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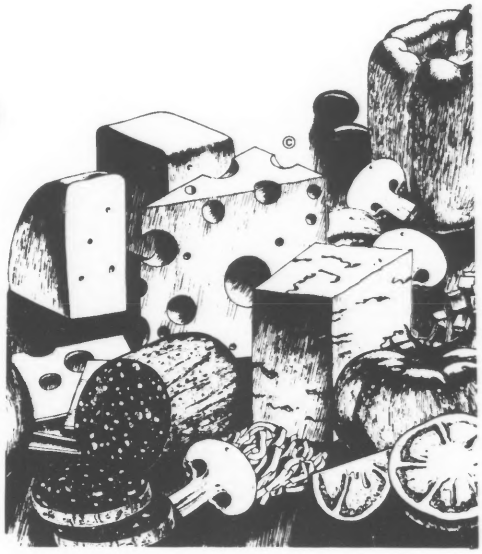

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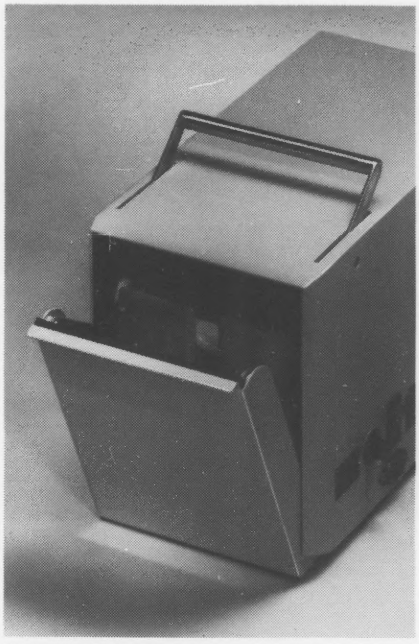

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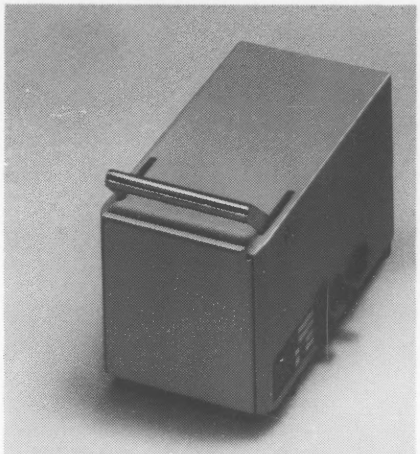

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Dairy and Food Sanitation

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ARTICLES:

Dairy and Food Sanitation, Vol. 8, No. 5, Pages 236-242 (May 1988)

Study of Milk Handling and Milk Quality in New York State Public Schools

by J.H. Davidson, G.F. Senyk, and D.K. Bandler
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Cornell University
Ithaca, NY 14853

Introduction

School milk sales represent approximately 15 percent of all milk consumed in New York State during the school year. It is safe to say that quality of milk affects its consumption. Inclusion of milk in school lunch program demonstrates a commitment to the nutrition of public school students. For the nutritional benefits to be provided, high quality products must be maintained. Additionally, consumers gained during the school years can establish a strong potential for continued consumption in adult life.

Materials and Methods

School Visitations

During the 1986-87 school year, 233 schools (80 Elementary, 46 Jr. High, 44 High, 33 Jr. Sr. High, 24 Central, and 6 Other schools) within 103 randomly selected New York State districts were visited by a dairy specialist with either the New York State districts were visited by a dairy specialist with either the New York State Department of Agriculture and Markets or the New York State Milk Quality Improvement Project. Permission was secured from each school visited.

An interview with the cafeteria manager, inspection of milk rotation and milk refrigeration equipment, and purchase of samples for chemical, microbiological, and sensory evaluation were included in each on-site visit. Temperature checks were made in all milk storage and service equipment with YSI Telethermometers (Yellow Springs Instrument Co., Inc., Yellow Springs, OH 45387) using surface probes (1). Samples representative of the most common fluid milk products offered for sale were purchased from the serving line and transported on ice to the university laboratories. Result of the sample analysis and any recommendations were sent the district food service manager.

Sample Analysis

Chemical evaluations consisted of determinations of tyrosine value, acid degree value, and pH. Tyrosine value was determined by Juffs' method (4). Acid degree value was evaluated using a method developed by Shipe et. al (6). Standard Plate Counts and coliform counts using Violet Red Bile Agar procedure, as described in *Standard Methods for the Examination of Dairy Products* were made to determine microbiological acceptability (5). Sensory evaluations were made by a panel of four trained judges at Cornell University using a modified American Dairy Science Association scoring system (2). Scores categorized milks as excellent (10.0-9.0), good (8.9-8.0), fair (7.9-6.5), consumer complaint (6.4-5.5), and unacceptable (5.4-1.0).

Results and Discussion

Milk Handling

Delivery: Most school districts received either daily delivery or delivery 3 times a week. The actual percentages are shown in Figure 1. Slower moving products such as skim milk and lowfat milk are sometimes delivered less frequently than whole and chocolate milk. Although daily delivery is best from a quality standpoint, it is becoming less practical from the supplier's side. As delivery becomes less frequent, school milk is spending more time in the school's refrigeration equipment. This is not necessarily bad; however, there are several pitfalls that must be avoided. Walk-ins and refrigerators are used to store fruit, meat, and vegetables as well as milk. Odors from these foods are readily absorbed into milk to produce an off-flavor. Milk stored in these common coolers for any length of time must be kept as far from odorous foods as physically possible. Another possible problem with less frequent delivery is that the milk served is older. Ideally it would be best to serve the freshest milk possible. Since the quality of milk does not improve with age, it is advisable that milk be consumed within 7 days of packaging whenever possible. This should be possible even with less frequent delivery as long as the milk delivered is fresh.

Unrefrigerated milk delivery trucks are a potential for temperature abuse of milk, as well as, a concern for school cafeteria managers. Although 72% of the managers interviewed reported their milk being delivered in a refrigerated truck, 25% were unsure if the truck was refrigerated, and 3% reported unrefrigerated trucks. Schools and dairies should work together to avoid the product being unrefrigerated during transport.

The cafeteria managers reported several problems with containers at a number of schools. These problems are

enumerated in Table 1. It appears that cafeteria managers could remedy a number of these by reporting problems to the dairies. Milk Quality Improvement Project personnel contacted dairies with serious problems and found them generally cooperative.

Handling at the School: The most important aspects of handling at the school are temperature, storage conditions, and rotation. Milk quality cannot be improved at the school. Close attention must be given to these factors to prevent acceptable milk from deteriorating into a product having off-flavors.

Temperature Control: The percentage of schools visited and the milk storage equipment that they used are shown in Table 2. Walk-ins were the most common equipment used for milk storage. Refrigerators and chests were used less often.

Figure 2 shows a comparison of temperature readings recorded in three different types of milk storage equipment (walk-ins, refrigerators, and chests) and the total temperature readings in storage equipment. The chest coolers often double as both storage and service equipment. Chest coolers provided generally lower storage temperatures than walk-ins and refrigerators. Walk-ins and refrigerators usually store many foods along with the milk. These foods are needed periodically throughout the meal preparation period causing the equipment doors to be opened and closed often. This results in elevated temperatures throughout the cooler. Chests are often used exclusively for milk storage and are opened for the lunch periods only.

The percentage of schools visited and the type of service equipment used are shown in Table 3. Eighteen percent of the schools visited used cold plates or no refrigeration at all in service areas. This situation has significant potential for thermal abuse of milk.

Figure 3 shows a comparison of temperature readings recorded in three types of milk service equipment (lowerators, chests, and cold plates) and the temperature readings recorded in all service equipment. There was a greater percentage of readings above 40°F in the service equipment than in the storage equipment (25 percent in storage equipment, 40 percent in service equipment). This was expected because the service equipment was often left open for a considerable period of time. Forty-one percent of the schools visited experienced a rise in product temperature going from storage to service equipment.

Seventy percent of the product temperatures recorded on cold plates were in excess of 40°F. This type of equipment does not provide the adequate cooling necessary to prolong product quality.

Rotation: Proper rotation of product provides the students with the freshest milk possible. Rotation includes ordering the correct amount of product, as well as using the oldest product first. This becomes more crucial as the delivery frequency decreases. On site visits revealed that products of several ages were stored at a number of school.

Figure 4 shows the percent of whole and chocolate milk by age collected from the schools visited. Overall, chocolate milk was fresher than whole milk. This was probably due to the faster turnover of chocolate milk. The reasons for this faster turnover will be discussed in the Milk Quality section. One quarter of the whole milk collected was 7 days or older. With delivery of fresh milk, ordering of correct amount of product, and proper rotation, all milk should be consumed within 7 days. Holidays and processor plant problems may occasionally make this impossible.

Product Offered and Consumption: Table 4 shows the percentage of schools at different grade levels offering the various types of fluid milk. The elementary schools are lagging behind the secondary schools in their willingness to offer chocolate milk. The probable explanation for this is that school lunch personnel and administrators are concerned about the nutritional value and sugar content in chocolate milk. Indications from the Dairy, Food, and Nutrition Council show that chocolate milk may have a place in the diet of elementary age students as well as older student (3).

Table 5 shows the average price and range of prices paid for products in public schools. Although skim milk is the least expensive product to purchase from the dealer, it is the most expensive unflavored milk offered to the students and faculty. It would appear that the health conscious consumer has to pay more for less.

Table 6 shows the percent of consumption of various products in public schools. Approximately 3/4 of the public school students were drinking one-half pint of milk per day. This statement is inaccurate because some students drink more than one-half pint of milk per day. This does not take waste into account either. Therefore, more than a quarter of the students in the schools visited do not drink milk at school. The reasons for this may include quality factors and accessibility of alternate beverages. Quality factors will be discussed in the next section. Eighty-three percent of the schools visited offer some type of juice, ala carte. This means that milk no longer has exclusive rights in school lunches. Poor quality will result in the loss of consumers to these alternative beverages.

Milk Quality

A total of 440 samples (190 Homogenized, 175 Chocolate, 60 Lowfat, and 15 Skim) were collected from schools and were chemically, microbiologically, and sensory evaluated at Cornell. All of the samples collected were offered for sale at the time of on site visitations. Since milk should be consumed within 7 days, if possible, quality data was broken down into three categories by sample age: less than or equal to 7 days old, older than 7 days, and total samples.

Chemical Analyses: Acid degree value (ADV) is a measure of enzymatic fat breakdown which cause a rancid off-flavor in milk. Although initial ADV is determined by farm and processing practices, it does increase with age in the finished product. An ADV of 1.2-1.4 may indicate a rancid flavor to sensitive people and an ADV above 1.5 will indicate a rancid flavor to many people (5). Lowfat and flavored milks usually do not develop a rancid off-flavor.

Figure 5 shows a comparison of ADV in homogenized samples that are less than or equal to 7 days old, older than 7 days, and all samples. Sixty-five percent of the samples older than 7 days were rancid or well on their way to becoming rancid. Seventeen percent of all the samples had an ADV of 1.4 or greater. Thirteen percent of the samples less than a week old had an ADV greater than 1.4 indicating some abuse of the milk probably either on the farm or in the processing plant.

Microbiological Analyses: Evaluations consisted of a Standard Plate Count (SPC) and enumeration of coliform bacteria. The presence of coliform bacteria is indicative of post-pasteurization contamination. Only 5 percent of the samples collected contained greater than 10 coliform bacteria per ml. This is the limit established by The Grade A Pasteurized Milk Ordinance (7). Figure 6 shows a comparison of SPC in all samples that are less than or equal (<=) to 7 days old, older than 7 days, and all samples. The majority of the samples tested were <=7 days old. This accounts for similarity between the total samples numbers and the <=7 days numbers.

Twenty-seven percent of the samples older than 7 days have SPCs greater than 100,000 bacteria/ml with 15 percent of the samples having counts greater than 1,000,000 bacteria/ml. These samples are not desirable for consumption. This data also supports the advantages of offering fresher milk.

Sensory Evaluations: Flavor is probably the most important quality factor that influences consumer satisfaction. If it does not taste good, it is not going to be consumed. The samples were rated for flavor by an expert panel.

Figure 7 shows the flavor scores of chocolate, homogenized, and low fat milks. The homogenized and lowfat samples were rated about the same. Sixteen percent of the homogenized samples would elicit consumer complaint or rejection. No white milk was rated as 'excellent'. Only 28 percent of the homogenized samples were considered to be 'good' as compared with 60 percent of the chocolate milk that was rated 'good' or 'excellent'. This could account for the chocolate milk having a faster turnover than white milk and as a result being a fresher product.

The most common flavor criticisms are shown in Table 7. Some samples had more than one criticism. Criticisms of chocolate milk were negligible. The overall flavor of white milk in general does not seem to be such that it will promote milk sales. If eating habits are formed during the public school years, the flavor of milk must improve if consumption is expected to continue through adult years.

The data has been presented in support of a within 7 day consumption recommendation.

Recommendations

Milk quality can be improved in New York State public schools. This can be achieved through several steps pertaining to storage conditions, attitudes, and education.

(1) Temperature Control
- -Store milk between 35-40°F
- -Provide visible accurate thermometers in all coolers
- -Elimination of all unrefrigerated transport or serving of milk
- -Eliminate use of cold plates (see Fig. 3)
- -Delay stocking and opening of milk service equipment until immediately before use.
- -Shade windows that allow direct sunlight to shine on milk and/or milk service equipment

(2) Stock Rotation
- -Know the age of milk being delivered
- -Order proper amount (No over-ordering)
- -Rotate using first in, first out procedures

(3) Storage
- -Store milk away from odorous food (Dairy only cooler is ideal)
- -Clean milk storage and service equipment often

One method to improve the factors that affect milk quality is to designate a 'dairy person' and assistant. In many instances this is already being done. Often, however, this person does not have the knowledge and training necessary to monitor all of these factors. A trained 'dairy person' may have included in their job responsibilities some or all of the following:
- -Order milk
- -Understand code date
- -Check age of milk on delivery
- -Rotate stock
- -Stock milk service equipment properly
- -Check temperatures daily
- -Know how to spot problems (i.e., burnt cartons, delivery of warm milk, leakers, etc.)
- -Know factors affecting milk quality (i.e., absorption of flavors)
- -Taste product periodically (trained to taste)

With responsibility for milk handling delegated to one trained, diligent individual, product deterioration at the school can be held to a minimum.

Schools are receiving fewer and fewer milk bids each year. This is due to the declining number of processing plants. Although this cannot be controlled, several factors should be considered in accepting a bid.
- -Cost
- -Frequency of delivery
- -Location and time of delivery
- -References and past experience
- -Responsiveness to complaints
- -Performance and service of dairy-owned equipment

Most schools visited felt that the on-site visitations and sample analyses by an outside observer provided a valuable objective assessment of milk handling and quality. The program is receiving continued funding to reach a broader scope of schools in the future. Educational materials for cafeteria managers are in the process of development and will be distributed statewide. Research is planned to see what can be done to minimize odor absorption by milk during storage.

Acknowledgement

The New York State Dairy Promotion Order provided funding for this study.

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Table 1. Problems reported with containers by school cafeteria managers.

Problems	# of Schools	Percent of Schools
Leaky Containers	93	40
Charred/Hard to Open	47	18
Dirty Containers	37	16
Frozen Milk	19	8
Improperly Filled Containers	14	6

Table 2. Percent of school buildings using various types of milk storage equipment.

Equipment Type	Number of Schools	Percent of Schools
Walk-in	135	59
Refrigerator	42	18
Chest	52	23

Table 3. Percent of schools using various types of milk service equipment.

Equipment Type	Number of Schools	Percent of Schools
Chest	74	34
Lowerator	104	48
Cold Plate	24	11
Unrefrigerated	16	7

Table 4. Percent of different school levels offering various types of milk.

School Level	Percent of Schools Offering Homogenized	Chocolate	Lowfat	Skim
Elementary	81	68	49	49
Jr. High	87	84	51	49
High	81	89	49	62

Table 5. Average price and range of prices per unit paid for products in public schools.

	Product Offered	Price	Range
Contract	Homogenized	.133	.11-.17
	Lowfat	.122	.10-.16
	Skim	.118	.09-.15
	Chocolate	.138	.11-.17
Student	Homogenized	.207	.09-.30
	Lowfat	.209	.08-.30
	Skim	.212	.10-.30
	Chocolate	.227	.10-.35
Faculty	Homogenized	.245	.15-.35
	Lowfat	.245	.15-.35
	Skim	.249	.15-.35
	Chocolate	.260	.20-.40

Table 6. Percent consumption* of various fluid milk products in public schools.

