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Dairy and Food Sanitation

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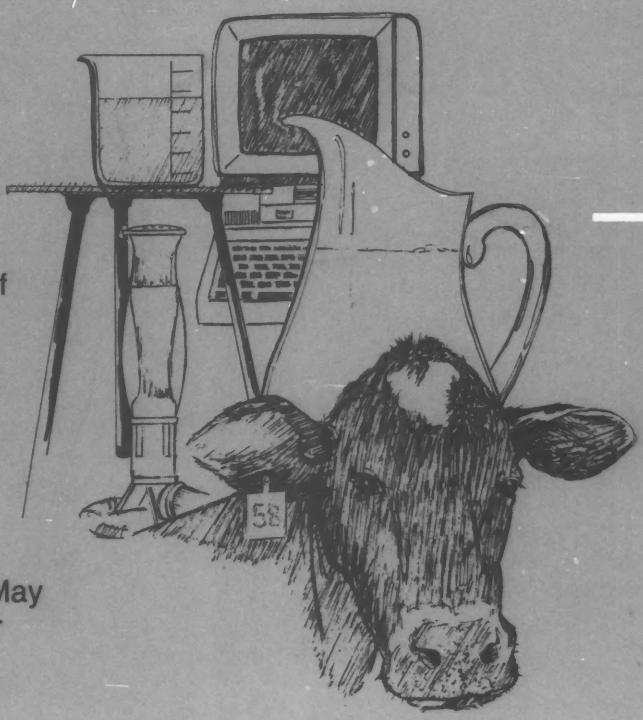
What is Wrong with Cultured Buttermilk Today



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Dairy and Food Sanitation

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Disposables Versus Reusables: A Study of Comparative Sanitary Quality

Morton S. Hilbert, M.P.H.
Professor and Chairman
Dept. of Environmental and Industrial Health
University of Michigan School of Public Health
Ann Arbor, MI

James Henderson, Ph.D.
Chief, Community Assistance Division
Michigan Department of Natural Resources
Lansing, MI

Do disposable cups, plates and other single-use food service utensils actually enjoy the sanitary quality that is claimed for them? A recent comparative study produced these findings:

- *The total plate count microorganism levels for reusable food service items was consistently higher than for disposable items sampled in this study.*
- *The percentage of reusable samples with detectable microorganisms was approximately two times that of disposable items.*
- *Disposables have less potential for bacterial contamination, probably because of reduced handling frequency.*

Whichever type of food service item is used, the strongest adherence to good sanitary practices, including proper dishwashing procedures, was indicated by the study.

The findings from test sites in the Ann Arbor, Michigan area correlated closely with the results of a similar study conducted seven years earlier in Syracuse, New York.

DISPOSABLES VERSUS REUSABLES: A STUDY OF COMPARATIVE SANITARY QUALITY

One of the key claims made for disposable food service items by the single service industry is their superior sanitary quality. The makers of paper and plastic cups, plates, bowls and other disposable food service utensils emphasize the public health value along with the convenience of their products, and point to widespread acceptance of disposables among public health professionals.

The line of reasoning proceeds as follows: Since disposables are used only once by one person, then discarded, they are inherently less likely than reusable utensils to be contaminated by bacteria and thus less likely to contribute to the transmittal of disease.

But what is the reality? To what extent are disposables actually less contaminated by bacteria relative to reusables? This question was the subject of a recent study sponsored by the Single Service Institute (SSI), the national trade association of the disposables industry. The final report, prepared by an independent laboratory under the guidance of the authors, is entitled "Comparison of Microbiological Contamination of Disposables and Reusable Food Service Items in Their Intended Use Environment." In objective, protocol and results, the study closely parallels a similar study conducted in 1976 in the Syracuse, New York area.

The earlier study revealed that in comparative tests in a variety of food service establishments in and around the city of Syracuse, the average bacterial counts of disposable food service items were significantly lower than those of reusable items. Further, in the specific bacteria categories of staphylococcus, streptococcus and coliform, disposables had significantly lower bacterial counts than corresponding reusable items.

During the earlier study, originally designed as a pilot project, consideration was given to replicating the test efforts at other food service sites in geographic locations other than Syracuse. The Syracuse results were so clear and consistent, however, that it was deemed unnecessary at that time to carry the studies further into other areas.

CORRELATION OF TWO STUDIES

Seven years later, the Single Service Institute decided to run another comparative study in another part of the country to test out once more the relative sanitary quality of disposable versus reusable utensils and to see whether

the new figures from a study conducted in Michigan held to the pattern of contamination differences recorded in the earlier Syracuse study.

Two key findings emerged from the correlation of the two efforts:

1. Confirming the Syracuse study, the results of the Ann Arbor study indicated a statistically significant difference between the sanitary quality of disposable and reusable food service items as measured by the frequency of occurrence of organisms on items and number of organisms detected per food service item (statistical significance established at the 95 percent confidence level).

2. The correlation of the two studies indicates that although they were independent, the results from both studies are estimates of the same population (i.e., the same results would be expected from samples collected at other locations).

From these correlations, it would be expected that, just as the Ann Arbor study validated the Syracuse findings with respect to the sanitary quality of disposables, any further studies of disposables versus reusables in other parts of the country would consistently produce similar results.

SUMMARY OF THE ANN ARBOR FINDINGS

The results of the new study can be summarized as follows:

- The total plate count microorganism levels for reusable food service items was consistently higher than for disposable items sampled in this study.
- The percentage of reusable samples with detectable microorganisms was approximately two times that of disposable items.
- Disposables have less potential for bacterial contamination, probably because of reduced handling frequency.

The study findings emphasize the importance of good sanitary practices, whether disposables or reusables are employed. Storage in a clean area, proper storage procedures and minimum handling are singled out as essential. Where reusable ware is used, proper dishwashing procedures should be strictly followed.

STUDY PROCEDURES/PARAMETERS

The study protocol was designed to compare the microbiological results obtained from swabbing disposable food service utensils, such as plates, cups, bowls, and tumblers, with the results from similar reusable items. From the very beginning, guidance was provided by an advisory committee consisting of three public health professionals.

The study sought to measure the sanitary quality of food service items at their point of use, so a survey was made of establishments in the Ann Arbor area to determine what types of utensils were being used and to select sites with the desired mix of food service items. Altogether, 15 sites were chosen, three each of the following kinds of establishments: motels, hotels, hotel bars, hospitals, and nursing homes.

Utensil samples were collected at times of day representative of actual use and were selected from as close to the point of use as possible.

For each motel, 25 disposable tumblers were randomly sampled from available rooms, while for each hotel 25 reusable glasses were taken for immediate swabbing.

In each hotel bar, 25 reusable glasses were randomly selected and swabbed. A mix of wine, beer, mixed drink and water glasses was chosen either from an overhead rack or from shelving in the immediate bar area.

In all three hospital settings, an equal number of disposable and reusable samples was tested just before the noon meal. In two hospitals, samples were chosen from both patient food service areas and the main cafeterias. In the third hospital, there was a kitchen but no cafeteria.

In two of the three nursing homes, an equal number of disposable and reusable items was tested. In the third home, available samples were chosen from a limited supply of disposables.

TESTING TECHNIQUES

In the swabbing procedure, a sterile swab was aseptically removed from its wrapper, then inserted into a vial containing 4.5 ml of sterile neutralizing buffer solution. Excess liquid was squeezed out against the inside of the vial. In actual swabbing, the swab handle was held at a 30-degree angle with the surface of the food service item. The swab head was rubbed slowly and thoroughly over the entire food contact surface area. The swab was rubbed three times over the surface, with the direction reversed between successive strokes as the swab rotated between the technician's fingers. Five total surfaces were swabbed per vial of rinse solution, with the swab immersed briefly in the vial between surfaces. For glasses, the outer one inch of the rim, the rim itself, and the entire inside surface area were swabbed.

After each fifth item was swabbed, the swab was returned to the vial with the swab stick broken off so that the handle portion did not enter the vial.

The vials containing the swabs were taken to the laboratory within two hours so that chilling was unnecessary. At the lab, 0.5 ml of sterile 10 percent sodium citrate was added to each vial to dissolve the swab. If samples could not be plated immediately, the vials were refrigerated, but all sample plating was completed within 24 hours of collection.

Before plating, each vial with the dissolved swab was manually shaken 25 times. Vial contents were aseptically dispensed by pipette as follows:

- *Total plate count* -- 0.1 ml and 1.0 of sample plus Standard Methods agar (incubated at 32°C for 48 hours).

• *Staphylococcus* -- 0.5 ml spread on each of two plates containing the Baird-Parker EY tellurite media (incubated at 35°C for 38 hours).

• *Streptococcus* -- 0.5 ml spread on each of two plates containing KF streptococcus agar (incubated at 35°C for 48 hours).

• *Total coliform* -- 1 ml filtered through a sterile membrane filter, which was then placed in a plate containing m Endo Broth (incubated at 35°C for 24 hours).

Controls made for each type of media were poured and similarly incubated. Neutralizing buffer and laboratory air controls were also plated.

After the incubation periods, the numbers of bacteria on each plate were counted and recorded. All questionable colonies on the staphylococcus and streptococcus plates were stained and verified microscopically.

REVIEW OF TEST RESULTS

The data from the study are illuminating both in themselves and in comparison with the results of the earlier Syracuse study. As already noted, the values from both studies correlate well, although the two studies were independent, and are significant at the 95 percent confidence level.

Table I shows the mean values of the bacterial counts (number of organisms per item) for both disposable and reusable utensils, as recorded in the Ann Arbor study and the earlier Syracuse study as well. The difference in counts between disposables and reusables underscores a potential for more contamination on reusable food service items.

Figure 1 presents the data on total plate count differences between disposables and reusables in another and revealing way. This depicts the range, median, and inner quartile range (middle 50 percent of data) for all disposable and reusable samples. The range of total microorganisms on disposables is seen to be from less than one to 207 organisms per food service item, while for reusables the range is from less than one to 18,000 organisms. While the median value for disposables was non-detectable, for reusables it was 6.5 organisms per item. The middle 50 percent of the data for disposables ranged from non-detectable to three organisms per item; for reusables the range was from two to 22 organisms.

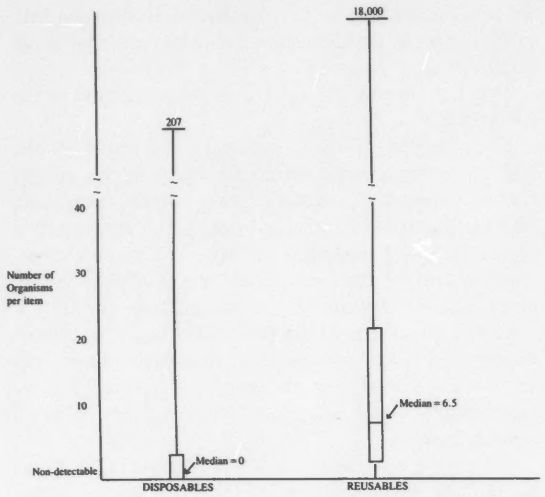

Figure 1. *Range, median, and inner-quartile range of total plate count organisms per item for all disposable and reusable samples.*

The data suggest that the most logical reasons for the larger number of organisms found on reusable versus disposable food service items are increased handling, improper cleaning and/or storage, and poor handling procedures.

APPLYING THE "100 MICROORGANISM" STANDARD

The report further relates the study results to the standard of 100 total microorganisms per utensil surface recommended in 1950 as a minimum requirement for effective machine dishwashing by the Committee on Sanitary Engineering & Environment of the National Research Council. Figure 2 compares disposables and reusables in terms of three different levels of total plate count organisms: non-detectable (less than one), from one to 100, and greater than 100 organisms. The figure shows that for reusables, 13 percent of all samples had counts above 100 -- the minimum level prescribed for dishwashing. For disposables, this number was only two percent. The highest percent occurrence for disposables was non-detectable, but for reusables was between one and 100 microor-

TABLE 1. *Comparison of mean bacterial counts for disposable and reusable food service items from two studies (organisms per item).*

	Disposables		Reusables	
Organisms	Ann Arbor Study (1983)	Syracuse Study (1976)	Ann Arbor Study (1983)	Syracuse Study (1976)
Total Plate Count	6.8	17.6	231.5	274.9
Staphylococcus	0.3	0.5	0.9	13.3
Streptococcus	0.0	0.2	2.5	10.6
E. Coli	0.0	0.0	0.0	0.8

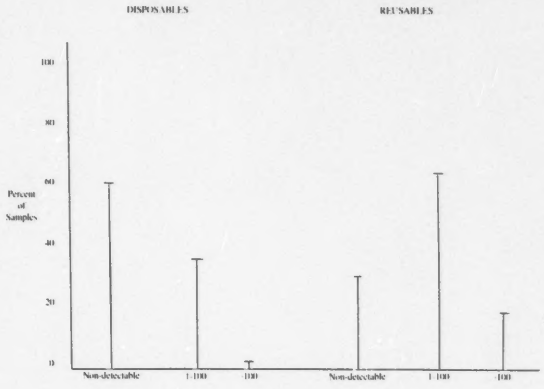

Figure 2. *Percent of all samples with measured total plate count organism levels of non-detectable, 1-100, and greater than 100 organisms per item by sample type.*

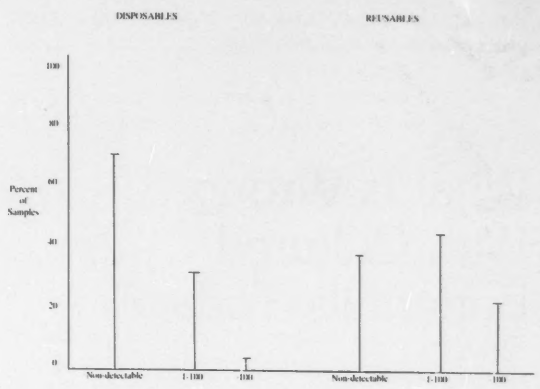

Figure 2. *Percent of all samples from a previous study with measured total plate count organism levels of non-detectable, 1-100, and greater than 100 organisms per item by sample type.*

ganisms. Figure 3 shows a similar comparison taken from the 1976 Syracuse study, revealing a pattern very close to the one that emerged from the 1983 Ann Arbor study.

The three hotel bars sampled in the study used reusables exclusively. The results showed a mean total plate count for bar glasses of 1560.9 organisms, with a frequency of occurrence of 93.3 percent -- far higher readings than the average for all reusables. This can be explained by the fact that sanitation practices in bars are frequently affected by peak volume business, during which time washing, rinsing, and drying operations are not likely to be well controlled. Figure 4 shows how bar glasses fared in terms of the 100-organism standard set for dishwashing effectiveness.

FINAL THOUGHTS

The study protocol did not call for a thorough probe of the health implications of the comparative sanitary quality of disposable and reusable food service items. For this, a correlation of the occurrence of total bacterial counts and incidence of acute disease would be necessary. But the data surely are suggestive of significant health implications, as a key premise in public health practice is that the more bacteria present, the greater the likelihood of potential health hazards and the greater the possibility of disease.

From the Editor

To all article reviewers and book reviewers for *Dairy and Food Sanitation*. Thank you for your time and effort in reviewing articles and/or books for publication in *Dairy and Food Sanitation*. We look forward to working with you in 1985. K. R. Hathaway, editor and Suzanne Trcka, Associate Editor, *Dairy and Food Sanitation*.

Dairy and Food Sanitation, Vol. 5, No. 1, Pages 8-13 (January 1985)

What Is Wrong With Cultured Buttermilk Today?

Ebenezer R. Vedamuthu

Microlife Technics
1833 57th Street
Sarasota, FL 33580

Paper presented at the Annual Meeting of the Florida Association of Milk, Food and Environmental Sanitarians, May 1984.

INTRODUCTION

Among the various cultured dairy products produced in the United States, Cultured Buttermilk shows the widest possible variation in quality. Cultured Buttermilk has been the Cinderella product of the dairy industry. Dairy plants in general (there are always exceptions) have over the years relegated the production of Cultured Buttermilk to almost a status of neglect. Is this an exaggeration? Yes, maybe to a certain extent, but have you ever thought about the location of the Buttermilk vat in your plant? Is its floor-location conducive to maximum sanitation? Is it located right next to chocolate milk production-vats where milk powder or chocolate dust are carried in air currents? Is it located in an area that allows cleaning, washing and sanitation of the floor and the walls around the tank? Are you *just* interested in getting the titratable acidity (TA) to 0.85 - 0.95% in the skim milk as fast as possible, bottling the product and calling it Cultured Buttermilk, irrespective of its body, texture, aroma, flavor and shelf-life?

