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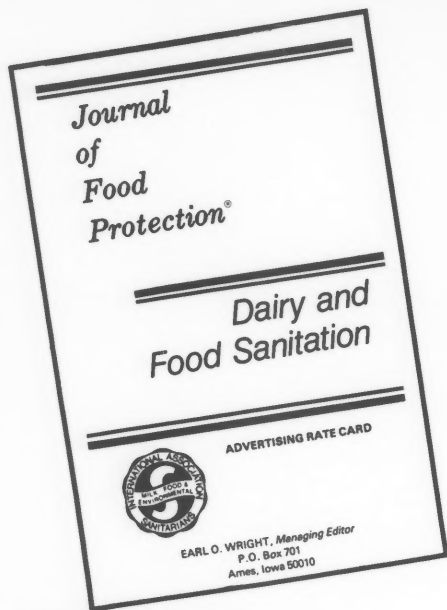
Dairy and Food Sanitation

A Publication for Sanitarians and Fieldmen

- The Why and How of Proper Milk Sampling by the Milk Hauler
- Reading Scientific Literature — Is It Worth Your Time?
- Quality and Labeling of Cottage and Ricotta Cheeses
- Plumbing Hazards in the Food Industry
- Microbiology in Food Processing



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THE WHY AND HOW OF PROPER MILK SAMPLING BY THE MILK HAULER

Milk sample collection is a daily routine job for the milk hauler. It is of major economic importance to the milk producer and the milk buyer that these samples be collected properly, and that they arrive at their destination with no change in their physical, chemical, or biological character.

“It follows then that in order to be able to do the sample collecting job properly, the milk hauler must have adequate equipment, a simple routine system to follow, and an understanding of the principles involved and the procedures to follow.”

It follows then that in order to be able to do the sample collecting job properly, the milk hauler must have adequate equipment, a simple routine system to follow, and an understanding of the principles involved and the procedures to follow.

ROUTINE SYSTEM

The popular system of collecting a sample from each tank at each pick up whereby the sample may be used for any purpose needed is the most efficient and is generally recommended. It is known as the “Universal Sample System.”

EQUIPMENT

With a job of such economic significance, the equipment needed is of major importance. It consists of sterile, single-service sample containers with positive leak-proof closures; a properly constructed stainless steel dipper; marking pen; a properly designed, constructed, and insulated sample box; rack; pocket thermometer; ice; timing device; flashlight, and weigh tickets.

TRAINING AND SUPERVISION

The milk hauler has every right to expect and receive training and supervision from the milk buyers and legal enforcement agencies. This is their responsibility.

AGITATION

Before extracting the sample from the milk in the bulk tank, the milk must be subjected to the necessary mechanical agitation. A minimum of five minutes agitation is required for smaller tanks and ten minutes on larger tanks.

WHY AGITATION?

There are two important reasons for thorough agitation of the milk in the tank. The lighter milk fat rises to the top and it must be uniformly mixed in the body of the milk or erratic milk fat tests will result. Further, since the bacteria rise with the lighter fat, excessive bacteria counts will result from improperly mixed milk. Somatic cell counts are affected in like manner. It can be readily seen that undue enforcement penalties can result from improperly mixed milk.

IDENTIFICATION OF THE SAMPLE

It is important that samples be legibly, clearly, and accurately identified to prevent errors during the recording and testing processes. Poor and inadequate identification can be very costly.

SAMPLE TEMPERATURE CONTROL

Possibly, the most neglected phase of milk sample care is temperature control, particularly from the farm to the terminal.

WHY?

Warming above 40°F provides an environment ideal for rapid bacterial growth and other biological changes. Test accuracy of the original sample diminishes rapidly with warm temperatures and time. Freezing changes the character of the milk in a manner that accurate test results cannot be obtained. There is a temperature range between 32°F and 40°F that must be maintained throughout the pick up and delivery process.

It follows then, that regardless of the season -- winter, spring, summer, or fall -- and the outside temperature, samples must be handled in the same manner in order to

protect them properly and maintain them between 32°F and 40°F.

TEMPERATURE CONTROL MADE EASY

EQUIPMENT

Sample Carrier - Durable, nonabsorbent, properly insulated, including the lid, separate compartment for auxiliary ice.

Designed especially for the bulk milk sampling operation. Adequately insulated to conserve ice and to insure positive temperature control. Purpose of separate compartment is to carry extra ice conveniently located so hauler can add ice when needed on the route.

ICE

Machine made; chipped or shaved. Experience has convinced many cooperatives and others that ice and ice water are the only media that will protect milk samples from warming above 40°F or freezing in transit. They have learned, in addition, that the samples must be in direct contact with the ice or ice water at all times up to the top of the milk line.

Ice water is 20 times faster in cooling milk samples than air at the same temperature.

PREVENT FREEZING IN WINTER WITH ICE

Strange as it may seem to some, ice in close contact with milk samples is the only way to keep the samples from freezing. Reason: milk has a lower freezing point than water and ice maintains a freezing point of 32°F and no lower.

ICE MACHINES

These same cooperatives and others have learned through their sampling experiences that the most efficient and economical way of providing the kind of ice necessary for sample temperature control is with ice machines in convenient locations. Large chunks of ice do not provide the necessary protection, machine made ice is far more efficient and adaptable to sample temperature control.

CHECK TEMPERATURES

Most regulations require an extra sample collected at the first pick up. While the purpose of this sample is for the enforcement agency to check on the driver's operation, it serves a far more important function for the hauler to check on his own operation. Practice temperature checking of this sample will soon tell him if his sample care is adequate. With warm and hot weather, the problem of temperature control becomes most important.

The majority of milk haulers desire to do the job of routine bulk milk sampling properly. With the proper equipment, system and understanding, he can do this job easily, effectively, and with pride.

PG 95 GRADE A PASTEURIZED MILK ORDINANCE 1978 Recommended, **PUBLIC HEALTH SERVICE-** **FOOD & DRUG ADMINISTRATION**

5. Universal Sampling System

It is required that if milk haulers collect raw milk samples the "Universal Sampling System" be employed, whereby milk samples are collected everytime the milk is picked up at the farm. The system permits the enforcement agency at its discretion, at any given time and without notification to the industry, to analyze samples collected by the hauler. The use of the "Universal Sample" puts validity and faith in samples collected by industry personnel.

The Universal Milk Sampling System

To properly evaluate the system, one must go beyond the explanation given by Federal Agencies. The reason, everyone concerned including the milk producer, the buyer and the laboratory benefit with its use.

Definition:

A milk sample is collected by the milk hauler from each tank at each milk pick up at the farm. This sample is collected and transported in a manner that will enable the testing laboratory to use any or all samples collected for every test needed. This includes milk fat and/or other component parts, quality control and for legal compliance.

Advantages

To the Milk Hauler:

Makes it possible for him to develop a simple routine method of collecting his samples. He need not collect special samples. Since he does not have knowledge of for what purpose the sample may be used, he is more aware of the need for doing the job properly.

To the Buyer, Seller or Producer:

Neither the milk producer or the milk hauler knows for what purpose the sample may be used. The temptation of collusion or tampering such as adding milk fat, in the case of special samples, is eliminated with the system.

To the Laboratory:

There are no less than six different routine tests that are made monthly on the milk samples. Since samples are available at every pickup, the laboratory director can plan his schedule to blend with his operation completely independent of the hauler. If rechecks are needed, a sample is available after the next or any subsequent pickup. He cannot operate efficiently under any other method.

To the Enforcement Agency:

Samples are available at any time needed for their purpose. It is impossible for this agency to collect samples other than by the milk hauler.

Is it Worth Your Time and Effort?

RICARDO J. ALVAREZ, PH.D.

*Director of Quality Assurance
GIBCO Laboratories
2801 Industrial Drive
Madison, Wisconsin 53713*

At times scientific literature may seem too lengthy, detailed, and not applicable to a plant manager, sanitarian, laboratory worker or administrator's needs and problems. However, there is a way to read and interpret scientific literature. Select the articles in professional journals that are within your area of work or personal interest. You may discover 'hidden' information that could help by supplying ideas for solving some of your needs and problems. Scientific literature is a valuable and perhaps for you, undiscovered, tool for professionals and field personnel.

Why should you spend the time required to read scientific literature? Should you bother? Why should a busy plant manager, food technologist, laboratory worker or administrator spend time and effort pouring over scientific articles that are invariably narrow in scope, intricately detailed, mystical, boring, and most importantly, rarely seem to

offer solutions to their problems? In fact, many food technologists and plant managers not directly involved in research see no reason to subscribe to technical journals such as *The Journal of Food Protection*, or, if they do take these journals out of some vague feeling of duty, they tend to shelve the issues, unread and many times unopened. I maintain, however, that while scientific literature is sometimes inevitably dry and often detailed, it is a resource that food technologists and plant managers neglect at a cost to themselves and the profession they represent.

Research papers are usually narrow and detailed because they must be. Scientific articles are nothing more than reports of planned, meticulous observations that have been integrated into existing knowledge. If too large a scope is attempted or if insufficient detail is recorded, the observations will not be precise enough. Scientific articles must be esoteric because of their function: yesterday's finding is common knowledge and frontiers are distant. Scientific writing is boring only when it is read as if it were a popular account or a textbook, which of course it is not.

Another criticism of scientific literature is harder to counter. What

benefit can plant managers, laboratory workers, food technologists, supervisors of food plants, quality control and quality assurance personnel derive from keeping up with journals. Their problems are practical and broad-based--the opposite, it seems, of the concerns of detailed technical papers. First, I will agree that researchers often do not do enough to reveal the practical side of their research, but there is a catch here--a new finding may not have an obvious application in the eyes of the researcher. Because no one knows a problem like the one who suffers from it, the people in the best position to put new knowledge to work are quality control personnel, laboratory workers, plant managers, and food technologists. In addition, the importance of an article is different to different people, and the application of its finding may or may not be related directly to the main point.

So, how should you read scientific literature? You first need to locate the articles of potential interest. Select articles that are within your area of work or are of personal interest. A person with a specific question can go to a research library and by abstracting journals and tracing citations find articles of

probable value in answering the question. Just to keep up with your area of interest, however, requires only a consistent effort of an hour or so every time an issue of *The Journal of Food Protection* or other journals in the field is published. Start by having in mind several subject areas in which you could use information or would be of benefit in your work. These areas should be broad so that you may discover "hidden" information within the various journals or within articles in a journal.

When you find an article that possibly contains information useful to you, attack it with expectations. What do you think you might find in this article? What would you like to find? These questions will help you analyze the paper and keep your interest up. First, read the authors' names. Do you know them or of them? Have you read other articles written by them? What are your lines of research and where and with whom do they work? Remember, for all its objectivity, scientific research is the product of human beings and your knowledge of their activities will help you understand this paper and evaluate it. Next, digest the title. It should encapsulate the research that is being presented. Now read the abstract carefully, trying to understand it, though it may be the densest prose you have ever encountered. After studying the abstract, you can

anticipate what will be presented. At this point, you may decide the article does not provide the information you need or does not interest you. Be cautious in this assessment, though, for the authors' interpretation of the research presented in the abstract may not be yours after examining the data. For the same reason, never take any action based only on a reading of an abstract of an article. Also, the valuable information in an article is not limited to the main points that dominate the abstract.

After having assimilated authors, title, and abstract, flip through the article and study the tables, figures, and photographs. Read the legends. At this point you will want to refer to the "Materials and Methods" section in order to understand the details of the experimental design. Use the results to clarify the figures, tables and/or photographs. After studying the figures, tables and/or photographs and consulting the "Material and Methods" and "Results" sections as necessary, you should understand the research that is being presented. At this point you can decide whether to spend more time with the piece or move on to something more useful to you. If you decide the article will be valuable, you then need to be critical. If the author presents any conclusions in the abstract, are they substantiated by the results? Read the introduction

and see whether the research fits with previous findings as the author says it does. Be sure to use the "Introduction" in conjunction with the "Literature Cited" to find other articles on the subject. Finally, read the "Discussion" and determine whether the authors' conclusions and amplifications overstep the support of the research findings. Ultimately, the burden of assessing published research lies with the reader. If you take the time and energy to do this, you will be much more knowledgeable than the person who depends on the authors for interpretation.

Having completed your reading of the scientific article, sit back, put away the paper, and reflect. You should be able to paraphrase the most important findings in three or four sentences relatively free of technical jargon. You should also be able to praise several aspects of the research and criticize several others. If you cannot perform these exercises, your reading was probably superficial.

Ricardo J. Alvarez* , Ph.D. Director of Quality Assurance, GIBCO Laboratories, 2801 Industrial Drive, Madison, Wisconsin 53713.

* Formerly associated with the Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida 32608.

QUALITY AND LABELING OF COTTAGE AND RICOTTA CHEESES

LESTER HANKIN,
DONALD SHIELDS,
and J. GORDON HANNA

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

Cottage and ricotta cheese were tested for accuracy in content labeling, shelf life, bacteria, and microbial analysis. In cottage cheese samplings, 19% failed to have acceptable quality at the end of their designated code period. With ricotta, 58% were acceptable according to the dated carton. Among label discrepancies noted in the study, of 140 cottage cheese samples, 19 declared sorbate presence on the label. In actuality, 33 contained sorbate.

Average annual consumption of cottage cheese in the United States is about 5 pounds per person (3). Cottage cheese is popular with a large segment of American consumers, particularly during a time of increasing health-consciousness. It is often eaten without further preparation and is used as an ingredient in other foods.

Cottage cheese is a soft uncured cheese usually made from skim milk. Lactic acid bacteria and associated *Leuconostoc* species are added to the milk to produce acid which precipitates the casein, the major protein in milk, and forms the curd. The lactic acid bacteria and *Leuconostocs* also

produce compounds that give the cheese its characteristic flavor. Sometimes the enzyme rennet is combined with the bacteria to help form the curd.

After the milk curdles or sets, it is cut into cubes and heated (to about 130-135 F). Heating helps expel some of the moisture held within the curd particles and to firm the curd. The duration of heating depends on such factors as acidity and milk solids content and determines the firmness of the curd. After heating, which destroys the lactic acid bacteria, the whey (the liquid portion of milk after the curd forms) is drained and the curd is further firmed by washing with cool water, then ice water, and the water is drained.

Finally, the "dressing" - salt, cream, stabilizer or other additives - is mixed with the curd. Fruit or vegetables may also be added. The amount and type of dressing selected depends on the type of product desired (lowfat, regular). The finished cottage cheese is finally packed into containers and refrigerated.

Various designations of curd sizes including large, small, California, and pot, generally indicate only the size of the curd particles. This is determined during manufacture by the spacing of the wire blades which cut curd. For large curd cottage cheese the curd is cut into half-inch cubes or larger; California and pot style are usually large curd. For small curd, one-fourth-inch size cubes are cut. Sometimes the cream dressing is whipped for a style known as whipped cottage cheese.

* Adapted from Bulletin 791 of the Connecticut Agricultural Experiment Station. New Haven, CT. Copies available on request.

Some labels declare salt content; others indicate an unsalted product. Usually the label states only that salt has been added but not the amount; up to 1% may be used in regular creamed cottage cheese.

According to Federal regulations (2) regular creamed cottage cheese must not exceed 80% moisture and must contain a minimum of 4% fat. To be labeled a dry curd cheese it must contain less than 0.5% fat. Lowfat cottage cheese must contain between 0.5% and 2% fat and have a moisture content below 82.5%.

Labeling must indicate if a preservative has been used and if enzymes were added during the manufacturing process. If the cheese is flavored (fruit, vegetables) the cheese portion must conform to Federal regulations. However, nutrient declarations are based on the finished product (2).

Ricotta cheese is similar to cottage cheese in many respects. It was formerly made only from whey, but now it is usually made from whole or part skim milk. Ricotta cheese is usually softer and has a finer curd size than cottage cheese.

As sold, ricotta cheese usually contains 4 to 10% fat. In the manufacture of ricotta cheese, lactic acid bacteria sometimes are used to form acid to precipitate the milk proteins and to improve flavor.

Enzymes and even food grade acids are used alone or in combination with the bacteria. Ricotta has more solids than cottage cheese, averaging about 25%. Ricotta is used most often in cooking and baking.

This study was undertaken to evaluate samples of cottage and ricotta cheese available for consumer purchase for composition and microbiological quality.

All samples in the study were purchased at food stores in Connecticut from April through June 1980. Over 140 cottage cheese samples, including 107 regular creamed (4% fat), 30 lowfat (1 to 2% fat) and 4 dry curd (less than 0.5% fat) were studied. Of the regular creamed type, 24 were flavored with fruit, vegetables, or herbs and four of the lowfat type were flavored.

Cottage cheeses came in seven curd sizes: large, small, tiny, California, chunk, pot and whipped. Not all curd sizes were found for each brand and 16 of the samples did not state a curd size on the label. Of the 19 ricotta cheeses 12 declared they were made from whole milk and 7 from part skim milk.

Two samples of most brands or varieties of cottage cheese (except for three brands) were purchased. Each sample was manufactured on a different day. For two brands only

one sample was obtainable and for another, three samples were obtained, one of which declared no added salt. One sample of each brand of ricotta cheese was tested. Duplicate samples of each cottage and ricotta cheese were purchased each time; one was used for microbial and chemical analysis, and one for flavor and keeping quality analysis.

Analyses for coliform bacteria were conducted using Violet Red Bile agar and for yeasts and milks using acidified potato dextrose agar according to the Standard Methods (8).

Analyses for percent acidity, fat and protein were made according to Official Methods (6). Calculations used for estimating carbohydrate and calories have been described (5). Sodium was determined by atomic absorption spectrophotometry (1) and sorbate by high-pressure liquid-chromatography (7).

Nutritional claims for cottage and ricotta cheese are usually based on a 4-ounce serving (113 grams). For comparison, data for the fat, protein, and carbohydrate and for caloric content are based on 113 grams.

For assessing keeping quality, samples were refrigerated at 40 F (4.4°C) and examined and tasted periodically until the code date was reached (date stamped on carton as last day of sale). Since flavor, size of

curd and consistency are matters of personal choice, samples were rejected as unsatisfactory only when an obvious flavor defect or surface microbial growth was evident. Cheese samples containing microbial growth on the surface when purchased were considered unsatisfactory.

Code periods, the number of days from manufacture to last day of sale stamped on the carton (code date) were supplied by all the manufacturers.

Plant Permit Numbers:

The product labels must state where the product was manufactured. This is done either by listing a plant permit number as designated by the State Department of Agriculture or, if the plant is making and distributing the product directly under its own brand, by listing its name and address.