Product	% Consumption
Homogenized	24.6
Lowfat	9.2
Skim	3.1
Chocolate	40.0
Total Milk Consumption	76.9

*Consumption = Average Daily Delivery/Enrollment

Table 7. Common Flavor Criticisms Found in 'White' Milk Samples

Flavor Criticism	% Samples with Criticisms
Lacks Freshness	52
Feed	30
Cooked	26
Burnt Carton	18
Oxidized	5
Rancid	2

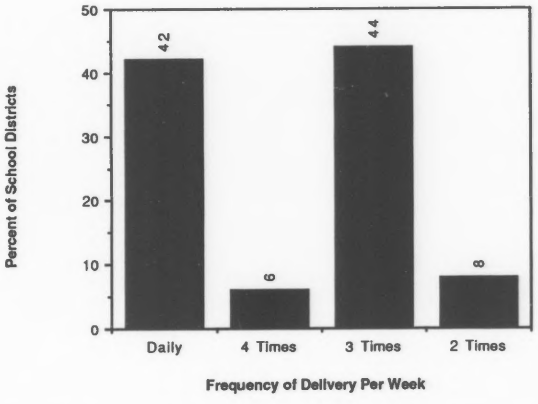

Figure 1. *Percent of School Districts with their Delivery Frequency.*

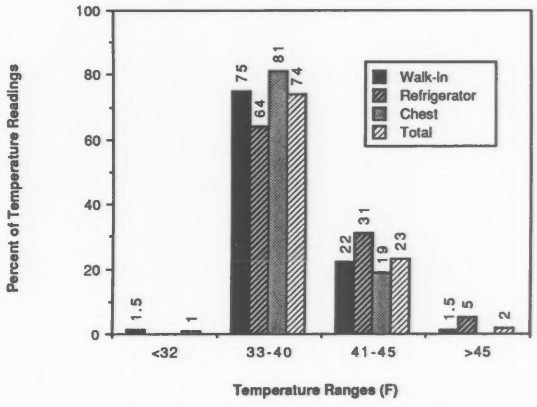

Figure 2. *Percent of Temperature Readings in Milk Storage Equipment.*

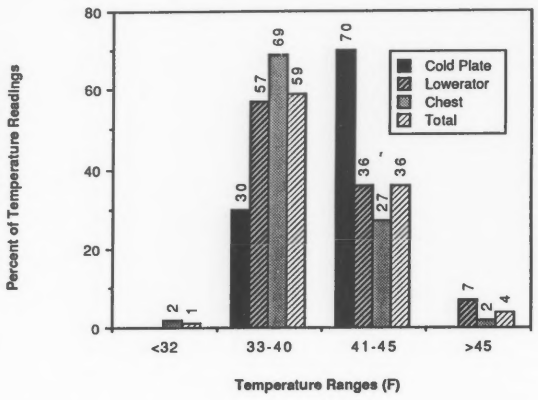

Figure 3. *Percent of Temperature Readings in Milk Service Equipment.*

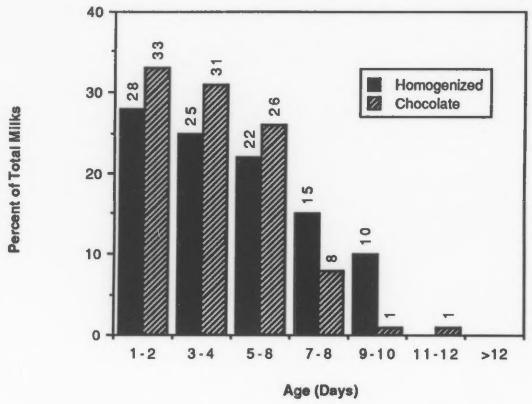

Figure 4. *Percent of Aged Chocolate and Homogenized School Milks.*

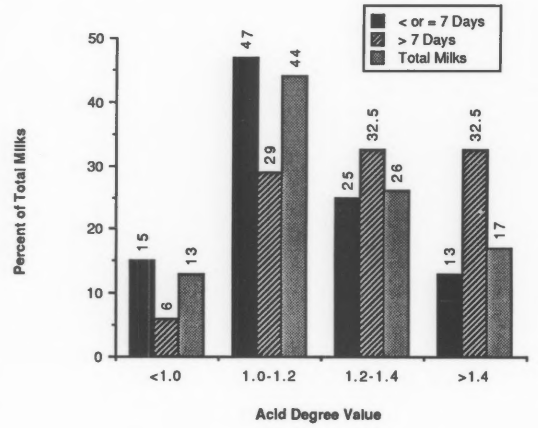

Figure 5. *Percent of Homogenized Milks with their Acid Degree Values.*

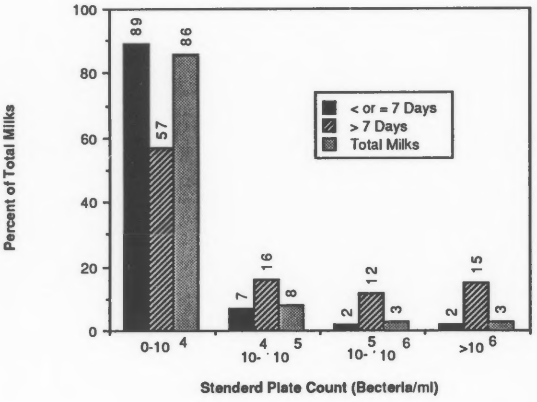

Figure 6. *Percent of Total School Milks with their Standard Plate Counts.*

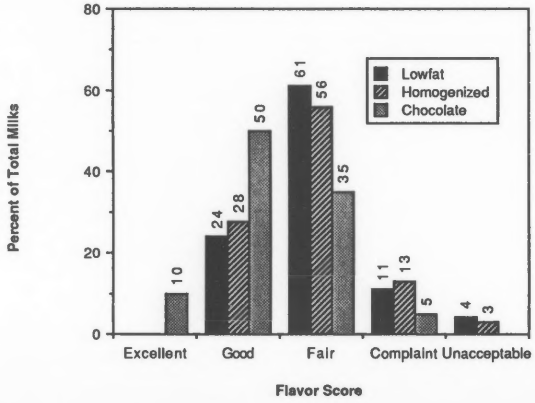

Figure 7. *Percent of Various Milk Types with their Flavor Scores.*

Dairy and Food Sanitation, Vol. 8, No. 5, Pages 244-250 (May 1988)

Field Evaluation of Well Purging Procedures

by M.J.L. Robin and R.W. Gillham

(Reprinted from Ground Water Monitoring Review, Vol. VII, No. 4 (Fall 1987)

Introduction

It is generally assumed that water that remains stagnant in a well is likely to have a different composition than the water within and surrounding the well screen. Processes that can alter the composition of the water include interactions with the well materials (Miller 1982), degassing and atmospheric contamination, biological activity (Marsh and Lloyd 1980), and/or contamination from dust or other foreign materials that might accidentally enter the well. As a result, it is generally recommended that a well be purged prior to sampling.

Purging a sampling well involves the removal of a sufficient quantity of water from the well to ensure that all the stagnant water will be removed from the well and/or that samples collected from the well are representative of the water in the formation in the immediate vicinity of the screen. Currently there is a variety of recommended purging procedures, including pumping until certain parameters, such as temperature or electrical conductance, become constant (U.S. Geological Survey 1980) and pumping three to 10 or more bore volumes, depending on the position in the well of the intake to the pump (Unwin 1982). In a recent literature review, Gillham et al. (1983) pointed out that the necessity, and in some cases the desirability, of the recommended purging procedures is poorly documented, and further suggested that in many circumstances, the purging procedures could have several negative consequences. In particular, it was suggested that:

- There is no assurance that the purposes for purging will be satisfied; i.e., that all the stagnant water will be removed from the well and/or that samples that are uncontaminated by the stagnant water will be obtained
- If a large drawdown is induced, the pressure drop in the screened portion of the well might have undesirable effects, such as degassing and volatilization, and may cause mixing of natural waters from different geologic layers, resulting in non-representative samples
- For large wells or geologic materials of low permeability, the purging procedure might be very time-consuming and therefore costly and impractical
- Disposal of the purged water can be a problem if the volume is large and if the water is contaminated with hazardous substances
- The purging procedure may require additional equipment other that the sampling equipment, thus resulting in higher costs.

In view of the key role played by the purging procedure in obtaining a water sample, and the uncertainties associated with the current procedures, it is appropriate that the effects of purging and the need for purging be re-evaluated.

This paper addresses three principal questions:

1. Assuming that the water in the well is contaminated due to stagnation, can the water in the screened interval be representative of the water in the formation?
2. If the answer to (1) is yes, then are there effective ways of obtaining a representative sample from the screened interval without first purging the well?
3. If the answers to (1) and (2) indicate a need for purging, or if purging is a regulatory requirement, then what methods are most effective in removing the stagnant water from the well?

Because of the case-specific nature of the processes involved, situations in which the solutes of interest interact with the well material were not examined. Rather, only non-reactive tracers were used to investigate the hydraulics of well purging in a series of sampling wells installed in a sandy surficial aquifer. A necessary step in conducting the experiments was the selection of a suitable tracer. The results of initial tests for this purpose will be presented because they are believed to be of relevance to the interpretation of previously reported studies of well purging procedures.

Site Description

The study site is located approximately 24 kilometers (km) (15 miles) north of Waterloo, Ontario, Canada, near the Woolwich landfill area described by Cherry (1983). The aquifer consists of stratified fluvio-glacial sand, with the individual layers varying in thickness from a few centimeters to several tens of centimeters, and varying in texture from fine to coarse sand. Ground water flow is predominately in the horizontal direction because of underlying clayey till. The average linear ground water velocity is approximately 1-2 cm/hr (0.8-1.6 ft/day). At the site selected for this study, the water table was approximately 4 to 5m (12 to 16 feet) below ground surface.

Six 5-cm (2-inch) wells were installed 3m apart in a straight line that was oriented approximately 45° to the direction of ground water flow. The wells were constructed from flush-coupled PVC with the screens having a slot size of 0.25mm (0.01 inch). The six wells are shown in cross section in Figure 1. Three of the wells were installed to a depth of approximately 5m (16 feet) below the water table, and the other three to approximately 1 to 2m (3 to 6 feet) below the water table. Three screen lengths, 31, 76, and 152 cm (1.0, 2.5, and 5.0 feet), were set at each of the two depths. The bore volumes at this site were on the order of 3 L for Well No. 1, 1.5 L for the other two shallow wells (3 and 5), and approximately 10 L for the deep wells (2, 4, and 6). For the purpose of this study, the "bore volume" was taken to be the volume of water contained in the well above the screen at static equilibrium (i.e., non-pumping conditions).

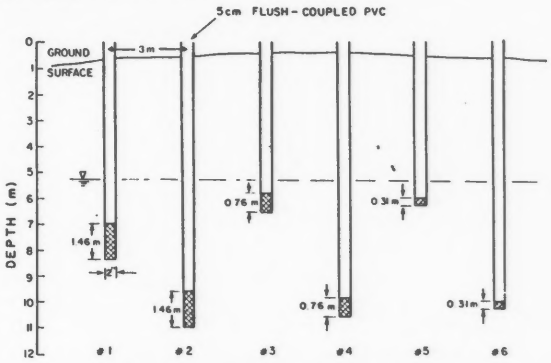

Figure 1. Cross section through the sampling wells at the study site.

Evolution of a Fresh Water Zone Within the Screened Interval

Methods

The main purpose of this series of experiments was to determine if a zone of "unaltered" water from the formation would develop within the screened interval of a sampling well. Three tracers were used in these tests: sodium bromide, sodium chloride, and deionized water.

Sodium bromide was considered to be an ideal tracer because bromide was not present at detectable concentrations in the natural ground water, it did not react with the geologic materials or the sampling materials, and it could be prepared to give solutions having the same density as the local ground water. Disadvantages included the relatively high analytical costs and the fact that the results were not immediately available such that adjustments could be made during the course of an experiment. Sodium chloride tracer solutions, with specific conductance used as the indicator parameters, have been used for tests of the type described here (Unwin 1982, for example). This has the advantage of low analytical costs and the immediate availability of the data. However, a specific conductance that is significantly above the background value invariably requires that the density of the tracer solution be greater than the density of the natural ground water. The more dense tracer solution overlying the less dense natural water raises the possibility for circulation and mixing within the well bore as a result of density instabilities. Indeed, results of preliminary tests showed this to be the case. Deionized water as a tracer would have the same advantages as NaCl solutions, but having the less dense water overlying the ground water would avoid density instabilities. The densities of the various tracer solutions used in the course of this study are given, along with the density of the natural ground water, in Table 1. As indicated, the density of the bromide tracer solution was identical to that of the ground water, where as the density of the deionized water and NaCl tracers were approximately 0.45 percent lower and 0.35 percent higher, respectively, then that of the ground water.

Prior to the start of the test at a particular well, the background concentration of the parameter of interest (specific conductance or bromide concentration) was determined in samples collected after first removing several bore volumes of ground water. The entire water column in the well, including the screened interval, was then replaced by the particular tracer solution.

The water column was replaced by first installing an inflatable packer just above the screen. The exact positioning of the packer was assured by allowing a spacing rod attached to the bottom end of the packer to rest on the bottom of the well. The water above the packer was pumped out and a slightly large volume of tracer solution was poured back into the well. The packer was then deflated and slowly withdrawn from the well. The procedure to this point (illustrated in Figure 2) was the tracer-placement method used in all the subsequent test of the study. A 6.4mm (1/4-inch) Teflon® tube was then inserted to the bottom of the screen. The tube was pumped while an additional amount of tracer solution was slowly poured into the well. When the indicator parameter concentration, monitored at the outlet of the pump, approached that of the tracer solution, the pump was stopped and, or ensure that the initial and final static levels in the well were identical, an additional amount of tracer solution was added as the Teflon tube was

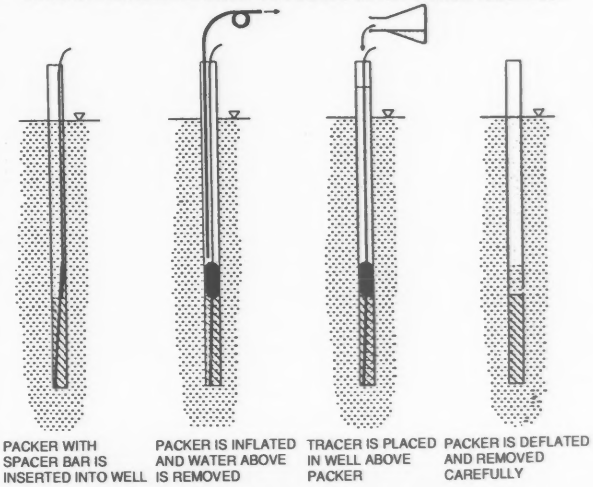

Figure 2. Tracer-placement method used in the purging experiments.

withdrawn. This procedure appeared to give an initially uniform tracer concentration throughout the water column; nevertheless, a small but unknown amount of the tracer solution probably entered the formation.

After the tracer was added, a bundle of five 1.6mm O.D. (1/16-inch) Teflon tubes were installed in the well. The tubes were terminated at the bottom of the screen, at mid-screen, at the top of the screen, mid-way between the top of the screen and the top of the water column, and just below the air-water interface. To collect water samples, the tubes were pumped simultaneously using a multichannel peristaltic pump. The combined discharge rate of the five lines (on the order of 5 to 10 mL per minute) was insufficient to cause any observable drawdown. In order to prevent cross contamination between sampling times, a volume equivalent to the volume contained in the longest tube of the bundle (10-20mL) was pumped from all five tubes and was discarded before collecting a sample. At the end of each test, the well was pumped from the air-water interface, while samples were collected from the small-diameter sampling tubes.

Samples from the deionized water and NaCl tests were analyzed for electrical conductivity using a flow-through cell connected to a 50mL syringe. Temperature was monitored using a thermistor probe installed in a plastic 'tee' at the outlet of the flow-through cell. The conductivity readings were corrected with the cell constant, and corrected for temperature. For the bromide tests, samples were collected in 20 mL scintillation vials and analyzed on a Dionex Liquid Ion-Exchange Chromatograph.

Results and Discussion

Figure 3 shows the results of the deionized water tests obtained for Well No. 2. Included in the figure are the length of the screen, the position of the static level, the locations of the sampling points, and graphs of electrical conductance vs. time for each sampling point.

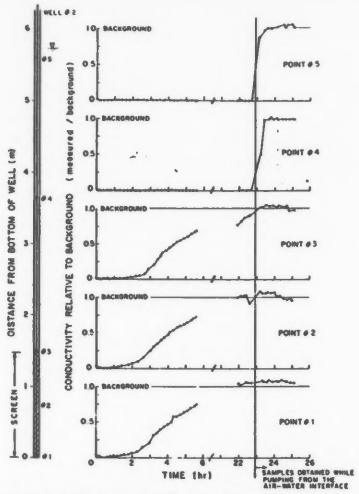

Figure 3. Development of a fresh water zone within the screened interval of Well No. 2 (deionized water test).

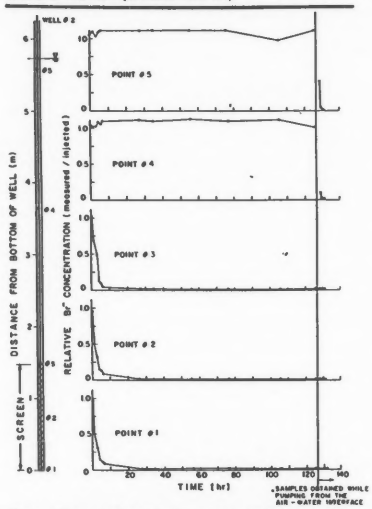

Figure 4. Development of a fresh water zone within the screened interval of sampling Well No. 2 (bromide tests).

TABLE 1
Density of the Natural Ground Water and of the Tracer Solutions Used in This Study

Solution	Density (kg/L)	Density Difference (%) (Tracer-Ground Water) x 100 / Ground Water
Natural Ground water[1]	1.000452	
NaBr tracer[2]	1.000452	0.000
Deionized water	1.000000	–0.45
2M NaCl injected in Well No. 1[3]	1.003	+0.3
Well No. 6[3]	1.004	+0.4
NaCl 0.02 M[2]	1.0012	+0.12

[1]Based on total dissolved solid measurements
[2]Calculated
[3]Estimated from electrical conductivity measurements

All points located within the screened interval consistently showed a rapid return to the background concentrations. Generally the concentration was within 25 percent of the background value within four hours of the start of a test, and was at background within 24 hours. The sampling point immediately above the screened interval showed a gradual trend toward background, but was still substantially below the background at 24 hours. Points located higher in the water column remained at the initial tracer concentration throughout the tests.

At the end of the experiment, when the wells were pumped from the air-water interface, the electrical conductivity at sampling points within the screened interval remained at background or increased slightly. Above the screen, the conductivity increased to or slightly above background. Values in excess of background can only be attributed to an initial uncertainty in the background value, or to variability in the background (possibly caused by previous NaCl tracer tests). The results shown for Well No. 2 are typical of the results obtained for all six wells, with the depth to the screen and the length of the screened interval having no apparent effect.

Under the conditions of these tests, it appears that the natural flow of ground water through the well screen maintained the water in the screen at an electrical conductivity close to that of the natural ground water. Furthermore, as indicated by the response of the sampling point above the screen, a relatively sharp interface appeared to be maintained between the water in the screened interval and the water above the screen.

In areas with lower hydraulic gradients, or less permeable geologic materials, the rate of natural purging through the screen would be less than observed in these tests. The apparently sharp interface suggests that even at these sites, it is possible that the natural purging process could maintain the chemical integrity of the water within the screened interval.

The results of the bromide tests, which were conducted only at Well No. 2, are given in Figure 4. They are almost identical to those obtained using deionized water, and therefore confirm that deionized water was an adequate tracer for the purposes of these experiments.

The results obtained using sodium chloride as the tracer were very different from those obtained using the other two tracers. The tests were performed only on Wells No. 1 and 6; the results for Well No. 6 were given in Figure 5. As shown in this figure, the concentration at all sampling points throughout the entire column gradually declined toward background. At most points in the well, the decline started within the first hour, but at 22 hours most points.ts were still only within about 25 percent of background. It is clear that no zone of fresh ground water was developing within the screened interval.

It is believed that the denser tracer solution overlying the less dense ground water tended to move into the screen as a result of hydrodynamic instabilities. These instabilities resulted in a gradual and continuous mixing of water in the screen with that in the water column above the screen. Although not presented here, the results of numerous NaCl tests showed that density contrasts as small as 0.1 percent could have a significant effect on the experimental results (Gillham et al. 1985).

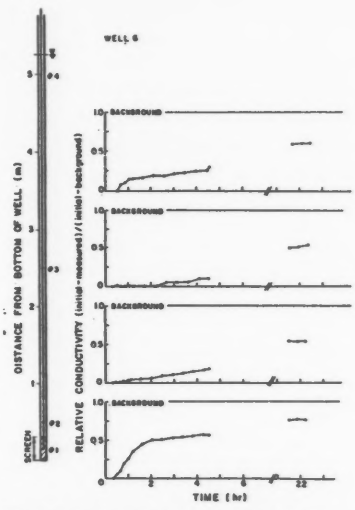

Figure 5. Development of a fresh water zone within the screened interval of sampling Well No. 6 (sodium chloride tracer).

These results show clearly that the density contrast between the tracer solution and the ground water is extremely important in this type of experiment, and raise questions concerning the applicability of results from other studies where solutions with densities greater than that of the natural ground water were used as tracers.

Sampling from the Screened Interval

Method

Following the demonstration that water within the screened interval of the sampling wells can be continuously purged by natural ground water flow, a set of experiments was conducted to investigate methods of retrieving a sample without causing contamination by the overlying stagnant water in the well.

