives, James L. Smith and Samuel A. Palumbo, Eastern Regional Research Center, Philadelphia, Pennsylvania 19118

J. Food Prot. 44:936-955

Microorganisms, both bacteria and fungi, are used as additives in meats, milk, cereals, vegetables and fruits to produce fermented products. The fermented foods differ from the starting material in texture, flavor and keeping quality. Fermentation causes changes in the nutritional content of foods; vitamin and amino acid levels may increase, decrease or remain static, depending on the type of microorganism used and the product fermented. Microorganisms also impart desirable flavors, improve texture and enhance digestibility of foods. Fermentation destroys food spoilage organisms and permits preservation of food. Lactobacilli in cultured milks are used to supplement the normal intestinal flora in individuals suffering from digestive ailments or enteric diseases. Cultured milks are tolerated by lactose-intolerant individuals because of lactose utilization in the gastrointestinal tract by ingested lactobacilli. If sufficient acid is formed, foods which have undergone a lactic acid fermentation, such as fermented sausages or cheese, do not support growth of food poisoning microorganisms. Products which undergo controlled commercial fungal fermentations have been shown not to contain mycotoxins. Histamines and other biogenic amines are present in cheese and other fermented products. Fermentation offers a means of producing safe, nutritious foods with desirable organoleptic qualities and extended storage stability.

Ginn Biography, *con't. from p. 523*

Association of Milk, Food and Environmental Sanitarians, served on the IAMFES Applied Laboratory Methods Committee and has been active in the National Mastitis Council. He is presently on the NMC board of directors. He is currently serving on the Technical Committee for *The 15th Edition of Standard Methods for the Examination of Dairy Products* for the American Public Health Association. For the past several years Roy has

served on the Laboratory Committee for the National Conference on Interstate Milk Shipments. Recently he helped develop a quantitative method for detecting beta lactam residues in milk for that committee.

Roy and his wife, Martha, have been married for thirty-two years and have four children and two grandchildren. He has been serving on the governing body of his church for the past three years.

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