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The Nutrient Profile of Ground Beef Patties in a Commissary Food-Service System

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The data for the study were obtained from a commissary foodservice system which annually reports a foodservice sales volume in excess of $125 million. The commissary annually ships over two million pounds of fresh beef and more than 1,500 tons of ground beef to over 100 restaurants, all of which are low-to moderately priced full-menu table-service family restaurants. One of the major objectives of food protection programs is to meet consumer expectations. Others have suggested that, to be successful in the foodservice marketplace, the restaurateur should strive to exceed the consumer's expectation level (1). These expectations are that food be safe, that it be nutritious, and that it be honestly represented. The increased consumer interest in the nutritional quality of food products was stimulated by the 1969 White House Conference on Food, Nutrition and Health; by the ten-state nutrition survey conducted by the U.S. Department of Health, Education and Welfare; by the Health and Nutrition Examination Survey (HANES); by public statements of nutritionists, consumer advocates, and others concerned about the nation's food supply; and by the need to expand protection beyond food sanitation. Nutrition has become the subject of controversy in American society, as well as a topic of great interest to industry, government, and the average consumer.

Consumer Concern about Nutrition

Consumer concern about the nutritional adequacy of restaurant menus, compounded by impending nutrition labeing regulations for restaurants, increases pressure on foodservice firms to respond with detailed public information on the nutritional quality of restaurant meals (2). The consumer concern over nutritional adequacy would logically encourage restaurateurs to respond with detailed, public information about nutritional value. Given the technical complexities of nutrition analysis and the status of governmental regulations, however, it is not surprising that so few restaurants refer to nutrition in advertising and menus. It is ironic that the United States government's overwhelming concern for accurancy on labels has posed one of the largest barriers to nutrition labeling. In its eagerness to prevent and punish deception, the government has kept any mention of nutrition out of most restaurant menus and advertisements (3). However, some fast-food chains, at the urging of the U.S. Food and Drug Administration, have made nutrition information available to customers in their outlets.

Today's American consumer wants information on nutrition, food ingredients, and the means to obtain a nutritionally balanced diet. As more and more meals are consumed in foodservice facilities, it becomes increasingly important to evaluate the nutritive value of foodservice meals. Some have appealed for documentation of nutrient values of typical limited-menu restaurant meals. Any attempts to improve the nutritive value of restaurant meals must include efforts to lead consumers to make wiser food choices, as well as encourage the foodservice industry to provide rich sources of all nutrients of their menus.

To the extent that a person or a society relies on food from foodservice systems, so ought those systems demonstrate that the customer's faith in the system is well-placed. It follows that, whenever claims of nutritional adequacy are made, the entrepreneur must substantiate those claims. In the final analysis the emphasis that the restaurateur places on nutrition in the foodservice operation directly depends on the desires of the target markets.

Methods and Analysis

Once the consumer is given nutrient information, that individual is still faced with the task of determining whether or not the food is nutritious. To provide some guidance, nutritionists have developed the Index of Nutritional Quality (INQ), an expression of the nutrient density of a food (4). The INQ expresses the relationship between the extent to which a food meets the requirements for a specific nutrient and the extent to which the food meets the needs for energy. The INQ for a food is the percent

U.S. Recommended Daily Dietary Allowance (RDA) for each nutrient divided by the percent daily energy requirement.

The degree to which a food satisfies nutrient need is classified as a "source" or "good or excellent source." It has been proposed that a food having an INQ of one or more for four nutrients or an INQ of two for two nutrients makes a "significant" contribution to the nutrient intake and may, therefore, be identified as nutritious (4). A food is considered to be a source of nutrient if it has an INQ of one and if one serving provides at least 2 percent of the U.S. RDA for that nutrient. To qualify as a good or excellent source, the food must have an INQ of 1.5 and provide 10 percent of the U.S. RDA in each serving. Easily obtained values in food composition tables are adequate to predict the nutrient value of foods because they are close enough to values determined by direct chemical analyses.

An important aspect of the evaluation of product quality is analyses of the nutritional characteristics of that product. If one recognizes that foods are complex mixtures of biochemicals and that reactions between these chemicals are dependent on many factors in the environment, it becomes obvious that different processes will have varying effects on these biochemicals. The major consideration in evaluating food processing, from a nutritional standpoint, is the trade-off between increased food availability and the effects that each of the various kinds of processing have on nutrition.

Many factors are responsible for the complexity of the problem of nutrient retention. At a minimum, however, the compositional and environmental factors must be considered. Even if a menu is correctly planned with the objective of optimal nutrition, many nutrient losses can still take place in the individual unit operations which make up the foodservice sequence: i.e., purchasing, storage, preparation, cooking, holding, and serving (5). The critical control points in a good manufacturing practices program to assure optimal nutrient retention would probably be associated with purchasing, preparation, cooking, and holding.

Storage times and temperatures may have a significant effect on nutrient retention in foods. Three stages of the foodservice process appear to require particular attention in terms of nutrient retention: raw material handling, food preparation, and the service of prepared foods. The materials and methods involved in food preparation influence the menu item's nutritional quality. The major sources of nutrient losses during preparation and service of foods of animal origin are thaw drip, cooking drip, nutrient leaching, heat losses, and excessive steam table holding in foodservice operations. The losses, of course, vary with the product considered, the nutrients of interest in the product, and the specific cooking and holding techniques. Commissary or centralized foodservice systems may enhance problems with nutrient retention. More research is needed on the nutritional effects of common food preparation processes.

The nutritional quality of any food is a function of its chemical composition as related to the specific nutrient needs of the individual. Unfortunately, the exact composition of foods and nutrient requirements of individuals are usually incompletely known. Moreover, the nutrient content of a food product is dependent to some extent on such factors as the production, processing, and storage conditions prior to consumption.

The precise description of the nutrient content of a food is also limited by the availability of the nutrient under consideration and the synergistic effect of various food combinations. In addition, nutrient losses can be experienced in meat products, particularly during thawing, cooking, and holding. The nutrient content of specific food items can be determined through complex chemical analyses. Beyond that, the nutrient profile of a menu item can be estimated through the use of tables of food composition. In order to compare the nutrient profile of the ground beef patties in this study to an individual's nutritional needs, several assumptions were made regarding target market age group, average weight and height of the target market group, and the average energy need of this group.

Materials and Methods

The Food and Nutrition Board of the National Academy of Sciences - National Research Council Recommended Daily Dietary Allowances (RDA), revised in 1980, were reviewed to determine the nutrient values for both males and females. For the purposes of nutrition analysis of the ground beef patties, the age group of 23 to 50 years was selected. The corresponding portion of the RDA for this age group is presented in Table 1. These values assume an average weight of 154 pound (70 kilograms) and height of 70 inches (178 centimeters) for the male, and an average weight of 120 pounds (55 kilograms) and height of 64 inches (163 centimeters) for the female. Based on the RDA, the average daily energy need was assumed to be 2,700 kcals for the male and 2,000 kcals for the female.

Data from food composition tables provide the least expensive, yet most widely used, tool for estimating the nutrient intake of an individual (4). These data are usually based on information extracted from one or both of the following sources: the U.S. Department of Agriculture Handbook, No. 456, *Nutritive Value of American Foods* (1975); or the U.S. Department of Agriculture Home and Garden Bulletin No. 72 (1977). The data for Handbook No. 456 originally was printed in the U.S. Department of Agriculture Handbook No. 8, *Composition of Foods--Raw, Processed, and Prepared,* which was initially published in 1950. This publication lists food values in terms of 100 grams edible portion (EP) and one pound as purchased (AP). Bulletin No. 72, on the other hand, expressed food values in terms of average servings or common household units.

The data for this study were taken from Handbook No. 456 because this facilitated the conversion to the values needed in this analysis. The values used were based on regular raw and cooked ground beef with an average fat content of 21 percent. These values were adjusted to the grand mean value, $\bar{X}$, obtained for the patty weights in the process capability analysis. Since each ground beef sandwich contains two patties, the grand mean value of 44.3 grams was multiplied by two to obtain the total precooked weight of the patties, or 88.6 grams. The values of the various nutrients present in the ground beef patties were obtained by taking a ratio of the cooked to raw values from Handbook No. 456. These values are presented in Table 2.

Since the patties are cooked on a griddle in the restaurant, the values represented in Handbook No. 456 are applicable. No attempt was made to estimate the nutrient contents of the cheese, special sauce, lettuce, and french fries added to the patties before service. In spite of the recognized limitations, the food composition tables permit estimates of the nutritive content of a food item that approximate those values determined by direct chemical analyses. The advantages of using these tables include lower costs in time, equipment, and money.