From the results already presented, it appeared that the small diameter tubes were an effective means of retrieving a sample from the screened interval. This method is, of course, limited to wells in which the static level does not exceed the depth of suction lift (about 8 m). Positive-displacement devices that are available commercially could resolve the depth limitation; however, unless used as dedicated samplers, these would be subject to contamination during lowering through the static water column. In this study, a commercially available syringe sampler was used for sample retrieval. (Industrial and Environmental Analysts Inc., Essex Junction, Vermont.) Syringe samplers have the advantage of remaining empty while being lowered through the water column to the desired sampling depth.

Before each test, the background was taken as an average of conductivity values of subsamples taken from 5L (1.3 gallons) sample pumped from the air-water interface (after having pumped several bore volumes) and from a syringe sample obtained at 15cm (6 inches) from the bottom of the well. After

the background determination, the water above the screen was replaced with deionized water using the inflatable-packer method described previously (Figure 2). Syringe samples were then obtained repeatedly at 15 cm (6 inches) from the bottom of the well, and occasionally at the air-water interface. The time elapsed between samples was kept to a minimum 5-10 minutes. The electrical conductivity and temperature were measured on subsamples from the syringe sample and averaged.

Results and Discussion

Plots of relative concentration vs. the number of samples are given in Figure 6. For the wells having long screens (No. 1 and 2), the first sampels showed essentially no cotamination, but (with the exception of Well No. 4) as the screen length became shorter, the first samples were progressively more contaminated.

Some contamination may have resulted from contact of the sampler with the water column as it was lowered into the well; however, it is believed that the major source of contamination resulted from the displacement volume of the sampler. This volume was measured to be approximately 600mL. In the 5cm (2-inch) wells used in the study, this would cause a rise in the water level of approximately 30cm, and the increased hydraulic head would cause the tracer solution to flow into the screen. In the case of short screens, the displaced volume was approximately equal to the volume of the screened interval, resulting in the highly contaminated samples of Figure 6 (Wells No. 5 and 6). The degree of contamination decreased in the medium length and long screens as the displacement volume became a smaller proportion of the volume of water within the screened interval.

The trends in concentration with the number of samples collected is undoubtedly the result of the oscillatory effect on the ground water-tracer interface and the mixing caused by the repeated lowering and withdrawal of the sampler. The conductance values in the samples taken from just below the air-water interface were substantially greater than the conductance of deionized water, providing evidence of this type of mixing. For the long- and medium-screened wells the electrical conductance of successive samples remained relatively unchanged (at a level somewhat below background) or decreased slightly. In these wells it seems that the screen water was ground water contaminated by the tracer each time the sampler was lowered into the well. For the short-screened wells the trend was reversed because the entire screen volume was initially displaced by the sampler and therefore the samples consisted mostly of tracer "contaminated" by progressively more ground water each time the sampler was removed from the well.

These results indicate that a sample that is representative of the ground water could be obtained from the screened interval of a sampling well, without prior purging of the well, through the use of a dedicated sampling device. The device would need to be permanently installed in the well, and the intake should be located near the bottom of the screened interval. The volume of the sample collected should also be significantly less than the volume of water stored in the screen. The degree of sample contamination that would result from the lowering of depth-specific samplers (such as a syringe sampler) would depend upon the increase in hydraulic head in the well (displacement volume of the device and radius of the well), the hydraulic response time of the well, and the length of the screened interval. Though not evaluated in this study,

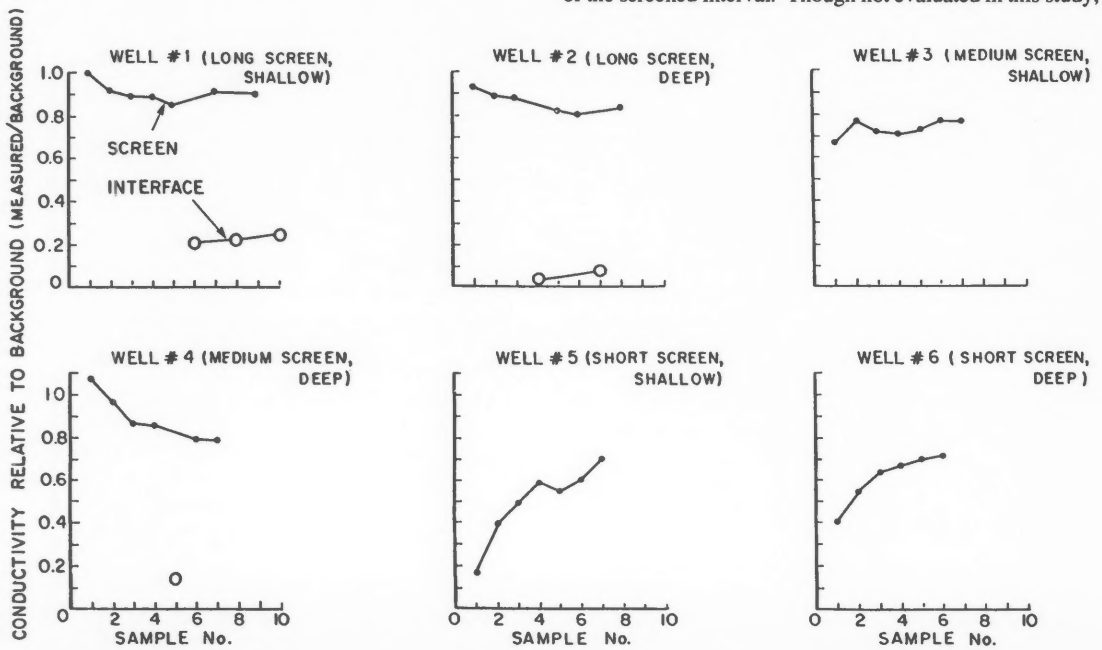

Figure 6. Results of syringe sampling.

it is quite possible that in geologic materials of moderate to low permeability, uncontaminated samples could be collected from the screened interval without prior purging of the well.

Evaluation of Purging Procedures

Several methods of purging sampling wells have been recommended in literature or are being practiced. Three of the most common methods were investigated: Pumping from the air-water interface, pumping from immediately above the screen, and the complete removal of the water column above the screen.

Pumping from the Air-Water Interface

One of the commonly recommended methods for purging a well is to pump from near the air-water interface. If the inlet of the pump is located near the interface, the water in the well should move up toward the inlet as a continuous column, with minimal mixing. The well should therefore contain fresh ground water after one or two bore volumes have been removed. However, laboratory evidence presented by Unwin (1982), using NaCl at a concentration of 4.5g/L, suggested that at least six to eight bore volumes need to be pumped before the well is adequately purged. As demonstrated earlier, this estimate is probably erroneously high because the denser tracer solution was overlying the lighter ground water resulting in density instabilities.

For the field experiments presented here, the background electrical conductivity was obtained by pumping from the air-water interface, at a rate of 500-800mL/min (0.13-0.21 US gal/min), with a 6.4mm (1/4-inch) Teflon tube and peristaltic pump. Using a packer inflated at the top of the screen, the water above the screen was replaced with deionized water (Figure 2). After removing the packer, the well was pumped from the air-water interface. Electrical conductivity and temperature were measured at the outlet of the pump by a flow-through conductivity cell and thermistor probe. The results, plotted as conductivity vs. number of bore volumes, are given in Figure 7. Because all wells responded in a similar manner, only the results for Well No. 2 are shown.

In all cases, most of deionized water was removed from the well in the first bore volume, though an additional bore volume was generally required to reach background. The number of bore volumes required to reach background did not appear to depend on the size of the bore volume, the screen length, or the pumping rate. The principal source of mixing seemed to be the removal of the packer after adding the deionized water.

Additional tests were conducted using the NaCl tracer solutions. Although the results are not presented here that evacuate the entire bore volume (such as triple-tube samplers, Robin et al. 1982). For each well, the background electrical conductivity was first obtained by pumping the well from the air-water interface. Deionized water (the tracer) was then placed in the well above the screen using the inflatable packer procedure described earlier, the packer was removed.

To simulate the purging procedure, the packer was reinserted and inflated at the same position as during the tracer injection. The water above the packer was pumped into a container large enough to hold one bore volume, and the electrical conductivity and temperature were measured on six or seven subsamples taken from the container. The packer was then deflated and removed carefully and the well was allowed to recover to its original level.

This procedure was repeated several times until the electrical conductivity did not vary from one volume to the next. The results are given in Table 2 as the mean conductivity of the subsamples relative to background.

The background was reached after one bore volume in Wells No. 4 and 6 and after two bore volumes in other wells. The second bore volume was probably required as a result of mixing caused by the placement and removal of the packer.

Summary and Conclusions

The experiments of this study were designed to give results applicable to a reasonably wide and important range of hydrogeologic conditions, in particular, conditions that could be encountered in granular aquifer materials. Furthermore, many of the principles revealed by the tests should, with some degree of judgment in their application, be pertinent to many other geologic materials. Nevertheless, the results were obtained through site-specific investigations, and their application to other sites should be undertaken with caution.

The results showed that a zone of unaltered water can develop and be maintained within the screened interval of a sampling well as a result of the continual flow of ground water through the screen. The fresh water zone developed within a few hours after pumping was begun; however, the time required would be strongly influenced by the local hydraulic gradient and the hydraulic conductivity of the geologic mate-

TABLE 2
Results of Flushing by Rapid Removal Followed by Recovery

Bore Volume	Electrical Conductivity Relative to Background					
	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6
1	0.10	0.04	0.27	0.09	0.10	0.10
2	1.13	0.44	0.84	1.05	0.84	1.01
3	1.01	0.99	0.97		0.98	
4					0.99	

rial. Because of the continual flow of water through the screen, one would expect that chemical reactions such as desorption or absorption between the screen materials and contaminants in the ground water would approach equilibrium and thus, the water in the screen may be representative of the water in the formation in the vicinity of the screen.

The presence of representative water within the screened interval presents the possibility of obtaining a sample without (or with very little) purging of the well. A suitable sampling method would be to use a dedicated sampler with the intake near the bottom of the screened interval. Examples of dedicated samplers include small diameter tubes pumped from the ground surface, or positive displacement pumps if the water level in the well is beyond the limit of suction-lift, or if degassing and volatilization are of concern. For this type of sampler only the internal volume of the device itself would need to be purged before sampling. Normally this volume would be very small relative to the size of the bore volume.

Another suitable sampling method would be to sample directly from the screened interval with a depth-specific sampler (such as the syringe sampler used in this study). If the permeability of the formation is moderate to high, then a volume equal to the volume displaced by the submerged sampler should be purged prior to sampling, in order to prevent stagnant water from entering the screen. Again, this volume would normally be very small compared to the bore volume. The results suggest that, depending on the dimensions of the sampler relative to those of the well, failure to remove this small volume can result in sample contamination by the stagnant water. Because of the mixing produced by the insertion and withdrawal of the sampler, repeated sampling with a depth-specific sampler should be avoided, unless the entire bore volume is purged first.

If the decision is made to purge the standing water from a sampling well, then the effectiveness of purging will depend strongly on the procedure use. If the well is completely evacuated, then there appears to be no need to remove more than one or two bore volumes. This would be the case when the portion of the well above the screen is isolated such as with Triple-Tube samplers and packered pumps, or when the discharge rate of the pump used to purge the well is substantially greater than the rate at which water flows into the well. Though we are not aware of supporting data, it is possible that complete evacuation might promote degassing and volatilization and in some cases may induce mixing in the formation.

If the well is not completely evacuated, then, from our results, it appears that the most effective means of removing the stagnant water from the well is to pump from immediately beneath the top of the water column. The volume required then is two to three bore volumes.

Based on these results, the commonly followed and rather broad recommendation of purging three to 10 bore volumes appears excessive if the inlet of the pump is at the air-water interface. Furthermore, the results presented here demonstrate that if the pump inlet is substantially below the air-water interface, even 10 bore volumes may not be sufficient to completely remove the stagnant water. The results of tests with NaCl solutions as tracers suggest that the three-to-10 bore volume recommendation may be based on questionable experimental procedures.

The density instabilities observed in this study have further implications with respect to the use of long screened intervals in the construction of monitoring wells. Should the screen intersect zones with varying degrees of contamination, causing variations in density then there is an opportunity for mixing within the well bore. As a result, the concentration in a sample taken from any particular point in the screen could be very different from the concentration in the formation. It is also possible that mixing may cause dilution of the contaminants to concentrations below the acceptable limit, thereby providing an overly optimistic picture of the aquifer.

The recommendation that purging be carried out until certain parameters (such as temperature and electrical conductance) are constant in time may also lead to excessive purging, without guaranteeing the complete removal of stagnant water. Although all reasonable precautions were taken in this study, the background specific conductance in the field fluctuated slowly and more or less randomly about the mean, such that such more purging was required than necessary to remove the stagnant water.

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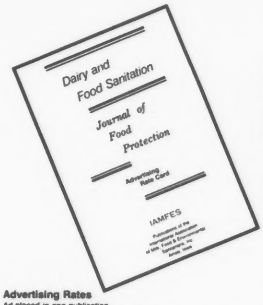

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Defrauding the Desperate: Quackery and AIDS

by Marian Segal, Member of FDA's public affairs staff
(Reprinted from FDA Consumer/October 1987)

The art of quackery has always kept pace with the science of medicine, and it has never been more evident than in the tactics now in vogue for promoting AIDS remedies. No more "eye of newt" and "toe of frog" stirred up by Macbeth's witches. To the contrary, today's proponents of special lotions, potions, diets and pills borrow handily from legitimate science, citing "scientific studies" and using the language of medicine in attempts to lend credence to their claims.

Aiming their ware at the sophisticated consumer who is wary of fraud yet desperate for help, quacks invent scientific sounding rationales for their products, hoping they might help the medicine go down. Thus, the use of terms such as "immunoaugmentative therapy" and claims to "bolster the immune system." But what's really going down is fraud. And business is booming. According to Congressional hearings, on estimated $1 billion will be spent on fraudulent AIDS therapies this year.

Dr. John Renner, chairman of the Midwest Council Against Health Fraud, based in Kansas City, Mo., has surveyed the market of fraudulent AIDS products, prompting him to state that "everything has been converted into an AIDS treatment." Remedies include processed blue-green algae (referred to by some as "pond scum") selling for $20 a bottle, injections of hydrogen peroxide, the food preservative BHT, pills derived from mice that have been given the AIDS virus, and herbal capsules that were found to contain poisonous metals. Additional "therapies" include thumping on the thymus gland - an immune system organ - to produce white blood cells that are severely depleted in AIDS, massaging the skin with a dry brush, bathing the body in a chlorine bleach , and exposing the genitals and rectum to the sun's rays at about 4 p.m. One man masquerading as a Ph.D. was injecting his patients with a processed byproduct of their own urine at $100 per injection.

Meredith Vieira, reporting on fraudulent AIDS therapies on CBS-TV's "West 57th" last April 27, interviewed a man who called himself Dr. Sebi. "Dr. Sebi," said Vieira, "isn't a doctor. He's an herbalist, a man from Honduras who brought his bag of miracles to Brooklyn. His cure for AIDS starts at $500. It's the same regimen of diet and herbs he prescribes for everything." In an earlier television interview with Washington, D.C.'s "Eyewitness News" reporter Ellen Kingsley, Dr. Sebi stated, "We have always charged $250 for the first consultation to get the herbal compounds. On the AIDS, we increase it to $500, because of the psychological reason that goes along with the price. When someone invests enough money, they're going to go along with the program...." Sebi has since been arrested for practicing medicine without a license.

These charlatans don't limit their pitches to people who already have AIDS or are infected with the AIDS virus. The fear generated by this disease has created a potentially unlimited clientele, and anyone is fair game. Especially dangerous are product claims that misinform the public about AIDS prevention and virus transmission. "Sani-Form" a piece of plastic designed to fit over a telephone mouthpiece, was promoted to protect against infection from public phones. That the product is rubbish constitutes less disservice to the public than does the suggestion that AIDS can be transmitted simply by touching an instrument used by someone with AIDS.

While products like Sani-Form reawaken groundless fears of catching AIDS through casual contact, a more insidious danger lies with false claims that a product will protect against infection in situations that do present a risk, such as practicing high-risk sex. This was the case with Lubraseptic, a product approved by the Food and Drug Administration for use as a condom lubricant/sperimicide. When studies showed that nonoxynol-9, the active ingredient in Lubraseptic, could kill the AIDS virus in vitro (in the test tube), the manufacturer began to promote the product as an AIDS preventative. However, laboratory test results often differ from in vivo results (in a living organism) and do not constitute proof of how a chemical will work in the human body. Unsubstantial claims such as this instill a sense of security where none is warranted, perhaps leading users of the product to ignore precautions that are known to help protect against spreading the disease.

Despite the quacks, FDA has not seen as many fraudulent AIDS products on the market as had been anticipated. This is in part because AIDS affects only a small percentage of the population. As the disease becomes more widespread, the market of fraudulent products is expected to grow.

The big money in AIDS fraud, according to George Blatt, director of FDA's Health Fraud Staff in the Center for Drugs and Biologics' Office of Compliance, probably comes from the sale of unproven products or "treatments" advocated by

foreign promoters or clinics. People with AIDS, or their friends or relatives, are spending millions of dollars to obtain these drugs or therapies abroad or - illegally - in this country. Two highly publicized overseas promoters offering bogus treatments are Dr. Lawrence Burton's Immunology Researching Centre in the Bahamas and the Hauptmann Institute in Austria. FDA has issued import alerts against products from both these facilities, barring their entry into this country. Before his death in 1985, Rock Hudson traveled to France for expensive treatments with HPA-23, reported by French investigators to inhibit the AIDS virus. Follow-up studies of the drug's safety and efficacy, however, showed excessive toxicity and little, if any, benefit to patients.

Others have been lured by claims that megadoses of vitamin C help the body's immune system fight the AIDS virus. Various claims for vitamins, nutrients and special diets are proving as popular in AIDS quackery as they have been in so many diseases preceding this one.

Not all who sell or provide unapproved treatments for AIDS are motivated by personal gain. Homemade concoctions of products such as the photography chemical DNCB, said to help clear up lesions in a skin cancer common in AIDS patients, and AL-721, a compound claimed by its manufacturer to hinder AIDS virus infection, are often provided free to patients by an underground network of "guerilla clinics" springing up around the country. (FDA has approved investigational new drug applications for testing AL-721 in humans. Unless and until studies show the drug to be safe and effective for treating AIDS, however, it cannot legally be promoted or sold for this purpose.) Some of the clinics will also refer patients to underground suppliers of other experimental drugs. An article in *USA Today* last April estimated that 5,000 to 10,000 patients use these products or seek information about them.

Well-intentioned proponents of these products contend that the substances may provide help, or, at the very least, hope, and that people have the right to try whatever may offer them hope, even if it is a worthless remedy. This argument is especially compelling for people with AIDS or other fatal diseases with no known cure.