The majority of the cottage cheese samples (56.7%) were made at six different plants in New York. Only two plants in Connecticut make cottage cheese and represent 3.5% of the samples. Forty-one samples had no plant permit designation; all but one were made by four manufacturers.

Code Periods and Shelf Life:

Twenty-six of the 140 cottage cheese samples, or about 19%, failed

to have acceptable quality at the end of the designated code period. Samples were stored at 40°F (4.4°C) after purchase.

The average age of all samples at purchase was 15.9 days from date of manufacture; the range was 5 to 39 days. Seven samples were beyond the code date (outdated) stamped on the carton, but all of these except one were of acceptable quality. Four samples contained visible microbial growth on the surface of the cheese when purchased and thus were not of acceptable quality. Only one had reached the end of its designated code date. Code periods (days from manufacture to date stamped on carton) ranged from 13 to 60 days.

The code periods for ricotta cheese ranged from 21 to 60 days. The average age at purchase was 19.5 days with a range from 1 to 46 days. Eight of the ricotta cheeses did not exhibit acceptable quality at the time of the code date stamped on the carton.

Microbial Analysis:

Yeasts: Most samples, 55%, of cottage cheese contained fewer than 10 yeasts per gram. Some samples contained an excessive number of yeasts, greater than 50 per gram. There was no evidence that samples containing sorbate, a yeast and mold

inhibitor, contained fewer yeasts than those samples which did not contain the preservative. All of the ricotta cheeses contained less than 10 yeasts per gram.

Molds: Mold contamination was generally minimal in the cottage cheeses at less than 10 per gram. However, many samples were eventually rejected as not lasting to the end of the code period due to microbial growth on the surface of the cheese. Ricotta cheeses were also low in mold contamination except for two samples that contained mold on the surface of the cheese when purchased.

Coliform bacteria: The presence of coliform bacteria usually indicates poor sanitation practices during manufacturing and processing. A large portion of the cottage cheese samples, 79%, contained fewer than 10 coliform bacteria per gram, indicating sanitary manufacturing techniques were used.

Only two samples of ricotta cheese contained an excessive number of coliform bacteria.

Gram negative bacteria: Psychrotrophs are organisms which can grow at refrigeration temperatures. Many of the psychrotrophs in dairy products are gram negative bacteria, usually pseudomonads. They are very active biochemically and able to

degrade the lipids, fat, and casein or milk protein, to produce flavors and odors that make the product unpalatable. Most psychrotrophs are killed by pasteurization and if found in dairy products were probably reintroduced during packaging.

Since protein and fat are major constituents of cottage and ricotta cheeses, testing was done for gram negative bacteria: those that degrade fat, lipolytic bacteria and those that degrade protein, proteolytic bacteria. Only about 13% of the cottage cheese samples contained large numbers, greater than 1,000 per gram, of proteolytic or lipolytic bacteria. This low number of samples containing gram negative bacteria again attests to satisfactory processing and packaging of the cottage cheese.

Six samples of ricotta cheese contained large numbers of gram negative lipolytic and proteolytic bacteria.

Additives: Almost half, or 43% of the cottage cheese sample cartons did not declare use of a stabilizer. The stabilizers commonly used are gums and carrageenens. Occasionally calcium sulfate, mono- and diglycerides and lecithin are used. Stabilizers are added to improve cream adhesion to curd particles and prevent the presence of "free" cream.

All but two cottage cheeses that declared sugar had been added contained either fruit or vegetables. Some manufacturers added citric acid, either to help improve the flavor or benefit shelf life through pH reduction. Six samples claimed an addition of artificial flavor.

Three samples of ricotta cheese stated that vinegar or acetic acid was used as an acidulant and two samples declared stabilizer addition.

Acidity: The titratable acidity of the cottage cheeses ranged from .83 to 1.66%. The higher the acidity, the tarter the product.

The average acidity of the ricotta cheese was .53%, considerably lower than the 1.14% average for cottage cheese. This only confirms that ricotta cheese is blander, less tart, than cottage cheese.

Curd size: Cottage cheese with labels stating that the curd size was large, small and even tiny were examined. California and chunk style are usually large curd. Curd size is also a matter of personal choice and generally does not affect the flavor of the cheese, only the consistency. However, it was observed that many times two containers of the same brand, labeled either large or small, both contained essentially the same size curd. Lowfat cottage cheeses generally had a finer

curd size than regular cottage cheese.

Sodium Content: Some people limit their salt intake, and thus the sodium content of the cottage and ricotta cheeses was studied. Only two brands of cottage cheese made a statement on sodium content on the label. Interestingly, one brand claimed no salt was added. One of these samples was low in sodium, the other contained as much sodium as most of the other samples. The label on another sample also stated no salt was added, yet this sample contained almost 400 milligrams of sodium per 113 grams; the label on another sample also claimed no salt was added and only 42 milligrams of sodium were found per 113 grams. The average content of sodium for all cottage cheese samples, except those stating no salt was added, was 472 milligrams per 113 grams.

The sodium content of the ricotta cheeses averages 246 milligrams per 113 grams, about half the average amount found in cottage cheese.

Moisture Content: The moisture content of creamed cottage cheese averaged about 80% and for flavored and lowfat cheese about 82%. In all, 20 samples of cottage cheese exceeded the Federal standard of 80% moisture for creamed cottage cheese and 82.5% for lowfat cottage cheese.

Preservatives: Only 16 of the

cottage cheese samples declared on the label that sorbate was added. This preservative, however, was found in 33 of the samples. In two cases sorbate was declared, but not found.

None of the ricotta cheeses declared use of sorbate on the label but two samples contained this preservative.

Nutrients: It was determined how closely the cottage cheeses adhered to their label claims for fat, protein, carbohydrate, and calories. For all samples the average fat content was 107% of claim with a range of 30 to 180%. The lowfat samples averaged 150% of the amount claimed. Samples claiming a minimum of 4% fat averaged about 100% of claim. The flavored cheeses, those with added fruit and vegetables, averaged only about 85% of the claimed amount. Some of these flavored samples claimed a minimum of 4% fat while others stated they were lowfat, 1 to 2% fat.

The average protein content for all types of cottage cheese was over 90% of the amount claimed. The average carbohydrate content varied among types of cottage cheese from a high of 104% for flavored cheeses to a low of 77% for regular creamed cottage cheese. The determinations for carbohydrate include all the lactose which is not converted to lactic acid

during the fermentation of the milk to form the curd and is entrapped in the curd particles, as well as any carbohydrate that is added in fruit-containing cheese. The average percent of claim for carbohydrate for all samples was 84.9%.

Caloric content for all types of cottage cheese averaged over 90% of the amount claimed.

Some of the part-skim milk products contained as much or more fat than the whole milk ricotta cheeses. Protein, carbohydrate, and caloric content of all ricotta samples was about the same.

Most, 81%, of the cottage cheese samples were of acceptable quality to the date stamped on the carton as the last day of sale, when samples were stored at 40°F after purchase. Most samples were of good microbial quality and contained low levels of yeasts, molds, or spoilage bacteria.

Nutrients were close to the amounts claimed. Lowfat cottage cheese on the average contained more fat 150% than the amount indicated on the label but within amounts specified by Federal regulations, 1 to 2%. Sodium content averaged about 472 milligrams per 113 grams or 4 ounces.

About 11% of the samples declared use of sorbate on the label. However, 23% of the cottage cheeses were found to contain this preservative.

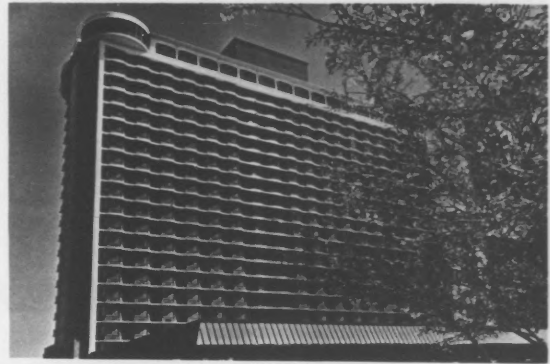
Most of the ricotta cheeses also were found to be of satisfactory microbial quality but only 58% remained of acceptable quality to the date stamped on the carton. Sodium content averaged 246 milligrams per 113 grams.

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Welcome to Louisville, "Derby City, USA". We invite you to attend the 69th Annual Meeting of IAMFES, August 22-26, 1982 at the Galt House, Louisville, KY. During the meeting a variety of events are planned, ranging from a cheese & wine reception to a cruise on the Belle of Louisville (a paddle-powered, triple decked, stern-wheeler). Music and an outstanding buffet will also be a part of this cruise. Spouses' entertainment will also be a big attraction at the '82 meeting. See you there!



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Plumbing Hazards in the Food Industry

Inadvertently contaminating a water supply through the plumbing system -- by backflow, backsiphonage and overhead leakage into open potable water containers -- is a problem of growing concern to sanitarians. Numerous outbreaks of gastroenteritis, dysentery, typhoid fever and chemical poisoning have been traced to another problem, cross connections. There are several methods used to combat these plumbing hazards including air gaps, vacuum breakers [both the pressure and non-pressure type] and backpressure preventers. Inspections should be made to ensure these devices perform correctly.

Fifteen years ago, chemicals used to fight scaling and corrosion were sucked into the water systems of a group of suburban homes, prompting a widespread outbreak of chemical poisoning. A plumber had made a mistake while installing the piping system and inadvertently created a route from the chemical source to the water supply.

Unfortunately this is not an isolated incident. Defects in the potable water supply systems -- backflow, backsiphonage, and overhead leakage into open water containers -- cause growing concern among sanitarians. Another problem area, cross-connections, has caused numerous outbreaks of gastroenteritis, dysentery and typhoid fever.

Other incidents of similar disease outbreaks include:

- Detroit -- Typhoid Fever -- industrial area, 1917
- Chlordane concentrate -- sucked into 500 homes, 1966
- English ship "Dronsay" -- Typhoid Fever, 1970
- Tampa, Florida -- Hepatitis, 1973
- Tennessee -- backsiphonage of chlordane -- 45 homes, 1976

These are just a few incidents which illustrate why public health officials, builders, plumbers, food service

personnel, maintenance men and homeowners should be made aware of the dangers of faulty plumbing.

It may be helpful to first define the terms used to describe what endangers a plumbing system. Cross-connections occur when the potable water (water which meets drinking water standards) comes in contact with or is connected to a system containing unsafe water, sewage, chemicals or other wastes.

There are two types of cross-connections. A direct cross-connection is a physical connection or arrangement of pipes between potable water and non-potable water or contaminants. Examples of this are fixtures with the water supply connected directly to the sewer, or a valved connection between potable water and non-potable water.

An indirect cross-connection occurs when the source of contamination may be blown across, sucked or diverted into a safe water supply. A common example is a lavatory or washbasin where the faucet is not sufficiently elevated above the rim of the bowl.

Backflow is generally referred to as a flow reversal due to a system pressure greater than that of the potable water supply. Backflow occurs under two conditions: backpressure occurs when the system pressure is greater than the supply pressure while backsiphonage occurs when supply pressure is less than the atmospheric or negative pressure.

Submerged inlets are unrestricted connections, supplying a fixture having less than two diameters of the outlet distance above the highest liquid level to which fixture contents may rise in a fixture.

An air gap is the unobstructed vertical distance between the lowest opening of any pipe or faucet which supplies water to a tank or plumbing fixture, and the flood level rim of the receptacle.

“Unfortunately this is not an isolated incident. Defects in the potable water supply systems – backflow, backsiphonage, and overhead leakage into open water containers – cause growing concern among sanitarians. Another problem area, cross-connections, has caused numerous outbreaks of gastroenteritis, dysentery and typhoid fever.”

There are many variables in piping systems which make it difficult to control back siphonage. They are continually being installed, altered or extended. Other problems exist when the plumbing installer or homeowner makes connections without being aware of possible dangers. And sometimes an extensive series of cross-connections complicate older plumbing systems.

The theory of backflow and backsiphonage may be explained as follows. Absolute pressure is gauge pressure plus atmospheric pressure (psia). Gauge is the pressure read on a gauge (psig). A vacuum indicates absolute pressure is less than atmospheric.

For an understanding of water pressure and its relationship to water depth, consider the pressure exerted on the base of a cubic foot of water at sea level. The average weight of a cubic foot of water is 62.4 pounds. The pressure exerted upon the square foot area is therefore 62.4 pounds per square foot gauge. The base is subdivided into 144 square inches with each subdivision being subjected to a pressure of 0.433 psig.

If another cubic foot of water is placed directly on top of the first, the pressure on the top surface of the first cube (which was originally atmospheric, or 0 psig) would now be 0.433 as a result of the superimposed cubic foot of water. The pressure at the base of the first cube would be increased to twice the pressure, or 0.866 (psig).

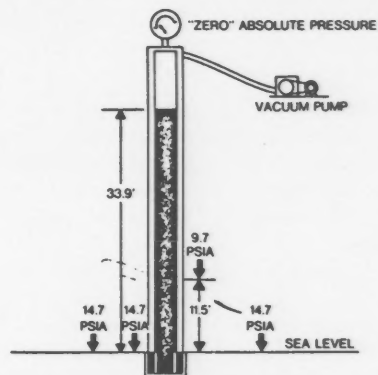
If this process were repeated it would increase correspondingly for each cubic foot of water. In general, with each foot of elevation change, within a liquid, the pressure change is by an amount equal to the weight-per-unit area of one foot of the liquid.

The siphon theory holds that if an open tube is inserted vertically into a liquid, the atmospheric pressure (14.7 psia at sea level) acts equally on the surface of the liquid within the tube and on the outside of the tube.

Thus the liquid inside and outside of the tube is at the same level.

If, as shown in Figure 1, the tube is tightly capped and a vacuum pump is used to evacuate the air from the sealed tube, a total vacuum is created within the tube. However, if the tube were opened at the bottom, the water would rise in the tube to a height of 33.9 feet ($33.9 \times .433 = 14.7$ psia) thus satisfying the pressure at sea level.

EFFECT OF EVACUATING AIR FROM A COLUMN

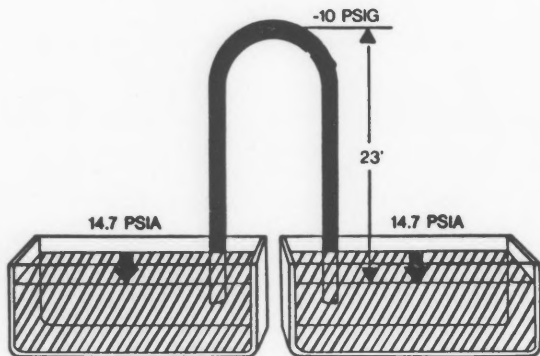


In other words, the water would rise to such a height that its weight would equal the pressure exerted by the atmosphere. If only 5 psi vacuum (-5.0 psig) were created, the atmospheric pressure would be 9.7 psi ($14.7 - 5.0 = 9.7$ psi).

Figure 2 is a diagram of an inverted U-tube that has been filled with water and placed in two open containers at sea level. If the liquid levels in each container are at the same height, a static state will exist. The vacuum at

any level in either leg of the "U" tube may be calculated as before ($23' \times .433 = 10$ psia).

PRESSURE RELATIONSHIPS AT DIFFERENT ELEVATIONS IN A CONTINUOUS FLUID SYSTEM

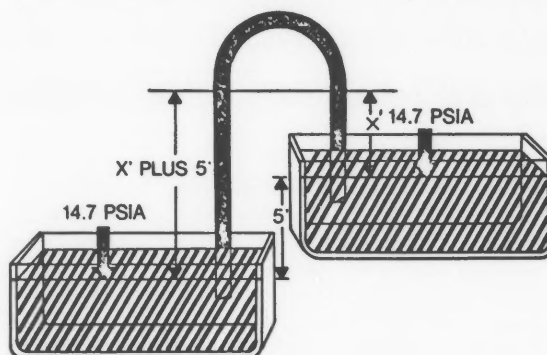


The equilibrium or static condition is altered by raising one of the containers so that the liquid level in one container is 5 feet above the level of the other, thus setting the stage for the siphon action. Atmospheric pressure is acting on the water surface at both containers.

In the tube on the right there is a vacuum equal to that created by a column of water "X" or 10 feet high. On the left, there is a vacuum equal to "X" or 10' plus 5 feet = 15 feet. Since 15 feet is higher than 10 feet the vacuum or suction on the left side is greater than the right, and the contents of the right container would be sucked up the U-tube and down into the container on the left.

The flow would be from the right tank to the left tank and is recognized as a siphon. Naturally water flows downhill, but with the aid of a siphon it may also flow over the hill with the additional help of atmospheric pressure. The crest of the siphon cannot, ideally, be higher than 33.9 feet above the upper liquid surface.

PRESSURE RELATIONSHIPS AT DIFFERENT ELEVATIONS IN A CONTINUOUS FLUID SYSTEM



There are several different ways negative pressure can be created in plumbing systems. One of the common ways it is created is in reduced pipe pressure by constricted flow. Another common occurrence is on the suction side of a pump when the line supplying the booster pump is undersized.

Heavy consumption of water, such as in fighting fires or a break in a water main, can create negative pressure. Shutting off and draining the water distribution system for repairs can also produce negative pressure, thus setting the stage for backsiphonage.

In addition to negative pressure necessary to cause backflow and backsiphonage, there must also be a cross-connection or connecting link between the potable water supply and source of pollution.

Some methods and devices to prevent backflow and backsiphonage include air gaps. The supply inlet should end above the flood-level rim of the fixture at a distance at least twice the supply inlet's opening diameter.

Another method is a vacuum breaker. This is a plumbing device that allows atmospheric pressure to enter piping systems between a source of pollution and the origin of the vacuum, thus preventing backsiphonage.

There are two types of vacuum breakers. The non-pressure type is used only when downstream pressure is atmospheric or less, and not under

continuous supply pressure. It must be installed on the discharge side of the control valve, on the atmospheric side of the valve, or between the valve and the fixture.

The pressure type is designed for use under continuous supply pressure, but is not good under backpressure. It can be installed ahead of the fixture valve. The device is usually spring loaded and designed to operate after extended periods of hydrostatic pressure. The pressure type should be used only where non-pressure vacuum breakers cannot be used.

Vacuum breakers should be subjected to routine visual inspections to determine if they are functioning properly. Malfunction may be indicated by excessive weeping, or leakage of the device. Stains or watermarks on the outside body may also indicate a malfunction.