Frankly, these sins of omission have been thrust upon us with the increase in the size of operations, tight scheduling calling for quick turn-over of tanks, and the ever increasing demand on man-power and equipment with greater volume of milk processed in the plants. Why is it we advertise and label our products "Country Style Churn Buttermilk" or "Farm-Style Buttermilk?" Today, we have a much better understanding of the science and technology of Buttermilk manufacture and, as a result, should produce a product better than or at least equal to the farm-made Buttermilk of yester years. With a little bit of understanding of scientific principles and a lot of emphasis on sanitation, we should be able to produce a top quality product.

At the beginning of this article, Cultured Buttermilk was referred to as the Cinderella product of the dairy industry. If the dairy industry is looking for a product to fit the dazzling glass slipper for the second half of the 1980's, Cultured Buttermilk is the princess. Let us look at the virtues of Cultured Buttermilk:

1. Firstly, it contains all the high quality nutrients in milk. It is rich in calcium, and, unlike cheeses, there is no loss of the high quality whey proteins in its production.

2. Secondly, there is very little or no milk-fat in Cultured Buttermilk, which is usually made from skim milk. Consequently, it contains very little cholesterol.

3. Thirdly, there is about 15% less lactose in Cultured Buttermilk as compared with milk. This may be beneficial for marginally lactose-intolerant individuals.

4. Unless salted, which in many cases is unnecessary, Cultured Buttermilk can be labelled as a "sodium free" or "low sodium" product. Sodium content of foods is gaining importance because of the recognition of the relationship between sodium intake and high blood pressure. Recently, the FDA published the recommendations for labelling of foods for sodium content.

5. Cultured Buttermilk provides an excellent base for making various kinds of dressings which require a smooth, tangy flavor. It has been rediscovered as an excellent ingredient in biscuits and pancakes, especially by the large chains of fast food establishments, to obtain the "fluffiness" and slight "sourness." And the demand is increasing.

6. Finally, Cultured Buttermilk is a refreshing drink either plain or flavored.

What is wrong with Cultured Buttermilk as it is marketed today? We have to examine four attributes to answer this question:

* Does it have a good, thick body?
* How smooth and rich is its texture?
* Does it have the desired acidity, diacetyl flavor and carbonation?
* What about its keeping quality under normal marketing channels and general usage practices in the consumer's home?

According to these criteria, many of the samples picked up at grocery stores are of ununiform quality ranging from very poor to good. Lack of uniformity is the major comment heard about Buttermilk samples submitted at the Annual Cultured Products Judging held by the American Cultured Dairy Products Institute (ACDPI). How can we right the wrongs so that we can produce a uniformly top quality Buttermilk? A good place to start is by evaluating current production practices against "ideal" technology that would yield an excellent product.

RAW MATERIALS

Table 1 lists the "ideal" combinations of raw materials needed for making excellent Buttermilk, contrasted against some of the current practices in the industry. To make top quality product, fresh skim milk with high non-fat milk solids content should be used. For good body and texture, the minimum non-fat solids content should be 9.0%; a better product is obtained with 9.25 - 9.50%. To bring the solids content up to 9.25 - 9.50%, high-grade, high-heat, spray-dried, easily soluble non-fat milk powder should be used. High-heat, spray-dried product has a better water-holding capacity than low-heat powder. Solubility of the powder is important, because undissolved powder may cause lumpiness, sandy, gritty or granular texture, and occasionally burnt flavor caused by undissolved powder in contact with the sides of the product vat getting burnt during heat-treatment of milk. Skim milk powder is the best ingredient to build up solids level because casein in milk is the component that forms the coagulum and acts as the sponge that holds up the moisture. Each pound of "native" casein can hold up to 1.5 pounds of water. So fortification of fluid skim milk with non-fat milk solids not only ensures good, heavy body but also prevents "wheying-off." Additionally, higher milk solids content provides good buffering and allows higher titratable acidity development if so desired.

TABLE 1. *Raw Materials Used in Cultured Buttermilk Manufacture.*

Ideal Combinations of Ingredients	Wrong Practices in Dairy Industry
*Fresh Skim milk Low-fat milk *Fresh Skim milk non-fat dry milk solids (NFMS) *Reconstituted high-heat spray-dried NFMS with good solubility *Minimum non-fat solids needed is 9%. Better with 9.25 - 9.50% *For uniform diacetyl flavor add 0.05-0.15% sodium citrate	*Use of Skim milk with low solids-contents *Use of wrong materials to increase solids level; eg. whey, lactose, "stabilizers" *Use of poor quality milk; high psychrotrophic count, high ADV content, presence of antibiotics, agglutinins *Use of return milk

Alternatively, one can use reconstituted skim milk powder in the place of fresh skim milk. With reconstituted skim milk powder, it is a little more difficult to achieve a "fine bouquet" and a smooth body. The apparent lack of fine flavor in Buttermilk made from reconstituted skim milk powder is primarily caused by its tendency to coat the tongue which masks flavor perception. Fresh low-fat milk (1-2% milk fat) yields an excellent product because milk fat gives richness, smoothness and mellowness to the flavor and body of Cultured Buttermilk.

From a flavor viewpoint, addition of 0.05 to 0.10% sodium citrate gives a uniform diacetyl flavor and sufficient carbonation. Flavor bacteria in Buttermilk starters (*Leuconostoc* spp.) convert naturally occurring citrate in milk into diacetyl. During the bio-synthesis of diacetyl from citrate, CO_2 is formed as a by-product. Citrate level in herd milk is highly variable during the year and may range from a low of 0.07 to a high of 0.20%. Actually, even the higher limit of 0.2% citrate in milk is insufficient to provide uniformly high diacetyl flavor from day to day, because diacetyl synthesized from citrate by flavor bacteria is converted to a flavorless compound, acetoin, by flavor bacteria themselves and other contaminating psychrotrophic bacteria. The synthesis of diacetyl and its conversion to acetoin occur simultaneously, but the synthetic phase proceeds at a greater pace when citrate levels are above a critical concentration. During this phase, diacetyl accumulates; but, once the citrate concentration falls below the critical level, destructive phase out-strips synthetic cycle and accumulated diacetyl is rapidly reduced to acetoin. Fortification of milk with 0.05 - 0.1% sodium citrate provides more substrate for diacetyl and CO_2 production and allows the diacetyl synthetic phase to last a little longer so that steps can be taken to arrest rapid conversion of diacetyl to acetoin. Generally, peak level of diacetyl is found between 0.68 - 0.78% titratable acidity (TA), and if Buttermilk is rapidly cooled to below 50F in that acidity range, loss of diacetyl flavor can be minimized. In milk without citrate fortification, if incubation is continued beyond 0.78 - 0.80% TA, diacetyl concentration falls precipitously. With citrate fortification, the decline in diacetyl level during incubation beyond 0.78% TA can be delayed. This allows development of higher TA required for certain markets without complete loss of essential diacetyl flavor.

Current practices in the farm and the processing plant lead to lower solids content in milk. Breeding practices to select for higher milk fat yield has to a certain extent lowered the protein content of milk. Water is used to push last portions of milk through the lines from the farm bulk tank to the tanker truck, and from the tanker truck to the milk silo and through processing equipment. So

dilution of milk occurs unintentionally. As a result, fresh skim milk could have a low solids level. This, however, can be alleviated by fortification with non-fat milk solids. The price of skim milk powder has been gradually increasing. Hence, many plants have turned to other cheaper ingredients to increase solids-content, although these substitutes have little or no beneficial attributes of non-fat milk powder. Some of the ingredients currently used include whey powder and lactose. Whey powder mainly consists of lactose, whey proteins and salts. Whey proteins do not form the milk coagulum except as a portion of the co-precipitate. The main coagulum is composed of casein matrix. Lactose, which makes up the major portion of whey solids, does not contribute to the body of Buttermilk. Also, adding lactose to skim milk does *not* accelerate fermentation because milk sugar is not the limiting factor in milk fermentations. In reality, milk contains such an excess of lactose that only 14-15% of the sugar in milk is consumed in Buttermilk fermentation. Instead of correcting problems associated with low solids in milk, addition of whey and lactose may lead to grainy texture, coarseness, caramelization and burnt flavor, and masking of the fine diacetyl flavor in the finished product.

Another ingredient added to skim milk to "help and preserve" the body of Cultured Buttermilk through post-incubation handling is stabilizer. Commercial stabilizers for Buttermilk contain gums and other hydrocolloids that bind and hold water, rennet, calcium chloride ($CaCl_2$), and fillers like whey powder or lactose. Gums and other hydrocolloids may help in preventing extensive breakdown or thinning of body and accompanying "whey-off" if the product is subjected to undue agitation, pumping and rough handling during post-incubation operations. Calcium chloride, although useful in aiding the thickening action of rennet, may be counterproductive by stimulating phage growth at the beginning of fermentation by providing free, soluble Ca ions necessary for phage absorption. In reality, stabilizers are unnecessary for the production of top quality Buttermilk if proper care is exercised in post-incubation handling operations.

Another facet to be considered is the quality of milk. The length of time that transpires between production of milk at the farm and its conversion to cultured products and intervening refrigerated storage have favored the predominance of psychrotrophic flora in raw milk supplies. Psychrotrophs as a group are metabolically versatile; many psychrotrophic bacterial species produce heat-sensitive and heat-stable proteolytic and lipolytic enzymes. Weak curd formation in cheese and cultured products has been consistently observed when milk with high psychrotrophic numbers (indicative of psychrotrophic growth) is used. This may be attributed to slow breakdown or modification of milk protein during refrigerated storage by proteolytic enzymes liberated by psychrotrophs. In Buttermilk production, weak curd formation results in poor, runny body or rapid loss of firmness during post-incubation operations.

Lately, the acid degree values (ADV) of incoming raw milk have been showing an upward trend during the warm months. ADV is a measure of milk fat breakdown. Although the increases in ADV are not reflected in the perception of rancid off-flavors in milk (the level of free fatty acids are below threshold concentration), the increased concentration of free fatty acids, especially C_6 series, do cause a slowdown in starter activity. Fatty acids of the C_6 series are inhibitory to lactic streptococci used in Buttermilk starters. Again, the increases in ADV could be attributed to psychrotrophic activity.

Another biological component in raw milk supplies that interferes in cultured product manufacture is *agglutinins*. Agglutinins in milk are antibodies produced in the mammary tissue in response to infections, for example, mastitis. Agglutinins inactivate bacteria by clumping them together. Starter strains vary in their sensitivity to the antibody. In milk containing agglutinins, sensitive starter strains are clumped together in pockets. Intense acid production in and immediately around the clumped cells causes localized curd formation. Thickened areas become heavy and settle to the bottom of the vat carrying the entrapped bacterial cells. Uneven acid production occurs in the vat, resulting in stratification with heavy curd and/or sludge at the bottom and varying degrees of thickening at the upper layers with the uppermost layer remaining fluid. Work done in Canada showed that heating at 176F for 15 min. is required to eliminate agglutinins in milk. High concentrations of agglutinins in pooled milk are also found during the freshening season. Colostrum contains high levels of antibodies. Compositional changes in milk during the post-parturition period (period immediately following calving) last at least for 5 days, *but may persist longer*. So milk during freshening season may contain fairly high titen of agglutinins even if milk producers do not co-mingle milk from newly freshened cows for the usual period of 5 days.

During seasons when mastitic infections occur, raw milk supplies are invariably contaminated with varying levels of antibiotics used in therapy. Antibiotics normally used in mastitis therapy severely curtail starter bacterial growth and activity. Most antibiotics are fairly heat-stable which renders milk contaminated by these drugs unsuitable for cultured product manufacture. Routine antibiotic testing of producers' milk is a must for all dairy plants. Similarly, quaternary ammonium compounds (quats) in residual amounts, unlike hypochlorites, are fairly stable and inhibitory to starter bacteria. Quats should not be used in cultured dairy product plants.

The afore mentioned quality variations in milk should be borne in mind by the processor, and adequate preventive measures should be taken and processing and technological adjustments made to obtain a high quality Buttermilk.

There are a few additional factors that should be included under the heading "Raw Materials." One common practice that is detrimental to the quality of Buttermilk is the use of "return milk" in its manufacture. This should be avoided.

Other obstacles to the production of top quality Butter-

milk come from incomplete or poor understanding of the physiochemical and biological properties of milk. Such lapses in understanding lead to chronic problems, especially in making high quality cultured products with whole milk or low-fat milk. Caution is necessary in such operations, especially if co-mingling of raw skim milk and homogenized whole milk is practiced. Homogenization of milk breaks down milk fat globules into smaller and uniformly-sized particles. During homogenization, the milk fat globule membrane is disrupted and the fat globules are stripped of their protective membrane. The reduction in size of the globules greatly increases the exposed surface area. Under these conditions, milk fat is extremely vulnerable to fat-splitting enzyme, milk lipase present in raw milk. The degree of fat breakdown when raw skim is co-mingled with homogenized milk depends on the contact time (period elapsing) before the temperature of co-mingled milk attains 140F during heat-treatment prior to inoculation with starter. Milk lipase is inactivated at about 135F. In extreme cases, if the contact time is sufficiently long, the Buttermilk becomes rancid. Generally, the contact time is not long enough to cause rancidity or other off-flavors but sufficient to liberate low concentrations of fatty acids, including the C_6 series. In such instances, inhibition of starter activity is observed. This is reflected in the prolongation of set-time to attain a specific TA.

Sometimes the homogenizer is used as a positive pump to convey skim milk into Buttermilk vats. This, however, should be done without application of any pressure on the homogenized valves. Forcing milk under pressure through homogenizer valves modifies milk protein such that it does not yield a very firm coagulum. So the curd is soft and the Buttermilk has a weak body.

Earlier, the need for fortification of milk with citric acid or its soluble salts was emphasized. Federal Regulations allow the addition of a maximum of 0.15% citric acid or its salts to milk in the production of Cultured Buttermilk. Very few processors add this ingredient; others consider that addition of citrates increases the cost of production. This is unfortunate because uniformly good flavor Buttermilk would give the product the competitive edge in the market place, and increased sales volume would far outweigh very little added cost in fortifying milk with citrate.

HEAT TREATMENT OF MILK

For making excellent Buttermilk, skim milk should be heat-treated at 185-190F for 30 min. Firstly, such a treatment destroys all biological competition in the vat, including bacterial spores which are usually found in milk powders. It also destroys phages. Further, it favors the interaction of k-casein with whey proteins which facilitates coprecipitation of whey proteins with casein. Additionally, such interaction increases the water-holding properties of the coagulum. The time-temperature combination of 185-190F for 30 min. causes a slight protein breakdown releasing peptides which are stimulatory to starter bacteria. There is also the expulsion of dissolved oxygen and formation of sulphydryl compounds which provide an ideal environment for starter growth. Lastly, such treatment is usually done in a vat, a *closed system,* which avoids chances for contamination.

Current practices in heat-treatment of milk are highly variable. In the Southeastern United States where much of Cultured Buttermilk is made and consumed, the daily production volume in some of the larger plants has increased considerably. There are more than a dozen plants in this area that produce at least 5,000 gallons of Buttermilk per day. Capital outlay in purchasing enough tanks for in-place heating, cooling and setting such a large volume of milk is quite high. Many of the plants do not have sufficient steam generating and refrigeration capacity, over and above normal plant demands on these systems, to heat and cool a series of tanks needed for such large volumes. Come-up times for attaining 185-190F in vats larger than 1000-gallon capacity are very long, and such prolonged heating of milk results in the formation of excessive amounts of browning compounds, especially aldehydes, which are inhibitory to starter cultures. Additionally, excessive heating of milk reduces curd tension in the Buttermilk, leading to weak, runny body and possibly wheying-off. Because of such practical considerations, more and more processors are shifting to high temperature short time (HTST) pasteurization of milk for culturing. Although this has offered a viable alternative, many of the benefits of vat heat-treatment (185-190F) are lost.

Regular HTST treatment of milk does not provide maximum destruction of microbial contaminants in milk, especially the spore-formers, which are usually found in milk powders. Also, complete destruction of phages is not achieved. HTST pasteurization is insufficient to predispose whey proteins to completely coprecipitate with casein. Hence, the increase in body characteristics obtainable with vat heat-treatment at 185-190F for 30 min. is not found with HTST treated milk. Because agglutinin destruction requires treatment for 15 min. at 176F, regular HTST-treatment (163F for 17 sec.) is inadequate to inactivate agglutinin. If Buttermilk were to be used in bakery goods, it is necessary to obtain complete denaturation of whey proteins to obtain the "rise" in baked goods. Vat heat treatment (185-190F for 30 min.) achieves this requirement, while HTST does not. Further, HTST-treatment involves passage of milk through pipes, pumps, balance tanks, regeneration-heating-cooling sections and flow-diversion valve; the milk thus treated then has to be conveyed to the Buttermilk vat. This makes the process an "*open system*" that allows various points for contamination to occur with foreign bacteria and phages.