In the book *Health Quackery* , published in 1980, the editors of *Consumer Reports* addressed this issue in examining the controversy surrounding Laetrile as a cancer treatment. Proponents of the drug, including some physicians, reasoned that little or no harm could come from permitting terminally ill patients to use a worthless drug. Consumers Union disagreed, stating that "the use of Laetrile as a treatment for terminally ill cancer patients stands in blatant violation of the basic patient right not to be duped and not to be offered a false sense of hope." They went on to say that "these patients also have the right to responsible, honest medical care of high quality for as long as they live. Dying patients rarely, if ever, require deceptive drug treatment."

If a speech before the National Association of Consumer Agency Administrators last June, New York City's Consumer Affairs Commissioner Angelo J. Aponte reminded his audience that, "Reliance on phony or unreliable cures or treatments can...lure people away from genuine therapies or preventives." He told of a physician who reported that one of his patients refused treatment with Retrovir (also known as AZT) - the only currently approved AIDS drug - in favor of going to France for useless injections of a glandular extract costing $10,000.

FDA recently issued a new rule that will permit terminally ill patients greater access to experimental drugs. This should help combat health fraud and eliminate the need for desperate patients to go abroad seeking help. The regulation is carefully designed to protect the welfare of patients and to safeguard the drug testing and approval process. FDA also works closely with legitimate sponsors of experimental AIDS drugs, and these are given the agency's highest priority for review.

As for "pond scum" peddlers and the like, FDA has taken direct action against vendors of such products as douches and condom lubricants who falsely advertise them as disease-fighting agents against AIDS. Last July, the agency issued a bulletin updating field staff on the problem and directing the districts to take appropriate action in cases where AIDS fraud is suspected. The bulletin instructed that any product label or accompanying labeling that includes a reference to AIDS, AIDS-related conditions, or the virus that causes AIDS should be considered a candidate for regulatory action. Products promoted to "strengthen" or "enhance"the immune system are also suspect. Field investigators around the country also work with state governments to combat health fraud. To help contain the growth of fraudulent AIDS products, the agency has established a special initiative, coordinated by the Office of Consumer Affairs, to monitor the problem and to work with other organizations to educate the public. The consumer must remember that AIDS is a quack's dream come true; an incurable, fatal disease surrounded by fear and ignorance is tailor-made for the enterprising huckster who will stir up a cauldron of diceit to turn a quick profit. And, if the experts are right in their predictions, more and more of these profiteers will be on the scene selling their wares. When the product is hope, let the buyer beware.

Dairy and Food Sanitation, Vol. 8, No. 5, Pages 254-255 (May 1988)

The Scientists Tell Me...

Mastitis Control Practices Vary in Effectiveness, Study Shows

by Marilyn Brown

TAES Science Writer

Mastitis, an infection of the mammary glands, is one of the chief problems faced by dairy producers. In its advanced state, mastitis is obvious, but often it has no symptoms and is not detected unless the milk is tested. Such subclinical mastitis accounts for about 70 percent of the milk loss caused by the infection.

Mastitis costs the average U.S. dairy herd the dollar equivalent of about 1,500 pounds of milk per cow per year in milk losses, medication expenses, treatment time, and premature culling, according to Texas Agricultural Experiment Station agricultural economists.

Consumers can be sure that at least a portion of those costs are passed on to them.

The most effective weapons for combatting mastitis are early detection and treatment of clinical cases and reducing the incidence of subclinical mastitis through improved health and herd management programs. Improved mastitis control is, in turn, passed on to consumers through improved product quality and lower milk prices, in areas where prices are free to vary.

The National Mastitis Council recommends that a proper mastitis control program consists of hygenic washing and drying of udders before milking, regular milking machine maintenance, teat dipping after milking, antibiotic therapy on all cows at drying off, and culling of cows with recurrent mastitis.

Controlled studies of these practices have found them to have substantial returns over costs, but under field conditions, the effects of all of the measures vary considerably.

TAES agricultural economists Wayne Howard, Thomas Knight, and Richard Shumway, and dairy scientists Michael Tomaszewski, Texas A & M University, and Robert Blake, Cornell, University, studied the current management practices used by Texas milk producers. Howard is now at the University of Guelph in Ontario, Canada.

The study was designed to determine the value of information disseminated to producers, as well as the value of somatic cell count (SCC) as an indicator of milk yield. Somatic cell counts are low in healthy udders, high in infected udders.

The study compares producers', extension agents', and experts' rankings of different management practices and compares marginal values and marginal costs of the different management practices. It also estimates the statistical relationship between management practices, somatic cell counts, and milk yields.

The research group surveyed 138 Texas dairy producers - chosen because they use the Dairy Herd Improvement Association's somatic cell count program - to determine current management practices. The majority of producers followed many of the practices recommended by the National Mastitis Council, but only 30 percent of them employed all five practices, the researchers found.

There were 5.8 percent who did not teat dip, 22.5 percent who did not treat their cows with antibiotic at the end of the lactation period, and 29 percent who did not cull, based on mastitis case history.

As expected, the researchers found that use of prep-stalls or automated prewashes had a positive effect on raising SCCs. Teat dipping had a positive effect on lowering SCCs. Regular servicing of milking equipment and visits by a veterinarian also slightly lowered SCCs, as did education and experience of the producers.

Unexpected results occurred for some recommended and widely used practices. In particular, drying udders with single-use paper towels was found to be no more effective than other drying methods. Dry cow treatment had only a small effect on SCC.

Also, while it is generally believed that larger herds have higher SCCs, this study did not bear that out, nor did it find any significant difference between low-, medium-or high-producing herds.

The study supports the effectiveness of proper washing, teat dipping, assuring dry udders at milking, frequent milking system servicing, and regular veterinary visits. It also shows the benefits of experience and formal and continuing education of the operator, the researchers say.

On the other hand, this study raises questions about the benefits of prep-stalls and pre-washes, the use of sanitizers in the washing solution, single-use paper towels, and dry cow

treatment. It challenges the common beliefs about large herd size and high production levels being associated with a high SCC.

Further study, especially on the use of paper towels and dry cow treatment, is needed to determine why results of field data are different from controlled experiments, the researchers say.

Experts and producers were fairly consistent in ranking management practices, but agents expected the impact of high SCCs on milk production to be greater than did the other groups. Experts did not believe that adding a sanitizer to the washing solution was cost effective.

For producers, the risk of the SCC option is that the information contained may not be worth the 12 cents per cow per month that it costs, the scientists say.

Editor's Note: Any question regarding this column should be addressed to Science writer, Dept. of Agricultural Communications, Texas A&M University, College Station, TX 77843.

It's safe to feed mastitic milk to calves

The practice of feeding mastitic milk often is questioned because of possible transfer of mastitis pathogens and antibiotic residues to the calf. In most cases, milk from quarters with clinical mastitis contain pathogenic bacteria and/or antibiotics resulting from therapy.

Research has shown that this waste milk can be fed safely to calves in either the fresh or fermented form. Weight gains were at least equal to feeding normal milk or other liquid feeds. Health disorders, including scours, were not increased when feeding waste milk. Also, feeding waste milk did not increase the incidence of mastitis or blind quarters when the calves eventually freshened.

In a literature review, E.M. Kesler, The Pennsylvania State University, recommended the following precautions when feeding waste milk to calves:

1. Delay feeding waste milk until the second day after birth because of possible permeability of the gut to pathogens.
2. House calves so that it is impossible for them to suckle each other during waste milk feeding.
3. Exercise caution in feeding waste milk to calves intended for meat. Antibiotic residues may remain in the tissues.

If the above precautions are followed, feeding waste milk to calves can be a safe and economical practice.

News and Events

Putting Used Oil, Batteries in Trash Illegal

Throwing away used oil or lead-acid motor vehicle batteries is now illegal, according to the Minnesota Pollution Control Agency (MPCA). The disposal prohibition, which includes disposal in landfills, took effect January 1, 1988.

Consumers must now take used oil and batteries to designated locations for recycling. Two 1987 laws require battery retailers to accept waste batteries from customers and oil retailers to either accept used oil or inform customers of a nearby recycling location for it. Individuals who dump batteries or oil are subject to civil or criminal penalties, the MPCA said.

"The goal of these laws is to encourage recycling of valuable reusable materials, rather than burying them in landfills, where they can contaminate ground water," said Richard A. Svanda, Director of the MPCA' Hazardous Waste Division.

Until recently, most of the used oil and batteries in Minnesota were turned in for recycling, the MPCA said. As the markets for recycled used oil and used battery-lead declined, recyclers who had once paid retailers for their oil and batteries began charging those retailers for pick-up. As a result, the MPCA said, many service stations and retail centers which had acted as informal collection centers for these products stopped accepting them. The new recycling and disposal laws attempt to maintain and stimulate the recycling system that had declined because of poor product markets and confusion over some oil and battery handling regulations, according to the MPCA.

Currently, more than 400,000 of the 1 million lead-acid batteries removed from vehicles in Minnesota annually are improperly discarded, releasing approximately 7.6 million pounds of lead and 400,000 gallons of sulfuric acid to the environment, the MPCA said. The acidic liquids at landfills can dissolve lead and allow it to leach into ground water. Exposure to lead in drinking water, soil or air can cause fatigue, high blood pressure and liver disease, and in extreme cases may lead to nerve and brain damage or death, according to the Agency.

Used oil is generated as a result of routine vehicle maintenance and some manufacturing operations. More than 2.3 million gallons of used oil generated in the state annually is disposed of improperly, potentially contaminating Minnesota waters with benzene, chlorinated solvents, lead and other heavy metals. Once into the ground water, even small amounts of used oil can contaminate large quantities of drinking water, the MPCA said.

Many retail outlets sell oil disposal products designed to hold oil in a container of absorbent material for disposal in the trash. Because used oil can no longer be placed in household trash, ordinary disposal after use in intended with these products is now illegal in Minnesota, the MPCA said.

For more information contact Laura Sobalvarro (612) 296-6549.

AOAC to Offer New Short Course on Sampling

The AOAC (Association of Official Analytical Chemists) is introducing its new two-day short course, "Field and Laboratory Sampling of Food, Drugs, and Agricultural Commodities," November 30 and December 1, 1988 in Arlington, Virginia.

In this course on sampling principles, their applications and administration, enrollees will learn how to improve the sampling process and thereby reduce the sampling error impact on the analytical scheme. Whether taken for basic knowledge or as a refresher course, the course will provide invaluable information to those involved in sampling quality assurance, sampling planning, field operations, regulatory affairs, manufacturing, laboratory management, sample analysis, as well as anyone wanting to know the what, how and why of sampling food, drugs, and agricultural commodities.

The course program will cover the following subjects:

- The Reality of Sampling
- Developing the Sampling Program
- Sampling Concepts and Statistical Approaches
- Sampling Equipment and Sampling Safety
- Documenting Sampling Collections
- Sample Preservation, Preparation, and Transport
- Principles of Sampling (Sample Collection and Sampling Schedules)
- Laboratory Sampling and Sample Preparation for Analysis
- Legal Considerations and Consensus Standards
- Sampling Project Discussions

Frederick M. Garfield, former Assistant Administrator of the U.S. Drug Enforcement Administration, AOAC's Scientific Coordinator, developed this short course. Mr. Garfield also developed and authored the popular AOAC Quality Assurance for Analytical Laboratories Short Course and the AOAC manual, *Quality Assurance Principles for Analytical Laboratories*.

Instructors will be selected from persons who have had extensive experience in sampling and sampling statistics.

This is not a completely new venture for the AOAC. The Association designed and presented a two-day sampling short course, under contract, for Agriculture Canada in March 1986, and a symposium in Scottsdale, Arizona in September, 1986 at the AOAC 100th Annual International Meeting and Exposition. Both programs were well received.

Registration for the course is now open. Course size is limited and on a "first come" basis. To register, first verify space availability by calling or writing AOAC Education Department, 1111 N. 19th St., Suite 210, Arlington, VA 22209, (703) 522-3032; then, to reserve your space, send your name, address and payment to cover applicable registration fee.

Kitchen Gadgets Help Prevent Food Poisoning

While you can spend hundreds of dollars on gourmet cookware, knives, food processors, pasta makers and other devices, the best investment you could make in kitchen equipment should cost under $25.

That's the price tag food safety expert Marilyn Haggard puts on several simple kitchen tools that can help prevent food-borne illness.

"Most food-borne illness occurs when bacteria grow in inadequately cooled or heated food, or due to cross contamination from raw animal product," says the Texas A&M University Agricultural Extension Service specialist.

She recommends the following kitchen tools to help prevent these problems:

•Acrylic cutting board, about $5-7, depending on size. Knives can leave gashes in a wooden cutting board and juices from raw meat or poultry can get into those gashes. If you don't deep-clean the board, bacteria remaining in the gashes can spread to other foods.

•Meat thermometer, about $4. With a meat thermometer, you can make sure that meat and poultry cook all the way through. Beef and pork are generally considered done when the internal temperature reaches 170 degrees F. Poultry is done at 180 degress.

•Refrigerator thermometer, about $2.50. Use the appliance thermometer to make sure the temperature of your refrigerator is 40 degrees F, or below and that the freezer is zero or below.

•Timer, about $9. If you don't have a timer on your range, consider buying one. Set the timer for two hours, beginning when perishable food is taken from the stove or refrigerator and ending when the leftovers are stored in the refrigerator or freezer. If perishable food is left on the table or counter after a meal, bacteria will multiply rapidly.

"An investment of a few dollars and some extra care in handling foods can help you avoid the uncomfortable flu-like symptoms from food-borne illnesses," remarks the specialist.

For more information, contact: Marilyn Haggard, (409) 845-1735.

Multnomah County Has Big Savings From Field WritR Handheld Computer

Art Bloom, Environmental Health Director for Multnomah County (Portland, OR), has just completed an evaluation of 12 handheld computers his county purchased in 1986, and is reporting an estimated 1987 savings in the food inspections program of $38,000, or approximately 13 percent.

Late in 1986, Art budgeted his 12 tiny Field WritR computers with the expectation that they'd increase inspector productivity. His Health Commission made him prove it, approving the purchase on the condition he would reassign one of his inspection staff members to a new environmental health program they felt was needed.

"It was the Field WritR that was mostly responsible," says Art: "I never anticipated that we'd see such dramatic productivity improvement so soon, even though I was sold on the idea from the start. My department is more caught up on its workload than it has been in years."

The Field WritR is part of an integrated computerized inspection system developed by Oregon Digital System, Inc. of Corvallis, OR (503) 752-0448. The system is being adopted by local governments nationwide. In 1987, Benton County, OR received a National Association of Counties Award for its pioneering work in field testing the handheld computers in restaurant inspections.

Art, at Multnomah County, is happy to discuss his experiences with anyone who calls with questions about his computers. You can reach him at (503) 248-3400.

For more information, contact: Dick Swenson, R.S., Inspections Division Mgr., Oregon Digital System, Inc., (503) 752-0448.

Enercon Industries Adds New Laboratory for Cap Seal Testing

Enercon Industries Corporation has announced the completion of a new fully-equipped induction cap sealing laboratory in its Menomonee Falls, Wisconsin plant.

The 450 square foot cap sealing facility will be used to test customer samples, and determine which equipment is most effective and efficient for a specific cap sealing application. It has the capacity to seal caps ranging from ten to over 120 mm.

Enercon will also utilize the lab for equipment and processing research and development, and testing and evaluating a new cap sealing equipment, induction inner seals, sealing heads and power supplies.

Enercon Industries manufacturers air- and water-cooled induction cap sealers with power supplies from one KW to seven KW for use in dairy, food, beverage, pharmaceutical, chemical and cosmetics applications.

For more information, contact: Dave Markgraf, Enercon Industries Corp., W140 N9572 Fountain Blvd., PO Box 773, Menomonee Falls, WI 53051. (414)255-6070.

Ag Biotech Company Cpens New Research, Production Facility

Evans BioControl, Inc. (EBI), dedicated to biological technology for the control of insects and other pests, officially opened a new 23,000-square-foot research and production headquarters at the Broomfield, Colorado, Interlocken Business Park on January 13.

During the Grand Opening Ceremony, Governor Roy Romer of Colorado and United Nations Ambassador Nouhoum Samassekou, SE from Mali, Africa, praised EBI for its work in biological engineering to solve pest problems around the world. Ambassador Samassedou noted that biological insecticides are seriously needed in his country in order to preserve a delicate ecosystem.

The Governor also praised the decision of the biotech firm to maintain its headquarters in Colorado. The company was established in Durango in 1979 as the Colorado Insectory, Inc. with two employees.

Evans BioControl now employs a staff of 60 and plans to hire an additional 15 to 20 biologists, entomologists and microbiologists in 1988 to support current business in North America and Africa.

The company is taking aim at the $5 billion chemical insecticide markets by focusing on the production and application of natural organisms as biological insect control agents.

Evi Schwartz, president and chief executive officer, explains that Evans BioControl is an emerging biotech firm that will be marketing worldwide from its new research and manufacturing headquarters north of Denver.

"We believe that for the long term, biological insecticides will become acceptable to society and will provide the breakthrough for possible head-on competition and replacement of conventional chemical pesticides," Schwartz says.

The first product of Evans BioControl is NOLO (tm) Bait, a biological grasshopper control agent that is specific to grasshoppers and some species of crickets. Introduced in 1984, the insecticide is the only biological product available for control of grasshoppers on rangeland and offers farmers and ranchers a natural alternative to conventional chemistry.

The active ingredient in NOLO (tm) Bait is a live organism, *Nosema locustae*. This naturally-occurring disease in grasshoppers is isolated and applied to wheat bran and spread aerially or by ground-driven applicators. When the wheat bran is eaten by the grasshopper, the organism infects the fat bodies and competes for energy reserves, causing loss of appetite and eventual death. Because of its action and infection of a grasshopper population, the product provides long-term control over several seasons, versus conventional chemicals which deliver shorter-term benefits.

NOLO Bait does not infect beneficial insects and is safe to birds, humans, livestock, pets and other mammals.

For more information contact: Wayne Tegeler, Evans BioControl, Inc., 895 Interlocken Pkwy, Unit A, Broomfield, CO 80020. (303)460-1780.

16th Edition of Standards Method for the Examination of Dairy Products

Request for Consensus Reviewers of the 16th edition of Standard Methods for the Examination of Dairy Products. The American Public Health Association is now preparing the 16th edition of standard methods for the examination of dairy products as was practices with the 15th edition. The APHA would like to develop a roster of persons from the dairy science field who are willing to serve as consensus reviewers for the chapter manuscripts before they are submitted for publication. The purpose of this is to assure that the methods that are included are realistic and up-to-date.

If you would like to serve as a consensus reviewer will you please send your name and address to: Howard L. Bodily, Ph.D., Consultant, APHA, P.O. Box 69, Midway, UT 84049. Please submit your name and address before August 31, 1988.

New Plant Section of IAMFES Dairy Quality and Safety Committee

The Dairy Quality and Safety Committee originated last August when the Farm Methods Committee was disbanded. This was done to allow committee members more freedom to work for resolutions of the problems facing the entire dairy industry.

Last February the farm portion of this group met and was organized.

The first meeting of the plant section will be held on Sunday, July 31, 1988 at 10:45 a.m. at the IAMFES annual meeting. Those indivisuals interested in organizing a group to deal with plant safety and quality problems are invited to attend.

The Dairy Quality and Safety Committee has adopted a mission statement and key activities. These will also be reviewed at that time.