A pressure-type vacuum breaker uses a spring-loaded disc with an upper seat and a lower seat to control flow. In normal flow conditions, the upper portion of the disc is held against the upper seat by line pressure and allows water to pass to the fixture without leaking through the top of the vacuum breaker.

Under normal conditions-no pressure or negative pressure-the spring forces the bottom of the disc onto the lower seat and allows air to enter the line through the open upper seat to prevent backflow and the continuation of the vacuum. Line pressure then takes over to return the device to normal flow position.

The last methods used to prevent backflow and backsiphonage are backpressure preventers.

The reduced pressure zone backflow preventer operates under the principle of a pressure zone between two check valves that will maintain two psi less than supply pressure. If the supply pressure becomes less than two psi a relief valve opens and the pressure in the reduced pressure zone becomes atmospheric.

Cross-connections can be prevented or corrected by maintaining an air gap, or using backflow preventers where air gaps cannot be maintained. Also, inspections can be made to ensure backflow preventers are working or installed correctly.

In food establishments, cross-connections may be found in several different areas. Steam tables, dishwashers, commodes, air conditioners and humidifiers are some of the areas where they may occur. The ice maker, coffee urn, steam kettle, water softener, boiler system, chlorinator and vending machine are others.

Other plumbing hazards are prevented with the use of

the "P" trap, an antisiphon trap, rather than the "S" trap. The "S" trap is generally prohibited since it is conducive or receptive to backsiphonage.

The United States Public Health Service, Food and Drug Administration, 1976 Food Service Ordinance, prohibits the direct connection between the sewerage system and any drains originating from equipment in which food, portable equipment, or utensils are placed. A backpressure in a sewerage system might occur forcing sewage into these fixtures.

A fixed air gap device is now accepted by most codes to comply with this new code requirement. These devices eliminate cross-connections and prevent sewage from backing up into the fixture.

Health hazards due to faulty plumbing installations, homemade repairs and worn-out equipment, have been present ever since the disposal of sewage by the water-carrier method was developed. By being aware of potential problems, and observant while making inspections, sanitarians may identify plumbing hazards unknown to the food establishment management. By seeking advice or working together with the plumbing code enforcing agency, it is more likely that safe drinking water can be delivered to the public at all times.

PREFERRED BACKFLOW PREVENTION DEVICE USAGE
FOR VARIOUS TYPES OF CROSS-CONNECTIONS

Type of Connection	TYPE DEVICE TO BE USED				
	Air Gap	Atm. Vac. Breaker	Pres. Vac. Breaker	Double Check Valve	Reduced Pres. Unit
Commercial Dishwashing Machines (160°F+) Hot Water Line		X			
Commercial Dishwashing Machines and Laundry Machines Cold Water Line			X		
Submerged Inlets at Steam Tables, Etc.		X ₁	X ₂		
Lawn Sprinklers			X		
Steam Cookers				X ₁	X ₂
Water Cooled Equipment					X
Toilets and Urinals		X			
Potato Peeler	X				
Ice Maker	X ₂		X ₁		
Garbage Can Washer	X ₁		X ₂		
Detergent Feeder Aspirator		X			

X₁ = Primary Choice

X₂ = Secondary Choice

MICROBIOLOGY IN FOOD PROCESSING

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Recurring problems in food processing include: unsanitary conditions, poor food quality, and the resulting hazards to the consumer's health. One part of the solution to these problems may lie in the utilization of microbiologic checks during food processing. Already in use, these sophisticated procedures may help investigators to better interpret data in judging the degree of plant sanitation problems or possible health hazards. Other benefits of the use of microbiology include helping to educate processors to comply with regulations, and providing supportive data for legal purposes.

"Including a microbiological approach in an evaluation of food plant sanitation will provide more data and evidence, making it easier for the investigator to arrive at a correct evaluation of processing conditions."

Until recently, inspections of food industries have focused on visible evidence of unsanitary conditions—rodent feces on the floor, cockroaches in the packaging room, or toxic chemicals in food storage areas. Now, a more sophisticated approach is being utilized in these investigations—microbiology during food processing. This procedure will help pinpoint the food product's danger to consumer health, or spot inferior food quality.

The nature of bacteria enables the use of microbiology in studying not only health hazards to the consumer, but also in indicating the sanitary state of a food processing operation.

When only results of a visible inspection are available, it is difficult for the investigator to correctly interpret data concerning the safety or quality of the food produced or processed. Including a microbiological approach in an evaluation of food plant sanitation will provide more data and evidence, making it easier for the investigator to arrive at a correct evaluation of processing conditions.

A roadblock remains: the absence of microbial standards which show the maximum number of bacteria that can be allowed in a food product and still have the food considered safe. This causes problems in correctly interpreting visual and biological inspection data.

Despite this deficiency, a microbiological approach to inspection can help to educate processors in complying with quality standards and regulations, and may even provide supportive data for legal purposes. There is no doubt that a carefully undertaken study of the microbiology of a food processing operation and a visual inspection can provide valuable data. A competent investigator can then draw some very helpful conclusions from such information.

The situation regarding certain foodborne pathogens is obvious: there should be no *Salmonella*, *Shigella* or enteropathogenic *E. coli* when processed food is examined by the procedures described in the Association of Official Analytical Chemists Manual (AOAC) or the FDA Bacteriological Analytical Manual (BAM).

The use of a recognized and approved procedure in investigations is a must, and cannot be overemphasized. But the mere presence of a few foodborne pathogens such as *Staphylococcus aureus*, *Bacillus cereus*, *Clostridium perfringens*, *Vibrio parahaemolyticus* or spores of *Clostridium botulinum* does not necessarily mean that a health hazard exists.

There are no federal numerical limits from the FDA for the maximum number of bacteria a food may contain. Some states, however, do have maximum limits concerning the numbers of bacteria certain foods may contain. Again, the use of a standardized procedure such as the Aerobic Plate Count (APC) is essential if this technique is to be useful.

The first Joint FAO/WHO (Food and Agriculture Organization of the United Nations/World Health Organization) Expert Consultation on Microbiological Specifications for Foods (1975) Committee has formulated microbial specifications for consideration by the Codex Alimentarius Commission.

The following foods were considered suitable for further study regarding microbiological specifications:

- Vegetable products (cereal grains, flours, cocoa products, chocolate)
- Animal products (meat, poultry, dairy products, egg products, precooked frozen seafood)
- Mixed products (infant foods, special dietary foods)

Work on these specifications is in progress. As an example of a microbial standard, the following limits for dried and frozen whole eggs are given. Note the considerable detail (n, c, m) involved in formulating these standards to insure that the conclusions drawn from them will be valid and meaningful.

Salmonella: Salmonellae organisms should *not* be recovered from any of ten sample units examined when the test is carried out according to the method described and $n = 10$, $c = 0$, $m = 0$. (n = number of units to be examined; c = maximum number of defective units permitted to meet a specific requirement; m = specific microbial requirement) In products intended for special dietary purposes, Salmonellae organisms should not be recovered from any of thirty sample units examined ($n = 30$, $c = 0$, $m = 0$).

Mesophilic aerobic bacteria: Mesophilic aerobes should not be recovered from any of five sample units examined when the test is carried out according to the method described in a number exceeding one million per gram, nor in a number exceeding 50,000 per gram from three or more of the five sample units examined. ($n = 5$, $c = 0$, $M = 10^6$) or ($n = 5$, $c = 2$, $M = 5 \times 10^4$)

Coliforms: Coliforms should not be recovered from any of five sample units examined, when the test is carried out according to the method described, in a number exceeding 1000 per gram, nor in a number exceeding ten per gram from three or more of the five sample units examined. ($n = 5$, $c = 0$, $M = 10^3$) or ($n = 5$, $c = 2$, $M = 10$).

The failure to have published microbial criteria for food products does not mean that the microbial approach to food processing improvement is impossible. It does place a great responsibility on the individual investigator or supervisor as to the interpretation of the findings.

Although microbial standards on finished food products might be of value in attempting to judge the degree of plant sanitation problems or health hazards, they have some severe limitations due to the very nature of modern food technology. For example, an excessively high-count food or food ingredient processed under filthy conditions might be made almost free of viable microorganisms in the finished product by quick-freezing or deep-fat frying, or other high heat processing and, thus, the finished product would appear acceptable.

Also, a finished product may be microbiologically acceptable on the basis of the Aerobic Plate Count, but the conditions under which the food was processed may have permitted *S. aureus* to grow and produce sufficient toxin to make the consumer ill. A microbial analysis on the finished product might not detect this bacteria and the toxin could be detected only by sophisticated


chemical tests.

In both of these instances, a prudent investigator, utilizing the proper microbiological approach, might obtain data from which one could hypothesize a serious lack of sanitation or that a health hazard existed. This shows that the microbiology of the food processing operation could be of greater value than the microbiology of the finished product if properly applied and interpreted.

But the need for additional tools in food inspection is evident. Proper use of microbiological investigative approaches in food processing will help to end unsanitary food quality and potential consumer health hazards.

TABLE 1. *High Risk Category*

Bakery products
Bakery mixes
Bakery icings
Bakery dough
Candy without chocolate, and candy specialties, chewing gum
Cheese and cheese products
Chocolate and cocoa products
Coconut and coconut products
Dietary conventional foods & meal replacements
Egg and egg products except USDA inspected
Fish and seafoods products
Food additives-enzymes, formulation aids, leavening agents, processing aids, stabilizers, thickeners, surface active agents, texturizers
Gelatin
Ice cream and related products
Ice
Infant and junior foods
Macaroni and noodle products
Meat and meat products (except USDA inspected)
Milk
Butter
Dry milk products
Filled milk
Imitation milk products
Multiple food dinners, gravies, sauces, specialties
Pepper (black, white)
Pie fillings
Poultry (except USDA inspected)
Pudding mixes
Rennet
Salad products, prepared
Soft drinks
Soups
Vegetable and vegetable products
Water and ice



Gazing At The Scars That Our Concoctions May Leave Behind

CHRIS LECOS

Thirty-five miles south of Little Rock, Ark., a Federal research facility follows a variety of scientific paths to evaluate and predict the effects of living in a chemical-filled world. This is the second of three articles on the research center, which is officially named the National Center for Toxicological Research (NCTR).

Like the intricate web a spider weaves to capture its prey, the National Center for Toxicological Research (NCTR) is a network of scientific threads, linked and integrated in such a way as to be suitable for investigating the broad array of effects that chemicals can have on the human system.

The scientific method used at this central Arkansas research facility generally has followed the evolutionary path of the science of toxicology. Some of the scientists are dedicated to the classical, traditional research into whether certain chemicals can cause cancer, genetic mutations, or birth defects.

Others seek to understand the effects of chemicals on tissues, cells, and organs; the behavior of toxic substances in the body; their effects on the body's ability to resist disease; the threat they pose to present and future generations; and their influence on the learning and behavior of children whose mothers have been exposed during pregnancy.

Still others are immersed in the complex, sometimes uncertain task of improving the science of toxicology to enable Federal regulatory agencies to make accurate assessments of the risks to humans from chemical exposure.

Exposure occurs to people in the food they eat, the water they drink, the air they breath, and from the products they handle or contact where they live and work. More than two dozen Federal statutes regulate the burgeoning chemical world. In the United States there are an estimated 70,000 chemicals in commercial production.

Humans, obviously, are not the direct test subjects of the center's research. At NCTR, thousands of animals—mostly mice and rats—are being exposed to a wide variety of toxic agents in both long- and short-term tests. These tests are designed not only to evaluate the ability of the agents to cause cancer, mutations, or birth defects but also to examine the mechanisms and evaluate the actions of a wide variety of toxic substances. Out of this research, NCTR seeks to strengthen its capability, methodology, and data to serve the regulatory needs of the two agencies that provide most of its funds—the Food and Drug Administration and the Environmental Protection Agency. NCTR's research, in turn, links up with the flow of scientific data obtained by FDA from its laboratories in the Washington, D.C., area and from its field operations.

Since May 1972, when NCTR officially came into being, FDA and EPA have allocated some \$200 million to convert, equip, and staff this one-time germ warfare facility (up until 1969) into an important and versatile

research arm of government—in effect creating the web of science that NCTR Director Ronald W. Hart calls interdisciplinary research.

NCTR's Division of Teratogenesis Research is a good example of some of the newer paths toxicologists are following today. The toxicologist knows that human exposure to chemicals is gradual, often constant, and usually occurs without the consumer being aware of it. The levels of exposure—from food, air, workplace, and other sources—are probably low in most instances. The scientist's concern is to come up with the kind of findings that make it possible to predict whether or not a chemical, singly or interacting with others, presents a health hazard. In effect, sound science that makes it possible to predict the toxicity of a chemical can serve as a means of preventing public health disasters. In its annual report, the Division of Teratogenesis Research, headed by Dr. John F. Young, defined the problem in this manner:

"The public and private sectors are keenly cognizant of the problems associated with birth defects and developmental disabilities. In the last 20 years environmental and medical accidents involving thalidomide, organic mercurials, lead, and diethylstilbestrol (DES) have dramatically demonstrated our lack of expertise in predictive toxicology and revealed the unique sensitivity of the immature human organism. During the last decade, the attempted regulation of food additives and environmental agents has been clouded due to concern for low incidence effects which are inherently very difficult to demonstrate experimentally."

In an interview, Dr. Young added that although conventional screening tests are still useful, their potential for predicting toxicity from the laboratory animal to man and for estimating risk to humans has not been adequately assessed.

To scientists such as Young, understanding the action of a chemical is important in trying to determine the potential impact of long-term human exposure.

"Essentially," he said, "we try to figure out the fate of a chemical. You take it in, you swallow it. Now you want to know what happens to it: where does it go, how long does it take to get there?"

Young said these scientists want to take the process one step further and find out the relationship between what the chemical does while *in* the body to what it does *to* the body. This is combining the sciences of pharmacokinetics (measuring the absorption, distribution, and metabolism of a compound) and pharmacodynamics (how pharmacokinetics influences the heart rate and the blood pressure and other physiological actions).

Currently, one of the high priority projects in Young's division is a major effort that involves five laboratories from around the country. The project is being carried out under the supervision of three NCTR researchers—Dr. Carole A. Kimmel, chief of the perinatal and postnatal evaluation branch, and her two associates, Judy Buelke-Sam and Jane Adams. The laboratories—selected to

provide a balance of government, academic, and private research participation—are a Veterans Administration research facility in St. Louis; the University of Missouri; Syracuse (N.Y.) University; Science Applications, Inc., a private La Jolla, Calif., firm that does contract work for government and industrial clients; and Children's Hospital Research Foundation, Cincinnati, which has been in the forefront of behavioral teratology research.

Studies and other evidence suggest that the two chemicals selected—d-amphetamine and methylmercuric chloride—can cause learning and behavior disabilities in children. What they want to know now is whether the six testing methods each lab is using are sensitive and reliable enough to detect these often subtle impairments after the animals are given "very low" doses of the compounds and whether all five laboratories independently will produce results that are similar enough to confirm the effectiveness of the screening and measuring techniques selected.

"This is not a study to answer questions about the compounds," Dr. Kimmel stressed. "What we're seeking is information about the methods and their ability to detect behavior and learning defects. We want to know if our tests are sensitive enough to pick them up."

Six laboratories were to participate, according to the original proposal, but the project, once estimated at \$1.5 million, was trimmed because of recent budget cutbacks affecting most Federal agencies. For the 1981 and 1982 fiscal years, the cost of the study now is estimated at \$475,000 a year. A fifth lab's participation in the project was made possible through a \$75,000 a year allocation of funds from the National Institute for Occupational Safety and Health.

The original protocol also called for testing three instead of two compounds. Dropped from the experiment was vitamin A, a compound of interest to FDA. D-amphetamine—an illicit drug, often described as an "upper" and as "speed"—was once used in some diet pills. Animal tests have shown that it can cause behavioral and neurochemical imbalances. It is included in the study because it is a widely known drug of abuse, said Buelke-Sam. Methylmercury, a by-product of the chemical industry and of chemical dumping, is of interest to EPA. A large dumping of mercury in Japanese fishing waters in the 1950's caused extensive problems of birth defects and other disorders in that country. It is also of concern in some parts of the United States.

NCTR's pursuits into the physiological toxic effects of chemicals is illustrated by the present research there into whether certain chemical agents fed to pregnant animals are capable of producing hypertension (high blood pressure) in the offspring of the animals. "Right now, there is no evaluation made of a compound for its potential to cause hypertension," one report noted. "If it could be shown that some compounds under suspicion can have this adverse effect in various animal species, the possibility of requiring some kind of safety assessment is raised."

The perinatal and postnatal evaluation branch is repeating a smaller scale study done in 1963 suggesting that several compounds prescribed for hypertension treatment, if given during pregnancy, could predispose the offspring of the pregnant animal to high blood pressure. One of the substances under study is sodium salicylate, a compound that the body forms from aspirin. In high doses, sodium salicylate is known to cause cardiac malformations; its effects at low levels are now being investigated at NCTR to determine what disruptions, if any, occur in the cardiovascular (heart-circulatory) system. The research, which includes checking blood pressure patterns and other physiological effects, may be completed by the end of 1987. Further studies are planned on additional chemicals. There are already some indications from preliminary results that low doses of sodium salicylate will cause elevated blood pressure in the offspring of rats and that female rats seem to be more sensitive to the drug than males—that is, that the blood pressures of the females tended to be higher than the males at the lower doses.

"No one did anything with the findings from the 1963 study," Young commented. "If it proves out that this was not a big shot in the dark, NCTR's work could provide the impetus for more research into this area."

In another series of experiments, ethanol, or alcohol, a major cause of birth defects in humans, is being tested by Dr. William Slikker, Jr., chief of the division's pharmacodynamics branch, and his associates. Current experiments involve mice and rats; further research is planned with rhesus monkeys. Eventually, Slikker indicated, the results could provide some answers to the current debate over whether all products containing alcohol should contain warning labels.

"The teratogenic effects of ethanol are well known," he continued. "Fetal alcohol syndrome is well defined but the more subtle effects may not have been observed through usual screening techniques used." Generally, ethanol affects dietary intake by reducing food consumption, and there is some concern that in animals, at least, it could have adverse effects on brain development and other cell functions.