Some of the benefits, especially those related to body characteristics of Buttermilk, lost through HTST treatment can be partially recovered by adjusting the flow-diversion valve to 180-185F and extending the holding time

to 1 1/2 to 2 min. by adding an extra section of loops that can be cleaned-in-place with the rest of the equipment and dismantled when necessary.

SETTING

Ideally, after heat-treatment, milk should be cooled rapidly to the setting temperature and inoculated with starter. If for some reason the tank cannot be inoculated soon after cooling to the setting temperature, it should be cooled further to 40-45F and held under refrigeration. Later when convenient, the tank should be reheated to the setting temperature and inoculated. If the tank is held too long at setting temperature without inoculation, any surviving bacteria or spores can initiate growth unhindered and impair the quality of Buttermilk.

To obtain good flavor, the vat should be set at 70-74F. At this temperature range, a balanced growth of acid and flavor organisms occurs. Also, at these temperatures, reduction of diacetyl is not precipitous and can be arrested by timely cooling of Buttermilk. Temperature control during incubation is important. Recording charts and thermometers should be periodically calibrated for accuracy.

At present, because of the large volume of milk handled, dairies aim for rapid turn-over of tanks and filling machines. Some dairies require 10 to 12-hr. sets for Buttermilk. Such scheduling calls for very fast acid production in the vat. Hence, high setting temperatures (78-80F) are used to speed up acid production. In large tanks as fermentation proceeds vigorously in a quiescent state, heat is generated and the internal temperature in the vat may rise by about 2 to 4F. Under these conditions, acid producers in the starter grow at a much faster rate than aroma bacteria. Because of such unbalanced growth, the final product is acidic, with little or no aroma and flavor. Such a product is more appropriately "sour milk" and not Cultured Buttermilk. When higher setting temperatures are used, close monitoring of TA is necessary to prevent excessive acidity, *rapid* loss of flavor, wheying-off and bitter flavor development in the finished product. Lack of good diacetyl flavor in Buttermilk set at higher temperatures may be remedied by fortifying milk with citrate up to 0.15% and by rapid cooling after the desired acidity is attained.

BREAKING AND COOLING

Breaking the coagulum should be done gently to preserve as much of the body as possible. Too vigorous a stirring at break will shear the body. The shape, angle and size of the agitator blade affects the vortex of the fluid being mixed and hence its shearing effect on the fluid. In large tanks, stirrers with a single small agitator blade cause excessive shearing at the bottom layers of the coagulum. Specially designed tanks and stirrers for large tanks which prevent shearing have been described in the literature. (Tamime and Greig, 1979).

Breaking and cooling represent a single combined operation. Gentle breaking and cooling operations are especially important when special cultures capable of producing "heavy body" are used. Such cultures contain specific proportions of specially selected lactic *Streptococcus* strains that produce capsular slime, which acts as a "natural" stabilizer in the coagulum. Rough handling during breaking and cooling destroys the capsular polysacharide matrix that imparts enhanced body and water-holding capacity to the Buttermilk. Cooling should be rapid to get the temperature down to 50F. Rapid cooling arrests excessive acid accumulation and loss of diacetyl flavor. Plate cooling destroys body.

FILLING

A top quality product in the vat can be lost if improper practices are used in operations connected with filling. In drawing Buttermilk from the vat to be conveyed to the filler, the best procedure to use is gravity flow. Alternatively, air pressure could be used to evacuate the tank. If pumps are necessary, a positive pump with back pressure should be used. Centrifugal pumps cause excessive shearing of body and should *not* be used.

All pipes from the vat to the filler should be of uniform diameter. Any sudden reduction in the diameter of pipe can cause a shearing effect. So also may the presence of too many elbows and steep upward gradients cause shearing.

Lines to filler and filler machines represent the major source of psychrotrophic contamination. Lines, hoppers and filling ports should be flushed with scalding hot water followed by chlorine rinse just before filling. Moving parts in the filler should be dismantled, hand cleaned and sanitized after every run. Periodically the lines and filler should be acid cleaned to remove milk stones.

Psychrotrophic flora cause rapid loss of diacetyl flavor, and induce off flavors, off odors and discoloration in Buttermilk. The rapid loss of diacetyl is due to highly active diacetyl reductase produced by *Pseudomonas* spp. Off odors and flavors generally result from protrolytic and lipolytic enzymes from psychrotrophs. *Pseudomonas* spp. also produce water soluble and fluorescent pigments which impart unnatural taints.

SANITATION

Sanitation is the key to successful production and marketing of Cultured Dairy Products. All milk contact surfaces should be cleaned-in-place and sanitized after use. Periodic black light check of contact surfaces for milk stones is necessary. Routine acid cleaning to keep contact surfaces free of milk stones is advisable. Gaskets and

rubber parts should be soaked in 5% NaOH to remove grease and protein deposits. It is a good practice to replace gaskets after a certain duration.

As pointed out earlier, location of the Buttermilk vat is important. The exterior of the vat should also be washed and cleaned every day. Buttermilk vats should *not* be located directly below air conditioning or air circulating vents.

Floors and drains are potential sources of phage and psychrotrophic contamination. Floors and drains should be treated every day with a phenolic sanitizer.

Finally, competent reliable employees should be used for Buttermilk production. Proper, sanitary work habits should be stressed.

REFERENCES

1. Tamime, A. Y. and R. I. W. Greig. 1979. Dairy Industries International 44(9):3.

Canadian Institute of Food Science and Technology 28th Annual Conference

The Canadian Institute of Food Science and Technology's 28th Annual Conference will be held June 23-26, 1985 at the Royal York Hotel in the heart of Toronto (416-368-2511). Our theme is "Food Links for Progress."

Our theme is designed to provide a platform for dialogue to food professionals around the world so that we may obtain a better understanding of how we can mutually benefit from working together. This will be accomplished by an excellent program of technical sessions, social events, companion programs, student activities and exhibit booths showing equipment, services and raw materials.

For more information contact: Mr. Bill Munns, Conference Chairman, Canada Packers Inc., 95 St. Clair Avenue W., Toronto, Ontario M4V 1P2, Canada. 416-766-4311.

Know Your Food Additives

Food additives are found in grocery products ranging from baby foods to coffee creamer. In fact, Americans swallow about five to ten pounds of emulsifiers, preservatives, flavorings, colorings, acids and vitamins in their food each year.

Yet few consumers can distinguish between products that use additives for a useful purpose, versus those that use additives to make a less-nutritious product more attractive, says Marilyn Haggard, a Texas A&M University Agricultural Extension Service nutritionist.

On the positive side, she says, preservatives help prevent spoilage, while emulsifiers keep water and oil mixed together. Vitamins and minerals add nutritional value.

According to the nutritionist, some of the most common useful additives include:

- Calcium propionate -- inhibits mold growth in bread.
- Polysorbate 60 -- an emulsifier.
- Beta carotene -- an artificial coloring that the body converts to vitamin A.
- Citric acid -- an acid that occurs naturally in citrus fruit.
- Thiamin mononitrate -- a nutrient (vitamin B-1).
- Carboxymethyl cellulose -- a thickening agent.
- Sorbic acid -- a preservative.
- Casein -- a protein that is obtained from milk.
- Vanillin -- the main flavor component of vanilla.

However, shoppers should be concerned when additives are used as a replacement for nutritional foods, says Haggard. For example, thickening agents are sometimes used to make a food look rich and thick, even if it contains smaller amounts of ingredients than a competing brand.

Artificial colorings and flavorings are sometimes substituted for fruit, chocolate or other real foods, she explains. Caramel coloring can make white bread look like whole wheat bread.

Flavor enhancers such as MSG may suggest to the eater that a food contains more meat than it really does. And vitamins added to sugary, non-nutritious foods permit extravagant nutritional claims, notes Haggard.

All food additives are tested by private companies. The Food and Drug Administration (FDA) then evaluates the tests and decides whether the chemical may be used in food, says the nutritionist.

Mr. and Mrs. Pat J. Dolan, not pictured is Orlowe Osten.

Osten, Dolan Honored By 3-A Symbol Council

Orlowe M. Osten and Pat J. Dolan recently were recognized for their service to the 3-A Sanitary Standards Symbol Administrative Council. Recognition plaques were presented to Mr. Osten in St. Paul by Symbol Council Chairman Warren S. Clark, Jr. and Vice-Chairman Carl F. Nielsen. Mr. Osten served as a Trustee of the Council from 1976-1984; he is the former Director of the Dairy Division, Department of Agriculture, State of Minnesota. Mr. Osten also is a past-president of the International Association of Milk, Food and Environmental Sanitarians.

The Council recognized Mr. Dolan during its semi-

annual meeting in San Francisco on October 16. Mr. Dolan served on the 3-A Symbol Council from 1972-1983, as a representative of the IAMFES. He previously served as Regional Administrator, California Department of Food & Agriculture until his retirement in 1977. Mr. Dolan currently serves as a consultant to the dairy industry.

The 3-A Sanitary Standards Symbol Administrative Council was organized in 1945. It is comprised of representatives from the Dairy & Food Industry Supply Association (equipment manufacturers), the Dairy Industry Committee (processors of dairy products) and the IAMFES. The objectives/purposes of the Council are, through voluntary action, to promote the public health, minimize confusion and conflict in the field of standards relating to the sanitary performance of dairy equipment, and to encourage the use of dairy equipment of sanitary design by administering and supervising the proper use of the 3-A Symbol, emblematic of compliance with standards of sanitary design developed by the 3-A Sanitary Standards Committees.

Additional information about the 3-A Symbol Council may be obtained from: Mr. Robert E. Holtgrieve, Secretary-Treasurer, 3-A Sanitary Standards Symbol Administrative Council, W255 N477 Grandview Boulevard, Suite 100, Waukesha, WI 53186.

Novel Plastic Pump May Provide Safe Water For Millions

A novel plastic pump, developed in cooperation between Canadian and Third World researchers, may provide the leverage needed to help millions of people in developing countries escape from a cycle of water-borne diseases that kills millions annually.

As described in the October issue of IDRC *Reports* magazine, the key element of the pump is a simple piston manufactured from PVC (polyvinyl-chloride) plastic. The piston is cheap, rugged, and can be readily made in developing countries.

By the end of the decade, close to 2 billion people will require new, clean water supplies. Most of them will be in rural areas where a reliable handpump is the only practical alternative to polluted water drawn from unprotected wells or streams and pools. The disease carried in contaminated water, and the hardships involved in obtaining water from distant supplies, exacts a terrible toll. Children are the hardest hit -- an estimated 5 million die each year from diseases associated with poor water supply and sanitation.

Supported by Canada's International Development Research Centre, researchers at the University of Waterloo carried out early development of the pump. A global testing network involving laboratory and field studies in England, Malaysia, Ethiopia, the Philippines, Sri Lanka, Thailand and Malawai adapted and refined the pump design.

Also in the October issue of *Reports:*

- a program to teach Indochinese refugees in Thailand in their own languages may be the beginning of a new life
- sexually transmitted diseases assume a global importance
- the poor in Central America battle one another to survive in hard times.

Reports, a magazine of features and commentary on development, is published four times a year by the International Development Research Centre. Editor-in-chief is Rowan Shirkie. The IDRC is a corporation created by the Parliament of Canada in 1970 to stimulate and support research designed to adapt science and technology to the needs of developing countries.

For more information contact: Tony Lovink, 613-236-6163.

Pharmacy Experts Disagree On Use Of Vitamin Supplements

Are most of the Americans who take vitamin supplements wasting their money on an unnecessary product? Two experts in the field of pharmacy offer different views on this issue in the May/June *ACSH NEWS & VIEWS,* a publication of the American Council on Science and Health (ACSH).

Millions of Americans are indeed taking unnecessary vitamin supplements, according to Dr. Murray Tuckerman, Professor of Pharmaceutical Chemistry at the Temple University School of Pharmacy in Philadelphia.

Dr. Tuckerman cited survey results indicating that about 98.8 million people in the U.S. take vitamin supplements. "Assuming that all of these people are normal and healthy and eating a standard American diet, none of them should require a vitamin supplement," he said.

"Supplements might be required for those in calorically deficient diets (weight reduction diets) if the diets are prolonged (more than three weeks)," Dr. Tuckerman told ACSH. "Others on nutritionally inadequate diets need dietary correction rather than vitamin supplements."

A different view was presented by Dr. David Roll, Associate Dean for Academic Affairs and Professor of Medicinal Chemistry at the University of Utah College of Pharmacy.

"There is a large body of the population who might benefit from supplementation, just as there are

those who are probably receiving no physiological benefit from taking supplements," he said in the ACSH interview.

"I believe it is important to emphasize that in the area of vitamin supplementation, there is a great deal of subjective opinion," Dr. Roll continued. "Unfortunately, some advertising for vitamin supplements plays on the uncertainty of our knowledge. Just as unfortunate is the belief perpetuated by some that supplementation is of no value to anyone."

Dr. Roll pointed out that four major national nutrition surveys have shown that some segments of the U.S. population have vitamin intakes below the recommended levels. "We need to better identify the segments of the population who would most benefit from supplementation and then do what we can to improve their nutrition," he said.

The medical risk from taking a low-dose multivitamin supplement is "negligible," according to Dr. Roll. He warned, however, against the medically unsupervised use of "therapeutic" or "stress" vitamins, and against the use of vitamins to treat the symptoms of serious disease.

The American Council on Science and Health is an independent, nonprofit consumer education organization promoting scientifically balanced evaluations of food, chemicals, the environment, and health. ACSH has offices in New York, New Jersey, and Washington, D.C.

Copies of *ACSH NEWS & VIEWS* are available from ACSH, 47 Maple St., Summit, NJ 07901.

Statistical Quality Control Short Courses Offered

Two sequential, intensive, two and one-half day "Deming type," Statistical Quality Control (SQC) Short Courses for the food processing and food related industries will be held April 15-19, 1985 at the University of California, Davis. The course will cover modern statistical problem solving tools, developed in the U.S. and used extensively and successfully in Japan. Dr. W. Edwards Deming, a prominent American statistician, has been instrumental in bringing these statistical approaches to Japan.

The SQC Short Courses are for managers, superintendents, food technologists, quality assurance personnel and administrators who deal with statistical quality control in food production facilities.

Both short courses will cover selected material on statistical quality control and emphasize practical examples and individual and small group exercises.

The "Statistical Methods and Techniques" short course, from April 15-17, will teach basic statistical approaches used to increase productivity through quality assurance. In problem solving sessions, the attendee will learn how to improve productivity through raw data analysis and data mechanics.

The "Applications of SQC to the Jobs of Quality" short course, from April 17-19, will show how statistical analytical tools improve profitability through product quality. The course will emphasize the effective application of statistical methods to achieve cost effective quality and production systems.

Most of the instructors will be available throughout the week to consult individually with students who have specific statistical problems. (Certified Quality Engineers may earn re-certification units by attending each SQC Short Course.)

The registration fee for the "Statistical Methods and Techniques" short course is $190; the "Applications of SQC to the Jobs of Quality" short course is $190. The registration fee for attending both courses is $380. Reference materials, lunches, beverage breaks, and a banquet are included in the registration fee. Registrants will receive a certificate of course attendance.

For further information about the short courses, contact Robert C. Pearl, Food Science and Technology Department, University of California, Davis, CA 95616. 916-752-0980.

A Closer Look At The Premium Frozen Dinner

With their gourmet names and fancy packaging, today's "upscale" frozen dinners seem quite different from the ordinary TV dinner on an aluminum tray. But that difference is mostly a matter of cost and type of ingredients rather than nutrition, says a Texas A&M University Agricultural Extension Service nutritionist.

The premium frozen food category has enjoyed meteoric growth, gaining about 35 percent in sales volume last year, says Dr. Alice Hunt. Sales are expected to triple in the next several years, she adds.

To find out whether the premium products are really different from their competitors, Extension researchers at Cornell University compared several poultry dinners and entrees for differences in calories, sodium content, ingredients and cost, reports Hunt.

They found variation in food combinations, with the more expensive premium dinners offering rice and wild rice pilafs and unusual combinations of vegetables instead of mashed potatoes, peas and carrots.

The dinners also vary on the quality of the main ingredient, she notes. The least expensive products are made from turkey rolls, for example, rather than whole turkey. Some products are labeled "gravy with

turkey," indicating more gravy than turkey. Some of the least expensive products list broth first in their ingredient statement, showing that it is the most predominant ingredient by weight.