Robert C. Sterrett Named Principal Environmental Engineer For Ashland Chemical Company

Robert C. Sterrett has been named principal environmental engineer for Ashland Chemical Company. The announcement was made by William L. Tordoff, director of engineering.

In his new position, Sterrett will be responsible for developing and managing Ashland Chemical's environmental programs and for ensuring all company locations are in continuing compliance with federal, state and local regulations. He will report to Tordoff and to S.B. Patrick, administrative vice president.

A native of Sebastropol, California, Sterrett joined Ashland Oil, Inc. in 1966 when the company acquired ADM Chemicals. He was named environmental engineer for Ashland Chemical in 1972 and since 1976 has served as manager of the environmental engineering group.

Sterrett is a graduate of the University of California at Berkeley with a bachelor of science degree in chemical engineering.

Ashland Chemical Company, a division of Ashland Oil, Inc., is a leading producer and distributor of chemicals, specialty chemicals and plastics for industry.

Solmar Announces Availability of Report: Enhanced Anaerobic Digestion and Odor Control Through Bioaugmentation

Solmar announced the availability of a recently published seven-page report entitled, "Enhanced Anaerobic Digestion and Odor Control Through Bioaugmentation." The report is a synopsis of a 1987 presentation by R.B. "Jones" Grubbs and Barry Molnaa to the National Conference on Municipal Sewage Treatment Plant Sludge Management.

"Sludge handling and disposal is one of today's most pressing problems for advanced wastewater treatment plants. We at Solmar are dedicated to show how bioaugmentation has proven useful in alleviating many sludge-related problems," noted Jones Grubbs, president of Solmar.

The paper focuses on anaerobic digestion through bioaugmentation as a solution for sludge treatment. Bioaugmentation in wastewater treatment involves the addition of specific micro-organisms to digest sludge and other waste products. The anaerobic digestion process removes organic wastes and odors while coincidentally producing methane gas as a source of energy.

The Grubbs/Molnaa paper discusses several successful applications of bioaugmentation in major pollution control and sanitation facilities throughout the western United States. Problems and solutions are documented with respect to specific details on chemical processes, cost of applications and continuing treatments.

Also included in the paper is a study on the principles of bioaugmentation including waste odor control and the benefits of methane byproducts from anaerobic digestion.

Thirteen sources are cited as research support of the published literature.

For a free copy of "Enhanced Anaerobic Digestion and Odor Control Through Bioaugmentation," call (714)538-0881, or write to Solmar Corporation, 625 West Katella, Suite 5, Orange, CA 92667.

Solmar Corporation offers a complete line of bacterial formulations for the treatment of industrial environmental and organic hazardous wastes. The company's highly trained technical staff has an extensive history of experience in the bioaugmentation field and provides technical support for the use of biological additives.

AIB to Conduct a Food Plant Microbiology Course

The American Institute of Baking announces a BASIC FOOD PLANT MICROBIOLOGY course to be conducted in Manhattan, Kansas, June 13-16. This 4-day course will introduce participants to microbiology laboratory techniques and will provide training as it applies to the modern food processing facility.

"Each year bakers, millers, and food processors face increased responsibilities concerning food product safety," commented William Pursley, director of sanitation education at the Institute. "Because of this, all personnel responsible for sanitation in the food plant must be thoroughly trained in all phases of plant sanitation. Since many governmental and state regulations governing food safety are becoming more stringent, this specialized area in increasingly important everywhere."

BASIC FOOD PLANT MICROBIOLOGY will be conducted by Dr. John J. Iandolo, Professor of Food Microbiology, Kansas State University, and will be assisted by the staff at the Institute.

In addition to learning how to operate the basic laboratory equipment and testing apparatuses, participants will learn how to set up a micro lab, how to conduct micro analysis of raw materials and finished product, and the interpretation of those results.

Write or call the Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, Kansas 66502, (913)537-4750 or 1-800-633-5137 for more information including registration forms.

Land O'Lakes First in U.S. With New High-Yield Cheddar Cheese Process

Land O'Lakes has announced it will become the first processor in the U.S. to use a new high-yield, ultrafiltration, continuous cheddar cheese process. The new process developed by APV and the dairy research division of CSIRO (Commonwealth Scientific Industry Research Organization) in Australia is called APV SiroCurd. It replaces the traditional cheese vat with a continuous process for the production of cheese curd from concentrated milk.

Purchased thru APV CREPACO, INC. the system will be installed in Land O'Lakes, "We believe this new process will revolutionize cheesemaking in the same way that the continuous churn revolutionized buttermaking back in the 1960's."

The new process offers several significant advantages. The most important is increased yields of cheese from the same amount of milk, resulting from additional milk proteins being retained in the cheese.

A second advantage is precise control of cheese composition. The new process controls the proportions of protein, moisture and fat within the finished cheese within a very narrow range. This will allow Land O'Lakes to offer its customers cheeses tailor-made to their exact requirements.

A third advantage is the increased value of by-product streams. Concentrating milk through ultrafiltration results in permeate, a by-product which can be used to produce lactose and molasses. Another by-product is a very high-protein whey which can be marketed as a food and feed ingredient.

For more information, contact Gordon Lane, Cheese Technologist, Process Engineering Group at APV CREPACO INC., 100 South CP Ave, Lake Mills, WI 53551, (414)648-8311.

Radioactivity From Nuclear Power Plants Is an Insignificant Health Hazard

Low-level radiation, such as the radioactivity emitted from nuclear power plants, is an insignificant hazard to human health, according to the report *Health Effects of Low-Level Radiation,* published by the American Council on Science and Health (ACSH), an independent scientific organization.

"In considering the health effects of radiation emitted by nuclear power plants, it is exceedingly important to be quantitative and to keep the risks in perspective by comparing them to other risks that we as a society have chosen to accept," said ACSH Executive Director Dr. Elizabeth M. Whelan.

"The health risks from nuclear power, while highly publicized, are inconsequential when compared to everyday risks such as cigarette smoking, alcohol consumption, driving automobiles, or flying in aircraft," she said.

The average dose of radiation received by citizens of Harrisburg, PA in the Three Mile Island accident would be expected to reduce their life expectancy by 1.5 minutes — roughly equal to the loss of life expectancy resulting from crossing 4 streets or riding 4 miles in an automobile, ACSH said.

"The radiation exposures in other widely publicized incidents, such as radioactive material leaking from a tank or a radioactive waste burial ground, have in all cases been even smaller than that at Three Mile Island," said Dr. Bernard Cohen, Professor of Physics at the University of Pittsburgh and Scientific Advisor to ACSH.

"In no case involving the nuclear power industry of a Western country has the radiation exposure to any individual exceeded the amount of radiation exposure that the person accepts unthinkingly each time he or she boards a plane for a transcontinental or transoceanic flight," Dr. Cohen continued.

Nearly all of our exposure to ionizing radiation comes from natural background radiation (81.3%) or radiation used in medical tests (14.4%); less than 0.1% comes from nuclear power sources, the ACSH report states.

"Many people are particularly concerned about the possibility that radiation exposure might cause mutations which would lead to genetic disease in future generations," said ACSH Associate Director Dr. Edward G. Remers. "In actuality, however, the genetic risks associated with low-level radiation are exceedingly small. A large nuclear power industry in the U.S., producing 80% or more of total electric power as compared to the 15% currently supplied, would be expected to cause about 40 additional cases of genetic disease per year. This would increase the current incidence rate by 0.04% — 4 in 10,000."

The American Council on Science and Health is an independent, nonprofit consumer education association promoting scientifically balanced evaluations of food, chemicals, the environment, lifestyle factors and health.

To obtain a copy of *Health Effects of Low-Level Radiation,* send a self-addressed, stamped ($.66 postage), business-size (#10) envelope to Radiaiton Report, ACSH, 47 Maple St., Summit, NJ 07901.

University of Wisconsin-Madison

Food Quality and Energy Usage in Foodservice Systems: Convective Thermal Processing of Turkey Rolls. This publication is the Final Technical Report of the joint project between the North Central (NC-120) Regional Research Committee of the United States Department of Agriculture and the United State Army Natick Research, Development and Engineering Center, Natick, Massachusetts.

Single copies of this report are available without charge from: M. Eileen Mattews, Ph.D., R.D., Dept. of Food Science, Babcock Hall, 1605 Linden Dr., The University of Wisconsin-Madison, Madison, WI 53706.

Consider Ingredients in "Healthy" Snacks

Some of the snack foods found in the health or natural foods sections at the supermarket may be giving you more sugar, sodium or fat than you bargained for, says a Texas Agricultural Extension Service nutritionist.

"Granola bars, dehydrated fruit bars, trail mix and other health snacks can be convenient and nutritious food choices, but also have their drawbacks," says Mary Kinney Sweeten.

Granola bars are a good example. The nutritionist explains that plain granola bars contain grains, such as oats, that add protein and fiber to the diet. With added filings, chocolate pieces or coating and syrup added to enhance flavor and chewiness, however, some snacks are more like candy than granola.

"Dehydrated fruit snacks which come in bars, bits and rolls are convenient lunch-box treats, but don't compare to fresh fruit for nutritional value," she maintains. "The fruit snacks also have added sugars and sweetners."

Sweeten says that microwavable popcorn, like regular popcorn, will vary in fat and sodium according to how much butter and salt is added.

"While consumer control how much salt and butter they add to the popcorn made the conventional way, the microwave product may contain more than they would normally use," she says.

According to the nutritionist, many of the trail mixes and bulk fruit and nut mixes have high nutrient values. But some, such as bulk party mixes, are high in fat, calories and sodium.

"Moderate amounts of almost any snack can fit into a balanced diet," Sweeten says, "but consumers shouldn't assume all foods are healthy because they're advertised that way."

If you're really concerned about nutrition, she advises carefully reading the ingredients list and nutrition information on snack food labels to find out just what you're getting.

Additional information can be obtained from Mary Kinney Sweeten, (409) 845-1735.

HBI Announces Availability of New Supplies Catalog

HBI, Haake Buchler Instruments, Inc., Saddle Brook, NJ has available a new 12-page catalog detailing their full line of chemicals, kits and supplies for electrophoresis applications.

The high purity grade chemicals from HBI, which include everything from Acrylamide to Xyelene Cyanol, are listed alphabetically and by application. A complete range of Ampholytes for isoelectric focusing and kits that have been newly-developed especially for introductory purposes are described in detail.

For the blotting of previously separated molecules (for further analysis), HBI offers Transfer Membranes. Transfilm and various gel polymerization accessories are also discussed.

For more information, contact HBI, Haake Buchler Instruments, Inc., 244 Saddle River Road, Saddle Brook, NJ 07662-6001. (201) 843-2320 in New Jersey, 1-800-631-1369 Toll Free. Telex 219730.

New Edition of "Tri-Clover Bevel Seat Fittings" Catalog Now Available From Tri-Clover, Inc.

A new, 24-page edition of the "Tri-Clover Bevel Seat Fittings" catalog of sanitary, leak-tight fittings is now available from Tri-Clover, Inc.

The catalog displays Tri-Clover's full line of sanitary type 304 and 316 stainless steel bevel seat fittings in 1-4" tube OD sizes which include elbows and bends, tees and crosses, adapters, reducers, and manual valves, built in compliance with 3A Sanitary Standards Criteria. The catalog also contains information on all critical dimensions and specifications.

Headquartered in Kenosha, Wisconsin, Tri-Clover, Inc. is a leading manufacturer of sanitary stainless steel valves, pumps and fittings, as well as flow control, batch/weigh and Clean-In-Place (CIP) systems. Founded in 1919, Tri-Clover, Inc. is now a members of the Alpha-Laval Group, a $1.5 billion multi-national organization headquartered in Sweden that operates more than 160 companies in 130 countries around the world.

For your free copy of "Tri-Clover Bevel Seat Fittings" Catalog, please write or call Tri-Clover, Inc., 9201 Wilmot Rd., Kenosha, WI 53141. Telephone: 414-694-5511.

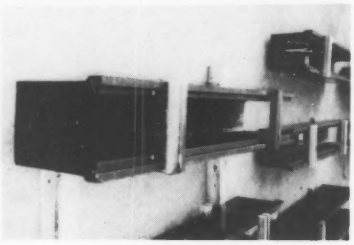
EPA Chemical Effects

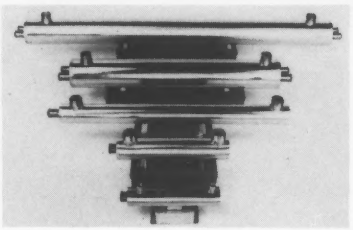
EPA researchers are attempting to develop a new weight-of-evidence (WOE) scheme, with accompanying criteria, which can be used to predict general toxicity risk to humans from subschronicor chronic exposure to chemicals in the environment. The scheme would apply to all effects on the nervous system, developmental or reproductive effects, immunotoxicity, mutagenicity, or carcinogenicity.

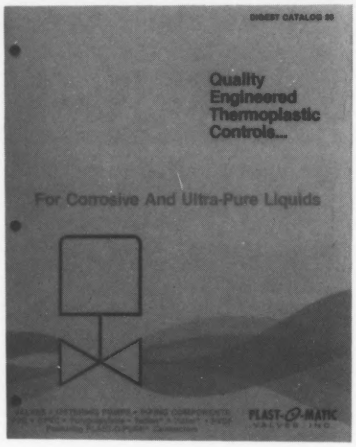
For further information, a draft report, *Weight-of-Evidence/Hazard Identification for Noncancer Health Effects* is available in limited supply from EPA, Attn: S.A. Perlin, OPPE, Washington, DC 20460 (202) 382-5869.

New Product News

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







New Waste Chemicals Handling Concept Slashes Installation Time and Costs

• A unique new approach to chemical liquid waste containment systems now offers a time- and cost-saving alternative to conventional type lining systems.

Pennwalt's new FABRI-KAST™ Systems are engineered, prefabricated trench sections, sumps and manways consisting of precast sections that can be rapidly installed with a minimum of steps.

Factory fabricated from a wide choice of Pennwalt corrosion resistant polymers, FABRI-KAST Systems components combine in one monolithic piece the two functions of conventional concrete substrate structure and chemically-resistant lining.

As a result, FABRI-KAST Systems can be installed in far less time and with less disruption to plant operations than virtually any other trench and sump lining system. Installed cost should also be lower in most cases, when the cost of forming and pouring a supporting concrete substrate is added to the cost of the protective lining system.

FABRI-KAST Systems are designed for open containment and transport of liquid wastes, spillages and recoverable by-product chemicals. They can be used either in new construction or in retrofit installations, replacing applied spray coatings, troweled topping, gunnites, membranes and acid brick—as well as the concrete substrate structure in many cases.

Primary applications are in: chemical processing, food, beverage, pulp and paper, power and related industries.

For more information on FABRI-KAST Systems, contact Donna Caplan, Pennwalt Corp., Corrosion Engineering Dept., Three Parkway, Phildelphia, PA 19102 (215) 587-7614.

Please circle No. 272
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Rex Spray Nozzles Described in Bulletin No. 7894

• The complete line of Rex flat spray nozzles is covered in Bulletin No. 7894 (eight pages) issued by Rexnord Inc.

Rex spray nozzles produce a flat, thin blade of water or liquid for the precision washing, cleaning, descaling and cooling of hard and soft materials.

They are used in the steel, food processing, beverage, container, forest products and transportation industries. Typical applications include washing of bulk materials in mining and chemical processing; washing systems for trucks, trains and subway buses; and lubrication systems for general manufacturers.

A selection procedure is included in the brochure. Typical application information for each industry is provided, including nozzle distance from material, type of washwater, operating pressure (PSI) and spray pattern widths.

A complete water discharge table is included, with rates from .9 to 190.4 gallons per minute (GPM) for operating pressures per square inch (PSI) from 15 to 1500.

According to the bulletin, the metal Rex spray nozzles are available in 13 different corrosion proof and standard metals.

The bulletin lists the benefits of Rex spray nozzles, including its non-clogging design, simple one step installation, and its precision pattern which cuts liquid usage by up to 80%. Every nozzle is tested under actual operating conditions before delivery, according to the brochure.

Rex spray nozzles are made in Milwaukee, WI and sold through distributors worldwide. The product operation also makes a complete line of belt conveyor idlers for bulk material handling.

For more information contact: Rexnord, Joe Valitchka, Product Manager, (414) 643-2168.

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on your Reader Service Card

New Catalog Features Thermoplastic Controls for Corrosive and Ultra-Pure Liquids

• Plast-O-Matic Valves, Inc., announces publication of its new Digest Catalog 20 with thermoplastic products for controlling corrosive or high purity liquids.

This new two-color catalog illustrates and describes the Plast-O-Matic line of check valves, vacuum breakers, pressure relief valves, pressure regulators, gauge guards, flow and level indicators, basket strainers, metering pumps, air and solenoid shutoff valves, diverter valves, flow control valves, manual, electrically and pneumatically actuated ball valves.

Included are the new Series SCKF & SCKR wafer design swing check valves, and the recently introduced Plast-O-Pure® Connectors for piping systems.

The catalog also explains the patented Fail Dry® safety design feature which provides early warning of a potential problem.

For a copy of Digest Catalog 20, contact Plast-O-Matic Valves, Inc., 430 Route 46, Totowa, New Jersey 07512. (201) 256-3000.

Please circle No. 274
on your Reader Service Card

Dependable Water Supply in Subzero Weather

• A steady supply of livestock water in the coldest weather, as well as running for home use, is maintained with new In-Pipe Heating Cable. Information and specifications for the system which uses a heating cable inside the water pipe, are detailed in this recent brochure. Water pipes protected in this manner do not need to be buried, even in the coldest area. To receive a copy of the literature, write: IPHC, Pyrotenax USA, Inc., 6501 Basile Rowe, East Syracuse, NY 13057.

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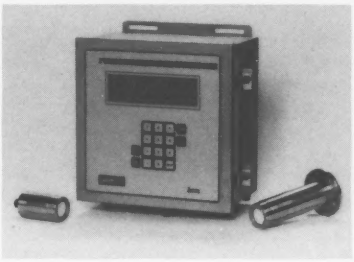

Zantel Instruments Introduces TANK MANAGER 305

• Zantel Instruments proudly announces the release of their new product line - TANK MANAGER 305. It is an automatic system for monitoring level, temperature and other characteristics of tank stored liquids.

TANK MANAGER 305 has several features that make it unique. All system data is easy to see on a large display instead of just a number in red lights. Ten minute readings for all sensors are saved for 24 hours. All data is power failure safe. The sensors are very accurate, stable and never require recalibration. The density of the liquid being measured is easily changed with a few keystrokes so level measurement accuracy is better than 1 in 1,000 gallons. As may as 32 Tank Manager 305 controllers can be interconnected on a network and can be monitored or further controlled by any computer.

The system comes with two digital output ports for running low level devices and can have up to three optional relay boards installed. Each relay board has eight double pole double throw FORM C contants to control at least eight devices. Both high and low setpoints can be defined for each sensor. Reaching any setpoint can cause the digital and relay channels to be activated and, with the modem option cause emergency phone numbers to be automatically called.