Furthest along is the experiment with mice, developed by Phillip Goad, a graduate student in the division. One group of mice is being fed a diet of ethanol along with liquid food fortified with vitamins, minerals, carbohydrates, fats and protein, while another group of mice is eating a normal nonfortified liquid diet with their ethanol. Control groups are receiving one of the diets but without ethanol. When the experiment is finished later this year, Slikker and Goad hope to see whether a fortified diet can modify the effects of the ethanol on the developing fetus and perhaps even provide some clue on whether there is any such thing as a safe level of alcohol intake during pregnancy. "Right now," Slikker said, "we don't know the answer. By comparing animals on a fortified diet and alcohol to those on ethanol in a normal diet, we can measure the effects of the extra nutrition and how

the weights of the fetuses are being influenced by both the nutritional and ethanol intakes."

The experiment with rats focuses on the effects on brain development of fetuses exposed to ethanol. "We're looking at it in different ways—not just brain mass or size but in terms of the brain's ability to utilize oxygen and the effects of ethanol on other cell functions," he said. The experiment, which is being conducted along with Dr. Donald E. Hill of the University of Arkansas for Medical Sciences, could provide information about the mechanisms whereby ethanol alters brain structure and function.

More specifically, the experiment with the rats will try to determine if short-term exposure to ethanol has any measurable effects on brain glucose metabolism in rats. Glucose is used by the developing brain as its normal energy source. The test may provide a clearer indication of whether alcohol intake adversely affects normal glucose metabolism.

Do the animals show any alcohol preferences? Slikker replied: "Some really get looped and other ones you just find hanging over the lip of the (feeding) tank. They just lap it up real slowly. Some of them make it through the entire study and others just die."

Another experiment, still very preliminary, involves methylphenidate (MEPH), which Slikker described as the most widely used prescription drug for the management of behavior problems in hyperkinetic children. The drug is sold under the trade name Ritalin.

There are no reliable procedures to determine the concentrations of MEPH and ritalinic acid in blood and urine. Without this knowledge, accurate correlations cannot be made between circulating levels of the drug and its effects on behavior. What needs developing, Slikker said, is a fast and reliable way for determining these levels in blood, urine, and saliva to determine dosage levels for children.

"Right now," he continued, "the way the dose is determined is by increasing it until they see some behavioral toxicity, or some inappropriate behavior from the child, then they back off a little bit. It's very crude. We'd like to find a sensitive and easily applied technique so we can determine what the blood levels are so we know what kind of dose they should get."

If a simple, fast, sensitive, and accurate analytical method is developed, the plan is to give oral doses of MEPH to adult volunteers at NCTR. Their blood, saliva, and urine will be sampled. "We plan to start by using ourselves to see if the (sampling) technique is sound," he added. "If we find that saliva sampling alone, for example, is a good indicator of what was going on in the plasma, then we wouldn't have to do invasive type sampling (like blood tests) to children." Eventually, the plan is use whatever acceptable analytical methods are developed with work being done with hyperkinetic children at the Child Study Center at the University of Arkansas for Medical Sciences in Little Rock.

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

News and Events

Kathy Hathaway Joins IAMFES as Associate Executive Secretary

Kathy Moore Hathaway has accepted the position of Associate Executive Secretary of IAMFES. She is also Editor of *Dairy and Food Sanitation*, and Associate Managing Editor of the *Journal of Food Protection*.

Kathy received her BA degree from the University of South Dakota in Vermillion in 1975, majoring in communications.

Previously, Kathy was employed at Hot Line Inc., a publishing and business service in Ft. Dodge, IA. Prior to working Hot Line, Kathy was employed in radio in various positions.

Kathy's responsibilities will include production supervision of the *Journal of Food Protection*, editing of *Dairy and Food Sanitation*, and working with state and national affiliates of IAMFES.

Kathy is married and has a one-year-old son. Her husband is attending Iowa State University, majoring in engineering.



USDA Revise List of Poultry Scald Agents

The USDA has issued a correction to a list of poultry scald agents contained in its new rule on substances which meat and poultry plants can use in processing.

The correction on a chart in the final rule shows that 16 poultry scald agents can be used in amounts "sufficient for the purpose," said Donald L. Houston, administrator of USDA's Food Safety and Inspection Service. Because those words were inadvertently omitted in the Oct. 5 rule, it appeared that the substances could only be used in amounts "not to exceed 0.0175 percent in scald water," he said.

The first poultry scald agent that should be designated as "permitted for use in amounts sufficient for purpose" is potassium hydroxide, and the last of the 16 agents is tetrasodium pyrophosphate, he said.

Nielsen Named DFISA Representative

Carl Nielsen, DCI, Inc., has been named as a DFISA representative to fill the vacancy on the 3A Symbol Council, the Dairy and Food Industry Supply Association has announced. The vacancy was created earlier this year by the death of Paul Girton, Girton Manufacturing.

. . . ARTICLES . . .

We are now accepting articles for 1982 publication. You are urged to submit your articles for possible publication on information of interest to *Dairy and Food Sanitation* readers.

Mail to:
IAMFES
Kathy Hathaway, Ed.
PO Box 701, Ames, IA 50010



Officers of the Ohio Association include: Dean DeVore, 2nd Vice President; John Lindamond, President Elect; Bryan Black, President; Harry Haverland, IAMFES; Robert Farst, Past President; Ronald H. Smith, Secretary-Treasurer was absent.

Inspection Insect Control Among Ohio Program Session

The Ohio Association of Milk, Food & Environmental Sanitarians held its Annual Meeting in early October in Columbus.

"Food, Dairy and Drug Retail Inspection" opened the program, and it was addressed by Paul Ferguson, Supervisor, General Section, Food, Dairy & Drug Division of the Ohio Department of Agriculture.

"Preservations of Human Milk," followed, and was discussed by Dr. E. M. Mikolajcik, Professor of Food Science and Nutrition, Ohio State University. Ivan Baker, Executive Secretary of the State Board of Sanitarian Registration highlighted several aspects of Ohio's Sanitarian Registration program.

The afternoon session opened with "Ohio Department of Health's Emergency Radiation Protection Plan for Grade A Milk and Milk Products," by Robert M. Quillin, Director, Radiological Health Program, Ohio Department of Health.

Richard Gillespie closed the program for the day with "Insect and Rodent Control." Gillespie is Training Officer, State Training Branch, Food and Drug Administration, Cincinnati.

Officers for 1982 include: Bryan Black, President; Robert Farst, Past President; John Lindamood, President-Elect; Dean DeVore, Second Vice President; and Ronald H. Smith, Secretary-Treasurer.

Crumbine Applications Due

Applications are now being accepted for the Samuel J. Crumbine Consumer Protection Award for 1982. The Crumbine Award is given annually to a deserving local public health agency for the excellence of its program of food and beverage sanitation.

The competition is open to all US local government units who can demonstrate outstanding qualities in the design and implementation of the public health measures they have instituted to prevent the outbreak of foodborne illness in the community.

Deadline for the 1982 Award entries is May 14, 1982.

Presentation of the Award will be made at the annual meeting of the International Association of Milk, Food and Environmental Sanitarians in Louisville, Kentucky, August 22-25, 1982.

Applications may be obtained by writing to the Award sponsor, the Single Service Institute, Inc., 1025 Connecticut Avenue, N.W., Washington, DC 20036.

Loop May Reduce Mastitis

A small, inexpensive plastic loop could be the answer to a \$2 billion a year problem for the nation's dairy industry and its 11 million dairy cattle.

The polyethylene loop is called an intramammary device (IMD) and the costly problem is mastitis, an infection of a cow's udder that decreases milk yield and quality while wreaking economic havoc with dairy farmers.

Inserting the IMD in a cow's udder may reduce the incidence of mastitis infection, according to Dr. Robert R. Peters of the University of Maryland, who is conducting the first large-scale field trials of the device since its invention by a California veterinarian.

In fact, says Dr. Peters, the little plastic loop could curb the \$24 million annual loss suffered by Maryland's dairymen alone by as much as 44 percent, with no subsequent loss in quality or quantity of milk yield.

"Once inserted, the device causes a mild irritation which triggers the release of leucocytes -- or white blood cells -- in the udder," said Dr. Peters.

Update on Fruit Fly Eradication

The Mediterranean fruit fly has been eradicated from Florida and all quarantine restrictions were lifted in mid-November, officials of the USDA have indicated.

The action released from quarantine a 52-square mile area of Tampa in Hillsborough County where five Medflies were found--the first Aug. 4 and the last Aug. 14, said Harvey Ford, deputy administrator of USDA's Animal and Plant Health Inspection Service.

"The cooperative effort worked well from the time the first fly was found," Ford said. "The quick action taken by Florida on trapping, pesticide application and regulation of movement of host commodities was instrumental in getting this infestation cleaned up quickly."

The eradication effort began Aug. 4, when the first fly was found. The identity of the adult fly found in a trap in a calamondin tree was confirmed Aug. 5. Florida began treating host trees from the ground in the immediate area Aug. 7, and began aerial malathion spraying Aug. 11. Parallel state-federal emergency regulations were put into effect Aug. 12.

By the end of the program, ten pesticide applications had been made on a weekly basis. Three life cycles of the Medfly had to pass after Aug. 14--the day the last fly was found--before officials could declare the pest eradicated.

Medflies attack over 200 fruits and vegetables. Adult flies lay eggs under the skin of fruit. Developing larvae feed on fruit flesh, rendering it useless. A current infestation of the pest is under regulation in areas of California, where a cooperative state-federal eradication program is making progress in eliminating the pest, Ford said.

Food Safety Poster Contest

Elementary school children from across the country are being asked to put on their thinking caps and draw up the perfect picture to show how to pack a bag or box lunch to prevent food poisoning.

The exercise is part of the second annual food safety poster contest sponsored by the USDA.

The contest will begin in January and close March 14. Donald L. Houston, administrator of USDA's Food Safety and Inspection Service, said this year's theme is planning and packing safe "brown bag" and box lunches for school.

"This year's theme was designed to teach children how to prevent food poisoning that can result from improperly prepared and packaged bag and box lunches," Houston said. "More than 2 million cases of food poisoning occur every year.

"We hope the contest will teach children--and their parents--that they play an important role in eliminating conditions that can lead to food poisoning," Houston said.

Food Safety and Inspection Service is the federal agency responsible for inspecting meat and poultry products to assure that they are safe, wholesome and properly labeled when they leave the plant.

Houston said students will be asked to plan a lunch that is fixed at home and taken to school. They will draw and label the foods chosen and show how they would pack them for safety.

Entries will be accepted in three categories--grades K-1; grades 2-4; and grades 5-6.

Ultrafiltration for Cheese Leads to Energy Savings

Last year, Wisconsin cheesemakers turned 15 billion pounds of milk -- 68 percent of the milk produced in the state -- into 1.5 billion pounds of cheese. It took a lot of energy -- an estimated \$30 million worth of natural gas and fuel oil -- to process that much cheese and its voluminous by-product, whey. Nationwide, cheesemakers used an estimated \$75 million worth of these fossil fuels in processing operations.

Researchers at the University of Wisconsin-Madison are working to reduce these energy requirements. Norman Olson, food scientist and director of the Walter V. Price Cheese Research Institute (CRI) at UW-Madison, reported on their progress at the Marschall International Cheese Conference held in Madison.

The key to the scientists energy saving hopes is a process called ultrafiltration. The food and dairy

Dairy Expansion Ideas Offered

With proper planning and management dairy expansion can be successful; without it change can lead to disaster, says William Crist, University of Kentucky dairy specialist.

The statement frequently made that it is important for dairymen to "get better before getting bigger" has some validity, says Crist. A University of Minnesota study involving 192 herds suggests that this statement applies especially well when one builds a new facility and increases herd size simultaneously.

The Minnesota study found that herds with an initial production level of less than 13,000 pounds of milk per cow per year lost about 419 pounds of milk per cow. Herds with an initial production level of more than 15,000 pounds of milk increased production 370 pounds per cow.

If any of your dairy patrons are planning to expand or change their dairy operation, the first item of business should be a checklist of things to do. Here are some suggestions from Robert Appleman, University of Minnesota dairy specialist:

Develop a complete plan. You may not want to build everything at once. But you should have a plan showing the completed facility.

Consider possible future expansion and changes. Keep in mind the next generation that will take over the dairy. What is done today should be planned with what might happen down the road to allow for additional changes. There are many 100-cow dairy farms today that were never going to milk more than 25 cows.

Visit other dairy farms. Spend some time visiting other dairymen already using the type of facilities and equipment you are considering. Ask questions. 1. Why did you do what you did? 2. What did you do that works particularly well? 3. What would you do differently if you had to do it all over again? Visit dairymen that have had at least three years experience with the building or equipment.

Seek advice before building. Consult with building contractors, extension people and others. Get their opinions and then build what you think is best, based on the knowledge you gain from these people.

Realize that it will be a disruptive year. Accept the fact that while you are making changes you will run into problems and as a result your production may suffer temporarily.

Ventilate properly. Understand the principles of ventilation. There must be adequate inlets and outlets even in cold housing. Proper summertime ventilation can help prevent a production slump in hot weather.

Plan the feeding system carefully. Feeding a balanced ration is critical for efficient milk production. Feeding grain only in the milking parlor limits production and increases the cost of producing milk. Additional grain mix can be fed by: Mixing some grain with the silage for all milk cows and regulating grain intake in the parlor according to production; using a magnetic or electronic feeder for high producers or dividing milk cows into groups and feed according to production if herd size is large enough.

Separate dry cows. Prevent fat cow syndrome by providing a separate area for dry cows and feeding them accordingly. Two groups of dry cows can be used if herd size is large enough.

Provide a hospital facility. It is important to provide an area for confining or restraining animals. Dairymen should have one area for every 40 cows, but there should be at least two areas. Locate off the return alley for easy access from the parlor or lot. Don't forget the heifers. Provide a chute and headgate for breeding and veterinary work.

Consider waste handling carefully. As herd size increases it becomes more difficult to haul manure daily. Manure storage and handling must be planned carefully to prevent pollution and keep costs low.

Don't forget the calves. Naturally ventilated cold housing such as open fronted sheds or calf hutches is economical and works well in many areas.

Install an equi-potential plane in any new milking parlor to reduce the risk of stray voltage.

List other items that are unique to your set-up.

Before signing on the dotted line for new facilities, the following seven steps should be taken by dairymen and their creditors to evaluate proposed herd expansion:

1. Project the number of cows you will be milking and estimate the number of additional replacements needed. Buy one yearling heifer and one heifer calf for each three cows purchased to have the normal number of replacements on hand.

2. Determine the feed requirements for the expanded herd. Figure in terms of 8½ tons of hay equivalent for each large breed cow and her share of female replacements that you will normally have on the farm. Storage and feeding losses are included in this estimate.

3. Determine the sources of feed for the expanded herd. Additional feed can be obtained by changing the cropping program, buying or renting more land and buying feed.

4. Determine the labor requirements and the sources of this labor for the expanded herd. Labor requirements will depend upon the number of cows handled, type of

Chlordane Case Reported

Chlordane contamination of a city water supply was discovered after tap water, smelling of kerosene or gasoline, was reported by a southwest Pittsburgh resident.

An oily and odorous substance in water mains supplying most of the adjoining neighborhoods was confirmed by the Allegheny County, PA, Health Department in late December, 1980. Large amounts of clean water were flushed through the affected lines and out of open hydrants. Valves were closed to prevent flow from the affected lines to the general distribution system. Chemical testing on the water samples showed a mixture of chlordane and various alkyl hydrocarbons. Residents and businesses were warned through the media and door to door announcements not use water in cooking or drinking. Clean water was distributed throughout the neighborhoods by truck.

In wider circles around the valved-off zone, water from hydrants and consumer taps was sampled for insecticides or hydrocarbon odors. In some areas of testing, levels varied from 0-905 ppb, with a high of 6,600 ppb in one dead-end water line near the point of contamination. The water ban was extended to adjacent neighborhoods. The ban finally included and affected over 10,000 people and many businesses.

Reported numbers of patients seen each week for gastrointestinal, neurologic, or dermatologic complaints was given for that period by four nearby hospital emergency rooms. Telephone-call records at ACDH reported that 168 residents of the affected neighborhoods had water-related illnesses. Complaints included 61% gastrointestinal, 13% headaches, and 7% eye or skin irritation. No one was hospitalized or incapacitated. All symptoms were mild. Water-related complaints were also received from 19 persons living outside the water-affected area.

After the high-volume flushing of mains and user service lines, samples were taken again 8 months later. These tests proved the sample values had fallen below 1 ppb, which is considered safe for normal use. The ban on the water was then lifted.

The source of contamination was suggested after extensive search to be an insecticide which had been deliberately injected into the system through a stopcock intended to provide access for testing devices.

Excerpted from CDC's MMWR, Vol. 30, No. 46, Nov. 27, 1981.



Taking part in a ceremony in Chicago's Chinatown which honored 50 foodservice managers and supervisors who successfully passed the final examination for Applied Foodservice Sanitation are (left to right) Erik Jensen, chairman of the Illinois Restaurant Association; Karim Hong, student employed at Pekin House Restaurant; Joyce Chan, instructor from Malcolm X College and Dr. Chester G. Hall, executive vice president of the National Institute for the Foodservice Industry. Applied Foodservice Sanitation is a course developed by NIFI, the not-for-profit foundation established by the industry to advance foodservice management standards through education. In addition to Chinese, examinations for Applied Foodservice Sanitation are available in Italian, Greek and Spanish translations to foodservice managers and supervisors preparing for sanitation certification, which has been required in Chicago since 1978.

Salmonella Outbreaks Occur in Northeast

Salmonella outbreaks have occurred in the northeastern United States since August 1981 when 3 outbreaks of salmonellosis associated with ingestion of pre-cooked roast beef were reported to the CDC.

Of the five outbreaks since that time, two involved precooked roast beef processed in a Philadelphia plant. Two others occurred as a result of a processor of precooked beef from Albany, NY.

In Pennsylvania, two cases were reported following a picnic in Montgomery County. Of 37 persons interviewed, 14 had been ill. Stool specimens from five patients showed *S. saint-paul*. Eating precooked roast beef and ham was positively associated with the illness. The roast beef and ham were both sliced and taken to the picnic on the same serving tray. However, there was not meat available for a culture.

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Permeate Could Replace Some Grain in Dairy Rations

Milk ultrafiltration could lead to a new form of on-farm recycling, says Neal Jorgensen, University of Wisconsin-Madison dairy scientist.

Recent feeding trials indicate that cows will readily consume any by-product (permeate) which remains after ultrafiltration of milk. Lactose (energy) in permeate could then replace limited amounts of grain in dairy rations.

The feeding trials were conducted in cooperation with researchers from the UW-Madison Walter V. Price Cheese Research Institute, who are studying an innovative method of concentrating milk on farms.