However, buying a premium dinner is no guarantee that you'll get more food, says Hunt. According to the Cornell study, calorie counts are relatively uniform among both premium and TV dinners. Most contain 28 to 32 calories per ounce. The weight loss promised on many of the low-calorie meals is mostly a matter of portion control rather than low-calorie cooking, since the calorie count per ounce is about the same as other products, says the nutritionist.

In addition, neither type of prepared dinner could be recommended for low-sodium diets, she observes. Some premium products are lower in sodium than TV dinners, but they still contain more than one gram of sodium. Not all frozen products are labeled with nutrition information or sodium content, so people on low-sodium diets would need to be cautious, adds Hunt.

Except for sodium, frozen meals -- whether premium or the TV variety -- are about the same nutritionally as home prepared food, says Hunt, and many of them represent a well-balanced meal.

Jackson Products, Inc. Manufacturer of the Year

The first recipient of the Commercial Food Equipment Service Association's Manufacturer of the Year Award is Jackson Products, Inc., Tampa, Florida. The award was presented at CFESA's Fall Banquet, October 22nd in Nashville, Tennessee.

Accepting the award on behalf of Jackson Products, Inc. was president of the firm, John Hollister, and national service manager, Jack Muzzio. The selection of the recipient was made by a mail ballot vote of the CFESA membership. Criteria for selection included manufacturer warranties, parts, products, communications with factory, service training, contracts, and literature.

Commenting on the purpose of the award, Chairman of the CFESA Industrial Liaison Committee Bob Bradford (EMR Services, Baltimore, Maryland) notes, "We would like to recognize, as an organization, the manufacturer who provides overall consistent service to service agencies. As an annual award, we hope to provide a stimulus to other manufacturers to enhance the service which they provide."

Roundtable discussion topics held at the Fall Conference were devoted to the subject of manufacturer service. Manufacturers and service agencies alike shared ideas on how such service could be improved. Written summaries of these discussions are available from CFESA Headquarters, 8600 W. Bryn Mawr, Suite 720S, Chicago, IL 60631.

ACDPI Mini-Klinic Held In Toronto

The recent American Cultured Dairy Products Institute (ACDPI) mini-Klinic held in Toronto, Ontario, Canada received rave reviews from the 37 delegates who represented 9 Canadian dairy companies and 5 U.S. firms.

According to Institute Vice President Dr. C. Bronson Lane, the two and one-half day intense training session dealt with the "basics" of cultured dairy commodity processing. Participants received instruction in basic microbiology, sanitation principles, product formulations, culture programs, and were provided "hands on" experience in recognizing defects in buttermilk, sour cream, yogurt, and cottage cheese.

Featured Klinic instructors included: Dr. Ron Richter, Texas A&M University; Dr. Ed Custer, Mississippi State University; Dr. Charles White, Louisiana State University; Earl Connolly, Fantasy Flavors, Inc.; Fran Lavicky, Nordica International. Presentations were also given by Dr. Vic Amer, Dairy Bureau of Canada, and Jeff Edwards (ACDPI Board Chairman), The Kroger Company.

The Institute will conduct two mini-Klinics in the Midwestern and Western sectors of the U.S. during 1985.

Chinese Dairy Specialists Visit SURGE Research Facilities

Babson Bros. Co., builders of SURGE dairy farm equipment, recently hosted a team of dairy specialists from the Peoples Republic of China.

Based in Peking, the five-member delegation, headed by Dr. Youchun Chen (Deputy Director of The Animal Breeding and Genetics Section of the China Academy of Agricultural Sciences), was in the U.S. studying leading dairy research institutions and equipment manufacturers. The purpose of their research is to make recommendations on the purchase of dairy production and processing equipment. These recommendations will be used by the Chinese Institute of Animal Science in the establishment of a 200-head dairy breeding, management and research facility in China.

The research team met with officials of Babson Bros. Co. for two days at the corporate offices and

research facilities located in Oak Brook, Illinois, and also toured the nearby Surge Training Center. They were shown all of the facilities at the center, and it was explained how the continuing education of dairy service personnel is essential for the proper maintenance of the equipment. Babson Bros. Co. holds weekly sessions throughout the year, training and/or updating about 1,000 members of its dealer network and their employees annually.

The Chinese delegation was instructed on industry-wide sanitary standards, proper milking techniques, and were shown state-of-the-art features on much of the SURGE product line equipment.

Also included in the Chinese delegation were Xikun Hu, Chief of Farm Administration; Fengchun Wu, Deputy Chief of Farm Administration Research; Zhenhuan Su, Vice Director of Administration Research; and Shangzhong Xu, Research Associate.

Paperboard Packaging Council Campaign On Advantages Of Paperboard Cartons Can Continue

A temporary restraining order request by the Society of Plastics Industry (SPI) to stop the Paperboard Packaging Council's (PPC) successful two and one-half year advertising and public relations campaign to raise consumer awareness of the advantages of paperboard milk cartons has been denied, according to Spencer Johnson, secretary - milk packaging group, Paperboard Packaging Council.

The PPC campaign is designed to promote the nutritional advantages of paperboard milk cartons in protecting milk from vitamin and flavor losses caused by exposure to light -- especially the fluorescent light in supermarket dairy cases.

After reviewing the SPI complaint, a district court judge denied the SPI request for a temporary restraining order, citing that SPI had not shown that the campaign would cause irreparable injury to SPI, and that SPI had not shown a high likelihood of success in proving that advertising claims in the campaign are "false and misleading."

In market areas where the PPC campaign has been conducted, many consumers have changed their milk buying habits by switching from translucent plastic jugs to light-blocking paperboard milk cartons. Dairies who offered the paper Gallon 2-Pak saw their participating supermarkets increase total milk sales as much as 15 percent over the same three-month period in the prior year. And dairies reported that participating supermarkets sold up to twice as much milk in paper cartons than before the program.

Johnson said that the PPC intends to defend vigorously the claims made in the campaign and will continue the effort to advise consumers of the importance of protecting milk from damaging effects of light.

Borden Announces Construction Of $30 Million Plant

Houston, the headquarters of Borden Incorporated Dairy Division, will be the location of a $30 million ice cream plant, the company's largest, officials of the division announced today. Ground was broken at the northwest Houston site Monday, August 13. The new facility is planned to begin operation by mid-1985.

The announcement lays to rest speculation about the company's plans for building a replacement following the destruction of the company's downtown Houston plant in a freak explosion on December 11, 1983. The accident, which occurred on a Sunday, involved no injuries.

"The decision to rebuild our ice cream plant in Houston," said Wayne Mosley, group vice president, "came almost immediately after the debris from the old plant had been cleared away. Borden has a longtime history in the Houston area and feels a deep commitment to the community's economic well-being."

A modern laboratory will be equipped to develop new flavors and the latest in ice cream products, and D. L. Brown himself, who's been with Borden for 42 years, will taste the new developments. The 92,000 square foot plant will receive and store milk, cream and condensed milk for making the ice cream in five tanks, the largest of which will have a 10,000-gallon capacity, the others a 6,000-gallon capacity each. All processing and packaging will take place on the premises.

A special glassed-in observation deck will also provide tour groups and other visitors viewing opportunities of the production area and a special tasting of Borden's ice cream.

Borden Incorporated employs over 32,000 people in 200 locations around the world. Taking a leadership role as a worldwide consumer products and chemical speciality company, Borden currently produces and markets over 6,000 dairy, food and chemical products around the globe.

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

The Larsen Company Totally Converts To Lead-Free Containers

• To allay consumer concerns regarding lead exposure from canned foods, The Larsen Company now includes the statement "Lead-free can with protective white lining" on the labels of its nationally distributed line of Veg-all canned vegetables. The Greenbay, WI food processor has totally converted its packages to welded and two-piece cans which eliminate the use of lead solder. Larsen's Veg-all products are also the first nationally distributed canned vegetables to feature the Hi-white protection liner in its cans.

"These technological advancements in packaging have enabled us to eliminate concern over lead in food cans," said Abbott E. Wilson, vice president of marketing for The Larsen Company. "The labeling of our lead-free containers will also help assure consumers that they are buying the best when they purchase our products."

"Our voluntary lead-free position demonstrates The Larsen Company's commitment to provide consumers safe, convenient and nutritious products. We did not require government or consumer pressure to recognize our responsibilities," Wilson said. The Larsen Company has also responded to consumer concerns by voluntarily providing nutrition, fill weight and sodium content information on its product labels.

Continental Can Company supplies The Larsen Company with welded, white lined containers. Continental's Conoweld, the industry's leading three-piece nonlead soldered container, represents the majority of the packaging company's metal food can production.

Please circle No. 263 on your Reader Service Page

Larsen Company lead-free cans

Award For Excellence In Marketing

• New round half-gallon packages with see-through windows in lids and color photographs on side panels have boosted sales of Penn Dairies' PenSupreme ice cream, as well as earned the company an award of excellence for the best ice cream advertising and marketing campaign in the U.S. during 1984. The competition was sponsored by the Milk Industry Foundation and the International Association of Ice Cream Manufacturers. The campaign was launched with the help of Lewis, Gilman and Kynett, Philadelphia.

For more information contact: Donnalyn Pompper, 215-351-0400.

Please circle No. 264 on your Reader Service

PenSupreme Ice Cream

New Liquid Soap From Mölnlycke

• A new liquid soap has received the EI rating from the U.S. Department of Agriculture, according to an announcement from Mölnlycke. MEVON No. 77 Antiseptic Soap now is authorized by USDA for use in federally inspected meat and poultry plants.

A nonperfumed, creamy white soap, MEVON No. 77 comes in one-liter plastic bottles to fit the Mölnlycke S-BOX Soap Dispenser. This lockable dispenser, supplied in a choice of decorator colors, is designed to be drip- and clog-proof. Its patented valve dispenses a measured, economical amount of soap sufficient for one hand-wash. Since both the dispenser and the bottle of soap are transparent, you can easily see when to refill.

For details and prices, contact Mölnlycke Industrial Products, P.O. Box 125, San Ramon, CA 94583-0125. 415-838-1120, collect.

Please circle No. 265 on your Reader Service Page

New Literature On Clean-In-Place Agitator

• DCI, St. Cloud, MN . . . announces the release of a bulletin illustrating their new CIPA-H, clean-in-place horizontal agitator. The full color bulletin outlines the benefits of the agitator, including time and labor savings, lower maintenance costs and improved quality control. For more information contact DCI, 600 North 54th Avenue, St. Cloud, MN 56301. 612-252-8200.

Please circle No. 266 on your Reader Service Page

"Dyna-Dish" - System Of Generic Laboratory Weighing Accessories

• Dyn-A-Med Products proudly introduces "The Dyna-Dish Weighing Accessory System." Now you can order all of your supply items used for sample weighing from one source.

This product line is suitable for any laboratory utilizing any make of electronic top load balance. Areas of application include: Agriculture, Bulk Counting, Checkweighing, Chemical Q.C. Testing, Dairy Research, Environmental Testing, General Manufacturing, Laboratory Weighing, Moisture Determination Testing, Petroleum Research, Quality Control Testing, Toxicology, University Science and Research, and Wastewater Treatment.

"The Dyna-Dish Weighing Accessory System" offers a variety of disposable product lines, including: "Dyna-Dish Weighing Boats," "Dyna-Dish Pan Liners," "Dyna-Dish Aluminum Weighing Dish (57 mm)," "Dyna-Dish Aluminum Foil Containers," "Dyna-Weigh Glassine Paper," and Aluminum Foil Wrap. Literature and generic pricing information are available by contacting: Randy Huster, Director of Marketing, Van Note Enterprises, 255 Bluff Court, Barrington, IL 60010. 312-382-5195.

Please circle No. 267 on your Reader Service Page

Dyna-Dish Weighing Accessories

Y'All Come - Nashville '85

Come on down to the 72nd Annual Meeting of IAMFES, August 4-8, 1985, at the Hyatt Regency in Nashville, Tennessee. In addition to the education program, we've cooked up some "down home" activities, including a pre-convention Grand Ole Opry visit on Saturday evening, August 3. There's lots to do in Nashville.....hope to Tennes"see" you there!

72nd Annual Meeting
Hyatt Regency, August 4-8, 1985
Nashville, Tennessee

MAIL TO: Cecil White, Finance Chairman
TAMWFP
1418 Highland Avenue
Murfreesboro, Tennessee 37130

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- ☐ Executive Board
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ADVANCE REGISTER BEFORE JULY 1, 1985 and SAVE!
(Refundable if cancelled prior to June 30, 1985)

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	Member	Companion(s) Each	Student	Non Member
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Grand Ole Opry** (Aug. 3) ☐ 6:30 PM ☐ 9:30 PM	☐ $19	☐ $19	☐ $19	☐ $19
Early Bird Reception*	☐ Free	☐ Free	☐ Free	☐ Free
Tennessee Hoedown	☐ $20	☐ $20	☐ $20	☐ $20
Banquet and Reception	☐ $20	☐ $20	☐ $20	☐ $20
National Mastitis Council*	☐ Free	☐ Free	☐ Free	☐ Free

*Indicate attendance **Indicate preference for showtime

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☐ N/A	☐ N/A	☐ N/A	☐ N/A
☐ Free	☐ Free	☐ Free	☐ Free
☐ $22	☐ $22	☐ $22	☐ $22
☐ $22	☐ $22	☐ $22	☐ $22
☐ Free	☐ Free	☐ Free	☐ Free

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International Association of Milk, Food & Environmental Sanitarians, Inc.
Annual Meeting August 4-8, 1985

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Food Science Facts
For The Sanitarian

Robert B. Gravani
Cornell University
Ithaca, NY

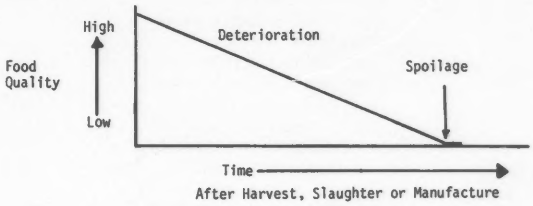
FOOD DETERIORATION AND SPOILAGE

Did you ever wonder what causes food to deteriorate and spoil?

The staling of baked goods, soft, mushy apples, mold growth on certain cheeses and the foul smell that is produced when foods are left in the refrigerator for long periods of time often come to mind when one thinks about food deterioration and spoilage.

Actually, food deterioration occurs in a variety of ways. Many complex biological, chemical and physical changes occur and these can affect the flavor, odor, visual appearance, nutritional value and/or safety of foods. In advanced stages the deterioration may actually damage the edible quality of a food, so that it won't be eaten. Food is considered spoiled when it has an unacceptable appearance, aroma and/or taste.

In most cases, foods deteriorate in quality from the time they are harvested, slaughtered or manufactured until they are consumed. The diagram below shows this concept:



Think of how a freshly picked apple tastes compared to one that has been held at warm temperatures for a week. The visual appearance, texture and taste of the apple will certainly be affected by this improper storage.

Food deterioration may be slow or rapid and depends on many factors, including: the nature and composition of the food, heat, cold, light, oxygen, microorganisms, natural food enzymes, moisture, dryness, industrial contaminants, some foods in the presence of others and time.

When discussing food deterioration and spoilage, other terms such as shelf life, keeping quality and storage stability often are used. These terms refer to the length of time food remains of acceptable quality when kept under given storage conditions. Since foods vary enormously, they are often grouped into three classes, based on their ease of spoilage.

1) Stable or non-perishable foods
2) Semi-perishable foods
3) Perishable foods.

1) *Stable or non-perishable foods* -- these are foods which normally do not spoil unless handled carelessly. Very few foods can truly be put into this group, but sugar, dry beans and canned foods are found here. Canned foods can become perishable if they are recontaminated after processing through damage to the seam or seal of the can. Spoilage of canned foods can also take place when these products are stored at unusually high temperatures.

2) *Semi-perishable foods* -- these products will remain unspoiled for long periods of time if properly handled and stored. Usually, dry foods such as flour, hard cheeses, dried fruits and vegetables are in this group. Although they are perishable, frozen foods, when stored at the proper temperatures, can be considered semi-perishable.

3) *Perishable foods* -- this group includes meat, poultry, fish, milk, eggs, many fruits and vegetables and all cooked foods except those that are very dry and ones that are high in acid.

Although most foods fall into one of these three groups, some are considered borderline and many may be difficult to place.