Zantel Instruments, a partnership between Zantel, Inc., a Louisiana corporation and Caldwell Systems Corporation, a California corporation, was formed specifically to bring state of the art solutions to the liquid storage and processing market. The four top managers of Zantel have over 100 years of experience in engineering management, production and marketing.

Zantel's strategy is to define liquid related industry problems and provide solutions that solve the problems with straight forward, easy to use and economical products. TANK MANAGER 305 is a perfect example. The Foods Division of Zantel is continuing with the stringent testing and introduction of follow on products in the TANK Manager 305 product line. The Petro-Chemical Division of Zantel will soon be announcing its MUST product line. The MUST system will exceed all EPA requirements for the monitoring of underground storage tanks.

For more information, contact: Geoffrey Archibald, Zantel Instruments, 12925 Alcosta Blvd, Suite 8, PO Box 617, San Ramon, CA 94583. 415-866-0899.

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Temperature Alarm System

• Odessa Engineering has introduced a cost effective Temperature Alarming System for Dairy Product Processors, Institutions and Manufacturers. The microcomputer based system monitors temperatures of refrigeration units or incubators containing items that may spoil if critical temperature ranges are not maintained. The temperature sensors may be wired a distance of up to 1500 feet from the central system. The unit contains a battery and charger capable of sustaining system operation for more than 10 hours. For more information contact: Odessa Engineering, PO Box 26537, Austin, TX 78755. (512) 251-5543.

Please circle No. 277
on your Reader Service Card

Mars Air Doors Provide Complete Protection Against Air Pollution, Dust, Dirt Fumes and Insects

• Using a powerful internal blower, when mounted over all types of doorways, the Mars Air Doors direct a stream of high velocity air downward to the floorline. Mars Air Doors create an invisible barrier to air pollutants, dust, dirt, fumes and insects. They provide significant energy savings as the air curtain destratifies warm ceiling air in winter weather and at the same time prevents heated air from escaping. Also, when installed on the "clean" side of an area, Mars Air Doors simultaneously perform many of the aforementioned functions.

Installation of a Mars Air Door allows personnel and material to pass freely from one area to another with an unobstructed view while desired temperatures are maintained.

Easy-to-install, over 60 heated and unheated models are available. All are designed and engineered to comply with and exceed the highest safety code standards of all recognized testing laboratories. Mars Air Doors comply with USDA regulations and are approved by the National Sanitation Foundation.

For further information, contact Mel Liner, National Sales Manager, Mars Air Doors, 14716 South Broadway, Gardena, CA 90248 (213) 770-1555.

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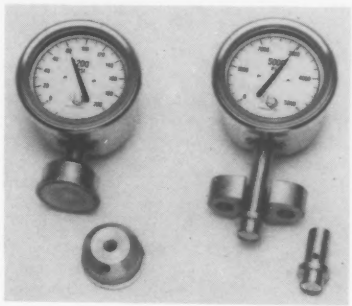

3D Instruments, Inc.

• 3D Instruments, Inc. of Huntington Beach, California is pleased to announce the simplicity, accuracy and reliability of 3D Instruments' Direct Drive Design precision pressure gauge is now available in stainless steel with sanitary seal connections. No gears or levers, means fewer problems, reduced maintenance and calibration costs.

The one piece design with integral seal will provide long life even with pulsation and vibration and meets 3A sanitary requirements of the Food, Beverage and Pharmaceutical Industries.

For more information, contact: 3D Instruments, Inc., 15542 Chemical Lane, Huntington Beach, CA 92649 (714) 894-5351.

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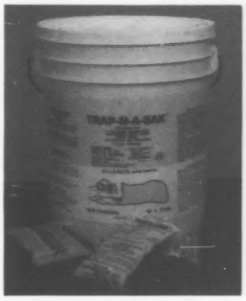


Sweet Corn Products Co.

• Sweet corn grown to maturity and processed in Knox County, Nebraska, is the base for a new rodenticide now available from Sweet Corn Products Company. The natural sugars in sweet corn greatly enhance bait acceptance, according to corn farmer Ray Lush, president of the new firm. This ends the universal problem of unpalatability in rat and mouse baits. New TRAP-N-A-SAK™ recorded an extremely high acceptability factor in the EPA'S's Efficacy Test. And rats, according to Ray, are extremely finicky eaters!

Active ingredient is Diphacinone. Packaged 50 three-ounce throw packs in heavy plastic pail. For more information: TRAP-N-A-SAK, Box 487, Bloomfield, NE 68718. (402) 373-2460

Please circle No. 280
on your Reader Service Card

Disposable Devices Facilitate Quality Control Testing

• Millipore Samplers and Swab Test Kits have been designed to facilitate quality control testing in hospital and research laboratories, food and beverage manufacturing facilities, cleanrooms, and other critical locations.

Millipore Samplers, disposable "dip-stick" devices, are instrumental in testing a variety of raw materials, including make-up water and sugars and syrups used in food and beverage manufacturing. The addition of a swab in sterile buffer allows you to use these products together for surface sanitation testing. This will help you to measure the effectiveness of your sanitation efforts and concentrate on areas requiring special attention.

For more information, call Millipore at 800-225-1380 (in Massachusetts, 617-275-9200) or write Millipore Corp., 80 Ashby Rd., Bedford, MA 01730.

Please circle No. 281 on your Reader Service Card

Helios Research Video Demonstrates Rotary Jet Cleaning Capabilities

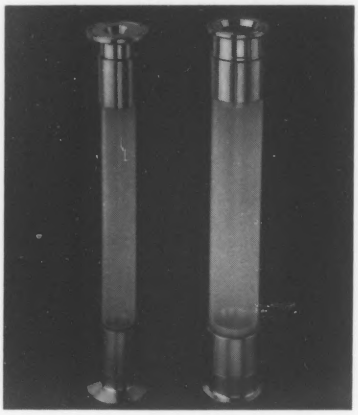
• Helios Research Corporation has produced a video to demonstrate the power with which its HelioJET™ system can drive Gamajet® rotary rank cleaning systems.

Each Helios sales representative has copies of the short three minute video, and the company is scheduling showing in chemical, food and other processing plants in which cleanliness and sanitation are major concerns.

The video dramatically demonstrates the pressure with which the Gamajet operates unrestricted. Instead of being bound by tank walls, the video was made outdoors, in the open, and the jet stream can be seen shooting as high as a giant tree behind the system, and digging a trench into the ground as it rotates toward the camera. The viewer is then asked to imagine this powerful stream impinging on even the toughest to clean materials inside reactor, storage and transportation vessels.

Using a cutaway, the video illustrates how in-plant steam and cold water pass through venturi-type orifices inside the patented HelioPAC™ and emerge as high pressure hot water. The HelioPAC, which has no moving parts, is nearly 100 percent efficient without the need for electric motors, mechanical pumps or conventional heat exchangers.

For information or to schedule a showing of the video, contact Lee Nicodemus, Helios Research Corp., 38 Dakin St., Mumford, NY 14511. (716) 538-6825.



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For more information, contact Sani-Tech, Box 1010, Andover, NJ 07821 (201) 579-1313.

Please circle No. 282 on your Reader Service Card

Food and Environmental Hazards to Health

Reduce Your Risk of Lead Poisoning

To reduce the risk of lead poisoning from ceramic dinnerware, experts advise:

•**Avoid use of ceramic ware for storing food.** Instead, use glass or plastic containers to store foods, especially those foods with a high acid content, such as orange, tomato and other fruit juices, wine, tomato sauces, and vinegar. Acid in the food can increase the amount of lead released into the food.

•**Beware of products purchased in other countries.** The safety of dinnerware can vary from country to country. If you're unsure about whether products meet safety standards, it may be wise t avoid the purchase - or, don't use them with foods.

•**Don't use antiques or collectibles to hold food or beverages.** Items bought are garage sales, craft shows, antiques shops, flea markets, rummage sales and other such places, along with family heirlooms, may have been made years before federal standards were imposed. Hence, using such items to hold food or beverages is not generally recommended.

•**Be cautious of ceramic items made by amateurs or hobbyists.** Glazes that are safe can be obtained by hobbyists, but there's no way of knowing if proper techniques and equipment were used to apply them. The safest course is to use such items for display purposes only.

These tips, say FDA officials, are intended as general guidelines. The fact remains there is no way of knowing for sure whether a piece is safe without having it tested. If you want further assurance, ceramic ware can be tested by a qualified commercial laboratory, though it may be expensive. Consult you local health department or the telephone book for laboratories in your area.

Mystery Poisonings Traced to Lead in Cups, Glasses

Two incidents in recent years-both involving married couples who consumed excessive amounts of lead from products that did not meet federal standards - illustrate some of the potential hazards from ceramic products made with glazes containing lead.

* * * *

In Olympia, Washington, Patricia and James Apperson drank fruit juice, wine, milk and soda from a set of black and gold decorated tumblers and cocktail glasses that Mrs. Apperson had bought for her mother in a Portland, Oregon, department store more than 40 years ago. Widely sold at the time, the glasses, bear the name "Fred Press" on them. When Mrs. Apperson's mother entered a nursing home in early 1986, the couple took the glasses back to Olympia, used them almost daily, and washed them regularly in their dishwasher.

Within a few months both were complaining of flu-like symptoms. By August, Mr. Apperson was hospitalized with what his doctors at first thought was a ulcer. He returned home, soon suffered acute abdominal pain, and reentered the hospital, where he was operated on last August 15 for a gangrenous gallbladder. At about the same time, Mrs. Apperson was suffering from severe stomach pains. When blood tests disclosed both were anemic, their doctors ordered new tests.

Blood tests disclosed that Mr. Apperson's lead level was a high as 125 micrograms per deciliter of blood - almost 2 1/2 times above what would be considered dangerous to an industrially exposed worker. Anything over 100 micrograms per deciliter is considered a medical emergency. Mrs. Apperson's blood level was 118 micrograms. Mrs. Apperson said his blood lead level was probably much higher at one time, but dropped because of blood transfusions that he received just before his gallbladder was removed.

Finding the contaminating source became the task of a state industrial hygienist. He checked the Apperson's home for lead paint, their tap water for lead from lead solder in the pipes, and their kitchen utensils. When he noticed that the black and gold glasses had a chalky appearance, he rubbed his finger along the inside. There was a distinct gray smudge. It was determined that frequent use of the glasses and regular cleaning with dishwasher detergents had accelerated the release of lead from the old glasses.

Although his wife is almost fully recovered, Mr. Apperson says he continues to suffer from fatigue, headaches, a skin condition, and other effects. He remains under a doctor's care.

* * * *

Donald M. Wallace and his wife France used their terra cotta mugs almost daily. The Seattle couple each drank eight to ten cups of coffee a day, and after almost three years, it almost killed them. Both were consuming lead that was leaching in excessive amounts from the poorly made cups that they had purchased in Italy in 1977. The Wallaces grew sicker and sicker, and their doctors were unable to correctly diagnose their illness.

Mr. Wallace lost 35 pounds, had trouble sleeping, became increasingly irritable and impatient, and had sharp pains in his wrists. He underwent two operations for carpal tunnel syndrome, a painful wrist disorder that he, in fact, didn't have. Mrs. Wallace's doctors at first thought she had the flu, then said it was porphyria, a rare, incurable metabolic disorder. Her body ached, and she was dehydrated and anemic. Her condition was worsening, and her doctors feared she would die.

Mr. Wallace, though ailing, desperately searched through medical books and journals and discovered that most lead poisoning victims were anemic and that its victims had symptoms similar to those of porphyria. He insisted on tests to measure blood lead levels, although his doctors were

con't. on p. 267

Letter to the Editor

Dear Editor:

We were pleased to see our article entitled "Safety Considerations for New Generation Refrigerated Foods" in the January issue of *Dairy and Food Sanitation*. We were very disappointed, however, to see that the committee member's names and affiliations were omitted. We feel that these names strengthen the credibility of the paper and the the individuals of this group deserve credit for the time and effort expended in developing this document. We hope you can acknowledge this group by printing a note in an upcoming issue listing the group's members along with the name of the article.

Thank you for your consideration in this matter.

Sincerely,
Jenny Scott
Manager, Microbiology Division
National Food Processors Assoc.

Safety Considerations for New Generation Refrigerated Foods

Refrigerated Foods and
Microbiological Criteria Committee of the
National Food Processors Association

Comittee members or alternates contributing to this paper: Richard V. Lechowich (Chairman), General Foods Corporation (currently with ABC Research); V. N. Scott (Co-secretary), National Food Processors Association; Dane Bernard (Co-secretary), National Food Processors Association; Daniel G. Brown, Geo. A Hormel & Co.; Gene Clyde, Westreco, Inc.; Donald A. Corlett, Del Monte USA; Forrest Dryden, Geo. A Hormel Co.; John Y. Humber, Kraft, Inc.; Lloyd R. Hontz, National Food Processors Association; J. E. Kennedy, Jr., American Home Foods; Lloyd Moberg, General Mills, Inc.; Robert Otto, Heinz, USA; Les Smoot, Ralston Purina; William Sperber, The Pillsbury Company; William Sveum, the Dial Corporation; George Tharrington, Beatrice/ Hunt-Wesson; Don Zink, The Campbell Soup Company.

Dear Editor:

An article appearing in the *New England Journal of Medicine*, October 24, 1985, p. 1092 is of particular interest. The doctors publishing that letter disagree with your report that *Toxoplasma gondii* is destroyed at 158 degrees F. It reports that an internal temperature of 176 degrees F is required for Twenty (20) minutes to destory *Toxoplasma gondii*.

This report indicates that its not possible for one to eliminate *Toxoplasma gondii* by the normal cooking process. It's not *undercooking*, its the presence of the organism and the temperatures that are either not reached at all or not maintained long enough that cause illness.

Since an estimated six (6) percent of all hamburger may be contaminated by pork during grinding, many people who eat cooked *EVEN WELL DONE*, ground beef may also risk picking the *T. gondii* infection.

LAW OFFICES OF RAYMOND A. NOVELL

SINCERELY,
RAYMOND A. NOVELL

(Anyone interested in copy of the article in its entirety from the New England Journal of Medicine, please write IAMFES, PO Box 701, Ames, IA 50010 or call (515) 232-6688 - 800-525-5223 (outside of Iowa).)

Food & Environmental .....

Con't. from p. 266

skeptical. But Mr. Wallace persisted, the test were done, and they confirmed that he and his wife were victims of acute lead poisoning.

Later, on his own, Wallace, a retired Air Force lieutenant colonel, had numerous household items tested, including the coffee mugs. "They were the one common item that Fran and I used regularly, but not our son Todd (whose blood tested normal)," Wallace said. The mugs were releasing 400 times more lead than FDA permitted. Since his and his wife's recovery, Wallace, now an industrial hygienist, has used his own money to buy and test a wide assortment of ceramic food ware. Products in violation were reported to FDA, resulting in major recalls of pottery from Spain and Italy by two large distributors in 1986.

Although their blood lead levels have since stabilized, Wallace and his wife are still concerned over possible long-term effects from the "burden of lead" that remains in their bodies. After it is consumed, lead moves out of the blood and can settle in the bones and organs for as long as 30 years.

FDA Consumer July-August 1987.

Affiliate Newsletter

GAFES Holds 2nd Annual Meeting

On February 19, 1988, the Georgia Association of Food and Environmental Sanitarians held their 2nd annual meeting at the Russell Research Center in Athens, Georgia. The theme to this meeting was "Current Sanitation Problems In The Foodservice Industry." Approximately 50 persons attended including a number of food and microbiology students from the Unviversity of Georgia.

The meeting featured several speakers from a variety of foodservice indusries who discussed various problems which are unique to their respective industries. During the business meeting, the following officers were elected:

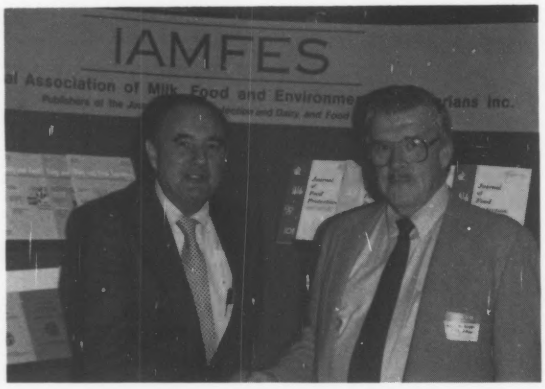
President - Dr. John Green, USDA, Athens

Vice-President - Dr. Robert E. Brackett, University of Georgia

Secretary - Steven P. Petrides, DeKalb County Health Department, Clarkston

Treasurer - James C. Camp, Food Food Technology, Douglasville

The GAFES organization looks forward to its 'sophomore' year of existence. With continued fine leadership and participation, the successfull first year shall serve as a model for many great years to come.



Changing of the Guard. Stan Skelskie (left), outgoing president of GAFES congratulates Dr. John Green (right), the 1988 President-Elect.

David Hitson of Southern Ice Cream Specialties speaks on sanitation problems in the dairy industry during the 2nd GAFES annual meeting.

Affiliate Calendar

1988

May 26, CONNECTICUT ASSOCIATION OF DAIRY AND FOOD SANITARIANS, INC. will hold it's annual meeting. For additional information, contact: Dr. Lester Hankin, The Conn. Agric. Exper. Station, PO Box 1106, New Haven, CT 06504, (203) 789-7219.

June 6-8, TEXAS ASSOCIATON OF MILK, FOOD & ENVIRONMENTAL SANTARIANS ANNUAL MEETING will be held at the Howard Johnson Plaza-South, Austin, TX. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78613-2363, (512) 458-7281.

September 26-28, INDIANA ENVIRONMENTAL HEALTH ASSOCIATION, INC., annual fall meeting will be held at the Hilton in Fort Wayne, IN. The contact person is Rosemarie Hansell, Marion Co. Health Dept., 222 East Ohio St., Indianapolis, IN 46204, (317) 633-9682.

September 27-29, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANTARIANS annual meeting will be held at Sheraton Inn-Binghamton at Sarbro Square, One Sarbro Square, Binghamton, NY. For more information, contact: Paul Dersam, 27 Sullivan Rd, Alden, NY 14004, (716)937-3432.

September 29-30, SOUTH DAKOTA STATE DAIRY ASSOCIATION will hold it annual convention at the Holiday Inn, Brookings, SD. For additional information, contact: Shirley W. Seas, Dairy Science Dept., SD State University, Brookings, SD 57007, (605)688-5480.

October 18-19, CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS CONFERENCE, to be held at the Concord Hilton Hotel, Concord, CA. For more information, contact: Jack Coppes, Executive Secretary, PO Box 9234, Whittier, CA 90608, (213) 699-4313.

Dr. John Green fields questions from the audience during the 'panel discussion' segment of the GAFES annual meeting.

Synopsis of Papers for the 75th Annual Meeting

The Significance of Aerial Microbiota on the Quality of Dairy Products, *Katalin Rossmoore, Paul Johnson, Cheryl Kovach,* Diversey Wyandotte Corporation, 1532 Biddle Avenue, Wyandotte, Michigan 48192.