The Index of Nutritional Quality (INQ) is one expression of the nutrient density of a food. That is, the INQ expresses the relationship between the extent to which a food meets the requirement for a specific nutrient compared to the extent to which it meets an individual's needs for energy. Mathematically, the INQ is calculated as follows:

$$\text{INQ}=\frac{\text{Percent U.S. RDA for a nutrient}}{\text{Percent energy requirement}}$$

If a food has an INQ of one or more for four nutrients or an INQ of two or more for two nutrients, that food makes a so-called significant contribution to the individual's nutrient intake and it may be identified as nutritious. A food is considered a so-called "source" of a nutrient if it has an INQ of one, and one serving of that food provides at least 2 percent of the U.S. RDA for the nutrient. The food must have an INQ of 1.5 and provide 10 percent of the U.S. RDA in each serving to be categorized as a "good or excellent source". The percent RDA and the INQ were calculated for the following eight nutrients present in the ground beef patties; protein, calcium, phosphorus, iron, vitamin A, thiamin, riboflavin, and niacin. The results of these calculations are presented in Table 3. Based on these values, the ground beef patties were classified as nutritious, and whether or not they were merely a source or a good or excellent source of each of the individual nutrients.

TABLE 1. *Recommended daily dietary allowances for selected nutrients for males and females in the 23 to 50 age group.*

	Recommended daily dietary allowances	
Nutrient	Male	Female
Protein (g)	56	44
Vitamin A (μg RE)[1]	1000	800
Vitamin D (μg)[2]	5	5
Vitamin E (mg αTE)[3]	10	8
Ascorbic Acid (mg)	60	60
Thiamin (mg)	1.4	1.0
Riboflavin (mg)	1.6	1.2
Niacin (mg NE)[4]	18	13
Vitamin B_6 (mg)	2.2	2.0
Folacin (μg)	400	400
Vitamin B_{12} (μg)	3.0	3.0
Calcium (mg)	800	800
Phosphorus (mg)	800	800
Magnesium (mg)	350	300
Iron (mg)	10	18
Zinc (mg)	15	15
Iodine (μg)	150	150

[1]Retinol equivalents. 1 RE = 1 μg retinol or 6 μg βcarotene or 3.33 IU.
[2]As cholecalciferol. 10 μg cholecalciferol = 400 IU Vitamin D.
[3]αtochopherol equivalents. 1 mg d-α-tocopherol = 1 αTE.
[4]Niacin equivalents. 1 NE = 1 mg niacin or 60 mg dietary typtophan.

TABLE 2. *Composition of raw and cooked ground beef patties with 21 percent fat based on values in USDA Handbook No. 456.*

	Product		
Item	Raw Ground Beef	Cooked Ground Beef	Loss, %
Weight (g)	88.6	63.6	28
Moisture (%/g)	(60.2/53)	(54.2/35)	35
Food energy (Kcal)	273	210	23
Protein (g)	15.8	15.4	3
Fat (g)	18.8	13.0	31
Carbohydrate (g)	0	0	0
Calcium (mg)	8.8	7.0	21
Phosphorus (mg)	138.1	122.9	11
Iron (mg)	2.4	2.0	17
Sodium (mg)	55.4	37.7	30
Potassium (mg)	253.3	172.2	30
Vitamin A (μg RE)	103.9	77.9	25
Thiamin (mg)	0.10	0.08	20
Riboflavin (mg)	9.10	0.09	10
Niacin (mg NE)	3.8	3.4	11
Asorbic acid (mg)	0	0	0

Discussion

The nutritional profile of the ground beef patties was estimated using values from the U.S. Department of Agriculture Handbook No. 456. These values were compared to the 23 to 50 year old age group's Recommended Daily Dietary Allowances

(RDA) to determine the Index of Nutritional Quality (INQ). The INQ is an expression of the nutrient density of a food, the ratio of the extent to which a food meets the requirement for a specific nutrient to the extent it meets the needs for energy for an individual.

If a food has an INQ of one or more for four nutrients or an INQ of two or more for two nutrients, that food makes a significant contribution to the individual's nutrient intake and it may be identified as nutritious. Ground beef patties are, therefore, identified as nutritious for both males and females in the 23 to 50 age group based on the INQs presented in Table 3.

The ground beef patties are, therefore, considered a source of protein, phosphorus, iron, and riboflavin for both males and females. In addition, the patties are a source of niacin for males. The ground beef patties are good or excellent sources of protein and phosphorus for both males and females, but a good or excellent source of iron only for males. These results are summarized in Table 4.

The ground beef patties are considered to be a source of protein, phosphorus, iron, and riboflavin for both males and females in the 23 to 50 age group. In addition, the product is considered to be a good or excellent source of protein and phosphorus for both males and females and iron for males only. What remains to be considered is the effects of each of the process flow steps on each of these specific nutrients.

Recommendations

If nutrient retention was the only basis for process evaluation, the choice of which process to use might be a relatively simple one. Nutrient retention is only one of the many considerations in food processing compounded by the fact that individual nutrients exhibit unique degradation rates. In addition the nutrient retention, the food product pH, color, flavor, texture and microbial load must be taken into consideration. Each process flow step under consideration might affect the specific nutrients in different ways.

Some losses of nutrients already will have occurred before the product reaches the commissary, the extent of which depends on the types of foods purchased. Regarding nutrient retention, the most important aspect of food receiving is to store the product as soon as possible after delivery by the supplier. This procedure will minimize exposure to the temperature danger zone and the thawing and subsequent refreezing of frozen products. Losses of specific nutrients during storage may take place if such variables as temperature, humidity, time, and light are not controlled. Generally, fluctuating freezer temperatures have a more adverse effect on texture and flavor than on nutrient retention.

Storage losses, in some cases the result of improper packaging, have a less substantial influence on nutrient retention than do the various stages of the preparation of animal products (including thawing, trimming, cutting, grinding, and forming). Thaw losses during the defrosting of frozen meats may be of major concern. The major losses of vitamins and, to a lesser degree, minerals, from foods often occur during the final preparation in the foodservice operation prior to consumption. Nutrient losses may occur in all forms of cooking as a result of the application of heat and other factors such as drip loss and leaching. These losses are directly influenced by the type of cooking method utilized. Meat cooked on a griddle retains more protein (i.e., less drip loss) than meats cooked with moist heat.

The major sources of nutrient losses during the preparation and service of animal products are: thaw drip, especially from comminuted meats; cooking drip; nutrient leaching; heat losses; and excessive hot holding of cooked foods. The specific nutrient losses are influenced by the nutrient profile of the food product and the extent of processing, storing, heating, and holding. Minerals are generally more stable than vitamins under conditions of handling and processing, and losses are negligible provided that losses by physical means (e.g., leaching, thaw exudate) are avoided. Protein nutritive values are generally not substantially affected during handling, processing, and distribution.

The proteins of beef are considered to be high quality nutrients due to the types and amounts of amino acids present. Meat proteins are classified as

TABLE 3. *The percent RDA and the index of nutritional quality for eight selected nutrients in ground beef patties.*

	Percent RDA		Index of nutritional quality	
Nutrient	Male	Female	Male	Female
Protein	27.5	35.0	3.5	3.3
Calcium	0.9	0.9	0.1	0.1
Phosphorus	15.4	15.4	2.0	1.7
Iron	20.0	11.1	2.6	1.1
Vitamin A	7.8	9.7	0.7	0.8
Thiamin	5.7	8.0	0.7	0.7
Riboflavin	5.6	7.5	2.4	2.5
Niacin	18.9	26.2	1.0	0.7

TABLE 4. *A classification of the nutrient content of ground beef patties based on the index of nutritional quality and the recommended daily dietary allowances for the 23 to 50 age group.*

	A source		A good or excellent source	
Nutrient	Males	Females	Males	Females
Protein	X	X	X	X
Phosphorus	X	X	X	X
Iron	X	X	X	
Riboflavin	X	X		
Niacin	X			

complete proteins because they contain all of the essential amino acids in the proportions needed by the body. Cooking of meat begins the breakdown of collagen due to partial hydrolysis. Cooking also enhances digestibility and palatability of meat proteins. There is little or no nutritive quality change in the beef proteins as indicated by monitoring the tryptophan, methionine, and lysine availability during cooking and processing methods (6). Little, if any, of the essential amino acids in meats are destroyed during processing and cooking. Maximum cooking losses range from a low of 5 percent for phenylalanine to a high of 40 percent for lysine (7). Generally, the amino acids and proteins present in meats are not significantly altered by pH changes, air or oxygen, or light.

Phosphorus is a macromineral that is widely distributed in foods. In general a diet with an adequate protein intake also provides adequate amounts of phosphorus. This is true because phosphorus is a component of most proteins. The phosphorus content of beef is not significantly altered during storage, processing, or cooking because the mineral is relatively stable to pH, oxygen, light and heat. Maximum losses are expected not to exceed three percent (4).