Even in our modern society with the convenience of refrigeration and freezing and good transportation, storage and distribution systems, foods continuously change. These changes result in a decrease in product quality (deterioration) and finally product spoilage which translates into economic losses. This is why prompt handling of food products during distribution as well as stock rotation and product removal from shelves in warehouses and supermarkets are vital.

The major causes of food deterioration include:

- Microorganisms

- Natural Food Enzymes
- Insects, Parasites and Rodents
- Temperature
- Moisture and Dryness
- Air
- Light
- Time.

These factors do not act separately, but more often several factors are involved in food deterioration. The factors involved will depend on the food and environmental conditions. For example, bacteria, insects, heat and light may be working together to deteriorate food in a warehouse. When all of the factors causing deterioration are applied to every natural and processed food product, one can easily see why many varied preservation methods are used in the food industry. Effective preservation techniques must be used to minimize or eliminate these causes of deterioration and insure that adequate amounts of good quality, safe, wholesome and nutritious foods reach consumers.

The major causes of food deterioration will be discussed in detail in future issues of Food Science Facts.

Dairy Quality

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

COTTAGE CHEESE QUALITY PROCESS CONTROL AND PROCESS STANDARDS

To assure the production of high quality cottage cheese, the cottage cheese manufacturer must institute a quality assurance program. Traditionally the cottage cheese manufacturer has emphasized quality control based on finished product inspections. However, this is a retrospective action which provides little assurance that a desirable product will be produced. While finished product inspection is a necessary part of a quality control program, quality has to be built into the product and cannot be economically or effectively achieved by finished product inspection alone.

To achieve the production of quality cottage cheese, the roles of quality assurance, quality control, and production must be properly performed. Lushbough (1) presents the following relationship: "Quality assurance oversees quality control just as quality control oversees and evaluates production."

Quality control overseeing production can be achieved by: 1) establishing written production procedures; 2) documenting critical processes such as pasteurization, cooking, cooling, and packaging temperatures; 3) monitoring culture activity; 4) establishing limits for holding ingredients such as creamed dressing (5), by establishing standards for critical processing steps such as packaging; 6) establishing environmental standards such as microbial load of curd wash water, packaging materials, and other contamination sources.

Production standards must be considered for both physical and biological parameters. Physical defects of cottage cheese (weak curd, shattered curd, free whey, and other physical defects) must be controlled through establishing written procedures for production. This must include proper temperature and time controls for incubating, curd heating, and packaging. The intent of the cottage cheese processor should be to produce cheese with uniform physical characteristics. The objective is to achieve a high degree of consumer acceptance by producing a product that the consumers expect and that is consistent.

To achieve a high degree of consumer acceptance, it is necessary to achieve an extended shelf life for cottage cheese. Biological parameters can greatly affect the shelf life. Generally, the Dairy industry agrees and research (2, 3, 4) has shown that post-heating contamination of psychrotrophic bacteria is a leading cause of quality defects of cottage cheese. Defects produced include gas production, sliminess, bitter flavors, color defects. These conditions are enhanced by poor acid production from starter culture and by poor temperature control during storage and distribution of the product.

Most psychrotrophic contamination and subsequent spoilage of cottage cheese is due to gram negative bacteria (2, 3, 4). These organisms are quite heat sensitive and normally do not survive the current cooking process. Therefore, sources of these organisms usually include: 1) contaminated curd wash water; 2) contaminated cream dressing; 3) poor cleaning and sanitizing of product contact surfaces. Also proper cleaning and sanitizing of product contact surfaces is essential for controlling yeast and mold contamination.

Controlling psychrotrophic contamination from curd wash water can be achieved through effective chlorination. Wash water should be chlorinated with a concentration of 5 to 15 ppm chlorine with a pH adjusted to about 6.5. Monitoring and controlling systems are necessary to achieve effective chlorination and microbiological control. Daily chlorine titrations, pH monitoring, microbiological testing (with standards established) are necessary functions of a quality control program.

Contamination of creamed dressing with gram negative psychrotrophic contamination can occur through: 1) ineffective sanitation; 2) cracks in the cooling section of the HTST; 3) cracks in pasteurized cream storage tanks; 4) contaminated air; 5) contaminated water supplies; 6) other environmental sources. Effective monitoring and controlling of psychrotrophic contamination in cream dressing should include line analysis and shelf life testing of the cream dressing. Microbiological standards as well as time and temperature standards must be established to help control the possibility of psychrotrophic contamination of the cream dressing.

Table I indicates standards that should be considered in establishing the process control system for cottage cheese production. The list is not an exhaustive list, nor is it a list that is practical for all cottage cheese opera-

tions. However, establishing and maintaining a list of production standards such as those listed in Table I can help manage a quality control program.

In next month's DAIRY QUALITY UPDATE, we will discuss standards for finished products and distribution.

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TABLE 1. *Proposed process standards for quality cottage cheese production.*

Dry Curd		*Culture Activity*	
Physical parameters	no defects	Acid development	.70% T.A. in 4 Hr.
psychrotrophic bacteria	< 1/50 ml	flavor	OK
yeasts and molds	< 1/50 ml		
coliform	< 1/50 ml		
Cream Dressing		*Curd Wash Water*	
Time	< 24 hr.	Temperature (third wash)	< 40F
Temp.	< 40F	Chlorine	5-15 ppm
Microbial (Line analysis)		pH	6.5
HTST - psy.	< 1/50 mls		
- coli	< 1/50 mls	*Packaging*	
Lines - psy.	< 1/50 mls	wt.	± .5%
- coli	< 1/50 mls	temp.	< 45F
Tank - psy.	< 1/50 mls	microbial contamination	
- coli	< 1/50 mls	of packaging material	< 2/packages

New Members

Donald E. Simmons
NW Alabama Regional Health Dept.
Tuscumbia, AL

Steven Hogarty
University of Georgia
Athens, GA

Boyce MacIsaac
P.E.I. Dept. of Agriculture
Charlottetown,
Prince Edward Island, Canada

Robert Childers
Bozeman, MT

Dr. Shin-ichi Sugiyama
Kikkoman Foods, Inc.
Walworth, WI

Daniel P. Biggins
McDonald's
Oak Brook, IL

Linda Hamilton
Barrhead, Alberta, Canada

Michael D. Nygaard
Olympia Cheese Co.
Olympia, WA

Food and Environmental Hazards to Health

Interest has been expressed to have case studies of food and environmental hazards to human health published in *Dairy and Food Sanitation*. Members of the Publication Committee of *Dairy and Food Sanitation* discussed this need at the Annual Meeting in Edmonton last August and agreed this could be useful information for field sanitarians everywhere. I was asked to review the several current publications giving such information and prepare such a report for *Dairy and Food Sanitation* readers each month.

It is my intent to select each month pertinent information on one or more investigations of human disease outbreaks of public health significance. The copy will consist mainly of written comments by the investigators reporting the problem, with personal remarks pertinent to the situation. Suggestions and comments from our readers will be appreciated.

Dr. Henry V. Atherton
Professor, Dairy Foods
University of Vermont
Burlington, VT 05405

Reviews of recent Public Health reports from various sources give cause to reemphasize the potential danger of drinking raw milk. As the study below indicates, even Certified Raw Milk can be the source of disease-producing bacteria.

Campylobacter outbreaks resulting from consumption of raw milk received little attention until recently, due to the difficulty of culturing the organisms from milk and other food sources. Investigations of several epidemics among school children since 1980 clearly implicate raw milk as the source of the organisms causing diarrhea and related symptoms in those affected.

Farmers and school personnel should be made aware of the potential serious consequences of serving raw milk to guests. Pasteurization remains the best hope of preventing the spread of milk pathogens common to the cows' environment.

From Morbidity and Mortality Weekly Report, October 5, 1984.

CAMPYLOBACTER OUTBREAK ASSOCIATED WITH CERTIFIED RAW MILK PRODUCTS - CALIFORNIA

On May 31, 1984, 28 kindergarten children and seven adults from a private school of 240 students in Whittier, California, visited a certified raw milk (CRM) bottling plant in southern California, where they were given ice cream, kefir, and CRM. Three to six days later, several of the group began to experience fever and gastroenteritis. Ultimately, nine children and three adults became ill, and most of them were absent from school. Studies on stools from these 12 individuals for routine bacterial pathogens showed nine positive and three negative for *Campylobacter jejuni*. Stools were obtained from nine non-ill children in another kindergarten class; these stools did not yield *C. jejuni*. The only common foods these children (ill and non-ill) ate were hamburgers, which are provided every Thursday to their school by a fast-food hamburger chain. No one else in the school became sick.

Reported in Public Health Letter 1984;6, Los Angeles County Dept. of Human Services, California Morbidity (June 15, 1984), California Dept. of Health Services; Enteric Diseases Br., Division of Bacterial Diseases, Center for Infectious Diseases, CDC.

Editorial Note: Other *Campylobacter* outbreaks have been linked to consumption of raw milk, including CRM (1). In June 1984, 17 members of a kindergarten class on Vancouver Island, British Columbia, Canada, visited a raw milk dairy; 13 drank raw milk. Nine persons became ill a median of 4 days after visiting the dairy. Stools from 19 persons were cultured; three yielded *C. jejuni;* four did not; the results of three are still pending (2). During 1983, two outbreaks of campylobacteriosis followed consumption of raw milk on school-sponsored outings in Pennsylvania (3). Similar outbreaks also occurred in 1981 and 1982 in Michigan, Minnesota, and Vermont. Technology does not presently exist to prevent contamination of raw milk supplies by *Campylobacter*, which is present in the intestinal tracts of about 40% of dairy cattle (4). Although infection may be more common than recognized, episodes of illness often are not well documented.

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The Canada Diseases Weekly Report for October 6, 1984 provided follow-up information and comment on the Vancouver Island situation mentioned above. They report that on July 12, health unit staff visited the farm and talked with the farmer, who seemed unaware of the diseases associated with the consumption of raw or unpasteurized milk. The only disease which he had associated with raw milk was undulant (abortus) fever. He was advised not to offer raw milk to the students in the future. A tour of the farm revealed some unsanitary conditions which could explain why the unpasteurized milk was a potentially dangerous vehicle for transmission of disease.

A letter was sent to the District School Superintendent summarizing the incident and requesting that information on the dangers of raw milk be sent to all teachers organizing similar trips. It was specifically mentioned that such visits should continue, but that no raw milk should be consumed by the students if it was offered to them. It was agreed that the farmer and the local representative of the Dairy Branch of the Ministry of Agriculture would also be sent a copy of the letter. Undoubtedly, the Dairy Representative would visit the farm and make some recommendations regarding the unsanitary conditions existing there.

Comment: This is the third *Campylobacter* outbreak, presumably associated with the consumption of raw milk, to occur in

Canada in as many years and the second one to be reported from British Columbia. The first B.C. report emphasized the need for effective control of this product and the importance of maintaining surveillance of any associated disease occurrence. Continued attempts should be made to educate the public and producers on the hazards of drinking unpasteurized milk. This second incident in a kindergarten class indicates that there is a constant need to inform educational institutions about proper hygiene measures and precautions to be adopted outside the classroom. However, the ultimate responsibility may rest with appropriate provincial authorities for allowing the consumption of unpasteurized milk by the public.

The word "bureau" is no longer in FDA's vocabulary, with the renaming of the four major units of the agency. The Bureau of Foods is now the Center for Food Safety and Applied Nutrition. The Bureau of Veterinary Medicine has become the Center for Veterinary Medicine. The word "national" has been dropped from the titles of two recently merged units, which will now be known as the Center for Drugs and Biologics and the Center for Devices and Radiological Health. (*FDA Consumer*, June 1984).

Information On Food Poisoning

Over 2 million cases of food poisoning occur in this country each year. Most of these unpleasant episodes can be traced to improper handling of food in the home, says the U.S. Department of Agriculture. Two new booklets by USDA tell how consumers can make it very difficult for trouble-making bacteria to do their dirty work.

"The Safe Food Book - Your Kitchen Guide" takes a broad look at the bugs that cause foods to spoil and gives up to date advice on safe cooking and storage, microwave cooking, special care for foods that are particularly susceptible to spoilage, what to do when the freezer fails, and more.

"Talking About Turkey: How To Buy, Store, Thaw, Stuff, and Prepare Your Holiday Bird" covers everything from choosing a turkey to the time the last leftovers are served. It also includes recipes.

Both booklets are available free from the Consumer Information Center, Pueblo, Colorado 81009. In addition, the Food and Drug Administration offers an easy to read chart listing food spoilage organisms, symptoms of food poisoning, and methods of prevention (originally published in the July-August 1982 FDA Consumer). "Who, Why, When and Where of Food Poisons" can be ordered from the Office of Consumer Affairs, HFE-88, 5600 Fishers Lane, Rockville, MD 20857. (*FDA Consumer*, September 1984).

FDA On Herpes

The Center for Food Safety and Applied Nutrition Retail Food Protection Branch of FDA issued a final interpretation on June 25, 1984 on the transmission of herpes by food or food-contact surfaces. The interpretation, which received the approval of a number of professional and trade associations, asserts that herpes simplex virus is not transmitted via food or food contact surfaces; therefore, there are no special steps which must be taken by the operator or regulatory authority beyond those clearly outlined in the model food codes for all personnel in the sections on personal cleanliness, employee practices and handwashing lavatory supplies. To receive a copy of the FDA Interpretation, write: Retail Food Protection Branch, FDA, 200 C Street SW, Washington, DC 20204. (*Environment News Digest*, September-October 1984).

SUSPECTED OUTBREAK OF FOODBORNE ILLNESS DUE TO *CLOSTRIDIUM PERFRINGENS* - NOVA SCOTIA

On the morning of 4 May 1984, an outbreak of diarrhea was noted among 74 of the 200 handicapped residents of the Halifax County Rehabilitation Centre in Cole Harbour. Clinical records were reviewed and food histories were obtained for the 24 hours prior to the onset of illness. The kitchen facilities and food preparation techniques of the institution were also reviewed by a food inspector.

Results: Along with the 74 residents, five staff members also became ill, bringing the total number of cases to 79. The most common symptoms were diarrhea, 96.2% of the cases; abdominal cramps, 17.7%; and vomiting, 1.3%. None of the cases experienced fever. The duration of the symptoms was less than 12 hours and there were no hospitalizations. The overall attack rates for residents was 37.1%. However, 4 units housing elderly or more debilitated residents experienced attack rates above 50%. Attack rates were highest in the 60-to 79-year old group. Analysis of food histories revealed an association between illness and eating beef and pork pies ($p < .001$ by x^2).

The investigation revealed that on 2 May about 18 kg of pork and beef were roasted in ovens and cooled at room temperature for several hours before being stored in a refrigerator overnight. The following day, the meat was ground, put into 23-cm pie shells and baked before serving. About 2/3 of the 25 pies that had been prepared were eaten at the noon meal and the remainder at the evening meal. The highest risk occurred when the pies were eaten at both meals.

Stool samples from 6 of the cases had a *Clostridium perfringens* colony count of 10^6 to 10^8 organisms per gram of stool. *C. perfringens* was also cultured from a sample of raw pork (30,000/g) obtained from the kitchen where the pies had been prepared, but no organisms were cultured from a sample of a pie.

Discussion: This outbreak of foodborne illness was probably caused by ingestion of beef and pork pie contaminated with *C. perfringens*.

The following sequence of events most likely caused this outbreak. The source of the organism was the raw pork which appeared to have been heavily contaminated. The roasting process probably did not destroy all of the spores and growth took place during the cooling period at room temperature on 2 May. The grinding process the following day would have distributed the *Clostridium* more evenly throughout the meat and the final baking did not kill all of the organisms. Presumably not all of the pies were contaminated, because many persons who had eaten them remained well.

Evaluation of the minimum cost for such a foodborne outbreak included the following: loss of wages and salaries $560; laboratory costs $1,670; and physician costs $650, for a total of $2,880.

The need for careful adherence to proper cooking practices must be emphasized. An educational program for the kitchen staff at the Rehabilitation Centre has been arranged. (*Canada Diseases Weekly Report*, October 1984).

Cryptosporidiosis Among Children Attending Day-Care Centers - Georgia, Pennsylvania, Michigan, California, New Mexico

During 1984, CDC has received several reports of cryptosporidiosis among children attending day-care centers. Seven investigations conducted in five states are summarized below.

Editorial Note: Outbreaks caused by a number of important infectious agents (including Giardia, Shigella, Haemophilus influenza, hepatitis A, rotavirus, and respiratory-tract viruses) have been documented in day-care centers. The investigations reported here (i.e., case histories from Georgia, Pennsylvania, Michigan, California and New Mexico) suggest that the intestinal parasite Cryptosporidium should be added to this list. Although a few children had moderately severe diarrhea, none required hospitalization.