Air sampling was carried out with Centrifugal Air Sampler at an air intake of 40L/min. Selective media were used for the enumeration of airborne bacteria and fungi. Samples were taken at several locations in dairy plants (loading docks, pre and post pasteurization areas, including fillers, drains. Samples were taken before and after CIP procedures, and environmental surface sanitizing. Dominant isolates were identified. Pseudomonas, Serratia, Klebsiella, Sarcina, Micrococcus, Staphylococcus, Fusarium, Aspergillus, Rhisopus, Penicillium, Chladosporium, Candida, Kluyveromyces, Rhodotorula, Saccharomyces were the most frequently isolated species. The level of contamination varied between 10-15,000 CFU/M^3 air. The highest was found near air movement sites, fillers, fans, blowers, drains, reclaim rooms and staging area. Fungi contamination of dairy products (cheese) could be related to air contamination, psychrotrophic gram negatives and psychrotrophic gram positives were related to pasteurized milk spoilage.

Survival and Growth of *Aeromonas hydrophila, Vibrio parahaemolyticus,* and *Staphylococcus aureus* on Cooked Mince and Surimis Made from Atlantic Pollock, *Steven G. Ingham* and Norman N. Potter,* Department of Food Science, Stocking Hall, Cornell University, Ithaca, New York 14850.

The present study was undertaken to determine if compositional differences in mince, salt-added surimi, and low-salt surimi prepared from Atlantic pollock affected the growth of *Aeromonas hydrophila, Vibrio parahaemolyticus,* and *Staphylococcus aureus* on these products in the cooked state. Samples were steamed, cooled, and inoculated. Samples inoculated with *A. hydrophila* were stored at 5, 13, and 25°C; all others were stored at 5 and 25°C. *A. hydrophila* grew well on the mince and low-salt surimi but not on the salt-added surimi at all three temperatures. *V. parahaemolyticus* counts decreased slightly on all three products during storage at 5°C. At 25°C *V. parahaemolyticus* counts initially decreased on all three products but then rose at least 10^2MPN/g on the mince and salt-added surimi. Counts on the low-salt surimi rose < 10^1. *S. aureus* counts did not increase on any of the products stored at 5°C. During storage at 25°C, *S. aureus* counts were always slightly higher on the surimis than on the mince, with highest counts on the low-salt surimi. Compositional differences had a major effect upon the growth of *A. hydrophila* on mince, salt-added surimi, and low salt surimi. Effects upon the growth of *V. parahaemolyticus* and *S. aureus* were slight.

HACCP Analysis of Convenience Store Operations: Microbial Evaluation of Roast Beef Sandwiches, **Nancy L. Burch - Central Michigan University, 200 C Wightman Hall, Mt. Pleasant, MI 48853; Carol A. Sawyer, PhD - Michigan State University.*

Processing of roast beef sandwiches was evaluated for potential microbial hazards in nine convenience stores (c-stores) in the Landsing, Michigan area. Evaluation consisted of a modified Hazard Analysis Critical Control Point (HACCP) approach in which processing methods in six c-stores were observed. Time-temperature relationships during sandwich production were recorded at six c-stores. Sandiwch samples were obtained immediately after production at six c-stores and three days later from all nine c-stores for microbiological analysis. The mean log of colony forming units (CFU)/g for Total Plate Counts in roast beef immediately following processing was 6.04 and after 3 days of refrigeration (1 to 5°C) in the store, was 8.39. Presumptive counts for *S. aureus* were isolated in 61% of the samples but never exceeded 4 as the mean log of CFU/g. Methods to optimize microbiological quality of roast beef sandwiches were identified as time-temperature control and personnel training.

Biomonitoring of Waste Effluents - An Overview For Environmental Sanitarians, *Homer C. Emery, R. S., Ph.D. - Box 1832, Frederick, MD 21701, U.S. Army Biomedical Research and Development Laboratory, Fort Detrick, Frederick, MD 21701-5010*

Test methods for monitoring the quality of wastewater effluents have drastically changed in the last twenty-five years. During the early 70's the major focus of testing and monitoring of waste effluents from municipal pollution control facilities was on oxygen demand and eutrophying characteristics. As new and increased numbers of chemical substances have been identified in wastewaters increased emphasis has been placed on biological monitoring for evaluating toxic effects.

In 1984, the Environmental Protection Agency issued a national policy calling for the biological monitoring of wastewater effluents to assess toxic effects on aquatic organisms. As more state water authorities adopt EPA recommendations for effluent toxicity testing, local sanitarians will need to have a greater knowledge of techniques and terminology related to biomonitoring. This presentation will provide an overview of the terminology and techniques currently used in biomonitoring. In addition aquatic toxicology research activities that may have future applications in biomonitoring will be presented.

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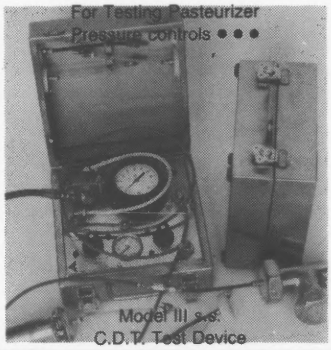

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Effect of Carbon Dioxide and Oxygen Enriched Atmospheres on the Shelf-Life of Refrigerated Pork Packed in Plastic Bags, Miguel A. Asensio, Juan A. Ordoñez and Bernabe Sanz, Departamento de Higiene y Tecnologia des los Alimentos, Facultad de Veterinaria, Universidad Complutense, 28040 -Madrid, Spain

J. Food Prot. 51:356-360

Changes in bacterial numbers, metmyoglobin percentage and 2-thiobarbituric acid number during the chill storage of pork longissimus dorsi packed with air, carbon dioxide, carbon dioxide and oxygen or vacuum-packed in plastic bags of high (polyethylene) and low (Cryovac BB-1) permeability to gases were studied. The fast increase of viable counts in polyethylene bags showed that plastic films of high permeability are not suitable to extend the shelf-life of meat using modified atmospheres. In Cryovac bags both carbon dioxide-enriched atmospheres and vacuum-packaging inhibited aerobic organisms, keeping the bacterial flora (mainly lactobacilli and *Brochothrix thermosphacta)* below the level of $10^8/cm^2$ for about 3 weeks. Metmyoglobin formation was not affected by 20% carbon dioxide, whilst 80% oxygen significantly decreased its rate. Metmyoglobin accumulation in vacuum-packed samples was even slower than in the oxygen-enriched atmosphere, but meat color was less attractive in the former than in the latter. Lipid oxidation was not the limiting factor of shelf-life in either of these two atmospheres. Off-odors appeared in both at approximately 20-22 d of storage.

Effect of Temperature, Water Activity and Other Toxigenic Mold Species on Growth of *Aspergillus flavus* and Aflatoxin Production on Corn, Pinto Beans and Soybeans, Mary W. Trucksess, Leonard Stoloff and Philip B. Mislivec, Divisions of Contaminants Chemistry and Microbiology, Food and Drug Administration, Washington, DC 20204

J. Food Prot. 51:361-363

Portions of corn, a commodity in which aflatoxin is frequently found, were held at 16, 26 and 32°C after the moisture contents were adjusted to achieve water activities (a_w) ranging from too low to ample for support of mold growth. Suspensions of mold spores from toxigenic cultures of *Aspergillus flavus, A. ochraceus, Penicillium citrinum, P. cyclopium* and *P. urticae* were added to the test portions, either as *A. flavus* alone, as *A. flavus* with one of the other molds or as a mixture of all 5 species. Additional water was used to obtain the proper moisture levels. A temperature of 16°C was generally too low for aflatoxin production by either the added or native strains of *A. flavus,* although the mold was able to grow at 16°C at a_w values as low as 0.80, 0.77 and 0.85 on corn, soybeans and pinto beans, respectively. Aflatoxin production was essentially the same at 26 and 32°C with limiting a_w values in the range of 0.85-0.89. Limiting a_w values for mold growth at 26 and 32°C were 0.73, 0.69 and 0.75 for corn, soybeans and pinto beans, respectively. This study provided no evidence that substrate suitability at limiting temperatures and a_w levels is a factor in the observed difference in the risk of aflatoxin contamination for these commodities. The study did indicate that the associated mold flora, when the seed is exposed to mold invasion, is a risk determinant.

Assessment of the Cleanability of Air-Actuated Butterfly Valves, J. L. Karpinsky and R. L. Bradley, Jr., Department of Food Science, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 51:364-368

Six common and commercially available 5.1-cm (2 in.) air-operated butterfly valves were fitted to a type 304 stainless steal manifold and circulation system. The system was microprocessor-controlled to simulate 3, 6 and 12 months of wear during typical processing and CIP procedures in a dairy-type application. Raw milk with added *Bacillus stearothermophilus* spores was diluted with water and was used as the circulation liquid. After a trial period, valves were carefully disassembled and tested microbiologically. Based on results a determination of cleanability was made. None of the valves proved to be totally cleanable without maintenance within 1 year of simulated operation. In fact, all but one valve failed within 6 months.

Inspection Systems and Mechanical Removal Systems for Bone and Cartilage Particles in Ground Beef Patties, B. W. Berry and E. C. Green, Meat Science Research Laboratory, Agricultural Research Services, USDA, Beltsville, Maryland 20705 and Food Quality Assurance Branch, MRDD, AMS, USDA, Washington, D.C.

J. Food Prot. 51:369-372

Ground beef patties were processed from boneless beef which was subjected to two different inspection systems for bone and cartilage defects. One system permitted a higher ("high") level of defects (USDA Food Safety and Inspection Service, Meat and Poultry Inspection Requirements), while the other system (USDA PP-B-2120 Federal Purchasing Specification) permitted only a lower ("low") level of defects. Before formation into patties, the ground beef was subjected to three processing systems for defect removal (none, Weiler Bone Collector System, Speco Spiral Groove Plate System). A sensory approach (teeth and tongue) for detecting defects with cooked patty samples revealed more bone and cartilage defects in the "high" than the "low" formulation regardless of defect removal system. While the defect removal systems reduced the levels of detected defects in the "high" formulation, neither system produced patties with defect levels achieved through inspection procedures required to produce "low" levels of these defects. However, it appears that much of the bone remaining as a defect in boneless beef is reduced in size during grinding so as to be undetectable by sensory approaches.

Critical Control Points of Street-Vented Foods in the Dominican Republic, Frank L. Bryan, Silvia C. Michane, Persia Alvarez, and Aurelio Paniagua, Food Protection, Pan American Health Organization, Pan American Zoonoses Center (CEPANZO), Casilla 3092, 1000 Correo Central, Buenos Aires, Argentina

J. Food Prot. 51:373-383

Hazard analyses were conducted at four street-vending stands in the Dominican Republic. Temperatures of foods were measured during cooking, display (holding), and reheating (when done). Samples were taken at each step of the operation and at 5 to 6-h intervals during display. Foods usually attained temperatures that exceeded 90°C at the geometric center during cooking and reheating. At three of the stands, foods (e.g., fish, chickens, pork pieces) were fried and held until sold. Leftovers were held overnight at ambient temperatures in the home of the vendor or in a locked compartment of the stand. They were usually reheated early in the morning and displayed until sold. During the interval of holding, aerobic mesophilic counts progressively increased with time from about 10^3 after cooking to between 10^5 to 10^9/g. The higher counts were usually associated with holding overnight. *Escherichia coli* (in water, milk and cheese samples), *Bacillus cereus* (in bean and rice samples), and *Clostridium perfringens* (in meat, chicken and bean samples) were isolated, but usually in numbers less than 10^3/g. At the other stand, foods (e.g. beans, rice, meat and chicken) were cooked just before serving as complete meals. There were no leftovers. This operation was less hazardous, although there were many sanitary deficiencies. Recommendations for prevention and control of microbial hazards (mainly reducing holding time, periodic reheating and requesting reheating just before purchasing) are given. The need and suggestions for implementing educational activities to alert and inform those concerned about hazards and preventive measures are presented.

Incidence of Fecal Coliforms and Serovars of Enteropathogenic *Escherichia Coli* in Naturally Contaminated Cheese, F. M. Abbar, Department of Biology, College of Science, University of Mosul, Mosul, Iraz

J. Food Prot. 51:384-385

A survey of 60 cheese samples from three different manufacturers and marketed in Mosul were analyzed during the summer of 1987 for fecal coliform counts and also for the presence of enteropathogenic *Escherichia coli*. Among these samples there was a wide variations in counts, which ranged from <10 to 26000/g while the average ranged from 500 to 14000/g. Only 43 *E. coli* isolates were recovered from the cheese. Four of them agglutinated with antisera used to screen for classical enteropathogenic serotypes.

Properties of Labneh-Like Product Manufactured Using Enterococcus Starter Cultures as Novel Dairy Fermentation Bacteria, Y. A. El-Samragy, E. O. Fayed, A. A. Aly and A. E. A. Hagrass, Food Science Department, Faculty of Agriculture, Ain Shams University, Shobra El-Khima, Cairo, Egypt

J. Food Prot. 51:386-390

The traditional yogurt starter, i.e. *Staphylococcus thermophilus* and *Lactobacillus bulgaricus*, has always been used to bring about the lactic acid fermentation during manufacture of concentrated yogurt known in Egypt as "Labneh". Different combinations of some strains of *Enterococcus faecalis*, isolated from Laban Rayeb (a type of fermented milk), in combination with a certain strain of *Lactobacillus bulgaricus* were used to produce a Labneh-like product. Chemical, microbiological and organoleptic properties of the Labneh-like product were assessed and compared to the characteristics of Labneh processed traditionally by two different dairy plants in Egypt. All treatments showed similar changes during storage at 5 ± 1°C for 28 d. Total solids, fat, titratable acidity and pH values coincided with those of Labneh. Some components increased until the seventh day, i.e. acetaldehyde and diacetyl, while other features, such as the ratio of soluble nitrogen/total nitrogen and tyrosine, increased until the fourteenth day of storage. Thereafter, no marked variations occurred. However, a decrease in tryptophan content of all products occurred during the storage period. Total viable count and count of lactic acid bacteria of Labneh-like product as well as Labneh increased until the end of the second week of storage and then decreased. Coliforms, yeasts and molds and psychrotrophic bacteria were detected in some fresh and stored samples. The starter culture which consisted of 1.5% *Enterococcus faecalis* 19 and 1.5% *Enterococcus faecalis* 22 was used successfully to manufacture a Labneh-like product with high acceptability when fresh or refrigerated at 5 ± 1°C.

Improved Selective Procedure for Detection of Salmonellae from Poultry and Sausage Products, J. S. Bailey, J. Y. Chiu, N. A. Cox, and R. W. Johnston, USDA, ARS, RRC, P.O. Box 5677, Athens, Georgia 30613; USDA-FSIS-Science, Western Labroatory, P.O. Box 4008, Alameda, California 94501 and USDA-FSIS-Science, Microbiology Division, 300 12th Street, SW, Washington, DC 20250

J. Food Prot. 51:391-396

The efficacy of lactose preenrichment and various selective enrichment and differential plating media were evaluated to determine the optimal procedure for detecting salmonellae from fresh chicken or frozen turkey, pork sausage, and cured chicken. Salmonellae were most frequently recovered from fresh poultry or pork sausage when samples were preenriched in lactose broth incubated at 35°C, selectively enriched in TT broth at 43°C, and streaked onto a new differential plating medium, modified lysine iron agar (MLIA/USDA). Enrichment of cured chicken in selenite brilliant green broth incubated at 43°C was more productive than in TT incubated at 43°C. When poultry and sausage samples were first preenriched at 35°C, selectively enriched at 43°C, and then streaked onto MLIA/USDA greater than 75% of all CFUs on the MLIA/USDA plates were typical of salmonellae. Different procedures are recommended for maximal recovery of salmonellae from fresh, frozen or cured poultry products.

Microbiological Quality of Fresh and Frozen Breakfast-Type Sausages Sold in Canada, J. M. Barber, S. A. Malcolm, K. F. Weiss and M. A. Johnston, Health and Welfare Canada, Health Protection Branch, Bureau of Microbial Hazards, Tunney's Pasture, Ottawa, Ontario K1A 0L2, Canada

J. Food Prot. 51:397-401

A national survey was conducted to determine the overall microbiological quality of fresh and frozen breakfast-type sausages manufactured in Canada. Fresh (61 lots; 55 producers) and frozen (62 lots; 35 producers) were analyzed for aerobic colony counts (ACCs), coliforms, *Escherichia coli*, *Staphylococcus aureus* and *Salmonella*. There was wide variation in aerobic colony count values, but most were in the range of 10^4 to 10^7 CFU/g. Detectable levels of *E. coli* and *S. aureus* were found in at least one-third of all fresh and frozen sausages. In addition, *Salmonella* was detected in 14.8% of lots of fresh sausages and 6.5% of lots of frozen sausages. Frozen sausages generally had lower microbial loads than fresh ones. Although no standards or guidelines for breakfast-type sausages are available from the International Commission on Microbiological Specifications for Foods (ICMSF), guidelines published in the literature were applied to ACCs, coliforms and *S. aureus* for both fresh and frozen sausages.

Evaluation of the β-Glucuronidase Substrate 5-Bromo-4-Chloro-3-Indolyl-β-D-Glucuronide (X-GLUC) in a 24-Hour Direct Plating Method for *Escherichia coli*, Elon W. Frampton, Lawrence Restaino and Nancy Blaszko, Department of Biological Sciences, Northern Illinois University, DeKalb, Illinois 60115

J. Food Prot. 51:402-404

A 24-h direct plating method for *Escherichia coli* using Peptone-Tergitol agar was used to compare the effectiveness of the chromogenic substrate 5-bromo-4-chloro-3-indolyl-β-D-glucuronide (X-GLUC) with the fluorogenic substrate 4-methylumbelliferyl-β-D-glucuronide (MUG) for β-glucuronidase activity. Values obtained for enumeration of two strains of *E. coli* recovered from artificially inoculated raw minced chicken (i.e., plating efficiencies on the inoculum, cells per g, and recovery percentages related to those on Plate Count Agar) indicate that X-GLUC at 50 µg/ml was as effective as MUG in an agar medium. Unlike MUG, X-GLUC does not require ultraviolet light illumination, and the color reaction produced remains localized in the positive colonies.

Comparison of Sampling Methods and Implications for Bacterial Decontamination of Poultry Carcasses by Rinsing, H. S. Lillard, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 51:405-408

This study showed that the whole carcass rinse and the stomaching or blending of excised skin techniques for sampling broilers, as commonly used, result in the isolation of comparable numbers of aerobes and *Enterobacteriaceae*. However, these data also show that all three methods recover only a very small percentage of the total bacteria present on broiler carcasses. Large numbers of bacteria were still recovered from the fortieth rinse of a single carcass, indicating that increased rinsing after bacteria become firmly attached to the carcass will only result in a slight reduction of the total bacterial load present, and will not result in a meaningful improvement in bacterial quality of the carcass.

Recovery of *Salmonella* from Fluid Milk, Clyde R. Wilson, Wallace H. Andrews, Paul L. Poelma and Verneal R. Bruce, Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 51:409-411

Methodology was developed for isolation of *Salmonella* from skim milk, 2% fat milk, whole milk and buttermilk. Lactose broth, lactose broth plus brilliant green dye, buffered peptone water and each milk type plus brilliant green dye were evaluated as preenrichment broths. Incubation temperatures of 35 and 43°C were compared for use at the preenrichment stage. The recovery of *Salmonella* was determined after selective enrichment in selenite cystine, tetrathionate and Rappaport-Vassiliadis broths. Results indicated that fluid milk should be examined for *Salmonella* by being preenriched in lactose broth, subcultured to selenite cystine and tetrathionate broths and streaked to selective agars, with 35°C as the incubation temperature throughout the analysis.