Most of the cows had a hankering for permeate although individual cows' consumption varied considerably, Jorgensen says.

About one-third of the cows in the trials relished permeate, one-third started to drink it after a couple of days and half of the remaining cows (one-sixth of the herd) accepted permeate after drinking water had been withheld.

The remaining cows flatly refused to drink permeate even after water had been withheld for as long as 18 hours.

The consumption patterns resemble those associated with whey feeding. Jorgensen says cows' varying consumption of permeate reflects variations in taste preferences, not any shortcomings associated with the permeate.

Composition of permeate is similar to that of whey. It contains about 7 percent dry matter, about 0.25 percent protein, and about 5 percent lactose.

About 13 pounds of permeate contains the same amount of energy as one pound of dry grain.

With the ultrafiltration process, one-half to two-thirds of the original volume of milk will remain on the farm as permeate.

For example, about 21-28 pounds of permeate would be available daily from a cow producing 13,000 pounds of milk annually. A cow producing 21,000 pounds of milk annually would produce 35 to 47 pounds of permeate daily.

During the feeding trials, cows consumed from 20 to almost 60 pounds of permeate daily with no adverse effects on milk and milkfat production or on total feed intake. Permeate consumption averaged 30 pounds daily.

Because dry cows and heifers would readily consume any permeate not consumed by lactating cows, Jorgensen says, there shouldn't be any problems caused by lack of demand for the product.

Guidelines for feeding permeate are similar to those suggested for feeding whey. Permeate must be offered fresh daily and fed in non-corrosive containers.

Equipment should also be cleaned daily. Most of the material in permeate is water soluble, so rinsing is usually all that's required for cleaning.

Since dairymen can't control consumption of permeate by individual cows, they have to treat the by-product as a supplement and can't deduct the nutritional value of permeate from the rest of the dairy ration.

"Permeate has excellent feeding value," Jorgensen says.

Silos Pose Potential Health Hazard

There's no question that modern glass-lined silos offer advantages to farmers in feed and forage preservation. But they also present a greater hazard to human health if not used properly.

That's the warning from Gary L. Smith, Extension safety specialist and agricultural engineering instructor at the University of Maryland in College Park.

Smith notes that old-fashioned concrete and masonry silos had enough porosity to allow poisonous silo gases to seep out slowly. Yellowish stains on older, much-used silos in rural areas around the country give proof of this phenomenon.

But modern airtight silos do not offer similar

protection to human health, Smith points out.

Manufacturers are aware of this hazard, and they have provided blower fans and stenciled safety instructions which should be carefully followed.

Basic precautions are as follows:

- When filling upright silos, run the blower fan for 15 to 20 minutes before you enter the structure. Keep the blower running as long as someone is inside the silo.
- After a silo is filled, keep all persons and animals away for at least two weeks--preferably three weeks. Never open up a silo unless someone else is close enough to come to your rescue if necessary.

ADSA Award Winner Achievements Highlighted

Award winners at the 1981 American Dairy Science Meeting (ADSA) included W. Nelson Philpot, Poul M. T. Hansen, Robert L. Bradley, David A. Wieckert, Howard A. Morris, Robert P. Niedermeier, George W. Reinbold, Thomas Richardson, and T. A. J. Payens.

Richardson Receives Borden Award

Dr. Thomas Richardson, recipient of the 1981 Borden Award, received a bachelor's degree in pharmacy from the University of Colorado in 1954. He completed a master's degree in veterinary science in 1956 and a doctorate in biochemistry in 1959 at the University of Wisconsin. Following completion of the doctorate Richardson spent two years training in lipid research under Dr. A. L. Tappel at the University of California, Davis. Dr. Richardson returned to the University of Wisconsin and attained professorship in 1970.

Richardson has produced over 125 journal articles in the past 22 years on the chemistry and biochemistry of proteins, lipids and enzymes in food systems; most of this research has been with milk and milk products. In the past 10 years, about 85 research papers have been published by the awardee's group.

His accomplishments in lipid research have included development of a novel and useful method for free fatty acid determination, characterization of lipoxygenase isoenzymes, identification of superoxide dismutase in milk and demonstration of the role of superoxide anion in oxidative deterioration of milk lipids. This year's awardee has proposed a structural model for the milk fat globule membrane and has explored the basis for the hypocholesterolemic effect of milk.

Over the past 10 years Professor Richardson has become a leader in application of immobilized enzyme technology to milk systems and, using this technology, has made important contributions in milk clotting, milk preservation and in unravelling casein micelle structure. Expertise he gained in solid state peptide synthesis during a study leave in 1971 has resulted in synthesis of peptides with antimicrobial properties and peptides which function as antioxidants.

That this year's recipient of the Borden Award continues to be a productive member of the scientific community is amply evidenced by current research in cholesterol oxidation, in modification of enzymes for increased efficiency in food processing and in cloning the genetic information for the rennin precursor, prochymosin, into *Saccharomyces cerevisiae*.

Ralston Purina Award to Wieckert

The 1981 recipient of the Ralston Purina Teaching Award, is Dr. David A. Wieckert.

Dr. Wieckert is recognized as an enthusiastic teacher and is credited with increasing undergraduate participation within the department. Dr. Wieckert has made significant contributions to committees affecting teaching quality in the college of agriculture, is well-known for his accessibility to students. Prof. Wieckert has helped develop 52 video tapes as a means of extending his course to other campuses of the University.

In 1967 he was the recipient of his campus' most prestigious teaching award. In 1969 he received the College of Agriculture Award of Excellence in Teaching. And in 1980 the Board of Trustees named him the first College of Agriculture Atwood Distinguished Professor for Teaching.

Dr. Wieckert was reared on a dairy farm and earned a bachelor's degree in dairy science at the University of Wisconsin in 1952. After graduation, he went to Sweden as an International Farm Youth Exchange student.

After a 2-year tour as a food inspector in the U. S. Army, Wieckert returned to earn master's and doctoral degrees at the University of Wisconsin in 1956 and 1963, respectively. His employment during his graduate years included extension youth work in Wisconsin, a teaching appointment at Southern Illinois University, and a stint as a Fulbright Scholar at Massey Agricultural College in New Zealand. He joined the faculty of the Department of Dairy Science at Wisconsin as assistant professor in 1963, and was promoted to associate professor in 1967 and to professor in 1970.

Philpot Recipient of West Agro Award

The 1981 recipient of the West Agro Chemical Company Award, Dr. W. N. Philpot is recognized worldwide as a knowledgeable authority on bovine mastitis. His work, well recognized by the dairy industry, led to the establishment of a major Mastitis Research Laboratory.

Under his direction, extensive work has been conducted and reported in a long list of technical and popular publications on: prevalence and management of mastitis in commercial dairy herds, economic importance of subclinical mastitis, microbiology of bovine mastitis, the eradication of *Streptococcus agalactiae* mastitis,

control of mastitis by dry cow therapy, role of teat dipping, factors affecting somatic cell counts in milk, role of vaccination in control of mastitis, evaluation of electronic methods in enumeration of somatic cells in milk, evaluation of automatic take-off devices for milking machines, evaluation of experimental antibiotics in treatment of mastitis, and perhaps most importantly, development of procedures for determination of effectiveness of post-milking teat sanitizers.

He has served as a consultant to the Bureau of Veterinary Medicine of the Food and Drug Administration. He is a charter member of the National Mastitis Council and has served it in many positions including the presidency. Philpot is author of a book on mastitis management which has been translated into French, Spanish, German and Hebrew editions. He developed two educational slide sets and authored and participated in four movies on mastitis. His understanding of the many interacting facets of dairy farming led to development of an effective Five Point Plan for the Control of Mastitis, which has been recognized and practiced around the world as the singularly most important management tool by dairy farmers to abate the costly mastitis problem.

Dr. Philpot was born June 9, 1935 in Polk County, Arkansas and was reared on a small dairy farm. He received his B.S. in Dairy Production in 1957, M.S. in Physiology of Reproduction in 1958, and Ph. D. degree in Animal Production and Microbiology in 1964 from Oklahoma State University. He joined the faculty of Louisiana State University as assistant professor in 1959, was promoted to associate professor in 1964, professor in 1975 and superintendent of the North Louisiana Hill Farm Experimental Station in 1980. He is a member of the American Dairy Science Association since 1956 and of many other professional organizations. He has 284 technical and popular publications to his credit. He was honored by Southern Arkansas University in 1970 and by Oklahoma State University as "Graduate of Distinction" in 1980.

Dairy Research Foundation Award to Hansen

The 1981 Dairy Research Foundation Award, given in recognition of outstanding research pertaining to dairy industry problems, has been presented to Poul M. T. Hansen.

Dr. Hansen's early work on the solubility of chocolate flavor led to development of a spectroscopic method for measuring the chocolate content of dairy products. His studies on the effect of heat on milk protein interactions has contributed to our understanding of the properties of sterile concentrated milk and milk products. His studies on sterile products led to an investigation of amino

sugars and their role in product stability, potential nutritional importance and usefulness as indicators of heat treatment.

A significant contribution arose from Dr. Hansen's study of hydrocolloid stabilizers and their interactions with proteins in milk and other food systems. His findings established that hydrocolloids can stabilize proteins in dairy-based food products by reacting with calcium-sensitive caseins. He has also applied the principle of protein-hydrocolloid reactions to recovery of proteins from whey and to isolation and purification of enzymes.

Hansen recently began research to determine the effect of processing and storage of human milk. This study is supported by NIH and is designed to determine the optimum conditions for preserving human milk.

Dr. Hansen was born September 24, 1929 in Denmark. He received his Bachelor of Science degree from the Royal Veterinary and Agricultural College of Denmark. He obtained his Master of Science and Doctor of Philosophy degrees in dairy technology from the University of Illinois. He served three years as Research Officer with CSIRO, Melbourne, Australia. While there he was given the Silver Award of the Australian Society of Dairy Technology. Since 1964 he has been a member of the faculty at Ohio State University. In 1975 he received a DRINC Research Fellowship to study at the USDA Eastern Regional Research Center at Philadelphia.

Paynes Given Miles-Marschall Award

The 1981 recipient of the Miles-Marschall International Dairy Science Award, T. A. J. Payens was selected from a long list of noted world scientists residing outside of North America.

Trained as a physical and physiological chemist, Dr. Payen's career activities brought him to the United States for one year's post-doctorate research in 1965 at the University of Illinois. Presently, he is the research officer and the head of the physical and physiological chemistry department at the Netherlands Institute for Dairy Research.

Payen's work has covered investigations on the nature of various caseins and their micellar structure, the mechanism of stabilizers, and the kinetics of milk clotting by rennet.

Payen's research has provided insight into the heat stability of evaporated milk, behavior of cold storage and UHT milk, agglutination of milk fat globules and production of cheese. Additionally, his basic studies on stabilizers, such as carrageenan, have shown unique interactions with milk proteins, leading to a concept entitled milk reactivity.

Milk Industry Foundation Award to Bradley

The 1981 Milk Industry Foundation Teaching Award, given in recognition of outstanding teaching in the field of dairy manufacturing, has been presented to Dr. Robert L. Bradley.

Bradley's superior teaching and devotion to promoting the welfare and advancement of students is recognized by students and faculty alike. Bradley provides organized and stimulating lectures, an ability to make complex subjects understandable, and a keen ability to motivate.

Bradley has been a leader in establishing and expanding a highly successful internship program and has been largely responsible for maintaining and upgrading the University Dairy Plant. Dr. Bradley serves as an undergraduate advisor as well as a graduate research advisor.

Bradley conducts extension programs throughout Wisconsin and is highly regarded by industry for his expertise in assistance with technical problems. He has served as Secretary and Treasurer of the Wisconsin Dairy Technology Society since 1969.

Dr. Bradley was born in Beverly, Massachusetts in 1933. He received the B.S. degree in Dairy Technology from University of Massachusetts in 1958, and the M.S. and Ph.D. degrees from Michigan State University in 1960 and 1964. Since 1964, he has been a member of the faculty of the University of Wisconsin where he is now a Professor in the Department of Food Science.

Reinbold Recognized through Service Award

The Distinguished Service Award awarded by the American Dairy Science Association recognizes outstanding contributions to the dairy industry through leadership in industry, science, engineering, public health or education.

Dr. George W. Reinbold, the 1981 recipient, is recognized for both industry and academic accomplishments. He received his B.S. from Pennsylvania State University and his M.S. and Ph. D. from the University of Illinois. Reinbold has held positions in industry with responsibilities for research and development in microbiology of dairy products with particular emphasis on cheese. From 1959 to 1974 he was Professor of Dairy Microbiology at Iowa State University. In 1974 he returned to industry as Vice President for Research and Development of Leprino Cheese Co., in addition to serving as Affiliate Professor of Dairy Microbiology at Colorado State University.

Reinbold's interests, originality and resourcefulness, as well as his dedication to the dairy industry, is reflected in his publications, patents and international involvement. He has been author or coauthor of over 125 papers and articles, three books and he has been issued four patents of significance to cheese production. His concern with the microbiology of foreign cheese, their starter cultures, curing and flavor has taken him to Norway, Switzerland, France, Finland and West Germany.

ADSA Award of Honor to Niedermeier

The 1981 ADSA Award of Honor is given to a member who has made outstanding contributions to the welfare of the Association. Dr. Robert P. Niedermeier has continued his enthusiastic commitment to dairying and the ADSA throughout his professional career in teaching, research, extension and administration.

The 1981 recipient joined the ADSA as a graduate student at the University of Wisconsin in 1940. After serving in the U. S. Navy from 1942 to 1946, he again became active in the Association while completing the Ph.D. degree. His leadership and personal contributions to ADSA began with committee assignments when his university hosted the 1953 Annual Meeting of the Association. Since that time he has served the Association continuously as a member of one or more committees followed by service as Director, Vice President in 1975 and President in 1976.

Niedermeier represented the Association on the Council of Intersociety Presidents and now serves as ADSA representative on the Board of the Council of Agricultural Science and Technology.

Niedermeier, an outstanding researcher and teacher, has served as Chairman of his Department for the past 19 years. He served as President of the Dairy Shrine Club and represented the Association in consultations with the World Dairy Federation.

Morris Winner of Pfizer Award

The 1981 winner of the Pfizer Award, Dr. Howard A. Morris, was selected on the basis of outstanding research in the area of cheese science and technology. His basic and applied research made significant contributions in the areas of biochemistry, microbiology, process technology and product development.

Salmonella, *con't. from p. 27*

The second outbreak took place in Bucks County, PA. Of 20 people, 11 were ill, and three were hospitalized. Five of the six stools again showed *S. saint-paul*. Again, precooked roast beef appeared to be the problem, although no meat was available for culture. The meat which was catered by a delicatessen and was eaten by three other people not associated with the party, who also became ill, *S. saint-paul* was found in 2 of 3 stool specimens.

Forty distributors in Pennsylvania, New Jersey, and Delaware, supply the beef connected in these two outbreaks, marketed as "VC Brand."

During a particular week in Oswego County, NY, four students at a college campus had diarrheal illness. Stool specimens from the four were positive for *Salmonella*. The four students had eaten at a student union delicatessen where other consumers had complained of the unusual rareness of the roast beef. The USDA on request from county health officials, sampled the campus commissary's three frozen roasts and found *S. chester* in two of them. They were supplied by an Albany, NY processor.

At a funeral reception in Albany County, NY, 12 of 18 people were interviewed, with 4 reports of illness. Roast beef consumption was again the factor. One stool culture

was taken, from which *S. chester* was isolated. No meat was available for testing. The meat was obtained from the same Albany, NY, processor as before.

An outbreak of diarrheal illness was reported at a Vermont hospital when 1 patient and 5 hospital employees became ill. Stool cultures proved positive for *Salmonella*. An investigation revealed that earlier 46 cases of diarrheal illness were contracted at the hospital, including 3 patients and 43 employees. One patient with *Salmonella* sepsis died. Illness again was associated with eating cold roast beef, *S. chester*, *S. havana*, and *S. livingston* were detected through testing of the roast beef from the hospital cafeteria.

The Albany plant was requested by the USDA to voluntarily recall all of the roast already distributed. Meat had been supplied to 20 distribution points in 8 northeastern states, and marketed under three brand names; State National Provisions, Orlev, and Quandts.

MMWR Editors note that these outbreaks emphasize the need for strict compliance with rules governing roast-beef processing. The public must be advised to recook or avoid excessively rare precooked roast beef.

Excerpted from CDC's MMWR, Vol. 30, No. 46, Nov. 27, 1981.

Silos, *con't. from p. 28*

- Keep the door closed between your barn and silo room during the danger period to protect livestock from silo gas.
- Provide for natural ventilation during the danger period to carry away silo gas fumes. This includes keeping outside doors and windows open in your silo room. Remove chute doors in your silo to the level of the settled silage.

Be on the alert for bleach-like odors or yellowish brown fumes in or near the silo, the Maryland Extension safety specialist cautions. These are the signs of nitrogen dioxide, the poisonous component of silo gas.

If you experience the slightest throat irritation or coughing in or around a silo, get to fresh air quickly, Smith warns. Only two or three breaths of silo gas can cause temporary loss of the sense of smell. This can lead to a false sense of security that the poisonous gas has gone away.

See your doctor immediately after exposure to silo gas.

Prompt medical treatment can prevent lung damage and keep pneumonia from developing later.

You can make your own test monitor for detecting silo gas by starting with a clean paper filter from the coffee-maker in your kitchen or the strainer in your milk room.

In a small clean dish, mix the following solution: 1/4 teaspoon of liquid cornstarch; 1/3 teaspoon of potassium iodide (brown iodine--not red) and 1/3 cup (3 shot glasses) of water.

Soak the paper disk in the liquid solution; then dry the disk in an oven at 100 to 125 degrees F. Fold Scotch tape over one edge of the disk and make a hole for hanging. Wet the disk with water and hang at the bottom of silo chute or inside the chamber of bottom-unloading silos. If the disk turns purple, silo gas is present. Once this chemical reaction occurs, the disk may not be reused.

The disk monitor should be regarded only as a supplement to other safety precautions mentioned in this story, the Maryland safety specialist warns--not as a substitute for them.

Quality Attributes and Quality Retention

Dr. O. Peter Snyder and Dr. Carolyn P. Thomas,
University of Minnesota

A quality product begins with quality ingredients. Examine supplies to determine that you are beginning with items which have appropriate characteristics. This Tech Brief will consider appropriate quality attributes for a number of foodstuffs, the way the items are graded by the U.S. government, and the means for retaining quality. As a basic rule, note the importance of rotating stock. First in, first out is essential for best quality. Inappropriate temperatures will cause a product to go from high quality to very poor quality in a very short time.