Cryptosporidium is a well-known cause of diarrhea in animals but has been recognized only recently as a cause of human disease. The first case of human cryptosporidiosis was reported in 1976; before 1982, literature exists on only seven human cases of cryptosporidiosis. Since 1982, the number of reported cases increased markedly. Initially, this increase was noted in patients with acquired immunodeficiency syndrome (AIDS), but recent reports indicate that cryptosporidiosis is common in immunologically normal persons. Patients with AIDS and cryptosporidiosis usually have severe, irreversible diarrhea, but persons with normal immunologic function have self-limited, although at times severe, diarrhea. The spectrum of illness caused by Cryptosporodium has yet to be clearly defined, and no satisfactory treatment is currently available.

Public health workers, physicians, parents, and day-care providers need to be alert to cryptosporidiosis as a potential cause of outbreaks of diarrhea in day-care centers. Special concentration and staining techniques for the recovery and isolation of Cryptosporidium are required, and investigators should notify laboratory personnel that Cryptosporidium is considered a possible pathogen in outbreaks. Knowledge of how Cryptosporidium is transmitted in the day-care setting is presently lacking, and only general guidelines for the prevention and control of enteric infections are available. Cryptosporidiosis outbreaks in day-care centers should be reported to state and local health departments. CDC would also like to be notified so that the spectrum of illness of this organism in this setting can be further defined. (*Morbidity and Mortality Weekly Report,* October 1984).

1985 IAMFES AWARD

NOMINATIONS

IAMFES is proud of its members and their contributions.

As a member you're entitled to nominate deserving colleagues for the IAMFES Awards.

Previous award winners are not eligible for the same award. Present Executive Board members are not eligible for nomination. **Candidates must be active IAMFES members.**

Simply check page 30 of this issue of DAIRY AND FOOD SANITATION for a complete listing of past award winners, or contact the IAMFES office in Ames.

Nomination forms were recently sent to all members. If you require another form, simply contact the IAMFES office. Nominations are due by March 1, with all completed materials due by April 1, 1985.

Presentation of the IAMFES Awards will be during the Annual Awards Banquet, at the IAMFES 72nd Annual Meeting, August 4-8, 1985 in Nashville, Tennessee.

Send all requests and completed materials to: K. R. Hathaway, IAMFES, P.O. Box 701, Ames, IA 50010, 515-232-6699 for any questions.

SANITARIANS AWARD

In recognition of outstanding service to the profession of the Sanitarian.

$1000 award and plaque

EDUCATOR AWARD

Presented to an educator in recognition of outstanding service in academic contributions to the profession of the Sanitarian.

$1000 award and plaque

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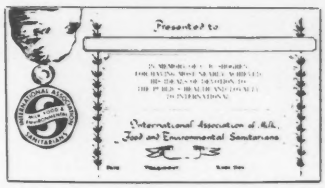
In recognition of outstanding service and devotion to the high ideals and principles of IAMFES.

plaque and life membership with IAMFES

CITATION AWARD

For many years devotion to the ideals and objectives of the association.

plaque award



SHOGREN AWARD

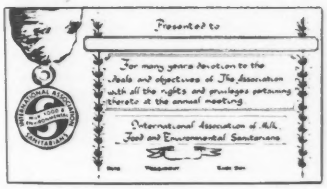
Presented to an affiliate association nominated for service to their members.

certificate award

HAROLD BARNUM INDUSTRY AWARD

In recognition of outstanding service to the public, International Association and the Profession of the Sanitarian.

$500 award and plaque



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Presented yearly to those members who are active within their affiliate and and the international group.

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Past IAMFES Award Winners

EDUCATOR-INDUSTRY AWARD

1973-Walter A. Krineke
1974-Richard P. March
1975-Dr. K. G. Weckel
1976-Burdet H. Heinemann
1977-Dr. Elmer H. Marth
1978-James B. Smathers
1979-Dr. Joseph Edmondson
1980-James R. Welch
1981-Francis F. Busta

In 1982 this award was split into the Educator Award and the Harold Barnum Award (for industry)

EDUCATOR AWARD

1982-Floyd Bodyfelt
1983-John Bruhn
1984-R. Burt Maxcy

HAROLD BARNUM AWARD

1982-Howard Ferreira
1983-C. Dee Clingman
1984-Omer Majerus

CITATION AWARD

1951-Dr. J. H. Shrader and William B. Palmer (posthumously)
1952-C. A. Abele
1953-Clarence Weber
1954-C. K. Johns
1955-Dr. R. G. Ross
1956-K. G. Weckel
1957-Fred C. Baselt
1958-Milton R. Fisher
1959-John D. Faulkner
1960-Dr. Luther A. Black
1961-Harold S. Adams
1962-Franklin W. Barber
1963-Dr. Merle P. Baker
1964-W. K. Moseley
1965-H. L. Thomasson
1966-Dr. J. C. Olson
1967-William V. Hickey
1968-A. Kelley Saunders
1969-Karl K. Jones
1970-Ivan E. Parkin
1971-Dr. L. Wayne Brown
1972-Ben Luce
1973-Samuel O. Noles
1974-John C. Schilling
1975-Dr. A. R. Brazis
1976-James Meany
1977-None Given
1978-Raymond A. Belknap
1979-Harold E. Thompson, Jr.
1980-Don Raffel
1981-Henry V. Atherton
1982-None Given
1983-William B. Hasting
1984-Dr. Elmer H. Marth

SANITARIANS AWARD

1952-Paul Corash
1953-Dr. E. F. Meyers
1954-Kelley G. Vester
1955-B. G. Tennent
1956-John H. Fritz
1957-Harold J. Barnum
1958-None Given
1959-William Kempa
1960-James C. Barringer
1961-Martin C. Donovan
1962-Larry Gordon
1963-R. L. Cooper
1964-None Given
1965-Harold R. Irvin
1966-Paris B. Boles
1967-Roger L. Stephens
1968-Roy T. Olson
1969-W. R. McLean
1970-None Given
1971-Shelby Johnson
1972-Ambrose P. Bell
1973-None Given
1974-Clarence K. Luchterhand
1975-Samuel C. Rich
1976-M. W. Jefferson
1977-Harold Bengsch
1978-Orlowe Osten
1979-Balus Walker, Jr.
1980-John A. Baghott
1981-Paul Pace
1982-Edwin L. Ruppert
1983-None Given
1984-Harold Wainess

HONORARY LIFE MEMBERSHIP AWARD

1957-Dr. J. H. Shrader
1958-H. Clifford Goslee
1959-Dr. William H. Price
1960-None Given
1961-Sarah Vance Dugan
1962-None Given
1963-C. K. Johns and Dr. Harold Macy
1964-C. B. and A. L. Shogren
1965-Fred Basselt and Ivan Parkin
1966-Dr. M. R. Fisher
1967-C. A. Abele and L. A. Black
1968-Dr. M. P. Baker and Dr. W. C. Frazier
1969-John Faulkner
1970-Harold J. Barnum
1971-William V. Hickey
1972-C. W. Dromgold and E. Wallenfeldt
1973-Fred E. Uetz
1974-H. L. Thomasson and K. G. Weckel
1975-A. E. Parker
1976-A. Bender Luce
1977-Harold Heiskell

and Presidents

1978-Karl K. Jones
1979-Joseph C. Olson, Jr.
1980-Alvin E. Tesdal
1981-Robert M. Parker
1982-None Given
1983-Orlowe Osten
1984-Paul Elliker

SHOGREN AWARD

1972-Iowa Affiliate
1973-Kentucky Affiliate
1974-Washington Affiliate
1975-Illinois Affiliate
1976-Wisconsin Affiliate
1977-Minnesota Affiliate
1978-None Given
1979-New York Affiliate
1980-Pennsylvania Affiliate
1981-Missouri Affiliate
1982-South Dakota Affiliate
1983-Washington Affiliate
1984-None Given

PAST PRESIDENTS

1912-C. J. Steffen
1913-C. J. Steffen
1914-C. J. Steffen
1915-A. N. Henderson
1916-Claude F. Bessio
1917-Wm. H. Price
1918-Alfred W. Lombard
1919-James O. Kelly
1920-Ernest Kelly
1921-C. L. Readhouse
1922-H. E. Bowman
1923-Geo. E. Belling
1924-J. B. Hollingsworth
1925-T. J. Strauch
1926-G. C. Supples
1927-W. A. Shoults
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1930-R. E. Irwin
1931-A. R. B. Richmond
1932-W. B. Palmer
1933-H. N. Parker
1934-P. F. Krueger
1935-C. K. Johns
1936-G. W. Grim
1937-J. C. Hardenbergh
1938-A. R. Telland
1939-V. M. Ehlers
1940-P. D. Brooks
1941-L. C. Frank
1942-F. W. Fabian
1943-C. A. Abele
1944-C. A. Abele
1945-R. R. Palmer
1946-R. R. Palmer
1947-R. G. Ross
1948-W. D. Tiedeman
1949-A. W. Fuchs
1950-M. R. Ficher
1951-K.G. Weckel
1952-H. L. Thomasson
1953-H. J. Barnum
1954-John D. Faulkner
1955-I. E. Parkin
1956-Harold S. Adams
1957-Paul Gorash
1958-Harold Robinson
1959-Franklin Barber
1960-W. V. Hickey
1961-John J. Shouring
1962-Charles E. Walton
1963-Ray Belknap
1964-John H. Frits
1965-W. C. Lawton
1966-Fred E. Utez
1967-P. R. Elliker
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1969-Samuel O. Noles
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1971-Dick B. Whitehead
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1973-Walter F. Wilson
1974-Earl O. Wright
1975-P. J. Skulborstad
1976-H. E. Thompson, Jr.
1977-H. V. Atherton
1978-David F. Fry
1979-Howard Hutchings
1980-Bill Kempa
1981-William Arledge
1982-Harry Haverland
1983-Robert Marshall
1984-A. Richard Brazis

24th ANNUAL MEETING
OF THE
NATIONAL MASTITIS COUNCIL, INC.

FEBRUARY 15-17, 1985
FRONTIER HOTEL
LAS VEGAS, NEVADA

February 15, 1985	
Friday	NMC Committee Meetings
7:30 - 9:30 P.M.	Technology Transfer Session
February 16, 1985	
Saturday	
7:30 A.M.	NMC Board Breakfast
8:00 A.M.	NMC Board Meeting
8:00 A.M.	NMC Registration
9:00 - 11:00 A.M.	Technology Transfer Session
11:00 A.M.	NMC Annual Meeting
11:05 A.M.	*Presidential Address:* Bob Eberhart, Pennsylvania State University, State College, PA
11:20 A.M.	Presentation of Certificates to National Members
11:30 A.M.	General Session, Don Berg presiding
11:30 - 12:15 P.M.	*Control of coliform mastitis:* John Bramley, National Institute for Research in Dairying, Reading, England
12:30 P.M.	NMC Luncheon
1:45 - 2:15 P.M.	*The teat's role in mastitis prevention:* Steve Nickerson, North Louisiana Hill Farm Research Station, Homer, LA
2:15 - 3:15 P.M.	*Predipping Panel:* Dave Galton, Cornell University; Bob Bushnell, University of California-Davis; J. W. Pankey, University of Vermont; Roger Natzke, University of Florida
3:15 - 3:30 P.M.	Milk Break
3:30 - 4:15 P.M.	*New FDA drug policy and its effects on mastitis treatment:* Dr. Lester Crawford, Director, Center for Veterinary Medicine, Hyattsville, MD; Dr. Paul E. Blackmer, veterinarian, Upland, CA
4:15 - 4:45 P.M.	*Milking procedures and their effects on milk quality:* Dennis Armstrong, Extension Dairy Specialist, University of Arizona, Tuscon, AZ
4:45 - 5:15 P.M.	*An approach to mastitis control in large dairy herds:* Tom Furhman, veterinarian, Chandler, AZ
5:15 - 5:45 P.M.	National Mastitis Council Business Meeting
February 17, 1985	
Sunday	
8:30 A.M.	General Session, Allan Bringe presiding
8:30 - 9:00 A.M.	*Somatic cell counts and effects on milk production:* Robert Miller, Chief, Milk Secretion and Mastitis Laboratory, USDA, Beltsville, MD
9:00 - 9:30 A.M.	*Using DHI somatic cell counts:* Jeff Reneau, Extension Dairy Specialist, University of Minnesota
9:30 - 10:00 A.M.	*The effect of quality and component premiums on mastitis awareness:* Dawson Jordan, Extension Dairy Specialist, Colorado State University, Fort Collins, CO
10:00 - 10:15 A.M.	Questions for the morning's speakers
10:15 - 10:30 A.M.	Milk Break
10:30 - 11:00 A.M.	*Pennsylvania's milker schools -- how they're organized and run:* Larry Hutchinson, Extension Veterinarian, The Pennsylvania State University, State College, PA
11:00 - 11:30 A.M.	*State Mastitis Councils -- how we're organized and what we do:* Frances Barnes-Pallesen, New York State Mastitis Control Program, Lansing, NY; Jim Kennedy, Missouri State Milk Board, Jefferson City, MO
11:30 - Noon	*Environmental influences on bovine mastitis:* John Bramley, National Institute for Research in Dairying, Reading, England

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105	125	145	165	185	205	225	245	265	285	305	325	345
106	126	146	166	186	206	226	246	266	286	306	326	346
107	127	147	167	187	207	227	247	267	287	307	327	347
108	128	148	168	188	208	228	248	268	288	308	328	348
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110	130	150	170	190	210	230	250	270	290	310	330	350
111	131	151	171	191	211	231	251	271	291	311	331	351
112	132	152	172	192	212	232	252	272	292	312	332	352
113	133	153	173	193	213	233	253	273	293	313	333	353
114	134	154	174	194	214	234	254	274	294	314	334	354
115	135	155	175	195	215	235	255	275	295	315	335	355
116	136	156	176	196	216	236	256	276	296	316	336	356
117	137	157	177	197	217	237	257	277	297	317	337	357
118	138	158	178	198	218	238	258	278	298	318	338	358
119	139	159	179	199	219	239	259	279	299	319	339	359
120	140	160	180	200	220	240	260	280	300	320	340	360

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Abstracts of papers in the January Journal of Food Protection

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

Thermal Resistance of Three Parvoviruses: A Possible Human Isolate, the Minute Virus of Mice, and the Latent Rat Virus, Alexander C. Fassolitis, James T. Peeler, Virgil l. Jones and Edward P. Larkin, Virology Branch, Division of Microbiology, Food and Drug Administration, Cincinnati, Ohio 45226

J. Food Prot. 48:4-6

Thermal inactivation of three parvoviruses - a possible human isolate (H-1), the minute virus of mice (MVM), and the latent rat virus (RV) - was investigated over a wide range of time and temperature contacts. The H-1 virus was inactivated at a lower FN50 value than were the RV and HVM. Ten minute inactivating temperatures were 74.5°C for H-1 virus, 86.5°C for MVM and 88.5°C for RV when inocula concentrations were ca. 1×10^3. All three viruses were shown to survive when processed at the milk pasteurization times and temperatures advocated in the U.S. Public Health Service milk ordinance and code.

Common Characteristics of the Swiss and Argentine Strains of *Clostridium botulinum* Type G, Haim M. Solomon, Donald A. Kautter and Richard K. Lynt, Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 48:7-10

Five strains of *Clostridium botulinum* type G of human origin, from Switzerland, were compared with two strains isolated from soil in Argentina. The Swiss and Argentine strains are the only type G strains isolated to date. Characteristics compared were toxigenicity, sporulation, proteolysis and carbohydrate fermentation. High toxin titers were produced in trypticase-peptone-glucose-yeast extract broth incubated anaerobically at 30°C for 10 d. Sporulation occurred in three strains incubated anaerobically on soil extract agar at 35°C for 15 d. Different concentrations of soil extract in the medium promoted sporulation of different strains. Toxins of the Swiss and Argentine strains showed identical patterns for trypsin activation, reaction to A-F antitoxin and neutralization by antitoxin prepared from strain 89G. All seven strains showed delayed proteolytic activity but failed to ferment any of the sugars tested.