Iron is present in foods in both the heme and nonheme form. Here iron is the form found in blood and muscle tissue; therefore, this is the form present in beef. The heme form of this micronutrient is highly available and not affected by the composition of the diet. The nonheme form, found in cereals and vegetables, is less readily available and absorbed. Meats improve the body's absorption of nonheme iron. The absorption of iron depends on its availability, as well as the combination of foods eaten. Beef is a relatively good source of iron because muscle tissue contains myoglobin, an iron containing pigment linked with a protein. Cooking losses of iron only occur in discarded cooking water and, therefore, a substantial portion of the iron in meats will be retained. Iron is not significantly destroyed by pH, oxygen, light or heat and the retention is likely to be approximately 97 percent (4).

Riboflavin is a relatively stable member of the B group of vitamins. This nutrient is unaffected by acids, oxidation and heat; however, it is inactivated by alkalis and light. Since riboflavin is only slightly soluble in water, it will not be affected substantially by the processing stages associated with the production of the ground beef patties.

Niacin exists as nicotinic acid (niacin) and nicotinamide (niacinamide) in foods. This B vitamin is extremely stable to acids, alkalis, light, oxidation and heat. Little of this nutrient will be lost during the normal procedures of food processing and preparation. The essential amino acid, tryptophan, is converted into niacin in the body. Beef is an excellent source of protein and niacin due, in part, to this conversion.

This analysis concentrated only on those nutrients in beef classified by the INQ procedure as sources or good or excellent sources. A discussion of other nutrients (e.g., thiamin) was omitted since none fulfilled the INQ criteria. As evidenced by the stability of these specific nutrients, it is highly unlikely that the ground beef patties would drop from sources to poor sources during the processing and preparation procedures employed. For example, to drop from a good or excellent source of protein to a source of protein for males, the precooked ground beef patty weight must be decreased from a total of 88.6 grams to approximately 25 grams. Similarly, the precooked weight must drop to approximately 27 grams to become merely a source of protein for females. As long as reasonable care is practiced, the ground beef patties should retain their INQ status.

The nutrient profile of the ground beef patties is a marketplace quality issue. If the target markets are interested in obtaining more nutritious foods in this firm's restaurants, it is management's responsibility to respond with products that meet or exceed the markets' expectations. Ultimately, the extent to which an organization provides nutritious food choices and nutrition information is directly influenced by the desires of their target markets. The trends in the United States indicate an increased nutrition awareness. However, it cannot be assumed that this firm's target markets strictly follow those trends. Marketing intelligence can provide information regarding how interested this firm's clientele is in obtaining nutritious menu items.

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Dissagreements on Dairy Policy Won't Go Away

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There's only one thing about the U.S. dairy surplus upon which everyone can agree: something must be done, and soon.

In 1982 the surplus dairy production purchased by the government was five times what it was in 1979. Last year the USDA's Commodity Credit Corporation (CCC) bought over 10 percent of the milk produced in this country, in the form of a quarter of the cheese, a third of the butter and nearly three-quarters of the nonfat dry milk.

Consumer demand during the same period stayed virtually the same.

"The government refuses to keep spending over $2.2 billion annually on price supports. And everyone agrees that a surplus of more than 13 billion pounds is unjustifiable," says Truman Graf, agricultural economist at the University of Wisconsin-Madison. "Any new legislation will have to include compromises by farm, trade, consumer and government groups."

Graf will moderate a panel on national dairy policy on March 17 at the Governor's Conference on Agriculture in Menomonie. Members of the panel include Robert Cropp, professor of agricultrual economics at the University of Wisconsin-Platteville, A. Eugene Havens, professor of rural sociology at the UW-Madison, and William Knox, editor of Hoard's Dairyman magazine.

The increased production wasn't limmited to any one part of the country. Between 1979 and 1982 production increased 4.9 percent in the Southeast, 6.9 percent in the Midwest, 7.9 percent in the Northeast and 18.1 percent in the West, Graf says.

He cites five reasons for the overproduction:

- Low beef prices discouraged dairy farmers from culling marginal cows. As a result, there were 2.9 percent more milk cows in 1982 than in 1979 - the first increase in milk cow numbers since 1953.

- Low grain prices created a lower feed-to-milk ratio - meaning more feed could be purchased with the proceeds from a pound of milk.

- Because of the recession, consumers weren't willing to buy more dairy products. The average American consumed one-third less milk products in 1982 than in 1940.

- A general drop in farm earnings encouraged more farmers to go into dairying where prices enjoyed relatively strong government support. Net farm income declined by a third between 1979 and 1982.

- Because of lower returns to dairy farms, farmer boosted production to generate enough cash to cover costs. A survey of 40 to 50 cow farms in Wisconsin showed a return of only 4.5 percent on an average investment of $280,000.

Farm groups, government officials and others proposed a variety of ways to reduce the surplus. At first, it looked like the winner would be the compromise worked out by the Reagan administration and Congress - ironically a plan disliked by all segments of the dairy industry. But this plan was halted at least temporarily by a federal judge in South Carolina soon after it went into effect.

Here's the government's plan in a nutshell: (1) Freeze the support price at $13.10 per hundredweight through October 1, then adjust it for inflation for fiscal 1984, so farmers continue to get the equivalent of $13.10 in 1983 dollars; (2) Penalize farmers 50 cents/cwt. if projected CCC purchases exceed five billion pounds of milk equivalent; (3) deduct another 50 cents if CCC purchases exceed 7.5 billion per year by April 1; and (4) Give a farmer back the second 50 cents if he reduced his annual production by a percentage as large as the U.S. annual surplus.

Because projected CCC purchases already exceed the volumns spelled out by this plan, the total initial penalty to producers is $1/hundredweight.

The plan has many opponents. Graf listed some of the most common arguments against it.

"First, critics say the combination of reduced income and higher production costs make this plan too costly for farmers. A $1/cwt. penalty means an average Wisconsin farmer, producing 500,000 pounds of milk per year, loses $5,000 from a net income of $12,600" he points out.

"Second, farmers don't have much incentive to reduce production, because the first 50 cents/hundredweight is nonrefundable," he adds. "They'd be more likely to cut production if they could get back the entire $1. As it is, most of the money is revenue for the U.S. Treasury. Farmers may well try to increase production to make up for the loss.

"Third, there's no incentive for increased consumption. Dairies will be paying the same price for dairy products, even though farmers are getting a lower net price for the milk that goes into those products."

Many alternatives have been proposed. Graf predicts that new legislation will incorporate one or more of the following strategies:

*Continue current penalties but give larger refunds for reduced production. One such proposal supported by many Wisconsin farm groups is the "50 cents pay in, $10 pay out" plan. It would deduct 50 cents/cwt. from each milk check, then refund $10/hundredweight of reduced production. The refund plus cost savings would mean farmers could net more money by not producing milk than by producing milk, and so would be a powerful incentive for reduced production.

*Substantially reduce support prices, tying support levels to how much surplus the government must buy USDA projections indicate that reducing the support price by $1.10/hundredweight would reduce CCC expenditures by about $378 million annually, through a combination of reduced production and increased consumption. Savings to the USDA would be even more with a larger reduction in price supports. This plan is favored by the Reagan administration, and by some farm groups - particularly those in the southeastern and western U.S. million.

*Give each farm a quota - a base volume of milk on which it can get regular prices - with a penalty of about $10/hundredweight for any milk over the base and incentive payments of $10/hundredweight for reducing production below that base. In this case the penalty for increasing production would be greater than under the "50 cents pay in, $10 pay out." But farmers with level production would have zero cost, compared to a 50 cents/hundredweight cost under the other plan.

The National Milk Producers Federation supports the quota plan, as does the U.S. House of Representatives. But the Reagan administration opposes it on philosophical grounds - and out of fear that the bases would acquire a cash value, and would be sold or leased.

*Eliminate price supports altogether. This would put approximately 13.8 billion pounds of CCC surplus milk purchases onto the open market, causing a drop in farm milk prices of roughly 28 percent - $3.70 below current support levels. Graf says this plan could put many farmers out of business.

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Flavorings for Foods with Reduced Salt Levels

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Salt has been used in many foods for centuries. Its primary function is to act as a flavoring for foods; however, it also helps control fermentation, acts as a preservative, solubilizes protein in meats, and helps control water activity. Because excess salt consumption has been linked to hypertension, the F.D.A. has recommended that we reduce our salt consumption. The average American consumes about ten grams of salt per day with about 50 per cent of that coming from processed foods. Reducing the salt in processed foods is not a simple task. The flavor changes most foods when the salt is reduced, and the lower salt level may affect the microbiological shelf life. Most salt substitutes are quite different in flavor from sodium chloride. Potassium chloride is the most preferred substitute; however, it imparts a bitter, medicine-like flavor and does not provide the flavor enhancement of regular salt.