Beef quality is determined by the age and sex of the animal and the amount of marbling, the fat distributed through the muscle tissue. Beef grades are prime, choice, good, standard, commercial, cutter, and canner. Meat stored above 28°F will decrease in quality regardless of initial grade.

Lamb and *veal* are younger and less fatty than beef although they are given the same grade names. With lamb, veal, and particularly *pork*, flesh should not be excessively soft or watery. Any strong odor is indicative of poor quality and such product should not be accepted. Pork, lamb, and veal should remain covered and rotated fairly quick. Pork is graded USDA #1, #2, #3, #4, medium or cull.

Fresh fish should be just that. Any dullness, color change or strong odor development indicates poor and/or lengthy storage. Price is more accurately an indication of quality for fish than for most other foods. Metals, especially copper, brass, and bronze, will encourage oxidation and off-flavor development in fish oils. Exposure to oxygen in the air also increases the possibility of off-flavors. Fish is graded by the U.S. Department of the Interior rather than the Department of Agriculture and is classified as grade A, B, or C. Seafood is less easily judged. Be sure lobsters are alive and oysters are tightly closed. Avoid stock with missing limbs or poor color.

Poultry is graded A, B, or C on the basis of meat to bone ratio, fat distribution, and muscle development. Age and sex determine chicken classes.

Broilers and fryers - 13 weeks or younger, male or female
Roaster - 3 to 5 month bird, male or female
Hen, fowl, baking or stewing chicken - 10 months or more, female
Cock or rooster - 10 months or more, male
Capon - 8 months, surgically unsexed male

Bruises and torn skin increase the possibility of bacterial contamination.

Eggs are graded by weight and internal characteristics observed during candling. A fresh egg must be no more than 29 days old but each day of storage means a loss of quality. Eggs should be as fresh as possible when delivered and then rotated rapidly to minimize in-house deterioration and maintain graded quality. Eggs used for fried, poached or hard-cooked consumption should be of highest quality (AA or A) for best eye appeal. Grade A eggs will hold air better than grades B or C, so would be the appropriate choice for omelets and souffles. The color of the shell has no bearing on quality. However, cracks, mottling or dirt on the shell are not acceptable, as bacterial contamination is a strong possibility. Likewise processing of non-shell eggs increases the potential for *Salmonella* contamination. Do not use these for egg-nogs or any other product which is not thoroughly cooked.

Fluid *milk* for human consumption must be Grade A; that is, have a bacterial count of no more than 20,000/ml after pasteurization. *Butter* and *cheeses* are graded AA, A, B, and C although cottage and process cheeses are simply graded "quality approved."

Whole milk contains 3.25% butterfat and 8.25% milk-solids-not-fat. Skim milk has about 0.1% butterfat, 8.0-9.25% total solids and is usually fortified with vitamins A and D. Two percent milk takes its name from its butterfat content and is usually made by combining fresh whole and skim milk. Other lowfat milks may be available labeled as 1/2, 1, or 1-1/2%. For certain preparations it may be desirable to use a concentrated form such as evaporated milk from which approximately half the water has been removed, or nonfat dry milk solids from which all the water and the butterfat have been removed. These products permit direct incorporation with the subsequent addition of appropriate water with other liquid ingredients for proper reconstitution.

Half and half and various creams are available, each with specific butterfat content required by the USDA.

	Butterfat	
	Minimum	Maximum
Half and half	10	18
Light coffee cream	18	30
Light whipping cream	30	36
Heavy whipping cream	36	--

Frozen desserts are classified by butterfat content and milk solids.

	Butterfat (min.)	Milk Solids (min.)
Ice cream	10%	20%
Ice milk	2-7%	11%
Sherbet	1-2%	2-5%
Ices	0%	0%
Frozen yogurt	no standards	no standards
Mellorine	0%	no standards

Fruit ices (water ices) by definition do not contain any dairy product. Currently there are no standards for frozen yogurt products. Minnesota officials have chosen not to set standards until they are determined by USDA. Mellorine is a frozen dessert in which butterfat is replaced by another fat, typically a hydrogenated vegetable oil. The amount of fat and the level of milk solids included determine whether it is more like ice cream or ice milk. It is illegal in most states. Soft serve products may be either ice cream or ice milk (not mellorine), although the great majority sold is ice milk. The product is not allowed to harden (ripen) after freezing. Water droplets separate from all frozen desserts when the product temperature rises. These do not reincorporate when freezing resumes, but freeze as ice crystals; gritty and unpleasant to the mouth. Crystallization in a supply indicates poor handling.

If *cheese* products are featured in the foodservice operation, the foodservice supervisor should carefully study types of cheeses, their qualities and characteristics to determine exactly which would be best for each preparation. A few brief points will be made here.

Natural cheeses are classified by firmness and ripening times. These factors also influence their storage time. Soft cheeses, particularly unripened varieties, can be kept for only a short time--while hard, ripened cheeses can be stored successfully for several months.

Soft cheeses, 40-75% moisture

Unripened

cottage
cream
Neufachtel

Ripened

by molds
Camembert
Brie
by bacteria
Limburger
Liederkrantz

Hard cheeses, 30-40% moisture
Semihard

Ripened

by molds
Gorgonzola
Roquefort
Stilton
by bacteria
Brick
Muenster

Very hard

No gas bubbles
cheddar
Edam
Gouda
With gas bubbles
Swiss
Parmesan

The plasticity of the cheese when heated for blending is determined by the degree of ripening, acidity, manufacture, and extent of drying. This plasticity influences the use of the cheese. Cream cheese has a high moisture content and combines readily with sugar, eggs, milk, and in sauces. Processed cheeses with emulsifier added to the natural cheese from which they are derived, also combine readily with sauce bases for souffles, etc. Cheddar cheese improves in cooking quality with refining time. High moisture content cheeses (ricotta, neufachtel, gouda) blend well. A cheese of low fat content has conspicuously poor cooking quality. Higher temperatures and longer cooking times cause toughening, matting and stringiness in the cheese with fat separation as well.

To determine the particular cheese for a certain menu item, the chef should consult a reference book. Two commonly available in the foodservice operations are *Wenzel's Menu Maker*¹ and *Specs* by R. B. Peddersen². The fat in dairy products is very capable of accepting aroma from other foods. Keep other foods away from dairy products as well as keeping containers closed and cheeses well-wrapped to avoid flavor exchanges.

The basis for federal fruit and vegetable quality grades, which is optional in most states, is size (or diameter), maturity (texture), color (gauge of maturity), product cleanliness and freedom from defects. Products are graded at the time of shipping, and 10-15% defect and below grade product is allowed by USDA grade standards. Product degradation due to injury or damage of the product include: 1) skin breaks which allow bacteria and molds to gain entrance and grow while speeding product degradation; 2) freezing or hail damage; 3) sunscald from exposure to direct sunlight.

¹Wenzel, G. L. *Wenzel's Menu Maker, 2nd ed.* CBI Publishing Co., Inc. 51 Sleeper Street, Boston, MA 02210, 1979.

²Peddersen, R. B. *Specs: the Comprehensive Foodservice Purchasing and Specification Manual*, Cehners Brooks International, Boston, MA 1977.

Most rots are caused by bacteria or fungus entering through a skin break and causing rapid product degradation. Product with broken skin should be used immediately and products already suffering from bacterial or fungal attack should be culled immediately. Types of rot include:

- 1) Bacterial soft rot occurs as dark green, greasy water-soaked soft spots. The control is to reduce humidity, avoid bruised and punctured product, and reduce temperature quickly to 40°F.
- 2) Gray mold rot appears as fairly soft, watery and gray tissue, with mold that is grayish brown and velvety. Spore masses may be conspicuous. The control is to maintain sanitation, avoid puncture wounds, lower temperatures, and lower humidity.
- 3) Rhizopus rot appears as decayed tissues, water soaked and leaky, softer than gray mold rot. Coarse threads (mycelium) with black spore heads. Develops under moist conditions. The control is to avoid injury and bruising and reduce temperatures quickly.
- 4) Watery soft rot appears as watery, slightly pinkish-brown soft areas, and in advanced stages a dingy cottony mold may be present with large oval black bodies called sclerotia. The control is to maintain sanitation, cull specimens that are discolored and lower temperatures and humidity.

Mold in the storage room can be kept to a minimum by maintaining good ventilation and seeing that stored product is mold-free initially. Due to these problems, a good pre-chill in the following steps is recommended:

- 1) place product in refrigerated room; 2) hydro-cool by spraying with water; 3) blast tunnel; 4) vacuum cooling.

Most produce is graded US #1 or US #2 with some special grades and some combination grades, depending on the item. Canned fruits and vegetables are graded A or B, again on the basis of size, color, and freedom from defects; not actual flavor or nutritional value. For canned goods, the Federal Food, Drug, and Cosmetic Act defines

- 1) standards of identity; 2) standards of quality;
- 3) standards of fill. Labels must show:
 1. legal name of product
 2. name and address of the canner or distributor
 3. net contents in weight, measure count
 4. variety, style, packing medium
 5. any artificial color, flavor or preservative
 6. if the product falls below standards of fill
 7. ingredient statement unless covered under the standards of identity

Specific grading aspects and quality characteristics for selected produce items will be discussed.

Citrus fruits are graded US Fancy, US #1, US Combination, US #2 Russet and US #3. Heavy for size indicates a high moisture content, and thus more juice per fruit. Avoid fruits that are bruised; display mold, green spots, or growth cracks; or that are definitely misshapen. Smooth textured skin is usually thin, indicating that most of the fruit is juice-bearing meat. Puffiness would precede internal decay and indicate dry, poor-tasting fruit. *Apples* and *peaches* have many grades; including US Extra Fancy, US Fancy, US #1, US Utility, and US #2. Others such as *cherries* and *blueberries*, are graded only US #1 and US Commercial, or just unclassified. Color and shape are directly responsible for the grade--the more uniform the color, the higher the grade. Hail damage, split or cracked skin, mold, irregularity in shape, and immaturity are undesirable characteristics. Maturity is important for flavor development (sweetness) and appropriate texture. Avoid sticky fruit, which is an indication of over-ripening and may also be the early stages of mold or rot development.

Melons are graded US Fancy, US #1, and US #2. A mature cantaloupe should have a slight indentation at the stem end and a definite light yellow or green netting. Casaba melons will have shallow, irregular, lengthwise furrows and no netting. Honeydews are smooth, large and bluntly oval; whereas the watermelon will be a longer oval. Persian melons are similar to cantaloupes, but rounder and more the size of honeydews. These fruit should be fairly evenly shaped and colored without large white streaks or yellow sunburn.

Avocados are graded US #1, Combination, US #2 or US #3 depending on firmness, color, and shape. *Bananas* are not graded. The best starch to sugar conversion in bananas takes place off the plant. Picked fruit may have a solid green peel and will progress through six additional peel color stages: light green; 50:50 yellow; green; more yellow than green; yellow with green tips; yellow; and yellow flecked with brown. Avoid fruit with cold damage (freezing) indicated by bruises and blackening on the outside curve. Anticipate using these products within a few days of ripening for maximum flavor and appeal.

Cabbage is only graded US #1 or US Commercial but *cauliflower* and *broccoli* are designated US Fancy, US #1, and US #2. Flowerets of broccoli and cauliflower should be in bud stage, not flowering. Cabbage, like carrots, may be stored for a month or two (or more depending on how long it has already been in storage), but most vegetables are considerably more perishable. Salad vegetables should be trimmed to remove extra leaves, should be clean and have well-developed heavy heads.

Uniformity of shape and evenness of color determine whether *green beans* and *peppers* will be US #1 or US #2. A poorly formed bean pod frequently means a few mature to over-mature beans at one end of the pod, with nothing at the other end. Spots, red-orange areas, hail marks, or generally pale color are undesirable and any cracks or breaks can mean bacterial contamination. A badly misshapen pepper is difficult to use either whole or in rings, but could be chopped for other recipes.

Celery should be straight and compact with no bowing or twisting. *Radishes* should be free of cracks and insect damage. *Greens* will be more tender before the leaves develop heavy veins. *Asparagus* must be young in order to be tender and should have a uniform bright green color.

Tomatoes are graded US #1, Combination and US #2 and are also sized:

	<u>Minimum</u>		<u>Maximum</u>
extra small	1-28/32"	-	2-4/32" diameter
small	2-4/32"	-	2-9/32"
medium	2-9/32"	-	2-17/32"
large	2-17/32"	-	2-28/32"
extra large	2-28/32"	-	3-15/32"
maximum large	3-15/32"		

Tomatoes are also given color designations from green to "turning" (10-30% pink) to pink (30-60% pink) to red (90% red) or mixed (all stages). Puffiness indicates internal air spaces, and growth cracks and blossom end rot mean bacterial contamination and/or mold potential. A well-developed peak at the end indicates dry tissue and open spaces. Mature fruit will have firm fruit; even, bright color; and when cross-cut will have mature seeds and firm flesh. *Eggplant* is designated US Fancy, US #1 or US #2. Look for pear-shaped eggplants 3-6" in diameter.

Cucumbers are graded US Fancy, US Extra #1, US #1, large or small, and US #2. The fruit should be fully shaped and have smooth, firm flesh. Overgrown cucumbers will have pithy flesh and tough seeds. Cucumbers should not be stored near lettuce because of the ethylene gas produced by the lettuce.

Corn in the husk is graded strictly on the basis of length: US Fancy, 6"; US #1, 5"; US #2, 4". Kernels should be plump, milky, and cover the entire cob. Avoid husks showing mechanical injury, frost damage, undeveloped areas or any dark mold rot. Corn loses quality very quickly; it is best the day it is picked. Once picked, corn should not be bagged in large quantities as it generates heat and quality is greatly diminished. Refrigerate immediately with adequate ventilation.

Root vegetables are graded US Extra #1, US #1, and US #2 based on size and conformation. Defects include double roots; wet, wilted, flabby or soft, cracked, or insect damaged vegetables. Variety determines the color of the turnip crown, not quality. Many are purplish-red, but green-or-white-crowned varieties are favored in some areas. To avoid "bleeding" of color, a short length of top should be retained on fresh beets. Left unpeeled in appropriate conditions, turnips, carrots and beets will retain good quality for several months.

US #1, US Commercial or Combination, and US #2 are the principal grades of *onions* and *potatoes*, while *squash* are only graded US #1 and US #2. Onions are also sized small, medium, and large, based on the diameter. The deceptive and confusing terms summer and winter are often applied to squash, and sometimes to onions. Onions are better termed green or dry. Squash should be classified:

- 1) soft-shelled, immature, small (e.g., cocozelle, pattypan, crookneck, zucchini)
- 2) hard-shelled, mature, small (e.g., acorn, buttercup, butternut)
- 3) hard-shelled, mature, large (e.g., banana, hubbard)

Rinds of soft-shelled squash should be easily punctured with the fingernail and seeds soft and fully edible. In the hard-shelled varieties, the seeds are removed before or after cooking prior to consumption. In all varieties, the squash should be heavy for size and have unbroken shells with no signs of decay. Onions, likewise, should be free of soft rot.

Some of the potato starch will be converted to sugars if raw potatoes are kept refrigerated. This not only causes an undesirable flavor but also causes increased browning when cooked. New potatoes will age quickly and have short shelf life. It is more economical to buy cured, mature potatoes with skin set as these are less easily injured and less discolored. Potatoes should be well shaped, allowing for variety. Russet Burbanks are large, long and cylindrical; Kennebecs are elliptical to round. The best potatoes for baking, french frying and mashing are mealy; that is, higher in dry matter content, such as Russet Burbank and Katahdin, while waxy varieties work well for other purposes. Wenzel suggests that other than baked and boiled potatoes, fresh product need not be purchased by restaurants; dehydrated and frozen products with fewer storage problems are available economically.

Mushrooms are graded US #1 or US #2. Sizing is determined by a diameter of more or less than 1-5/8" cap diameter. No slime, bruises or age spots should be present. The desired shape is straight and erect, with no indentation or flattening of the cap. The stem should be

trimmed so it is no longer than the cap height. If mushrooms are given an overwrap, be sure it has holes in it; otherwise, *Clostridium botulinum* toxin will be formed in the anaerobic conditions.

US standards for *garlic* provide for one grade, US #1, which is given those properly cured bulbs with plump, well-filled cloves; free from decay, wet spots, cuts, sun damage, insect, sponginess, or sprouts; which have a minimum diameter of 1-1/2". Large cloves mean greater yield and easier preparation. Depending on the use, garlic powder (finely ground garlic) may be more efficient and/or economical.

The range of *grocery items* purchased and stored will depend upon the types of preparation and particular needs of the foodservice operation. These could include applebutter, coffee, flours, honey, nuts, olives, raisins, shortening, tomato paste, vinegar and probably at least a dozen herbs and spices. The diversity is limitless. These are all the supplies arriving which are generally stored at room temperature. As with fresh, more perishable products, regardless of type, dealing with reliable suppliers, receiving good merchandise, and care in rotation are the keys to quality retention. (Note: Due to the P.A.C. Act (Perishable Agricultural Commodities Act), each time buyer and seller close a deal, even over the telephone without a signed contract, the deal is considered a binding contract. This is an exception to any other legal contract situation.)

Reprinted from "Quality Assurance Tech Brief²," published by the Dept. of Food Science and Nutrition, Agricultural Extension Service, University of Minnesota.

Expansion, *con't. from p. 26*

milking, housing and manure handling systems, feeding technology and the amount and type of crops grown.

5. Estimate the necessary additional capital investment. This is a critical part of planning. Investment usually runs higher than anticipated, so estimate on the high side.

6. Project income and expenses for the expanded business. Itemize estimates for operating expenses, interest and depreciation. Timing of anticipated income and expenses (cash flow) is very important.

7. Perform a financial analysis on the added investment and the expanded business. Consider projected profitability of the investment, projected length of payback period and the financial position of the business at the time of peak indebtedness.

Expansion can lead to a better dairy operation and more income. Or it can lead to disaster. It all depends on how well it is planned and carried out.

Reprinted from Professional Fieldman, a Klenzade publication, Sept-Oct., 1981 issue.

Ultrafiltration, *con't. from p. 25*

industries already use the process to concentrate whey proteins, but Olson and co-workers want to take advantage of the fact that it can be used to separate and concentrate milk components.