Aflatoxin Conversion by Dairy Cattle Consuming Naturally-Contaminated Whole Cottonseed, Ralph L. Price, J. H. Paulson, Otis G. Lough, Conrad Gingg and Andy G. Kurtz, Department of Nutrition and Food Science, The University of Arizona, Tucson, Arizona 85721, Office of the Arizona State Chemist, Mesa, Arizona, Cooperative Extension Service, University of Arizona, Phoenix, Arizona 85040, Triple G Dairies, Tolleson, Arizona and United Dairymen of Arizona, Mesa, Arizona and Arizona Farm Bureau, Phoenix, Arizona

J. Food Prot. 48:11-15

Whole cottonseed determined to have aflatoxin B_1 (AFB_1) levels of 5, 31, 104, 280, and 560 μg/kg was fed as 15% of the total dairy ration to a commercial herd of 90 grade Holstein dairy cattle for 70 d. Milk from the bulk tank was sampled either daily or after each milking and analyzed for aflatoxin M_1 (AFM_1). The ratio for AFB_1 in the dairy ration to AFM_1 in the milk averaged 75 to 1 under conditions and at levels tested with no consistent relation to the level of AFB_1 in the feed. Approximately 1.6% conversion occurred during the steady state of consumption and secretion. The federal action level of 0.5 μg AFM_1/L of milk would be produced by cows consuming a ration containing 15% whole cottonseed contaminated with approximately 250 μg AFB_1/kg.

Highly Sensitive Paper-Disc Assays for Detecting Penicillin in Milk, Gina M. Balbi and Paul A. Hartman, Department of Microbiology, Iowa State University, Ames, Iowa 50011

J. Food Prot. 48:16-20

A modified *Bacillus subtilis* disc-plate assay could detect 0.015 I.U. of penicillin G per ml of milk, whereas the lower detection limit of the standard assay was 0.050 I.U. per ml. Likewise, a modified *Bacillus stearothermophilus* disc-plate assay could detect 0.003 I.U. of penicillin G per ml of milk, whereas the lower detection limit of the standard assay was 0.005 I.U. per ml. Increased sensitivities were accomplished by preloading assay discs with "critical" concentrations so that minute quantities of antibiotic above the "critical" concentrations would produce zones of inhibition. Only a few alterations in routine laboratory procedure were required to perform the assays. Use of these assays should assure a milk supply that would not cause allergic reactions in humans or significantly inhibit dairy starter cultures. The general principal of "critical" concentration might have applications other than those that we have described, to increase the sensitivity of radial-diffusion analyses for biologically active compounds.

ICMSF Methods Studies. XV. Comparison of Four Media and Methods for Enumerating *Staphylococcus aureus* in Powdered Milk, A. Chopin, S. Malcolm, G. Jarvis, H. Asperger, H. J. Beckers, A. M. Bertona, C. Cominazzini, S. Carini, R. Lodi, G. Hahn, W. Heeschen, J. A. Jans, D. I. Jervis, J. M. Lanier, F. O'Connor, M. Rea, J. Rossi, R. Seligmann, S. Tesone, G. Waes, G. Mocquot and H. Pivnick, Institut National de la Recherche Argonomique, 35042 Rennes, France; Health Protection Branch, Ottawa, Canada; VeterinärmedizinischeUniversität, Wien, Austria, Rijks Instituut voor de Volksgezondheid, Bilthoven, The Netherlands; Laboratorio Provinicale d'Igiene e Profilassi, Novara, Italy; Università degli Studi di Milano, Milano, Italy; Institut für Milchforschung, Kiel, Germany; Stichting Centraal Orgaan, Zuivelcontrole, Leusden, The Netherlands; St. Ivel Technical Centre Bradford-on-Avon, Wilts, United Kingdom; Food and Drug Adminstration, Minneapolis, Minnesota; Moorepark Research Centre, Fermoy, County Cork, Ireland; Istituto di Microbiologia, Lattierocasearia, Università di Perugia, Italy; Ministry of Health, Haifa, Israel; CITIL-INTI, Buenos Aires, Argentina; and Rijkszuivelstation, Melle, Belgium

J. Food Prot. 48:21-27

Four media were examined for their usefulness in enumerating *Staphylococcus aureus* inoculated (a) into milk that was then dried or (b) directly into dried milk powder. In all, seven strains of *S. aureus* were inoculated individually into each preparation and were enumerated after two periods of storage (18 to 19 d and 60 to 61 d). Fourteen laboratories from twelve countries participated in the comparison which found that direct plating on agar medium in 14-cm petri dishes may be as useful as enrichment followed by streaking. Plating on Baird-Parker medium or on Hauschild pork plasma fibrinogen medium and a MPN method using Giolitti and Cantoni's broth with Tween 80 were equally sensitive for enumerating *S. aureus* in dried milk powder. The use of Hauschild medium may eliminate the need for supplementary tests to confirm colonies as *S. aureus*, but in some cases was found to fail in some laboratories. Giolitti and Cantoni's broth without Tween 80 generally was less useful than the three other media for enumerating *S. aureus*. *S. aureus* inoculated into milk that was then dried survived longer than when inoculated into dried milk.

Infulence of Lactic Acid Bacteria and the Overall Flora on Development of Pathogenic Bacteria in Vacuum-Packed, Cooked Emulsion-Style Sausage, H.-J. S. Nielsen and P. Zeuthen, Food Technology Laboratory, The Technical University of Denmark, DK-2800 Lyngby, Denmark

J. Food Prot. 48:28-34

A study was done on the influence of the saprophytic flora and/or lactic acid bacteria on development of *Staphylococcus aureus, Bacillus cereus, Salmonella typhimurium, Salmonella enteritidis* and *Yersinia enterocolitica* in vacuum-packed bologna-type sausage; *Clostridium perfringens* was tested in vacuum-packed frankfurters. Both lactic acid bacteria and the normal flora affected growth of the pathogenic bacteria. At low temperatures increasing inhibition was noted by the lactic acid bacteria acting on *S. aureus* and *Y. enterocolitica*. The normal flora severely restricted growth of *Y. enterocolitica* and salmonellae but not that of *S. aureus*. *B. cereus* was strongly inhibited by lactic acid bacteria, whereas *C. perfringens* did not grow in the vacuum packages with the concomitant flora.

Effect of Pepsin Treatment on the Chemical Iron Profile of Soy-Based Foods Supplemented with Selected Iron Sources and Enhancers, S. W. Rizk and F. M. Clydesdale, Department of Food Science and Nutrition, Massachusetts Agricultural Experiment Station, University of Massachusetts, Amherst, Massachusetts 01003

J. Food Prot. 48:35-38

Changes in chemical iron profile occurring from pH 2 to 6.5 in a wheat-soy blend, a corn-soy-milk mix, and a soy-extended beef patty were investigated. Iron solubility in these products, as affected by in vitro digestion with pepsin, was dependent on a combination of ligand, iron source, pH and food. The greatest solubilizing capacity of the ligands added was provided by ascorbic acid at pH 2 and 4, and by citric acid at pH 6. Improvements in percent soluble iron were related to pepsin digestion and the presumed appearance of protein degradation products.

Microbiological Profile and Storage Temperatures of Egyptian Rice Dishes, M. R. El-Sherbeeny, M. Fahmi Saddik, Hekmat El-Said Aly and Frank L. Bryan, Nutrition Institute, Ministry of Health, Cairo, Egypt and Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia

J. Food Prot. 48:39-43

Cooked rice and other dishes containing rice (172 samples) were tested for aerobic colony count (30°C), *Salmonella, Shigella, Staphylococcus aureus*, and presumptive *Bacillus cereus*. *Salmonella* was isolated from a sample of Oriental rice that was prepared in a five-star hotel kitchen. *Shigella* was isolated from a sample of boiled rice from a four-star hotel kitchen. Nineteen percent of the samples were contaminated by *S. aureus*, and 73% of these contained more than 10^3/g. Forty percent of the samples were contaminated by *B. cereus*, 31% of these contained more than 10^3/g. Rice was more frequently stored at safe temperatures (>55°C) in four- and five-star hotels than in any other type of establishment or that which was sold

by street venders. Aerobic colony counts (30°C) per g were usually quite low when rice was held at temperatures of 55°C or higher. These counts generally became progressively higher as the temperature decreased, often reaching quantities exceeding 10^6 when temperatures were 44°C or below. This was particularly so when the temperature range was 25-34°C. These counts were lower for fried and Oriental rice than for boiled rice, rice and vegetables, kushari (a mixture of rice, macaroni and lentils), and rice and shirea (thin, wheat macaroni).

Microbiological Quality of Crabmeat During Processing, B. A. Wentz, A. P. Duran, A. Swartzentruber, A. H. Schwab, F. D. McClure, D. Archer and R. B. Read, Jr., Division of Microbiology and Division of Mathematics, Food and Drug Administration, Washington, D.C. 20204 and Minneapolis Center for Microbiological Investigations, Minneapolis, Minnesota 55401

J. Food Prot. 48:44-49

Duplicate samples of crab and crabmeat (body meat and claw meat) were collected four times a day for two consecutive days at seven in-line locations (plus finished product claw and body meat) along the processing lines of 47 crabmeat plants located along the Atlantic Ocean and Gulf of Mexico coasts of the United States. All the plants adhered to Good Manufacturing Practice, as determined by visual inspection. Two sanitation inspections and sample collections were conducted at 5-month intervals to reflect seasonal variation. In all, 8,477 in-line samples and 2,459 finished product units of blue crab and crabmeat and 522 in-line samples and 128 finished product units of red crab and Maine crab and crabmeat were analyzed microbiologically. Geometric mean aerobic plate count at 35°C (APC 35) values increased from 1,200 CFU/g before pick to 20,000 CFU/g in the finished product (body meat). For claw meat, APC 35 values increased from 15,000 CFU/g before pick to 24,000 CFU/g in the finished product. Aerobic plate count at 30°C (APC 30) values were consistently higher (2-fold or less) than APC 35 values. Coliform counts in both finished products were ≥19/g in approximately 60% of the units. Coliforms exceeded 500/g in 3.8 and 3.2% of the finished product units for body meat and claw meat, respectively. Geometric mean *Escherichia coli* counts were <3 for all sample sites and finished products, with only 3.3 and 2.7% of the units showing detectable *E. coli* for body meat and claw meat, respectively. Geometric mean values for *Staphylococcus aureus* were 16.8/g for finished body meat and 16.0/g for finished claw meat; approximately 20% of the units of both finished products had *S. aureus* values >100/g. *S. aureus* counts increased significantly after picking.

Toxicologic Response in Mice Fed Cucurbita Fruit, Gilbert S. Stoewsand, Antoni Jaworski, Stanton Shannon and Richard W. Robinson, Departments of Food Science and Technology and Horticultural Sciences, Cornell University, New York State Agricultural Experiment Station, Geneva, New York 14456

J. Food Prot. 48:50-51

Reports from Australia of illness in consumers eating bitter squash prompted a 10-wk mouse-feeding study containing increased levels of the fruit of two cultivars of *Cucurbita pepo,* L., 'Blackjack' and 'Straightneck', and an accession of the bitter species, *Cucurbita texana,* Gray, was conducted. The latter produced poor growth, severe diarrhea, anemia and 40% mortality in mice fed diets containing 1% freeze-dried fruit. Diets containing 10 or 20% *C. texana* caused 100% mortality within a few days. The cultivar contained 3.56 and 1.39 mg per g of fresh fruit cucurbitacins E glycoside and I, respectively. The cultivars of *C. pepo,* 'Blackjack' and 'Straightneck', contained no detectable cucurbitacins; animals fed up to 20% freeze-dried squash in their diets showed no toxicity, with normal growth and hematology.

Spoilage of Soft Drinks Caused by Bacterial Flocculation, B. J. Juven and I. Shomer, Department of Food Technology, Agricultural Research Orgnaization, The Volcani Center, P.O. Box 6, Bet Dagan 50250, Israel

J. Food Prot. 48:52-53

Fruit-flavored soft drinks (pH 3.0) spoiled due to flocculation caused by strains of *Acetobacter* spp. The floc consisted of bacterial cells attached to cellulose microfibrils. Floc production was inhibited at 4°C; it was not prevented by addition of 200 ppm benzoate, 200 ppm sorbate or 100 ppm sulfur dioxide.

Putrefactive Amine Changes in Relation to Microbial Counts of Ground Beef During Storage, N. Sayem El Daher and R. E. Simard, Centre de recherche en nutrition and Département de sciences et technologie des aliments, Université Laval, Sainte-Foy, Québec G1K 7P4, Canada

J. Food Prot. 48:54-58

Seven amines currently found in ground beef, 1,3 diaminopropane, histamine, cadaverine, putrescine, spermine, spermidine and tyramine, were evaluated as indicators of total bacterial, psychrotrophic and coliform counts in raw ground beef stored for 12 d at 4, 7 and 10°C. At 2-d intervals, amines were analyzed by extraction with 0.6 *N* $HClO_4$, separation by ion exchange column chromatography, and detection by ninhydrin. Lysine decarboxylase positive bacteria (LD^+) during storage at 4°C were also studied. Correlation and regression analysis were used to determine the relationship of amine concentration to bacterial count. The percentage of lysine decarboxylase-positive bacterial colonies increased until the 6th day of storage and then decreased until the 12th day. Total and psychrotrophic bacterial counts ranged from 10^2 to 10^9 bacteria/g and were correlated significantly with putrescine, 1,3 diamino-propane, tyramine, cadaverine and spermidine. Cadaverine was the only amine that correlated significantly with coliforms ($P \geq 0.95$).

Detection of Penicillin G and its Benzylpenicilloyl (BPO) - Derivatives in Cow Milk and Serum by means of an ELISA, Peter Rohner, Melchior Schällibaum and Jacques Nicolet, Institute of Veterinary Bacteriology, University of Berne, Postfach 2735, CH-3001 Berne, Switzerland and the Swiss Dairy Research Institute, CH-3097 Liebefeld-Berne, Switzerland

J. Food Prot. 48:59-62

Pharmacokinetic characteristics of benzylpenicillin and its benzylpenicilloyl (BPO)-derivatives were studied in serum and milk of health cows, using a classical biological assay (*Sarcina lutea* test) and a competitive ELISA for BPO detection. The plasma level and passage into milk was determined after intramuscular administration of penethamate-hydroiodide and benzylpenicillin-procaine. In serum of cows receiving penethamate hydroiodide, BPO seemed to persist for a rather long time; the reason for this observation was not clarified. The effect of local (intramammary) application of penicillin G was followed with milk from cows having healthy and mastitic quarters. In all cases, it was found that BPO was not excreted any longer than active penicillin G in milk. In a further survey, 1015 bulk milk samples from two large dairy regions were examined with the ELISA and a biological assay using *Bacillus stearothermophilus* var. *calidolactis*. None of the samples showed detectable BPO or antibiotic residues. It is concluded that milk containing inactive penicillin derivatives, like BPO, is not an important source to cause allergies.

Evaluation of the Potential for Botulinal Toxigenesis in Reduced-Sodium Processed American Cheese Foods and Spreads, C. Karahadian, R. C. Lindsay, L. L. Dillman and R. H. Deibel, Departments of Food Science and Bacteriology, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 48:63-69

Process cheese foods and spreads manufactured to contain low sodium concentrations (ca 320 mg/100 g or 90 mg/28 g, one serving) and added delta-gluconolactone (0.33%) were resistant to toxigenesis by *Clostridium botulinum* inoculated at a rate of 1000 spores/g and held at 30°C for 84 d. Low pH values (5.26 or less) provided by delayed acidity development from delta-gluconolactone were influential in the *C. botulinum* inhibition observed. Disodium phosphate, trisodium citrate, dipotassium phosphate, tripotassium citrate, and sodium aluminum phosphate used in screening tests as single emulsifiers (2.5%) in process cheese foods and spreads allowed toxin formation in many samples prepared. However, some inhibition of toxin formation was indicated for samples emulsified with disodium phosphate, and possibly trisodium citrate.

Microbiological Quality of Cream-Type Pies During Processing, A. H. Schwab, B. A. Wentz, J. A. Jagow, A. Swartzentruber, A. P. Duran, J. M. Lanier, R. J. Barnard and R. B. Read, Jr., Minneapolis Center for Microbiological Investigations, Minneapolis, Minnesota 55401 and Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 48:70-75

In-line samples of crust, filling and topping were collected from pies being prepared by all U.S. firms making frozen cream-type pies for interstate distribution. All firms adhered to Good Manufacturing Practices, as determined by visual inspection. Geometric mean aerobic plate count values were generally low for crust, filling and topping, ranging from 49 CFU/g for topping containing dairy ingredients as it was deposited onto the pie filling to 2400 CFU/g for filling containing dairy ingredients as it was deposited into the crust of the pie. Geometric mean coliform, *Escherichia coli* and *Staphylococcus aureus* values were generally lower than the limits of detection, which were 3/g for coliforms and *E. coli* and 10/g for *S. aureus*.