About four years ago, we found that our flavorings made from yeast decreased the bitterness of vinegar. During that same time period, some articles began to appear about sodium chloride and its role in hypertension. When potassium chloride was tested as an alternative to salt, two disadvantages (compared to sodium chloride) were found: (1) a bitter, medicine-like aftertaste, and (2) less saltiness (sharp, biting taste).

Putting these facts together, we suggested testing our ZYEST flavorings to determine whether they could reduce the bitterness of potassium chloride. We found that both ZYEST® -70 and ZYEST® -FM decreased the bitterness of the potassium chloride and enhanced the basic food flavor itself. (Figures 1,2). This led to our recommending the ZYEST products for improving the flavor of those foods formulated with potassium chloride to reduce the sodium content. Testing at several food manuufacturers showed that this provided some of the answers needed but not all. We also found that the complexity of the problem varied with the type of food. Tests in our laboratory showed that only 0.7 per cent of ZYEST-70 (based on weight of potassium chloride) was needed to mask the bitterness in a water system. As the food system became more complex, such as a broth or a poultry stuffing, the ratio of ZYEST-70 increased to 0.25 to 0.40 parts per 1.0 part of potassium chloride before the bitterness reduction was achieved. (Figure 3). This led to the co-processing and drying of a potassium chloride-autolyzed yeast combination now tradenamed ZYEST® -45 and protected by a U.S. patent. (Figure 4). This co-processed combination keeps the autolyzed yeast in intimate contact with the potassium chloride which results in less bitterness at lower ZYEST concentrations.

Using the co-processed combination of potassium chloride and autolyzed yeast, we were able to achieve an average of a 25 per cent to 30 per cent reduction in sodium before we encountered some off-flavors. We have de-

ZYEST—70

Autolyzed yeast flavoring which subtly enhances natural flavors such as: poultry, seafood, pork, and other food flavors. It reduces the bitterness of potassium chloride in a food system, but does not increase the salt-like flavor as much as ZYEST—SL or ZYEST—45. Typical use levels are from 0.20 to 1.00 per cent.

Figure 1.

veloped a new autolyzed yeast called ZYEST® -SL (Figure 5) that helps to overcome some of the formulation problems in reducing sodium content even further.

ZYEST-SL imparts a salt-like taste, has more flavor enhancement properties than the other ZYEST products, and has more saltiness (about 75 per cent more) that an equal quantity of ZYEST-45.

However, let me emphasize that neither ZYEST-SL or ZYEST-45 are salt-substitutes. They are both new flavoring ingredients which serve as tools in achieving a good food flavor with a reasonably salty taste. In fact, you see in the formulas presented that their level of use varies in selected food systems to obtain good flavor results with a reasonably salty taste.

Typical use levels of ZYEST-SL are from 0.15 per cent to 0.75 per cent in soup, sauces, dressing, ground meats, sausages, and snack foods (based on the finished food product). Most food applications use from 0.15 per cent to 0.50 per cent ZYEST-SL so the average use level is quite low.

When ZYEST-SL is used in combination with ZYEST-45 and potassium chloride, we have found it possible to reduce the sodium content to a greater extent. We have made food products where the sodium has been reduced from 34 per cent to 89 per cent using these two ZYEST products.

Some food systems present special problems when the sodium chloride content is reduced.

For example, in a reduced-salt frankfurter formula, a 2.5 per cent regular salt level was replaced using a combination of ZYEST-SL (0.30 per cent), ZYEST-45 (0.55 per cent), potassium chloride (KCl) (0.84 per cent), and sodium chloride (1.05 per cent) (a 58 per cent reduction in salt). (Figure 6). This combination satisfied three important criteria:

1. Flavor was as good as the regular 2.5 per cent salt frankfurter--

   The bitterness of KCl was avoided by using it at a reduced level, adding ZYEST-45 to add additional saltiness without bitterness, and utilizing ZYEST-SL to impart more salt-like flavor and enhance the sausage flavor.

2. Texture was firm enough--

   When the salt content is reduced below 2.0-2.25 per cent, the texture of the frankfurter becomes softer and

ZYEST—FM

An autolyzed yeast flavoring for use in reduced-sodium sausage products. ZYEST—FM helps to reduce the bitterness of potassium chloride, is less hygroscopic than ZYEST—70 and functionally improves the texture of frankfurters. Typical use levels are 0.75 to 1.25 per cent.

Figure 2.

How the level of ZYEST—70 needed to reduce bitterness of potassium chloride varies in four food environments

	Effective Level (per cent of potassium chloride)
Water	0.7%
Dry potassium chloride in salt shaker	7-10%
Broth	25-30%
Stuffing mix	33-38%

Figure 3.

ZYEST—45

Autolyzed yeast flavoring which contains 32 per cent potassium chloride. This processed combination offers additional salt-like flavor and less bitterness than a simple blend of ZYEST—70 and potassium chloride. Typical use levels are from 0.25 to 1.75 per cent.

Figure 4.

ZYEST—SL

A unique flavoring with the highest level of salt-like flavor of the ZYEST products. It imparts about 75 per cent more salt-like flavor per unit weight than ZYEST—45, and enhances the natural flavor of a wider variety of food products. Typical use levels are from 0.10 to 0.90 per cent.

Figure 5.

the skin formation on the outside of the frankfurter is affected. This is because the salt helps solubilize the myosin protein of the meat which helps to produce a firm frankfurter with good peelability. The proper texture results were accomplished using a combination of the ZYEST-SL flavorings with potassium chloride.

3. Shelf life was not decreased (Figure 7)--

Shelf life of the lower sodium frankfurter as determined by microbiological testing was not significantly different from the Control frankfurter made with sodium chloride by itself

If additional salt-like flavor impact was desired in the sausage formula, the ZYEST-SL level could be increased to .35 per cent to .45 per cent. Good flavor results were also obtained at this level.

Our research personnel have formulated a non-salt-added barbecue seasoning for use on snack foods as noted in the formula. The sodium chloride flavor was replaced using ZYEST-SL, ZYEST-45, potassium chloride, and citric acid. We were able to replace 100 per cent of the salt by adjusting the seasoning levels and enhancing the overall flavor and salt-like impact using ZYEST-SL and ZYEST-45 (Figure 8). However, there is still some sodium in the snack and seasoning. By analysis, the reduced-sodium BBQ chip contained 123 mg. of sodium per 100 gr. of product (Figure 9). If 3/4 oz. was used as the serving size,

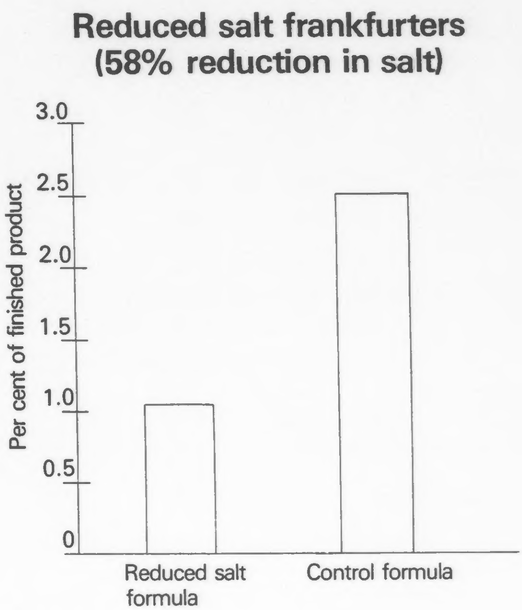

Figure 6.

Microbiological shelf life of inoculated frankfurters

	Plate Count 0 Weeks	Plate Count 3 Weeks
2.5% Salt	<100	153,000,000
1.05% Salt 0.84% Potassium Chloride 0.55% ZYEST—45 0.30% ZYEST—SL	<100	114,000,000

Conclusion — No significant difference in the microbiological shelf life.

Figure 7.

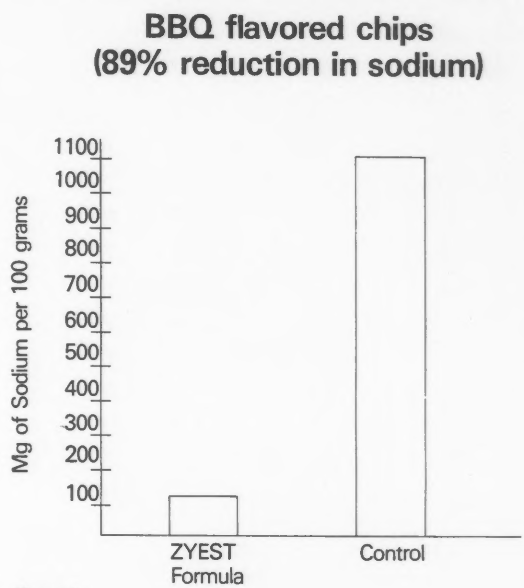

Figure 8.