Hazard Analyses of Foods Prepared by Inhabitants Near Lake Titcac in the Peruvian Sierra, Frank L. Bryan, Silvia Michanie, Magda Moscoso Vizcarra, Obdulia Navarros S., Dora Taboada, Nelly Mendoza Fernández, Elena Guerra Requejo and Blanca Perez Muñoz, Veterinary Public Health Program, Pan American, Zoonoses Center (CEPANZO), Pan American Health Organization, Casilla Correo 3092 (1000) Buenos Aires, Argentina

J. Food Prot. 51:412-418

Hazard analyses of food preparation practices were conducted in two households in an Andean Indian Pueblo near Puno, Peru and in a house on the outskirts of this city. These analyses consisted of watching all steps of preparation, recording temperatures throughout all these steps, and collecting samples of food and testing them for common foodborne pathogens and indicator organisms. Only cereal-potato soup (a very popular and inexpensive food in the region), kidney stew, and parched cereal were prepared during the survey. The soups boiled during cooking and most of them were eaten during the first serving. Vegetative forms of pathogenic bacteria would have been killed during cooking, but heat-resistant spores would have survived. Leftovers in the pueblo homes, when there were any, remained without heat on the clay stoves on which they had been cooked until eaten or reheated. In the other household, cooked foods were moved from the stove to an earthen floor and kept there until reheating. Under this condition, cooling was more rapid than when left on stoves. The interval of time that cooked foods were between 49°C (120°F) and 21°C (70°F) during holding was less than 4 h, thereby limiting spore germination and bacterial multiplication. In the only household in which foods were reheated, they boiled. Critical control points for food preparation in homes are cooking, holding between cooking and serving, and reheating.

Proposed Theoretical Water Activity Values at Various Temperatures for Selected Solutions to be Used as Reference Sources in the Range of Microbial Growth, Silvia L. Resnik and Jorge Chirife, Departamento de Industrias, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Ciudad Universitaria, 1428 Buenos Aires, Republic of Argentina

J. Food Prot. 51:419-423

This paper compiles recent data on the theoretical prediction of the water activity (a_w) of selected saturated salt solutions, unsaturated NaCl and LiCl solutions, and H_2SO_4 solutions. These results are presented in tabular form in such a way that they can be safely used as reference sources for a_w determination in the range of microbial growth (i.e. about 0.57-0.97) and at different temperatures.

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August 1, Monday
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A guided bus tour of historical Tampa, FL. Visit the University of Tampa campus including the lovely H. B. Plant Museum which was once the lavish Tampa Bay Hotel built in 1890. Shop at Hyde Park in the restored area, drive along Bayshore Blvd. where some of Tampa's finest old mansions are located. Lunch at the Colannade Restaurant over-looking the water. Browse the marketplace at Harbour Island and finally visit Ybor City, Tampa's famous Latin quarter. Here you visit historic Ybor Square located in a cigar factory built in 1886. There will be ample time for shopping in the quaint shops and you will view cigars being handrolled. Cost: Adults $25.00; Children (12 and under) $12.50.

A DAY OF ADVENTURE AT BUSCH GARDENS
August 3, Wednesday
9:30 a.m. - 4:30 p.m.

Spend the day at Busch Gardens, The Dark Continent. Visit the fourth largest zoo in the United States, the amusement park, nature shows, and all Busch Gardens has to offer. Including Lunch at the park. Cost: Adults $25.00; Children (2 and under) $4.00.

DISNEY WORLD PACKAGES
August 4 & 5, Thursday and Friday

For those interested, 2 or 3 day post-meeting Disney World packages will be arranged by Around the Town Travel Agency, Tampa, FL. Typical packages will include transportation, park admission, and lodging at special rates. Arrangements must be confirmed no later than June 30, 1988.

SOCIAL EVENTS THROUGHOUT THE MEETING

Cheese & Wine Reception with Exhibits, Sunday Evening
Gasparilla Festival, Monday Evening
Awards Banquet & Reception, Wednesday Evening

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July 31 - August 4, 1988
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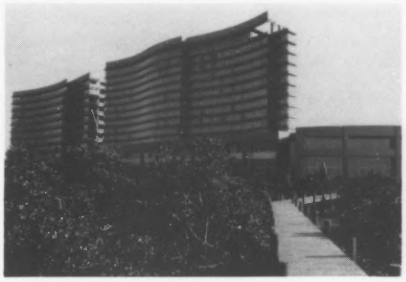

The Florida Association of Milk, Food and Environmental Sanitarians (FAMFES) will be hosting the 75th IAMFES Meeting, July 31 - August 4, 1988. They cordially invite you to participate in the educational sessions as well as in social functions and special events with old or new colleagues and friends, view the table top exhibits, and enjoy Florida hospitality at the Hyatt Regency Westshore, uniquely located in a 35 acre nature preserve on beautiful Tampa Bay.

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Calendar

1988

May 19, EPA INORGANIC LABORATORY DATA QA/QC VALIDATION (80), will be held in Pittsburgh, PA. For more information, contact: Barbara, Professional Analytical & Consulting Services, Inc., (412) 262-4222.

May 19-20, ANALYTICAL & ENVIRONMENTAL TRAINING COURSES will be held in Pittsburgh, PA. The course title is Mass Spectrometry for Managers (05). For more information, contact: Barbara at Professional Analytical and Consulting Services, Inc., 409 Meade Drive, Coraopolis, PA 15108, (412) 262-4222.

May 19-20, SCALE-UP IN THE FOOD PROCESSING INDUSTRY, will be held in Chicago. For additional information, contact: The Center for Professional Advancement, PO Box H, New Brunswick, NY 08816, (201) 613-4500.

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

May 26, CONNECTICUT ASSOCIATION OF DAIRY AND FOOD SANITARIANS ANNUAL MEETING. For more information contact: Lester Hankin, The Conn. Agric. Exper. Sta., PO Box 1106, New Haven, CT 06504, (203) 789-7129.

May 29-June 2. INTERNATIONAL CONFERENCE ON MASTITIS will be held in St. Georgen/Langsee, Carinthia, Austria. For information, contact: Prof. Dr. E. Glawischnig, International Conference on Mastitis, Il. Medizinische Universitatsklinik for Klauentiere, der Veterinarmedizinischen Universitat in Wien, Linke Bahngasse 11, A-1030 Vienne, Austria, 0222/73 55 81 ext. 500, 501.

June I, BASICS OF TOXICOLOGY, will be held in Pittsburgh, PA. Offered by the Professional Analytical & Consulting Services, Inc. For more information, contact: Barbara, Professional Analytical & Consulting Services, Inc., 409 Meade Dr., Coraopolis, PA 15108, (412) 262-4222.

June 1-3, RESPIRATORY PROTECTION, will be held in New Jersey. The short course is sponsored by the The Center for Professional Advancement, PO Box H, East Brunswick, NJ 08816, (201) 613-4500.

June 1-6, ENVIRONMENTAL SHORT COURSES: Toxicology for Engineers & Managers, EPA Environmental Analytical Chemistry, Environmental Laboratory QA/QC Data Validation to be held in Pittsburgh, PA. For more information, contact: Barbara Nowicki, Course Coordinator, Professional Analytical & Consulting Services, Inc., 409 Meade Dr., Corapolis, PA, (412) 262-4222.

June 2-3, BASICS OF INFRARED SPECTROMETRY & SPECTRAL INTERPRETATION will be conducted by the Professioal Analytical & Consulting Services in Pittsburgh. For more information, contact: Barbara, Professional Analytical and Consulting Services, Inc., 409 Meade Dr., Coraopolis, PA 15108, (412) 262-4222.

June 6-8, TEXAS ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS ANNUAL MEETING to be held at the Howard Johnson Plaza-South, Austin, TX. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78613-2363, (512) 458-7281.

June 6-9 EPA ENVIRONMENTAL ANALYTICAL CHEMISTRY (130), will be offered by the Professional Analytical & Consulting Services, Inc., in Pittsburgh, PA. For more information, contact: Barbara, Professional Analytical & Consulting Services, Inc., 409 Meade Dr., Coraopolis, PA 15108, (412) 262-4222.

June 6-9, EVALUATION AND CONTROL OF PROCESS HAZARDS, will be held in New Jersey. For additional information, contact: The Center for Professional Advancement, PO Box H, East Brunswick, NJ 08816, (201) 613-4500.

June 7-9, ACQUATIC TOXICITY REDUCTION IN INDUSTRIAL, sponsored by the The Center for Professional Advancement will be held in New Jersey. For additional information, contact: The Center for Professional Advancement, PO Box H, East Brunswick, NJ 08816, (201)613-4500.

June 20, TESTING IN THE FOOD INDUSTRY, will be held at the Omni Royal Orleans, New Orleans, LA. Contact: Robert S. First, Inc., 707 Westchester Av., White Plains, NY 10604, (914) 949-42548.

July 2-7, WORLD ASSOCIATION OF VETERINARY FOOD HYGIENISTS Xth INTERNATIONAL SYMPOSIUM IN STOCKHOLM, is sponsored by the World Health Organization and International Union of Food Science and Technology. For more information, contact: W.A.V.F.H., K. G. Linderholm, Box 22067, S- 104 22 Stockholm, Sweden.

July 8-15 RAPID METHODS AND AUTOMATION IN MICROBIOLOGY will be held at Kansas State University. The workshop is certified by American Society for Microbiology for Continuing Education Credits. Contact Dr. Daniel Y.C. Fung, Call Hall, Kansas State University, Manhattan, KS 66506, (913) 532-5654.

July 11-13, AMERICAN INSTITUTE OF BAKING IN MANHATTAN has scheduled an updated seminar entitled "Dietary Fiber" in Manhattan, Kansas. For more information write to the Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502, (800) 633-5137

July 12-14, BASIC PASTEURIZATION COURSE, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians will be held at the Seven Oaks Hotel, 1400 Austin Hwy, San Antonio. For additional information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78641-2363, (512) 458-7281.

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

August 1-5, BIOTECHNOLOGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND BIOLOGICALS, sponsored by the Massachusetts Institute of Technology, Cambridge, MA. For further information, contact: Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

August 7-12, 1988 ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at the Hyatt Regency, Chicago, IL. For more information, contact: Mrs. Ann Kulback, SIM, PO Box 12534, Arlington, VA.

September 7-8, ANNUAL CONFERENCE OF THE NORTH CENTRAL CHEESE INDUSTRIES ASSOCIATION, South Dakota State University, Brookings, SD. For further information, contact: E. A. Zottola, Sec-Treas., NCCIA, PO Box 8113, St. Paul, MN 55108.

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

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

September 13-15, SPECIAL PROBLEMS IN MILK PLANTS COURSE, sponsored by the Texas Asssociation of Milk, Food and Environmental Santarians. To be held at the Howard Johnson Plaza So., IH 35 at Woodward, Austin. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78641-2363, (512) 458-7281.

September 14-16, AACC - SENSORY EVALUATION OF FOOD, held in St. Paul, Minnesota. For information, contact: AACC Short Course Program, 3340 Pilot Knob Rd, St. Paul, MN 55121, (612) 454-7250.

September 15-16, WISCONSIN LABORATORY ASSOCIATION ANNUAL EDUCATION CONFERENCE, will be held at the Paper Valley Hotel and Conference Center, Appleton, Wisconson. Contact: Gary Jansen, Pabst Brewing Co., Box 706, Milwaukee, WI 53201, (414) 223-3574.

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

September 26-28, INDIANA ENVIORNMENTAL HEALTH ASSOCIATON, INC. Annual Fall Meeting to be held at the Hilton Inn in Fort Wayne, IN. For information, contact: Rosemarie Hansell, Marion Co. Health Dept., 222 East Ohio St., Indianapolis, IN 46204, (317) 633-9682.

September 27-29, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to hold annual meeting at the Sheraton Inn-Binghamton, Sarbro Square, One Sarbro Square, Binghamton, NY 13901. For more information, contact: Paul Dersam, 27 Sullivan Rd, Alden, NY 14004, (716) 937-3432.

September 29-30, SOUTH DAKOTA

STATE DAIRY ASSOCIATION, will hold it's annual convention at the Holiday Inn, Brookings, SD. For more information, contact: Shirley W. Seas, Dairy Science Dept., SD State Univ., Brookings, SD 57007, (605) 688-5480.

October 3-5, CONFERENCE ON LISTERIA MONOCYTOGENES, will be held in Rohnert Park, California. It is sponsored by The Society for Industrial Microbiology. Additional information can be obtained from: Mrs. Ann Kulback, SIM, PO Box 12534, Arlington, VA 22209, (703) 941-5373.

October 8-9, MICROWAVE PROCESSING OF FOOD, sponsored by AACC to be held in San Deigo, CA. Information can be obtained by contacting: AACC Short Course Program, 3340 Pilot Knob Road, St. Paul, MN 55121, (612) 454-7250.

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

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

October 18-19, CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS CONFERENCE, to be held at the Concord Hilton Hotel, Concord, CAl. Fore more information, contact: Jack Coppes, Executive Secretary, PO Box 9234, Whittier, CA 90608, (213) 699-4313.

October 31-November 2, FOOD PROCESSING WASTE CONFERENCE, will be held at the Pierremont Plaza Hotel, Atlanta, Georgia. The conference is sponsored by the Environment, Health and Safety Division, Georgia Tech Research Institute. Additional information can be obtained from Edd Valentine or Chuck Ross, Georgia Tech Research Institute, Economic Development Laboratory, Environmental, Health, and Safety Division, Atlanta, GA 30332, (404) 894-3412.

November, GUM CHEMISTRY AND TECHNOLOGY, will be held in Chicago, Illinois. For information, contact: AACC Short Course Program, 3340 Pilot Knob Rd., St. Paul, MN 55121, (612) 454-7250.

November 1-3, BASIC PASTEURIZATION COURSE, to be held at the Viscount-Travel Lodge, 1818 Southwest Freeway, Houston will be sponsored by the Texas Association of Milk, Food and Environmental Santarians. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78641-2363, (512) 458-7281.

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

November 30-December 1, FIELD AND LABORATORY SAMPLING OF FOOD, DRUGS, AND AGRICULTURAL COMMODITIES, to be held in Arlington, VA. Course size is limited and on a "first come" basis. To register, first verify space availibility by calling or writing AOAC Education Dept., 1111 N. 19th St., Suite 210, Arlington, VA 22209, (703) 522-3032.

November 30 - December 1, FIELD AND LABORATORY SAMPLING OF FOOD, DRUGS AND AGRICULTURAL COMMODITIES, to be held in Arlington, VA. Sponsored by AOAC. For information, contact: AOAC Education Dept., 1111 N. 19th St., Suite 210, Arlington, VA 22209, (703) 522-3032.

December 8-9, STARCH: STRUCTURE, PROPERTIES AND FOOD USES, sponsored by AACC to be held in Chicago, IL. Information can be obtained by contacting: AACC Short Course Program, 3340 Pilot Knob Rd., St. Paul, MN 55121, (612) 454-7250.

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If you're not running a Charm, you're running a risk.

You're looking at a partial list of the antibiotics you can catch with the Charm test.

You are also looking at a partial list of antibiotics other tests can't detect.

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Partial list of antibiotics detectable with:
◆ CHARM TEST
■ CHARM TEST II
● CHARM FIELD TEST

BETA-LACTAMS (P)
●◆■ Penicillin BT
●◆■ Penicillin G.
(benzylpenicillin)
(benzathine)
(potassium)
(procaine)
(sodium)
(benethamine)
(calcium)
●◆■ Penicillin O
●◆■ Penicillin S
●◆■ Penicillin N
●◆■ Methicillin
●◆■ Nafcillin
●◆■ Ticarcillin
●◆■ Penicillin V.
(benzathine)
(hydrabamine)
(potassium)
●◆■ Oxacillin
●◆■ Cloxacillin
(benzathine)
●◆■ Dicloxacillin
●◆■ Flucloxacillin
●◆■ Ampicillin
(trihydrate)
●◆■ Amoxicillin
(trihydrate)
●◆■ Piperacillin
●◆■ Hetacillin
●◆■ Carbenicillin
●◆■ Cephalothin
(Cephaloglycin)
●◆■ Cephapirin
●◆■ Cephapirin Benzathine
●◆■ Cephradine
●◆■ Cephacetrile
●◆■ Cephalexin
●◆■ Cephaloridine
●◆■ Cefazolin
●◆■ Cefoxitin
●◆■ Cefaclor
●◆■ Cefadroxil
●◆■ Cefamandole
●◆■ Cefatrizine
●◆■ Cefazedone
●◆■ Cafmenoxime
●◆■ Cefmetazole
●◆■ Cefonicid
●◆■ Cefoperazone
●◆■ Ceforanide
●◆■ Cefotaxime
●◆■ Cefotetan
●◆■ Cefotiam
●◆■ Cefroxadine
●◆■ Cefsulodin
●◆■ Ceftazidime
●◆■ Ceftezole
●◆■ Ceftizoxime
●◆■ Ceftriaxone
●◆■ Cephalosporin C
●◆■ Cephamycin A
●◆■ Cephamycin B
●◆■ Cephamycin C
●◆■ Cephapirin Sodium
●◆■ Cephradine

TETRACYCLINES (T)
■ Tetracycline
■ Choritetracycline
■ Oxytetracycline
■ Demeclocycline
■ Methacycline
■ Doxycycline
■ Minocycline

AMINOGLYCOSIDES (ST)
■ Dihydrostreptomycin
■ Streptomycin sulfate
■ Neomycin
■ Kanamycin
■ Amikacin
■ Gentamicin
■ Tobramycin

MACROLIDES (E)
●◆■ Troleandomycin
●◆■ Erythromycin
Erythromycin Stearate
Erythromycin Estolate
Erythromycin Gluceptate
Erythromycin
Lactobionate
Erythromycin Phosphate
●◆■ Spiramycin
Erythromycin Thiocynate
●◆■ Oleandomycin
●◆■ Tylosin
●◆■ Lincomycin
●◆■ Clindamycin

SULFONAMIDES(SM)
●◆■ Sulfamethazine
●◆■ Sulfadimethoxine
●◆■ Sulfabromomethazine
●◆■ Sulfadimthoxine
●◆■ Sulfamethoxypyridazine
◆■ Hydrochlorothiazide
◆■ Chlorothiazide
◆■ Furosemide
◆■ Trichloromethiazide
◆■ Dexamethasone
◆■ Sulfasuxidine
◆■ Dapsone
◆■ P-Aminosalicyclic acid
◆■ Trisulfapyrimidine
◆■ Sulfamethoxazole
◆■ Phthalylsulfathiazole
◆■ Sulfachloropyidizine
◆■ Sulfanitran
◆■ Sulfaquinoxaline
◆■ Sulfathiazole
◆■ Sulfomyxin
◆■ Thiabendaxole
■ NOVOBIOCIN (N)
●◆■ CHLORAMPHENICOL (C)

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