Under pressure, small-sized components, such as water molecules, lactose, and salts, pass through a special filter, while larger-sized proteins and fat globules cannot. The significance of this separation to cheese-making is that proteins and fat -- the makings of cheese -- become concentrated as the water and other small-sized components are removed.

The idea is that, with the proper equipment, dairy farmers may be able to concentrate milk's cheese-yielding components on the farm, sell them to cheesemakers and feed the "waste" liquid back to their herds. Reduced in volume -- and weight -- the concentrated "milk" would require less energy for hauling and processing, yield more cheese per vat of starting ingredients and result in less whey to evaporate or otherwise dispose of. Perhaps one-half to two-thirds of the milk components that now end up in whey would be recycled directly to the cattle.

According to Olson, the greatest potential for saving energy lies in reducing the volume of whey that cheesemakers must process. Surveys indicate that 60-80 percent of cheese plants' "processing" energy goes for removing water from whey. Most of the rest goes for pasteurizing the incoming milk and cooking cheese curd. This amount could be reduced also by starting with concentrated milk.

The energy used in hauling milk is only a few percent of that used in processing cheese and whey. Still, the energy savings possible from having a reduced volume of milk to haul adds to the scheme's attractiveness.

So far, studies into the feasibility of this energy-saving scenario have given encouraging results. Olson reported that on-farm ultrafiltration seems to be technically feasible and that dairy cattle consume the "waste" liquid (which replaces some of the grain in their rations). Furthermore, experiments indicate that at least some types of cheese can be made from concentrated milk with standard cheesemaking procedures.

Olson, CRI staff member C. Scott Bush and research assistant Clint Garoutte made Colby and brick cheese from milk that had been ultrafiltered to twice its normal protein content. The Colby was as good as or better than standard commercial Colby, but the brick was not up to commercial standards -- it was firmer, coarser in texture and had less flavor than commercially acceptable brick cheese. Other researchers have also had varied success at making other types of cheese from milk concentrated by ultrafiltration, Olson noted.

The researchers made Colby and brick cheeses because these are "washed curd" cheeses. Normally, the curd of these cheeses must be washed to remove lactose, which would cause excess acid formation in the curing cheese. But curd made from ultrafiltered milk does not have to be washed because it starts out with less lactose. Omitting the washing step would mean additional energy savings -- and time savings -- for cheesemakers, Olson said.

In these exploratory experiments, the researchers used ultrafiltered skim milk to which they added cream to achieve the proper fat levels because they encountered problems with fat loss when they used ultrafiltered whole milk. Olson said he thought the fat loss occurred because the concentrated milk yielded a larger volume of curd, which was difficult to handle in the equipment used.

The cheese specialist said he expects that cheesemaking procedures and equipment could be modified to overcome such problems and to make most kinds of cheese successfully from ultrafiltered whole milk.

In another phase of the research, research assistant Anne Slack, food scientist Clyde Amundson and chemical engineer Charles Hill focused on technical and economic aspects of onfarm ultrafiltration. (The applications of ultrafiltration have been among Amundson's research interest for many years.)

In the present study, the researchers were able to ultrafilter the milk as it came directly from the cows. This means it should be possible to place ultrafiltration unit in a pipeline milking setup. Starting with raw, whole milk, they recovered all the milk fat and 99 percent of the milk protein in the concentrate. Refrigerated, the concentrated milk had the same keeping qualities as whole milk. Clean-in-place ultrafiltration equipment can be cleaned with the same materials used to clean standard pipeline systems.

In short, on-farm ultrafiltrations seem to be technically feasible. But the researchers say the process must still be tested under actual working conditions -- on dairy farms -- before it can be declared technically acceptable.

On the economic side, Slack, Amundson and Hill balanced the initial cost plus operating expenses of a complete clean-in-place ultrafiltration system against the savings to be gained by the farmer in reduced refrigeration, storage and hauling costs. (Reduced bulk tank size is the major factor.) They concluded that at today's prices, concentrating milk two-fold by ultrafiltration would pay for dairy herds of 100 or more cattle, but not for 50-cow herds. The economics would be better if milk were concentrated three-fold, but not enough to make the investment pay for a 50-cow herd.

This means that today's ultrafiltration would be economical only for Wisconsin's largest dairy operations -- average herd size in Wisconsin is 40. The process would be economical for more dairymen in California, where the average herd size is over 100.

But ultrafiltration could become economical for smaller operations in the future. Part of the reason large operations came out ahead in the analysis is that appropriately sized ultrafiltration units are already available commercially. Units appropriate for smaller herds would cost more because they would have to be special-ordered. They would cost less if they were mass-produced, although they would probably remain more expensive than larger units, on a cost-per-output basis, because the pump would account for a proportionately larger part of the purchase price. The current cost of a clean-in-place ultrafiltration setup adequate to handle the milk from a 50-cow herd is about \$6000. That for a 1000-cow herd is about \$53,000.

The researchers aren't ready to urge dairymen to ultrafilter their milk or cheesemakers to make cheese out of the concentrated product. But their favorable findings so far -- and the long-range energy outlook -- convince them that the idea merits further study.

Morris, *con't. from p. 31*

Dr. Morris's research concerning the role of lactic streptococcal proteases on formation of small peptides during cheese ripening led to a U.S. patent.

Morris has an ability to translate fundamental research findings into practical applications. He has developed technology for small scale production of cheese at home or on the farm resulting in an expansion of quality farmstead cheese production in the State of Minnesota.

Morris serves as a research team leader and has served as the graduate student advisor for 19 M.S. and 10 Ph.D. students.

Dr. Morris received his Bachelor's degree from Utah State University and the Master's and Doctorate degrees from the University of Minnesota. He joined the staff of the University of Minnesota as Teaching Assistant in 1946 and has served that institution continuously since that date with the rank of Professor since 1960. His research and studies have involved sabbatical terms in Europe, the United Kingdom, Wales and New Zealand. In addition to A.D.S.A., he is a member of American Association for the Advancement of Science, American Society for Microbiology, Institute of Food Technologists and the International Association of Milk, Food, and Environmental Sanitarians.

Food Service Sanitation Notes



Food Service Sanitation Notes is written by the National Sanitation Foundation. Write to the NSF with your questions on food service sanitation, problems for which you need answers, or issues you feel should be aired. They'll be included in a future issue of Dairy and Food Sanitation.

Q. Are any types of paints accepted by NSF for food service equipment?

-HRI 265 Class
Michigan State University

A. Paints may be considered under the food equipment standards primarily for dry, non-wearing splash and non-food zone applications.

There are also applications for polymeric coatings. An example is the use of a polymerized fluoridated hydrocarbon as a heated food zone surface material (coating).

Q. How does NSF determine the adequacy of metals used in food service equipment?

-Jim Roberts
Michigan State University

A. Section 3 of each of the NSF food service equipment standards describes the basic material requirements for each zone. The material requirements will vary with the specific end use application and the contact zone.

The basic requirements relate to cleanability and the ability to withstand conditions of the exposure environment, including corrosion resistance. For food contact applications (food zone), the materials must not impart taste or odor, nor contribute to the adulteration of the food.

Laboratory evaluations are made to determine the cleanability characteristics of material surfaces. The general requirement for food contact surfaces is a No. 3 (100 grit) finish on stainless steel. Any material surface cleanability can be compared with this requirement in the laboratory.

Resistance to the use environment can be determined to some degree by laboratory exposure to the various anticipated environmental conditions.

ADDRESS any problems or questions you wish clarified or answered to:

Food Service Sanitation Notes
National Sanitation Foundation
3475 Plymouth Road
P.O. Box 1468
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NATIONAL MASTITIS COUNCIL PROGRAM
February 16-18, 1982
Tuesday, February 16, 1982

- "The Future Integrated Approach for Mastitis Control" - Dr. Roger Morris - Australian Bureau of Animal Health.
- "American Association of Bovine Practitioners and NMC Team Approach to Mastitis Control" - Dr. Leon Weaver, DVM - Rancho Cucamonga, CA
- "Integrating Microbiology into Mastitis Programs" - Dr. Ralph Farnsworth, DVM - University of Minnesota
- "Results of Virginia's Two Year Mastitis Study" - Dr. Gerald M. Jones - Virginia Polytechnic Institute and State University
- "Results of Nebraska Mastitis Teamwork Effort" - Don J. Kubik - Extension Dairyman - Concord, NE
- "My Mastitis Control Program" - Richard Zimmerman, Dairyman - Fairbury, NE and Ivan Connealy, Dairyman - Decatur, NE

Wednesday, February 17, 1982

- "Antibiotic Residue Violation. Relative Merit of Various Tests" - Gordon Carter - Washington, DC
- "A Challenge - Developing a Total Residue Avoidance Program" - Dr. John E. Spaulding - Food Safety and Quality Service - Washington, DC
- "Update on Knowledge and use of Antibiotic Sensitivity Testing" - Frances D. Barnes - New York Mastitis Council
- "Best Use of Bacteria Culture Results" - Dr. Jenks Britt - Russellville, KY

- "How to use Somatic Cell Count Within a Herd" - Dr. Larry Heider, DVM - Ohio State University
- "Physiology of Involution - Resistance to Infection" - Dr. K. L. Smith - Department of Dairy Science - OARDC
- "Natural Infection in the Dry Period" - Dr. R. J. Eberhart - The Pennsylvania State University
- "Experimental Infection in Dry Period" - Dr. J. S. McDonald - National Animal Disease Center
- "Antibiotic Therapy in the Dry Period" - Dr. R. P. Natzke - University of Florida
- "Antibiotic Formulations for the Dry Period" - Dr. W. D. Schultze - Animal Physiology and Genetics Institute, ARS

Thursday, February 18, 1982

- "Review of Knowledge Concerning Milking System Sizing and Performance" - Dr. Steve Spencer - Pennsylvania State University
- "Approaches to Summarizing Somatic Cell Counts Which Improve Interpretability" - Dr. George Shook - University of Wisconsin-Madison
- National Mastitis Council Annual Meeting.
- "Use of Somatic Cell Count Reference Samples" - Dr. Bill Heald - Pennsylvania State University
- "Interpretation of Somatic Cell Counts from DHI and Milk Plants" - Don Wesen - North Carolina State University

Calendar

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 SANITATION WORKSHOP. Mission De Oro Santa Nella, CA. Presented through cooperation of sanitation organizations, industry trade associations and University of California Cooperative Extension. Contact: Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916-752-1478.

Feb. 10-11---DAIRY AND FOOD INDUSTRY 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 MARYLAND 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 31---NINTH CNA/IFT/ISMS NUTRITION SYMPOSIUM, "Current Issues Facing Food, Nutrition and Health Professionals." Ramada O'Hare, Des Plaines, IL. Sponsored by Chicago Nutrition Association, Chicago Section of Institute of Food Technologists, 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.

JFP Abstracts

Abstracts of papers in the January Journal of Food Protection

Impedance Measurements in Raw Milk as an Alternative to the Standard Plate Count, S. Gnan and L. O. Luedecke, Department of Food Science and Technology, Washington State University, Pullman, Washington 99164

J. Food Prot. 45:4-7

Electrical impedance, using the Bactometer 32, was evaluated as an alternative method to the Standard Plate Count (SPC) to determine the initial microbial count of raw milk samples. The raw milk samples were obtained from farm bulk tanks on commercial dairy farms. Analyses were started within 24-36 h after collection. The impedance method was used to evaluate the samples as raw milk, raw milk plus yeast extract, raw milk given preliminary incubation (18 h at 13 C) or raw milk given preliminary incubation plus yeast extract. The yeast extract (1% final concentration) was added after the milk was placed in the module wells. The geometric mean SPC of each of these four groups was 4.51, 4.37, 4.96 and 5.14, and the corresponding mean detection times with Bactometer 32 were 10.13, 8.80, 8.28 and 6.11 h, respectively. The correlation coefficient of detection time to SPC was -0.77, -0.88, -0.78 and -0.79, respectively, for the four sample groups. When specific detection cut-off times (approximately 7 h) were selected and a maximum SPC of 100,000 CFU/ml was selected, 85.2%, 97.2%, 81.0% and 83.6% of the samples in the above four groups were correctly classified.

Effect of Pre-Filtration and Enzyme Treatment on Membrane Filtration of Foods, Phyllis Entis, Michael H. Brodsky and Anthony N. Sharpe, QA Laboratories Limited, 135 The West Mall, Toronto, Ontario M9C 1C2, Canada and Bureau of Microbial Hazards, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, Canada

J. Food Prot. 45:8-11

Effects of prefiltration and enzyme and surfactant treatments on the filterability of foods were examined. The clarification of food suspensions, using a fine wire cloth prefilter, did not affect microbial recovery from the 87 food samples examined. One hundred and nine foods were clarified by prefiltration and then tested for their filterability through a 0.45- μ Hydrophobic Grid Membrane Filter; 68 could be filtered without any additional treatment. Of the remaining 41 foods, 39 were rendered filterable with an appropriate enzyme or surfactant treatment. The application of these procedures greatly enhances the practicality of membrane filtration for microbiological analysis of foods.

Neutralized Direct-Acid-Set Whey as an Extender for a Chocolate-Flavored Dairy Drink, L. C. Blackburn and R. Bassette, Department of Animal Sciences and Industry, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 45:12-13

A chocolate-flavored dairy drink was prepared in which four parts of neutralized direct-acid-set whey and six parts of whole milk were combined with 1.44% chocolate flavoring, 4.5% sugar and 0.2% nonfat-dry milk. The extended chocolate-

flavored drink was compared with a conventional chocolate-flavored low-fat milk made with the same formulation except skim milk replaced neutralized whey and no nonfat-dry milk was added. Both products were heated to 80 C and mixed 2 min in an institutional Waring blender to disburse salts from neutralized whey, pasteurized at 80 C for 35 min and cooled immediately to 5 C. Sedimentation, viscosity, pH and consumer acceptability were determined. No sedimentation occurred after 7 days of storage, but after 10 days about 5.3% sediment by volume was observed in both drinks upon centrifugation. After 7 days at 4 C, the whey-extended chocolate drink had a 4% by volume watery layer that increased to 4.5% after 10 days. Maximum viscosities of 47 and 49 centipoise, respectively, were obtained after 5 days at 4 C for the extended and conventional chocolate-flavored low-fat milk. Viscosities declined to 26-27 centipoise after 10 days. Twenty-two of a consumer panel of 37 preferred the whey drink over the conventional, and seven expressed no preference, judging by a combined preference/triangle test. When data from the triangle taste test were subjected to a statistical analyses, the probability for preference was .47 for the whey drink, .30 control and .21 no preference. There was no difference in acceptability ($p > 0.05$).

Potential Implication of the Freezing Point Depression by Enzymatic Hydrolysis of Lactose in Milk, I. J. Jeon and R. Bassette, Department of Animal Sciences and Industry, Kansas Agricultural Experiment Station, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 45:14-15

The potential problem of detecting added water in lactose-hydrolyzed milk by cryoscopic examination was investigated. The extent to which hydrolysis of lactose corresponded with a given freezing point was calculated and tested experimentally. Cryoscopic measurements were related to the percent of lactose hydrolyzed in milk. Hydrolyzed milks readjusted to normal freezing points with added water were examined by lactometer and sensory evaluations. Although such milk adulterated with up to 25% added water could escape detection by either cryoscopic or sensory evaluations, the Quevenne lactometer could detect 10% added water.

Influence of Drying Plant Environment on Salmonellae Contamination of Dry Milk Products, D. L. Jarl and E. A. Arnold, Land O'Lakes, Inc., P.O. Box 116, Minneapolis, Minnesota 55440

J. Food Prot. 45:16-18

This study was done to correlate incidence of salmonellae found in the dry milk processing plant environment with finished product contamination. Three plants with various histories of environmental salmonellae incidence were chosen for the study. The daily plant samples representing one lot of production were placed in a 1500-g composite in a sterile sample container and submitted to the central analytical laboratory for analysis. Two samples of nonfat dry milk were found to contain salmonellae in 8 continuous months of sampling and testing. In each instance of finished product positive, the environment had at least four positive samples recorded in the routine environmental program during the

week or on the day in which the positive product was noted. Repeat tests of the positive product were negative on one lot and confirmed the positive in two of three retests of the other lot. It may be concluded from this study that controlling salmonellae in the dry milk plant environment will effectively preclude finished product contamination since dry milks are produced in essentially closed systems in a process that includes a pasteurization step.

Evaluation of a Unique Chamber for a Beef Carcass Cleaning Unite, M. E. Anderson, R. T. Marshall, W. C. Stringer and H. D. Naumann, U.S. Department of Agriculture, Science and Education Administration, 113 Eckles Hall, University of Missouri, Columbia, Missouri 65211 and Food Science and Nutrition Department, University of Missouri-Columbia, Columbia, Missouri 65211

J. Food Prot. 45:19-22

Our objective was to develop basic design criteria for use in fabricating a functional chamber for a red meat carcass cleaning unit. Emphasis was placed on eliminating the doors. A model carcass cleaning chamber was constructed to test effects of selected design parameters on direction and velocity of airflow. Based on data from the tests using the model, a full-scale chamber with no doors was designed, fabricated, and installed in a commercial packing plant for testing. The air moves into the chamber at both the entrance and the exit. This movement of air into the chamber prevents water droplets entrained in the air from escaping into the slaughtering area and causing condensation on the walls and roof.

A Food Illness Outbreak Caused by *Salmonella muenster*, Nassim H. Nabbut, Elie K. Barbour, Habeeb M. Al-Nakhli and Suleiman I. Zamel, Ministry of Agriculture and Water, Regional Agriculture and Water Research Center, Animal Production and Health Section, P.O. Box 17285, Riyadh, Saudi Arabia

J. Food Prot. 45:23-25

An outbreak of *Salmonella* food poisoning affected 12 persons attending a home dinner in Riyadh on January 10, 1980. The clinical manifestations were mild in 3 of the patients and severe in the other 9. The incubation period ranged between 14 and 32 h with an average of 18 h. The illness lasted 3-4 days. The clinical symptoms included diarrhea, abdominal colics, vomiting, fever (38-40 C), chills, headache, dizziness, inappetence and muscle and joint aches. Six of the patients required the care of a physician, but none of them required hospitalization. Epidemiological investigation of the outbreak revealed that the implicated food was roast beef. Nine persons who attended the same dinner, but did not eat roast beef, were not ill. The fresh roast beef, approximately 2 kg, was bought from a supermarket. It was cooked the night before the dinner, refrigerated for 24 h, warmed the next day and kept at ambient temperature in the kitchen for about 3 h before it was served. Bacteriological examination of the roast beef showed that *Salmonella muenster* was present in large numbers. Stool specimens of 11 of the patients were positive for *S. muenster*. Eight of them excreted the same *Salmonella* serotype up to 17 days after recovery from the illness; two other patients excreted this serotype up to 27 days after recovery.