BBQ-flavored chips Milligrams, sodium/100 grams

Test	123
Control	1100

Sodium Reduced 89%

Figure 9.

the BBQ would contain 26.3 mg. of sodium and would qualify for the "low-sodium" category. This formula represents an 89 per cent reduction in sodium. (Figure 10).

We have also formulated a low-sodium margarine using ZYEST-SL and ZYEST-45. The new formula represents an 89 per cent reduction in sodium as compared to a commercial salted margarine. If we assume one ounce as a serving size, the serving would contain 23 mg. of sodium which qualifies for the "low-sodium" category.

We have developed suggested formulas for several types of foods including hams, pepperoni (Figure 11,12), and soup mixes, etc.

Margarine
89% reduction in sodium

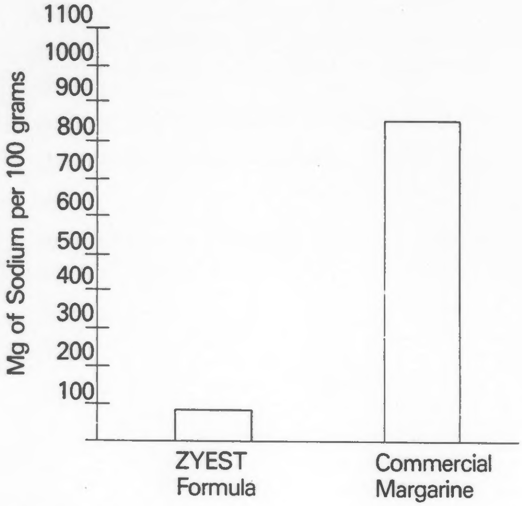

Figure 10.

Ham
(50% salt reduction)

Ingredients	Salt Level	Replacement Formula	Protein Contribution
Sodium chloride	2.5%	1.00%	0
Potassium chloride	—	0.74%	0
ZYEST—45	—	0.80%	0.28%
ZYEST—SL	—	0.17%	0.12%
	Totals	2.71%	0.40%

ZYEST—45 — 35% protein content
ZYEST—SL — 70% protein content

Figure 11.

Pepperoni
(50% salt reduction)

Ingredients	Salt Level	Replacement Formula	Protein Contribution
Sodium chloride	4.62%	2.30%	0
Potassium chloride	—	1.87%	0
ZYEST—45 (35% protein)	—	1.18%	0.41%
ZYEST—SL (70% protein)	—	0.70%	0.49%
ZYEST—FM (52% protein)	—	.41%	0.21%
	Totals	6.46%	1.11%

Figure 12.

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Sorghum Silage Boosts Beef Cattle Gains

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Texans, who first hybridized the sorghum plant and boosted its yields so it became a major grain in Texas and the U.S., are still not making full use of its potential, according to Dr. Lowell Schake of the Texas Agricultural Experiment Station (TAES).

When the entire sorghum grain plant is harvested, stored and fed as silage it produces *one-third* more liveweight gain than if only the grain were harvested and fed to cattle, which is our usual practice.

Silages are widely recognized as a most efficient means of preserving plant nutrients for feeding cattle but sorghum silages have not been as widely utilized as other silages, especially when compared to corn silage.

Sorghums long have been assigned nutritional values inferior to corn and much of the recent whole plant sorghum grain processing research at TAES has been designed to overcome these limitations, Schake says.

Sorghum grain silage can be successfully prepared by field harvesting the entire plant (grain head, stem and leaves). Capturing the leaves and stems almost doubles the dry-matter yield, compared to harvesting the grain alone.

"Leaves and stems are not efficiently used as cattle feed when left in the field," Schake says, "because as the plant matures, nutrient digestibility decreases rapidly and because harvesting alternatives are less efficient, too.

"At time of harvesting, the entire plant should be chopped into small segments, about ½ to ¾ inch in length, when plant dry matter is close to 35%. After field harvesting, the freshly-chopped sorghum should be tightly packed into silos and sealed, to aid preservation until feeding."

Daniel McDaniel, a typical, successful stocker-operator near Cameron, Texas, was concerned about the need to further process (roll grind) the grain within sorghum silage, to feed his cattle during intervals of insufficient pasture grazing.

This concern was typical of many cattlemen and TAES researchers have made a number of tests to determine the facts. Several pre- and postensile grain processing experiments have shown that sorghum grain silage does not require physical processing of the grain, prior to feeding.

Apparently the grain becomes soft enough while stored with the stems and leaves to result in satisfactory nutrient utilization. Silage roller mills or other expensive equipment are *not* recommended to successfully feed sorghum grain silages, which can save cattlemen considerable time and money.

The feeding of whole plant sorghum grain silage is no less complicated than feeding of other silage, Schake says, but feeding the entire crop offers producers an efficient alternative to increase their beef gain per acre of sorghum. This is especially important in the production of future lean beef supplies, where more efficient use of plant by products or roughages is envisioned to play an ever increasing role.

Liveweight beef gains per acre can almost be doubled by use of ratoon (regrowth) sorghum grain silage crop. Since the first cutting of silage is made 2 to 3 weeks before conventional dry grain harvest, the growing season for a second or ratoon crop is extended enough to allow many areas in Texas to take advantage of the desire of the sorghum plant to continue to grow until frost.

"At College Station, we harvested

the first whole-plant sorghum-grain silage crop in early July," Schake says, "and immediately fertilized and irrigated the sorghum stubble, and by late October harvested a second crop.

"The second crop produced many small seed heads with a resulting nutritional value at least equal to the initial harvest. Total dry matter yield was 80% of the initial crop. All silage harvesting, processing and feeding techniques remained the same for both harvests.

"Whole plant sorghum grain silages make an almost complete ration for growing calves, with them gaining at the rate of about 2.0 pounds per day. A small amount of protein, vitamin and mineral supplement is required, plus other accepted management practices, to obtain these results.

"If sufficient time is available, cattle may be developed to slaughter weights on a similar sorghum silage program."

Frequently more feed energy, in the form of grain, is added to increase rate of gain for cattle fed in feedlots. Recent TAES data indicated that certain levels of added grain did not increase performance as expected.

Whole plant sorghum grain silage represents about half grain and half stover (stems and leaves). When the total grain content of a feed mixture (silage plus grain) is around 60 to 70%, little or no improved rate of gain or feed conversion resulted.

Higher grain levels (75% or more) show more favorable cattle performance, as expected. The explanation for these relationships, Schake says, involves unique demands of fermentative and hydrolytic digestion in ruminants. The best advice for cattlemen is to avoid feeding cattle intermediate (60 to 70%) levels of grain.

"Sorghum silages, harvested and fed as indicated by these research results, can greatly increase the amount of liveweight cattle gain per acre, compared to harvesting and feeding only dry grain," Schake says.

"Over 6 million stocker and feeder cattle are managed in Texas each year. One common problem of many stocker-calf grazing programs is the lack of a dependable supply of forage to support adequate rates of gain.

"Sorghum grain silages may be fed during intervals of limited grazing, allowing a year-long stocker program to be established. The problem of many stocker-calf grazing programs is the more predictable performance of calves throughout the year, allowing cattlemen more management options regarding sale and purchase of calves, while efficiently using the stem and leaf by-products of sorghum grain production," Schake concluded.

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Houston, TX

News and Events

Student Essay Contest Sponsored by the ACDPI

The American Cultured Dairy Products Institute has launched an annual student essay contest in commemoration of its 25th Anniversary, according to Chairman of the Institute's Board of Directors DuWayne Beckerleg, Bancroft Dairy, Madison, Wisconsin.

The contest will be open to eligible undergraduate students in dairy/food science departments of U. S. and Canadian colleges and universities. Winners of the manuscript competition will be provided opportunity to present their papers at the Institute's Annual Conference, be given appropriate recognition, and receive a cash award.

"The cultured dairy foods industry is a challenging and dynamic one, and will require scores of well-trained individuals to assume future leadership positions", relates Beckerleg. "The essay contest will help generate student interest in this rapidly growing food processing area, and assist in informing consumers about the health maintenance and high nutritional values of cultured dairy products."