Identification of *Enterobacteriaceae* from Foods with the Spectrum-10, N. A. Cox, M. Van Wart, J. S. Bailey and J. E. Thomson, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613 and Del Monte Research Center, P.O. Box 9004, Walnut Creek, California 94598

J. Food Prot. 48:76-79

Spectrum-10, a newly developed miniaturized identification system, was analyzed for its ability to accurately and rapidly identify members of the *Enterobacteriaceae* family. This study, conducted at two separate laboratories, tested freshly isolated organisms from raw and frozen foods (180) and stock cultures (144). For comparison purposes, the Micro-ID and API-20E identification systems were concurrently inoculated with the test organisms. In comparison to the Micro-ID and the API-20E systems, the Spectrum-10 identified 95 to 96% of the stock cultures to genus and species, whereas 93% of the fresh isolates were identified to genus and 82% to species.

Mycotoxins - Their Biosynthesis in *Alternaria,* E. E. Stinson, Eastern Regional Research Center, Agricultural Research Service, U.S. Department of Agriculture, Philadelphia, Pennsylvania 19118

J. Food Prot. 48:80-91

Alternaria produce a wide assortment of toxic and nontoxic secondary metabolites. A brief summary of the numerous secondary metabolites of *Alternaria* and their toxicity is followed by a presentation of the current view of the polyketide biosynthetic mechanism and its application to the biosynthesis of these compounds. Possible mechanisms for the biosynthesis of alternariol, alternariol methyl ether, and other dibenzo-α-pyrones are presented, as well as mechanisms for the biosynthesis of tenuazonic acid and altertoxin I. Bioregulation of the production of these materials by light, heat, nutrients and NADPH production, and the role of mannitol in NADPH formation are also discussed.

Calendar

1985

January 28-31, BASIC FOOD PROCESSING SANITATION, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

January 28-February 1, "FOOD MICROBIOLOGY" SHORT COURSE, to be held in the UCLA Extension Building, 10995 Le Conte Ave., West Los Angeles. For more information contact: UCLA Extension, 213-825-1295.

January 29-30, ENERGY MANAGEMENT IN DAIRY PROCESSING WORKSHOP, to be held in the Agricultural Research Bldg., Purdue University, West Lafayette, IN. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

February 4-8, MILK MANUFACTURING SHORT COURSE, North Carolina State University. For more information contact: John Rushing, 919-737-2956, or Bruce Winston, 919-737-2261.

February 5-6, FOOD PROCESSORS SANITATION WORKSHOP, to be held at Mission De Oro, Santa Nella, CA. For more information contact: Bob Pearl, 916-752-0980.

February 13-14, DAIRY AND FOOD INDUSTRY CONFERENCE, The Ohio State University. For more information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210-1009.

February 14-15, MEAT PROCESSING CONFERENCE, to be held at the San Francisco Hilton, San Francisco, CA. For more information contact: Shirley Rexroat or Wade Brant, 916-752-2191.

February 15-17, NATIONAL MASTITIS COUNCIL ANNUAL MEETING, to be held at the Frontier Hotel, Las Vegas, NV. For more information and registration materials contact: John Adams, National Mastitis Council, 1840 Wilson Blvd., Arlington, VA 22201. 703-243-8268.

February 17-19, 10TH WINTER INTERNATIONAL FANCY FOOD & CONFECTION SHOW, to be held at the Los Angeles Convention Center, Los Angeles, CA. For show information contact: Pat Dolson, Manager, IFFCS, P.O. Box 3833, Stamford, CT 06905. 203-964-0000. For industry information contact: Jean Frame, Executive Director, NASFT, Suite 1606, 215 Park Ave. South, New York, NY 10003. 800-255-2502 or 212-505-1770.

February 18-20, KENTUCKY ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS EDUCATIONAL CONFERENCE, to be held at the Executive Inn, Louisville, KY. For more information contact: Henry Wilson, Jefferson County Health Department, 400 East Gray Street, Louisville, KY 40202. 502-587-3885.

February 25-27, THE LAW AND THE FOOD INDUSTRY, a course to be held at UC Davis, CA. For more information call: 916-752-6021.

February 26-27, 11TH ANNUAL ABC RESEARCH CORPORATION TECHNICAL SEMINAR. For more information contact: Sara Jo Atwell, Administrative Assistant, ABC Research Corporation, P.O. Box 1557, Gainesville, FL 32607. 904-372-0436.

March, ANNUAL MEETING OF THE MICHIGAN ENVIRONMENTAL HEALTH ASSOCIATION, to be held at the Lansing Hilton - Playboy Club, Lansing, MI. For more information contact: J. Douglas Park, 3500 N. Logan, Lansing, MI 48909. 517-373-2936.

March 4-6, PRINCIPLES OF SENSORY EVALUATION WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

March 5-6, VIRGINIA ASSOCIATION OF SANITARIANS & DAIRY FIELDMEN DAIRY INDUSTRY WORKSHOP, to be held at Donaldson-Brown Continuing Education Center, VA Polytechnic Center & State University, Blacksburg, VA. For more information contact: W. J. Farley, Rt. 1, Box 247, Staunton, VA 24401. 703-434-3897.

March 6-7, SECOND ANNUAL CHEESE RESEARCH AND TECHNOLOGY CONFERENCE, to be held at the Sheraton Inn and Conference Center, Madison, WI. For more information contact: Norman F. Olson, Walter V. Price Cheese Research Institute, Department of Food Science, University of Wisconsin-Madison, Madison, WI 53706. 608-263-2001.

March 11-12, NEW YORK STATE CHEESE MANUFACTURERS' ASSOCIATION ANNUAL MEETING, to be held at the Syracuse Marriott Inn, East Syracuse, NY. For more information contact: D. K. Bandler, 11 Stocking Hall, Cornell University, Ithaca, NY 14853. 607-256-3027.

March 11-12, PRINCIPLES OF SANITATION FOR WAREHOUSEMEN, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

March 13-15, FOOD IRRADIATION UPDATE, to be held at the UC Davis Faculty Club, Old Davis Road, UC Davis, CA. For more information, or to enroll, contact: Jim Lapsley at 916-752-6021.

March 17-20, AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE ANNUAL MEETING AND CONFERENCE/KULTURES AND KURDS KLINIC/NATIONAL CULTURED PRODUCT EVALUATION SESSIONS, to be held at the Opryland Hotel, Nashville, TN. For more information contact: C. Bronson Lane, ACDPI, P.O. Box 7813, Orlando, FL 32854.

March 20, INDIANA DAIRY INDUSTRY CONFERENCE, to be held at Stewart Center, Purdue University, West Lafayette, IN. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

March 25-27, PRINCIPLES OF QUALITY ASSURANCE, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

March 25-29, MID-WEST WORKSHOP IN MILK AND FOOD SANITATION, The Ohio State University. For more information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210-1009.

March 26-27, WESTERN FOOD INDUSTRY CONFERENCE, to be held at Freeborn Hall, University of California, Davis, CA. For more information contact: Shirley Rexroat, 916-752-2191, or Bob Pearl, 916-752-0980.

April 3-4, SYMPOSIUM ON "TECHNOLOGICAL DEVELOPMENTS FOR TODAY AND TOMORROW," to be held at the Giant's Stadium Club, East Rutherford, NJ. For more information contact: Ms. Connie Sibona, 201-361-0900.

April 14-17, 66TH DFISA ANNUAL CONFERENCE, Marriott's Marco Beach Resort, Marco Island, FL. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

April 14-18, INTERNATIONAL FOOD FAIR OF SCANDINAVIA - TEMA 85, the 8th international fair for food and beverages, held together with the 5th international hotel, restaurant and catering fair. For more information contact: Leslie Christensen, General Manager, Bella Center A/S, Center Boulevard, DK-2300 Kobenhavn, Denmark.

April 15-16, ADVANCED PEST CONTROL, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

April 15-19, STATISTICAL QUALITY CONTROL SHORT COURSES - STATISTICAL METHODS APPLIED TO PRODUCTIVITY IMPROVEMENT AND QUALITY CONTROL - FOR THE FOOD PROCESSING INDUSTRY, to be held at the University of California, Davis. For more information contact: Robert C. Pearl, Food Science & Technology Dept., University of California, Davis, CA 95616. 916-752-0980.

April 17-19, MEETING OF THE FLORIDA ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS, to be held at the Quality Inn - Cypress Gardens, FL. For more information contact: Dr. Franklin W. Barber, 1584 Cumberland Ct., Ft. Myers, FL 33907. 813-936-4769.

May 6-7, MOLD MONITORING AND CONTROLS SPECIAL COURSE, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

May 8-10, SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION meeting. To be held in Spearfish, SD. For more information contact: Cathy Meyer, President S.D.E.H.A., PO Box 903, Mitchell, SD 57301. 605-996-6452.

May 13-16, ASEPTIC PROCESSING AND PACKAGING WORKSHOP, to be held at Purdue University, West Lafayette, IN. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

May 14-16, CONFERENCE ON INFANT FORMULA, to be held at the Sheraton Beach Inn & Conference Center, Virginia Beach, VA. For more information contact: Dr. James T. Tanner, Food & Drug Administration, HFF-266, 200 C Street S.W., Washington, DC 20204. 202-472-5364.

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

May 21-23, INTERNATIONAL DAIRY FEDERATION SEMINAR, Progress in the Control of Bovine Mastitis, to be held at Bundesanstalt fur Milchforschung, D-2300 Kiel, FRG. For more information contact: Prof. Dr. W. Heeschen, Bundesanstalt fur Milchforschung, Institut fur Hygiene, Hermann-Weigmann-Strabe 1, P.O. Box 1649, D-2300 Kiel / FRG. Telephone: (0431) 609-392 or 609-1. Telex: 292966.

May 21-23, DESCRIPTIVE ANALYSIS WORKSHOP, to be held in London, England. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

May 24, DFISA INTERNATIONAL TRADE SEMINAR, to be held at the Key Bridge Marriott, Washington, D.C. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

June 17-20, BASIC FOOD PLANT MICROBIOLOGY, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

June 23-26, CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY 28TH ANNUAL CONFERENCE, to be held at the Royal York Hotel, Toronto, Ontario, Canada. For more information contact: Mr. Bill Munns, Conference Chairman, Canada Packers Inc., 95 St. Clair Avenue W., Toronto, Ontario M4V 1P2, Canada. 416-766-4311.

July 15-17, TECHNIQUES IN MEASUREMENT WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

August 3-9, 1985 ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at the Westin Hotel, in Copley Place, Boston, MA. For more information contact: Mr. Forrest S. Moy, Morton Thiokol, Inc., Ventron Division, 150 Andover Street, Danvers, MA 01923. 617-774-3100.

August 4-8, IAMFES ANNUAL MEETING, to be held at the Hyatt Regency, Nashville, TN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

August 5-9, "BIOTECHNOLOGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND BIOLOGICALS," to be held at the Massachusetts Institute of Technology, Cambridge, MA. For more information contact: Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

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

September 9-12, ASEPTIC PROCESSING AND PACKAGING OF FOODS, sponsored by The International Union of Food Science and Technology Food Working Party of the European Federation of Chemical Engineering, to be held in Tylosand, Sweden. For more information contact: Ann-Britt Madsen, Kurssekretariatet, Lund Institute of Technology, P.O. Box 118, S-221 00 Lund, Sweden.

September 17-19, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to be held at the Sheraton Inn, Syracuse, NY. For more information contact: D. K. Bandler, 11 Stocking Hall, Cornell University, Ithaca, NY 14853. 607-256-3027.

September 30-October 2, ADVANCED SANITATION PROGRAM, to be held in Chicago, IL. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

October 1-3, STORAGE LIVES OF CHILLED AND FROZEN FISH AND FISH PRODUCTS, to be held at The Conference Centre, University of Aberdeen, Aberdeen, Scotland. For more information contact: IIR Conference Organiser, Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen AB9 8DG, UK.

October 5-9, DFISA FOOD & DAIRY EXPO '85, to be held at the Georgia World Congress Center, Atlanta, GA. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

October 21-23, STABILITY AND QUALITY CONTROL WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

October 21-25, 69TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, to be held in Auckland, New Zealand. For more information contact: H. Wainess, Secretary, U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 28-30, PCO RECERTIFICATION, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

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April 14-18, FRUIT AND FRUIT TECHNOLOGY RESEARCH INSTITUTE INTERNATIONAL CONFERENCE to be held at the CSIR Conference Centre, South Africa. For more information contact: Symposium Secretariat S.341, CSIR, P.O. Box 395, Pretoria 0001, South Africa. Telephone: 012 869211 x 2063. Telex: 3-630 SA.

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

June 29-July 2, 29TH CONFERENCE OF THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY, to be held in Calgary, Alberta, Canada. For more information contact: Terry Smyrl, Ph.D., Alberta Horticultural Research Center, Brooks, Alberta, Canada. T0J 0J0. 403-362-3391.

August 3-7, IAMFES ANNUAL MEETING to be held at the Radisson South, Minneapolis, MN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

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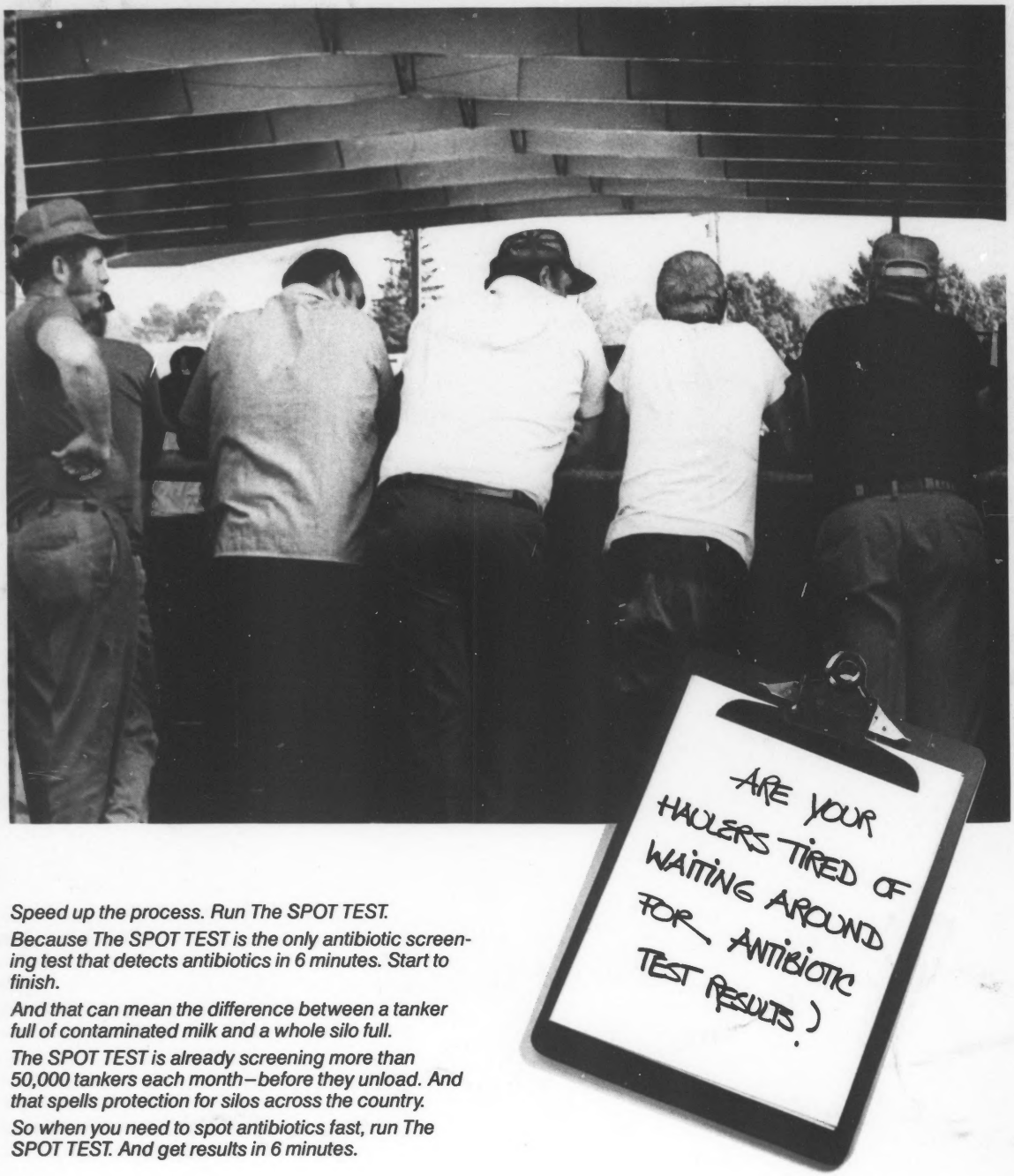

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