Determination of Ethanol in Whey-Sugar Solutions by Freezing, B. J. Demott, Department of Food Technology

and Science, University of Tennessee, Knoxville, Tennessee 37901

J. Food Prot. 45:26-28

The composition of solutions undergoing yeast fermentation was simulated by using direct-acid-set cottage cheese whey containing increasing amounts of ethanol (0 to 5.4%) with decreasing amounts of sucrose (10 to 0%). Each decrease of 1 g of sucrose per 100 ml of whey accompanied by an increase of 0.54 g of ethanol decreased specific gravity 0.0046 unit and lowered the freezing point 0.159 H. Whey containing 10% added sucrose was treated as follows: (a) inoculated with *Kluyveromyces fragilis*, (b) carbohydrate splitting enzymes added and inoculated with *K. fragilis* and (c) carbohydrate splitting enzymes added and inoculated with *Saccharomyces cerevisiae*. All mixtures were incubated 48 h at 32 C during which six samples from each treatment were analyzed for total solids, specific gravity and freezing point. No difference ($P > .05$) was noted between samples treated with enzymes or those treated with the two yeasts cultures as related to decrease in total solids concentration or specific gravity. Each 0.001-H decrease in freezing point was accompanied by a total solids decrease of 0.006 g per 100 g of whey in the non-enzyme treated sample, and 0.008 g and 0.010 g per 100 g whey in the enzyme-treated samples inoculated with *K. fragilis* and *S. cerevisiae*, respectively. Each 0.001-H change in freezing point was equivalent to a change of 0.00003 specific gravity unit in the non-enzyme treated sample and 0.000043 and 0.000048 specific gravity unit in the enzyme-treated samples inoculated with *K. fragilis* and *S. cerevisiae*, respectively. The precision with which freezing point can be determined suggests its use in evaluating the amount of ethanol produced during fermentation.

Effect of Pork Belly-Type on the Microbiology of Bacon Cured with or without Potassium Sorbate, M. K. Wagner, A. A. Kraft, J. G. Sebrank, R. E. Rust, and C. M. Amundson, Departments of Food Technology and Animal Science, Iowa State University, Ames, Iowa 50011

J. Food Prot. 45:29-32

Fat- and lean-grade hog bellies were used to evaluate the microbiology of bacon cured with either 40 ppm of nitrite + 0.26% of potassium sorbate or 120 ppm of nitrite with no potassium sorbate. Bacon slices were inoculated to provide an initial representative flora of 10^5 - 10^6 organisms per g of meat. Bacon was packaged in high barrier film with high vacuum (28-29 in. of Hg), stored at 0 - 5 C, and analyzed at 0, 10, 21 and 28 days after processing for enumeration and identification of mesophilic, psychrotrophic and lipolytic organisms. In general, the 40 ppm of nitrite + 0.26% of potassium sorbate cure provided greater bacterial inhibition (especially in fat bacon) than did the nitrite cure. *Lactobacillus* and *Bacillus* were the most common isolates characterized.

Isolation of Pectinolytic *Aeromonas hydrophila* and *Yersinia enterocolitica* from Vacuum-Packaged Pork, B. R. Myers, R. T. Marshall, J. E. Edmondson and W. C. Stringer, Department of Food Science and Nutrition, University of Missouri-Columbia, Missouri 65211

J. Food Prot. 45:33-37

A survey was made of commercially available vacuum-packaged fresh pork held at 5 C for 7, 14, 21 and 28 days. Also, four vacuum-packaged leg roasts were stored for 21 days at 5 C

then for 90 days at -18 C before sampling. Surface cores of meat were enriched in sorbitol bile broth 21 days at 5 C to enhance recovery of *Yersinia enterocolitica* on pectin agar. Of the 54 samples surveyed, 20% yielded highly pectinolytic colonies of *Aeromonas hydrophila* that were cytotoxic to Y1 and HeLa cells, 6% yielded *Y. enterocolitica* and 6% yielded *Yersinia intermedia*. *Yersinia* was recovered from both fresh and frozen samples. This is believed to be the first report of pectinolysis by *A. hydrophila* and recovery of cytotoxic *A. hydrophila* from vacuum-packaged pork.

Precooking and Flake Size Effects on Spent Fowl Restructured Steaks, S. C. Seideman, P. R. Durland, N. M. Quenzer and J. D. Michels, Departments of Animal Science and Nutrition-Food Science, South Dakota Agricultural Experiment Station, South Dakota State University, Brookings, South Dakota 57007

J. Food Prot. 45:38-40

Four formulations of spent fowl muscle, each made to contain 40% dark muscle and 60% white muscle, were prepared as follows: (a) raw meat, large flake size; (b) raw meat, small flake size; (c) precooked meat, large flake size and (d) precooked meat, small flake size. Each formulation was mixed with 0.3% NaCl, 0.25% Na tripolyphosphate and 0.25% hydrolyzed vegetable protein for 10 min, pressed into logs under 400 psi, frozen and cut into steaks. Steaks were evaluated for moisture and fat content, cooking properties, texture and sensory attributes. Restructured steaks made from precooked chicken muscle had lower initial moisture contents and lost less moisture during cooking than restructured steaks made from raw meat. Flake size had no significant effect on cooking losses; however, the smaller flake sizes contributed to a more tender product. Steaks made from the raw chicken meat were of a more acceptable flavor. Restructured steaks made from raw flakes were significantly more desirable in texture and overall palatability and were more tender and juicy than restructured steaks made from precooked chicken.

Quality Changes of Beef Steaks Stored in Controlled Gas Atmospheres Containing High or Low Levels of Oxygen, Laura Bartkowski, F. D. Dryden and J. A. Marchello, Department of Animal Sciences, University of Arizona, Tucson, Arizona 85721

J. Food Prot. 45:41-45

Steaks from bovine *Longissimus* and *Semimembranosus* muscles were used to determine the influence of gas atmospheres on beef color, microbial growth and shrinkage during 9 days of retail display in two separate experimental trials. Steaks were displayed in one of four gas mixtures and were compared to steaks packaged under conventional vacuum and in a film wrap. Gas mixtures containing O₂ levels of 10% (one-half ambient) did not maintain a bright red color, but those with 40-75% O₂ (more than twice ambient) maintained acceptable color for 9 days of storage. Atmosphere stored steaks lost more moisture (P<0.05) than vacuum-packaged steaks. Psychrotrophic and mesophilic microbial counts from steaks stored 9 days in atmospheres containing 15% CO₂ were lower (P<0.05) than the counts for the control steaks.

Evaluation of a Proposed Reconditioning Process for Frozen Shrimp, George P. Hoskin, Francis S. D. Lin and Paris M. Brickey, Jr., Division of Microbiology, Bureau of Foods,

Food and Drug Administration, Washington, DC 20204

J. Food Prot. 45:46-47

A proposed procedure for reconditioning filth-contaminated shrimp was evaluated for its effectiveness in removing urea, a component of soluble filth. Contamination of fresh shrimp was simulated by placing 1.0 µl aliquots of a solution containing 0.025 × 10⁶ mCi ¹⁴C-urea onto the epithelium of peeled shrimp. Following the washing procedure, 41% of the labeled urea remained with the shrimp tissue.

Effects in Rats of Cyclopropanoid Fatty Acids from Cottonseed Oil, Lucy L. Fan, Barney W. Hilton and Alan Wohlman, Research Department, Frito-Lay, Inc., 900 N. Loop 12, Irving, Texas 75061

J. Food Prot. 45:48-53

The effects of cyclopropanoid fatty acids naturally present in cottonseed oil have been investigated in rats by feeding diets containing 0, 60, 300, 600 and 3,000 µg of cyclopropanoid fatty acids/g for 3 and 6 months. At the end of 3 and 6 months of feeding, rats were sacrificed for histopathological and biochemical evaluations. Body weight, food consumption, physical appearance, organ weight, hematological profiles, histopathological indicators, liver microsomal protein, activity of NADPH-cytochrome c (P-450) reductase, and the hepatic contents of cytochromes P-450 and b₅ were not distinctly different among the five groups of rats. However, there was a positive correlation between the amount of cyclopropanoid fatty acids deposited in the body fat and content of these fatty acids in the diets. The significance of these results is discussed.

Protection Against Heat-Injury in *Staphylococcus aureus* by Solutes, J. L. Smith, R. C. Benedict and S. A. Palumbo, Eastern Regional Research Center, 600 East Mermaid Lane, Philadelphia, Pennsylvania 19118

J. Food Prot. 45:54-58

The effect of solutes on heat-injury in *Staphylococcus aureus* 196E was studied in 25% ground beef (GB) slurry or distilled water equilibrated at 49 C. Exposure to 49 C for 90 min resulted in a 3-4 log cycle increase in injured cells. The number of injured cells was the difference between bacterial counts on tryptic soy agar (TSA) + 1% pyruvate and TSA + 9% NaCl. Increasing levels of NaCl (1-9%) added to GB slurry gave increasing protection against heat-injury and resulted in a decrease in the number of injured *S. aureus*; glycerol and sucrose had a similar effect. At 0.85 M (equivalent to 5% NaCl), other compounds such as sodium citrate, KCl, NaNO₃, Na₂SO₄, Na₂HPO₄, NH₄Cl, CaCl₂, and LiCl were more effective than NaCl in protecting against heat injury; sodium acetate, MgSO₄, NaI, MnCl₂, MgCl₂, NaBr, NaH₂PO₄, and KI were less effective than NaCl. In the presence of 5% NaCl, it was necessary to raise the temperature from 49 to 55 C to obtain significant heat-injury to *S. aureus*. Addition of NaCl prevented the leakage of UV-absorbing materials and decreased the extent of magnesium ion leakage from heat-injured staphylococci.

SDS-Gradient Gel Electrophoretic Separation of Muscle Polypeptides for the Estimation of Maximum Cooking Temperatures in Meat, P. Steele and W. J. Lambe, Department of Agriculture, Animal Health Laboratory, Jarrah Road, South Perth, Western Australia, 6151

J. Food Prot. 45:59-62

SDS-polyacrylamide gradient gel electrophoresis is presented as a technique with potential for the identification of maximum processing temperature in cooked meat products derived from several species. The method is applicable to the examination of these products where evidence to confirm heat inactivation of viruses may be required for quarantine purposes. The methodology for sample preparation, electrophoresis and visualization of separated proteins and an estimate of molecular size of individual proteins is given.

Destruction of Microorganisms During Thawing of Skim Milk. A. Gebre-Egziabher, Beatrice Thomson and G. Blankenagel, Department of Dairy and Food Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N0W0

J. Food Prot. 45:63

The viability of four species of microorganisms (*Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Saccharomyces cerevisiae*) during rapid and slow thawing of frozen milk was investigated. Results indicated that the destruction of microbial cells was significantly greater when skim milk was thawed slowly. Recovery of viable organisms by plating was generally slightly higher when peptone water was used as a diluent, although differences were not statistically significant.

Microbial Flora of Livers, Kidneys and Hearts from Beef, Pork and Lamb: Effects of Refrigeration, Freezing and Thawing. M. O. Hanna, G. C. Smith, J. W. Savell, F. K. McKeith and C. Vanderzant, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 45:64-74

Aerobic plate counts (APC) of livers, kidneys and hearts obtained from beef, pork and lamb soon after slaughter were nearly always $<10^4$ and often $<10^3$ per cm^2 . Differences in APC of different sites of the same liver, kidney or heart, within each species, were not significant ($P>0.05$). APC of livers, kidneys and hearts from pork and lamb after storage for 1, 3 or 5 days at 2 C were not significantly different ($P>0.05$) from those at day 0. APC of beef livers, kidneys and hearts after 5 days at 2 C differed significantly ($P<0.05$) from those at day 0, 1 and 3. Temperature abuse of fresh organs for 6-12 h at 30 C before freezing caused major increases in count. Frozen storage of livers, kidneys and hearts (4 days at -20 C) did not cause significant changes in APC. The initial microbial flora of fresh livers, kidneys and hearts was varied with coryneform bacteria and *Micrococcus* sp. often constituting a major part ($>25\%$) of the microbial flora. After storage for 5 days at 2 C, *Pseudomonas* sp. more often became a major part of the microbial flora of liver samples. Frozen storage for 4 days at -20 C did not change the microbial flora of beef samples greatly; in pork and lamb, coryneform bacteria more frequently became a major part of the microbial flora after freezing. Changes in pH of livers, kidneys and hearts during storage for 5 days at 2 C were small.

Effects of Packaging Methods on the Microbial Flora of Livers and Kidneys from Beef or Pork. M. O. Hanna, G. C. Smith, J. W. Savell, F. K. McKeith and C. Vanderzant, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 45:75-82

Aerobic plate counts (APC) of vacuum-packaged beef livers, beef kidneys and pork livers during refrigerated storage were nearly always, particularly after 14 days at 2 C, much lower than those of comparable samples packaged in polyvinyl chloride (PVC) film. The pH of vacuum-packaged livers and kidneys decreased during refrigerated storage; the same was true for products stored in PVC film except that the pH of kidneys increased. In refrigerated vacuum-packaged livers and kidneys, lactic acid bacteria (homo- and heterofermentative lactobacilli, streptococci, *Leuconostoc* sp.) became more predominant, whereas in products packaged in PVC film, gram-negative bacteria frequently became more dominant.

Mechanism of Beef Shelf Life Extension by Sorbate. G. Gordon Greer, Agriculture Canada, Research Station, Lacombe, Alberta, Canada T0C 1S0

J. Food Prot. 45:83-84

In both beef extract medium and on the surface of rib-eye steaks, potassium sorbate inhibited growth of psychrotrophic beef-spoilage bacteria by prolonging the lag phase of growth without affecting rate of growth. As a result, steak retail shelf life was extended by 2 days following a 10% potassium sorbate dip.

Inhibition and Control of Bacterial Spore Germination. Leslie A. Smoot and Merle D. Pierson, Department of Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061

J. Food Prot. 45:85-93

Factors affecting germination of bacterial spores as well as chemical inhibition of germination are reviewed. Current theories on the nature of initiation of the germination process are also presented. Transformation of a dormant bacterial spore into a metabolically active vegetative cell involves a myriad of complex biochemical events of which the "trigger reaction" is thought to be the prime event. The ability to control or prevent this complex sequence of events from occurring by manipulation of environmental factors or use of chemical inhibitors has been the objective of numerous research endeavors. A thorough understanding of these factors is important to both maintenance and future development of an adequate, safe and wholesome food supply.

Foodborne Disease Risk Assessment of Foodservice Establishments in a Community. Frank L. Bryan, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia 30333

J. Food Prot. 45:94-101

An administrative procedure based upon epidemiologic data to estimate risk of foodborne disease from foods served in foodservice establishments is presented. The method utilizes food-property risk, food-operations risk, and average daily-patronage risk as coefficients to compute a composite risk index. The food-property risk is concerned with the characteristics of the foods prepared in an establishment in regard to the relative frequency that these foods have been, or because of their intrinsic qualities could become, vehicles of foodborne pathogens. The food-operations risk is concerned with the probability that foods are or will become contaminated, that contaminants survive or are likely to survive certain processes, and that if bacterial contaminants are present, they could multiply to sufficient quantities to cause disease. As the number of persons that eat an implicated or likely vehicle, the risk increases.

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SOMEONE YOU SHOULD KNOW IN THE DAIRY INDUSTRY



Jim Rahr, Dairy Sanitation Routeman

Jim Rahr works for Botens Dairy Supply, in Cuba, N.Y. and has been a routeman for nine years. Before that he was a dairyman with one of the largest herds in Allegany Co., N.Y. A graduate of New York State Agriculture Technical Institute, and the Surge Training Center in Illinois, Jim offers his views on the value of a dairy route sanitation program.

"For a dairyman trying to make a living from his commitment to the dairy industry, a routeman is his link to the dairy equipment dealership. The routeman is the dealership in the field, sharing the latest information on good milking practices, improved equipment and better sanitation.

Qualities Of a Routeman

"A good routeman needs three basic qualities to help him succeed: Honesty, knowledge of his customer's business, and respect for that customer. A man is only as good as his promise, and if my promise is no good, that's the way I'm perceived. This means when I say I'll deliver a part or merchandise, I make sure I deliver it on time as promised.

"Dairyman expect me to know about their business. Sometimes I feel like a walking encyclopedia, but to help a man do a better job, you have to know the things that can help him. My years as a dairyman helped greatly, and I still keep up on the latest dairy information.

"Respect for the dairyman may be the most important part of a routeman's job. You have to remember the dairyman is a businessman, and his beliefs are part of his livelihood. You might see a way to do something differently to help him out, but you tell him from a position of respect, not superiority.

How We Help

"Since we're bringing the dealership to the dairyman, we can help in a number of ways right there. Our services include:

- Testing the dairyman's water and prescribing the best detergent to meet his needs.
- Making sure service is available to him when his equipment needs attention.
- Leaving enough supplies so the dairyman won't run out and have his operation suffer.
- Delivering supplies in bulk, at the lowest price we can offer.

- Informing him on the latest information which can help improve his operation.
- Checking important details such as vacuum pump oil and vacuum controls to make sure they're working properly.

"In addition, there are some intangible values which only a routeman who's involved with his customer can offer. Like suggesting help from an outside source such as a vet or extension specialist. Understanding the dairyman's thinking helps me serve him better. Once he understands I'm only in business if he is, he knows I want to help him succeed.

"You can't be pushy, but you want the dairyman to understand the importance of things like changing inflations often enough to protect his herd, and using the right products for proper sanitation. I try to think to myself, if I were this dairyman, what would I want to know to help improve my business? This helps me explain things without seeming pushy or like a hardline salesman.

"Another important service which helps both routeman and dairyman is the records kept on supplies used. When I was on the farm, I was a stickler for record keeping and I still believe in it. My records assure the dairyman enough supplies without overstocking. I also know how often inflations need to be replaced.

"We want to help the dairyman help his cows' performance. In my dairy, I had a sign in my parlor which read, 'Every Cow Is A Lady, Treat Her As Such.' I modified that as a motto for our dealership to say, 'We Are The Milking Cow's Friends.' I truly believe a route program is worthwhile for the dairyman and his herd or I wouldn't be in it, and you can take my word on that!"