ACDPI members serving on the contest oversight committee include: Dr. Charles White (Chairman), Louisiana State University; Bill Brown, Florida Department of Agriculture and Consumer Services; Clark Crane, Publix Supermarkets; Dr. Ed Custer, Mississippi State University; Dr. Frank Kosikowski, Cornell University; Dr. James Martin, Clemson University; Dr. Khem Shahani, University of Nebraska; Kenneth Haynes, Funke Dairy Supplies.

1982 Dry Milk Book Available from the American Dry Milk Institute

The American Dry Milk Institute is pleased to announce the availability of its "Census of 1982 Dry Milk Distribution and Production Trends", a yearly publication compiled by the Institute. This publication contains comprehensive industry data and reliably reflects domestic sales and specific markets of utilization for nonfat dry milk, dry milk, and dry buttermilk.

This industry-wide survey of the end-use of dry milks distributed in 1982 is intended to serve as a guide in directing promotional efforts to continue the expansion of commercial markets for dry milks. Continued research and development of new uses for the various dry milks are necessary for full expansion of this segment of the dairy industry and represents a program objective of the Institute.

This publication is available for puchase at $4.00 per copy; for further information contact the American Dry Milk Institute, Inc., 130 North Franklin Street, Chicago, IL 60606, 312-782-4888.

National Conference for Food Protection Announces Meeting

A National Conference for Food Protection will be held in Washington, DC, May 9-11, 1984, according to an announcement of its organizers, the Study Committee for a National Conference for Food Protection. The Study Committee is a coalition of some ninety trade associations, professional societies, government agencies and food companies who share a common concern for food safety in the United States.

In making the announcement, Study Committee chairman, Charles W. Felix, said: "The Conference is being designed to enable industry, government and the consumer to share perspectives on the toxicological and microbiological aspects of food safety problems and, at the same time, to identify the needs, directions and opportunities of food production, processing, handling and regulation through the year 1990."

A further goal of the Conference, according to Mr. Felix, will be to establish an organization for the continuing study of food safety problems and for promotion of the recommendations of the Conference.

"We intend to avoid the shortcoming of the First National Conference on Food Protection held in Denver in 1971," said Felix. "Because there was no follow up mechanism built into that Conference, many of its recommendations fell by the wayside, and it has taken 13 years to pick up the thread of what was otherwise an excellent beginning to a national dialogue on food safety."

Unlike the 1971 Conference, the 1984 Conference will not be limited to microbiological concerns, but will also address toxicological problems, education and training, food processing and preservation, standards and regulations, and new foods, including the impact of genetics and the space program on food production.

The two-day Conference is expected to draw more than 400 participants from across the United States. They will meet at the Hyatt Regency Crystal City in Arlington, VA.

The Conference will be supported through a registration fee of $95 and through contributions from interested parties. A $5,000 grant from three members of the Single Service Institute -- James River-Dixie/Northern, Inc., Keyes Fibre Company and Amoco Chemicals Corporation -- has enabled the Study Committee to make preparations for the meeting.

More information about the National Conference for Food Protection may be obtained by contacting Charles W. Felix, Chairman, Study Committee for a National Conference, 1025 Connecticut Avenue, NW, Suite 1015, Washington, DC 20036, 202-347-0020.

New Ways to Combat Bacteria in Dairy Products

Milk processors may have new allies against bacteria and other foes of milk quality.

Food scientists at the University of Wisconsin-Madison found that sorbic acid, an antifungal agent commonly added to food, inhibits production of aflatoxins but won't stop some molds which can give dairy products an unpleasant kerosene odor.

They also confirmed that certain types of cold-loving bacteria damage milk protein.

Consumers might blame packaging materials when dairy products acquire a kerosene-like odor. The real culprit is probably a sorbate-resistant strain of Penicillium roqueforti or similar mold which produces smelly 1,3 pentadiene, says food scientist E. H. Marth.

It's not a new problem, but Marth and graduate student M. B. Liewen recently determined how the resistant strain manages to thrive on sorbic acid, findings which should lead to ways of solving the problem.

Spores of resistant molds took up sorbic acid about as rapidly as the sensitive strains but concentrated less of the acid inside the cells. Apparently, cell walls of resistant strains become less permeable to sorbic acid.

Marth and graduate student A. E. Yousef also found that sorbic acid and several other substances inhibit growth of Aspergillus parasiticus mold which produces aflatoxins.

Aflatoxins, potent carcinogens in certain organs, are occasionally found in temperate regions when the mold contaminates feedstuffs. Marth previously found that contaminated feedstuffs lower milk production and that the toxin tends to persist in products made from contaminated milk. However, he has found several promising methods of removing or inactivating aflatoxins so contaminated milk might be used instead of discarded.

Milk is tested for aflatoxins in states where it's likely to be a problem.

Another problem which crops up in dairy plants occurs when milk is held for several days before processing. The culprits are psychotrophic bacteria which multiply during refrigeration.

Marth and co-worker J. P. Burlingame-Frey found that Lactobacillus bacteria attack and change the structure of casein particles, the source of about 80 percent of the protein in whole milk.

"Changes in the size of casein particles markedly alter the functional properties of such products as dried milk, such as whippability, sinkability and dispersability, as well as reduce cheese yields," Marth says.

Rapid processing of milk prevents the problem, and that's the best solution until the researchers learn how to prevent bacterial growth.

The researchers discussed their findings at the 78th annual meeting of the American Dairy Science Association held June 26-29 on the UW-Madison campus.

Directory of Food Protection Available from NEHA

A Directory of Food Protection Professionals has been published by the Food Protection Section of the National Environmental Health Association.

According to Dee Clingman, NEHA Food Section Chairman, the Directory lists individuals who are engaged in food protection in government, industry and education. The alphabetical listing is cross-referenced by specific areas of expertise. The publication will enable individuals to rapidly locate technical assistance in specific food protection areas or geographic locations.

Single copies of this Directory are available through the National Environmental Health Association, 1200 Lincoln Street, Suite 704, Denver, CO 80203.

Carbohydrates Not Fattening

Carbohydrate foods like pasta, potatoes, corn and bread are often portrayed as the fattening "villians" in American diets.

But they are actually full of energy, nutrients, fiber and protein, and not all that fattening, says Mary K. Sweeten, a foods and nutrition specialist with the Texas Agricultural Extension Service, Texas A&M University System.

According to the specialist, the chemical composition of carbohydrates is indicated by the name -- carbo- for cabon; and hydrate, for water.

Carbohydrate foods provide an efficient source of energy essential for functioning of the muscles, brain and nerves and for good use of other nutrients in the body, explains Sweeten.

They act as carriers of many essential nutrients, including vitamins and minerals. They are also a good source of dietary fiber, and an inexpensive source of protein.

"Far from being fattening 'villians', carbohydrates are necessary for a balanced diet," says Sweeten. Consumers should be wary of any diet that recommends severly limiting or eliminating carbohydrates, cautions the specialist.

Guernsey-Holstein Cross

Dairy cattle conventionally have been bred for high volume milk production, with less attention paid to the percentage of solids in the milk.

However, most of the milk produced in Minnesota is made into products--cheese and butter, for example--in which solids content determines the final output. Now, researchers at the North Central Agricultural Experiment Station in Grand Rapids are trying to combine quality and quantity by crossbreeding Guernseys, known for their high-solids content milk, with characteristically high-volume milk producing Holsteins, which now make up more than 90 percent of Minnesota's dairy cattle population.

In a series of experiments under the direction of University of Minnesota-St. Paul Experiment Station researcher Leslie B. Hansen, the station Guernsey herd has been divided into three breeding groups. The control, or straightbred, group is being crossed with high milk-solids yield Guernsey sires. A second group is being bred to high milk-solids red-and-white Holstein bulls, and the third with quality Holstein stock of any color. Daughters of these crosses will be bred back to Guernsey bulls, and so on, in a "criss-cross" breeding scheme.

According to Grand Rapids animal scientist Thomas Heeg, this type of crossbreeding, fairly common in beef and swine, has not been used widely in dairy cattle before. If the experiences with these other livestock are any indicator, though, there is a good chance that the procedure may prove financially rewarding for Minnesota dairy farmers.

"The resulting cattle may not exceed Holsteins for a single trait such as milk production," Heeg noted, "but they might have advantages in other aspects over purebreds, such as fat percentage, other milk solids, protein, hardiness and growth."

Currently, milk producers are reimbursed for the quantity of milk and butterfat content, rather than for overall quality. But Heeg believes this will be changing in the future, with market prices reflecting the non-fat solids content as well. This trend would provide a strong incentive to dairy farmers to incorporate high-solids producers, such as those that researchers hope will come out of this program, into existing Holstein herds.

National Frozen Vegetables Council Formed

Representatives of the frozen vegetable industry met on June 7, 1983, in Denver, Colorado, and formed the National Frozen Vegetable Council.

At the time of formation, it was announced that the purpose was to advance the interests of the frozen blanched vegetable industry; that membership on the Council would be open to every frozen food processor of blanched vegetables; that each would have one vote at Council meetings; and that the National Frozen Vegetable Council would be established as a subsidiary of the American Frozen Food Institute.

Ole Cerutti, United Foods, Modesto, California, was named chairman of the Council and Alex Stuart, Dalgety Foods, Salinas, California, was named vice president.

Named to the initial Executive Committee were Edward J. Tobin, Comstock Foods; Ray Walker, Tandam Associates; Larry Reiling, North Pacific Canners and Packers; Dick Dickinson, Frozen Foods, Inc.; Alex Stuart, Dalgety Foods; Mort Rudin, Southland Frozen Foods; Gordon Smith, Smith Frozen Foods; Dave McCaffray, National Fruit Canning Company; Ole Cerutti, United Foods; and Lee Turman, Stilwell Foods, Inc.

The newly formed Executive Committee, chaired by Alex Stuart, Dalgety Foods, established the goals and objectives of the Council, proposing a five-year plan of activity and actions to be accomplished in "year one".

Further information can be secured by contacting M. J. Bohannan, Secretary/Treasurer of the National Frozen Vegetable Council, at the American Frozen Food Institute offices, 1838 El Camino Real, Room 202, Burlingame, CA 94010, 415-697-6835.

Dry Cows Benefit from Special Management

Dairy farmers who keep their dry cows and milking herd together could be hurting the dry cows' future performance. "There are three distinct phases in the dry period and dry cows must be managed differently in each of those phases," says Bob Appleman, dairy specialist at the University of Minnesota Agricultural Extension Service.

"Two often, dry cows are allowed to run in the milking herd. Consequently, they get either too much or the wrong kind of feed. Dry cows need special consideration for top production and fewer health problems later on."

Appleman outlines the phases of the dry period to include drying off (the first 1 to 14 days), the dry period (30 to 46 days), and pre-calving (the last 10 to 14 days).

"The best drying off procedure is to discontinue milking abruptly and treat with antibiotics. If no treatment is given, an intermitten method of dry off may reduce the incidence of infection." Minnesota research also shows that reducing feed intake and limiting water consumption can reduce milk flow, easing cows into dry off.

"The most critical period for the establishment of new mastitic infections is during the first week after dry off and the last week before calving," says Appleman. "Dipping teats in disinfectant solution and injecting antibiotics into the mammary gland at dry off is the only proven effective mastitis control program. The organisms that case mastitis originate in the environment and spread to dry cows in wet, dirty lots or through contaminated bedding or manure. "Strict sanitation is the only way to prevent the spread of those organisms. A good straw bed is better than sawdust, especially in higher temperatures and high humidity." During hot summer months, high temperatures can also create undue stress in dry cows. Shade management is needed to reduce stress."

"Dairy cows should be dry for 40 to 70 days," Appleman stresses. "Dry periods of less than 40 days don't allow the udder enough time to prepare for another lactation. More than 70 days can result in too much body condition." 1983 records show that in low-producing Minnesota Holstein herds (less than 1200 pounds of milk per cow annually), 53 percent of the cows are dry fewer than 40 days or more than 70 days. High-producing herds have 30 percent of the cows outside the 40- to 70-days range. "Part of the problem with dry periods that are either too long or too short is that some farmers aren't keeping the accurate records they should or aren't utilizing the records they do keep. Reproductive problems are also reflected in the length of the dry period," he adds.

Fat cow syndrome is a major problem in dry cow management. Overly fat dry cows frequently develop metabolic disorders like milk fever, ketosis and displaced abomasums. To combat the syndrome, Appleman urges separating dry cows from lactating cows and feeding a lower energy ratio to avoid letting cows become too fat during the dry period. Individual feeding can prevent excessive weight gains by providing dry cows with limited amounts of a balanced ration. If dry cows are group-fed in a loose housing arrangement, the energy concentration of the ration must be reduced as compared to the lactating cow ration to prevent overconditioning of aggressive eaters. "Forages should comprise the bulk of the ration and grains and other concentrates should be fed only to cows going dry in thin condition," he adds.

As cows enter the pre-calving phase, the feeding program should change. "Within 10 to 14 days before the expected calving date, grain should be added to the ration to prepare rumen microflora for the higher grain diets fed during early lactation. We recommend a grain feeding rate of 0.5 percent of body weight daily," Appleman advisess.

To separate cows from the milking herd, Appleman suggests that farmers with herds of 100 cows or more provide two lots, one for cows in the dry period and one for cows in the phase before calving. Cows in the drying off period can be maintained with the lower-producing cows until the drying off period is completed.

For smaller herds, a single dry lot plus a separate paddock or box stalls for cows in pre-calving will do. Regardless of the housing method, Appleman stresses sanitation to reduce the introduction of mastitis. "Keep cows in a clean, dry resting place and in well-drained lots free from mud and fecal contamination."

Fast Food Isn't Junk Food

Fast food can contribute to good nutrition, and be part of a healthful diet.

Wisely selected fast food meals can provide a significant portion of the nutrients people need each day, and they don't have to be excessively high in calories. Fast food does have nutritional drawbacks, however, including the limited variety of menu items available, and the lack of low-sodium items on most fast food menus, the American Council on Science and Health (ACSH) reported today.

Extensive nutrition information for specific items served by nine major fast food chains in included in the ACSH report "Fast Food and the America Diet", along with addresses that consumers can write to for further information.

Fast food meals provide ample amounts of protein, and moderate to large quantities of vitamins and minerals. However, since variety is important for good nutrition, and the menus of fast food outlets are limited, "meals eaten at these retaurants should be incorporated into a varied diet that includes many other food choices," the ACSH report states.

When asked if fast food could be incorporated into special diets, ACSH Associate Director Dr. Richard A. Greenberg said that "people on low-calorie diets can eat fast food if they make appropriate choices. Weight watchers must be careful about their selections, though, because fast food menus include both high-calorie items and those with more moderate calorie counts."

Virtually all chains serve some relatively low-calorie entrees, such as a small hamburger or cheeseburger, which can be combined with lowfat milk, coffee, or a diet soft drink for a nutritious meal that fits into most weight-reduction diets. Omitting high-calorie condiments such as mayonnaise reduces calories further.

"The key to wise use of fast food--and all foods--is selection in accordance with sound nutrition principles," Dr. Whelan continued. "Fast food's potential nutritional contribution to the diet is limited only by the variety of menu items available."

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

A single complimentary copy of the report "Fast Food and the American Diet" can be obtained by sending a self-addressed, stamped (37 cents postage), business-size (#10) envelope to ACSH, 47 Maple St., Summit, NJ 07901.

Caged Poultry More Productive

There is widespread concern, both from within and without agriculture, about some of the traditional management practices used in animal agriculture and the stress thought to be associated with today's intensive animal agricultural production systems.

Those outside agriculture are concerned that some of the traditional or modern production practices may cause undue stress and adversely affect the animals' welfare. Those from within production agriculture are doubly conerned because any practice which causes undue stress or mortality is not only inhumane but also uneconomic.

Two of the essentials to profitable animal production are that death be kept to a minimal level and that productivity be kept as high as feasible. Obviously any practice that causes undue stress or mortality is going to cost the producer.

Genetic research may be helpful in selecting animals better suited to production environments and improved design of some production facilities may improve both the environment and productivity.

At Texas A&M University scientists with the Texas Agricultural Experiment Station (TAES) studied laying hens in cages at various bird densities and compared them to hens kept in floor pens and outdoor range pens.

"In this research," according to Dr. Richard Cain, environmental physiologist, "we considered the physiological, behavioral and economic aspects. The egg production rates were significantly better in cage management systems than in floor or range pens, and only small differences were noted between 1, 2, 3, 4, 5 or 6 birds per cage.

"Cost per dozen eggs favored cage management by a factor from 2.2 to 4.5 times over floor pens and range pens. Least expensive were eggs from the 5-hens-per-cage system ($.50/dozen) and most expensive were floor pens providing 4 square feet per hen ($2.27/dozen).

"Behavioral patterns for pecking, pacing and loafing were different between cage and floor systems, but activities such as preening, feeding and drinking did not differ.

"Body weights were lighter in floor pen managment systems," Cain says, "and mortality was also greater than in cage systems.

"Physiological measurements of stress response such as blood corticosterone levels, (an adrenal gland hormone produced when animals are stressed), were significantly higher for floor pen and range pen birds than for caged hens. Among caged-hen treatments, only 6 hens/cage were elevated and these levels were below those for floor treatments.

"These results indicate that any stress a laying hen may be subjected to in a modern cage management system is less than the stress encountered in normal flock conditions in floor pens or range pens, even when given 4 square feet per hen.

"In other words, a hen's chance of being at the bottom of the peck order is reduced when groups of birds are small, and apparently the stress of large social gatherings is greater than that of modern cage systems," Cain concluded.

New Product News

•A new 4 page brochure describes energy conservation and other user benefits of Mars Air Doors. Easily mounted over entranceways of receiving/warehouse doors up to 16 feet high.

1. In cold weather they reduce the load on heating systems by drawing warm air down to floor level where it is needed as 60% of wasted heated air is trapped under ceilings. Stratified air is mixed and circulated with building heat and heat given off by lights and machinery, etc.

2. Deflect wind and reduce heat loss through open doors.

3. During warm weather, they direct a stream of unheated air downward to keep insects, dust and fumes from entering open doors.

4. If air conditioning exists in the building during warm weather, the air doors can be used to prevent loss of conditioned air.

5. Use of Mars Air Doors allows personnel and cargo to pass freely from one area to another with an unobstructed view through open doors or passageways, eliminating doorway accidents.

Mars Air Doors are the only air doors with National Sanitation Foundation and U. L. listing.

A model selection chart with performance specifications is included in the brochure. Free copies from Mars Air Doors, 114 Sheldon St., El Segundo, CA, 90245, 213-772-3321.

Mars Air Doors
Energy Conservation Brochure

•Like many other businesses in the '80s, dairymen are increasingly using the systems approach to improve management efficiency and boost herd production. The Dairy Equipment Company of Madison, WI, offers a line of computerized dairy record keeping equipment, the System 2000, that monitors milk flow and provides vital production data.

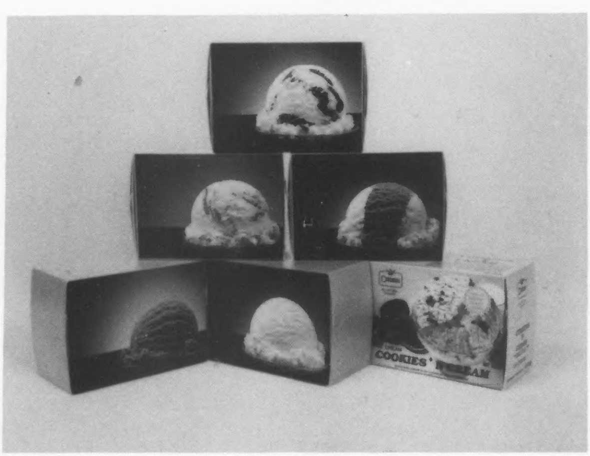
In the harsh milking environment with its high humidity and an accumulation of acids from cow urine, the milking parlor is washed down several times a day using high pressure water with strong soaps and detergents. To prevent water and dust from getting into the System 2000's sensitive control panels, GE Silicones translucent Silglaze N and Gesil N black sealants are applied to the panels, with Gesil N gray sealant being used for the computer's stainless steel parts.

An electronic milking meter, tracking the cow's production to the tenth of a pound, is attached during the milking process, and when the milk flow ends, the milking unit detaches. When hooked to an Agricomp computer, the system provides management with vital, on-the-spot herd information. Dairy Equipment utilizes both advanced technology GE silicone costruction sealants to seal the inside of the System 2000 computerized controls.

"Dampness develops during the milking process. The cows and the milking units are constantly being hosed," explained Dairy Equipment project engineer Jim Carrano.

"Because the equipment operates in a state of high humidity that might penetrate the stainless steel control panels, we needed a sealant that offered us the strongest protection. We found it in Gesil N and Silglaze N sealants."

"One of the reasons we were immediately sold on the sealants after testing samples sent to us by the distributor, S & S Sales Corporation, was that they didn't require a primer. The Gesil N sealant adhered to the stainless steel with no problems, an important consideration for us. The sealants give us good protection, making the equipment impervious to adverse environmental conditions. I would go so far as to say that using Gesil N and Silglaze N sealants makes our equipment almost inpenetrable. We'vd used the two sealants for about six months and are very pleased with their performance," said Carrano.



Fold Pak Corporation introduces new line of cartons

•Fold Pak Corporation, a manufacturer of ice cream and frozen food cartons, recently introduced a new line of cartons for premium grade ice cream. These cartons are produced on 24-point SBS (solid bleached sulphate) board and feature full color graphics. As part of its new line, Fold Pak has also added numerous designs ideally suited for a wide variety of ice cream products.

The firm manufactures various constructions in order to meet the needs of the industry. Constructions include lock-end cartons with and without zipper, tamper-evident cartons and klik-lok blanks. Cartons range from pint to half gallon to gallon sizes.

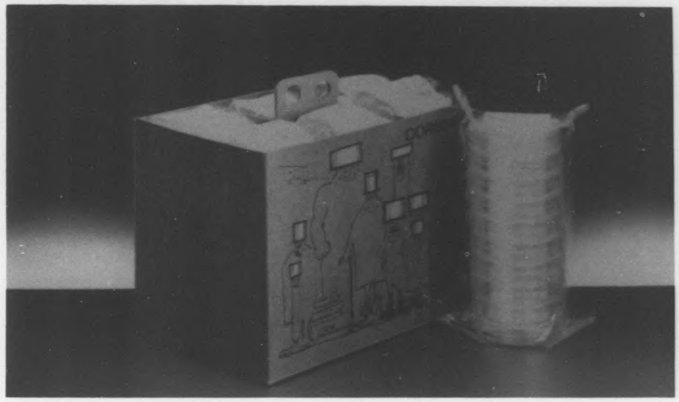
The new line complements an already large library of attractive ice cream designs. For additional information contact: Fold Pak Corporation, 110 Charlotte Place, Englewood Cliffs, NJ 07632, 201-568-7800.

•Plastic tissue culture dishes from Corning Science Products are being shipped in new "Six-Pack" carriers that also act as shelf organizers.

The Six-Pack is a rugged corrugated carrier with six sleeves of Corning disposable plastic 100mm X 20mm tissue culture dishes packed 10 per sleve. The new pack makes storage easier by keeping dishes organized on the shelf or in the drawer.

After the dishes are used, the carrier can be used to store fixed and stained dishes or as an organizer or carrier for other lab items. In addition, when the sleves are opened, fewer dishes are exposed; thus few dishes are open to contamination.

Information on Corning's complete line of tissue culture dishes is available from Corning Science Products, Corning Glass Works, MS-21-5-10, Corning, NY 14831.



Corning Tissue Culture Dishes in Six-Pack Carriers

•Thomas J. Lipton, Inc. has introduced Pripps Pluss in the aseptic Brik Pak carton in Southern Georgia and Florida.

Pripps Pluss is a quick-energy beverage developed by A. B. Pripps, a 150-year-old manufacturer of malt beverages, mineral water, soft drinks and fruit juices headquartered in Stockholm, Sweden.

Lipton has been licensed by Pripps to manufacture the product using the Pripps formula and to market it in the United States.

For more information contact: Mr. Bob D'Amico, Project Manager, New Beverage Products, Thomas J. Lipton, Inc., 201-567-8000.

Lipton Introduces Pripps Plus

•Designed for consecutive-shift production without operator supervision, Polypack's new, PH series shrink wrappers utilize modular components to simplify automatic product bundling.

Featuring Polypack's time-tested wrapping and sealing assemblies, the PH series incorporates the cleanliness and durability of heavy gauge, stainless steel construction with the convenience and cost effectiveness of powered film feeds, energy efficient shrink tunnels, and quick release change part assemblies and protective guarding.

Directly related to the product size and the collation required, production capacities up to 50 bundles per minute can be realized.

For more information contact: Kevin J. Harris, National Sales Manager, Polypack, Inc., 4390 - 28th St. No., St. Petersburg, FL 33714, 813-522-0538.

AFFILIATE NEWSLETTER . . .

IT IS YOURS
Remember, this is
YOUR organization,
your input is needed.

Tennessee Meeting Highlights

The Tennessee Association of Milk, Water & Food Protection held their Fourth Annual Meeting in Nashville, TN at the Ramada Inn - Airport on June 6-7, 1983 with 54 members, speakers and guests in attendance.

Mr. Randle Richardson, the Assistant Commissioner, Tennessee State Dept. of Agriculture, welcomed the group and challenged them to continue the very informative and educational program that the organization has followed.

Session Chairman Orland Britton with Kraft Dairy Group, Greeneville, TN opened the afternoon session with the introduction of Arnold Stallings. Mr. Stallings is Market Milk Administrator with Federal Orders in the Tennessee area and is from Louisville, KY. In his remarks, Mr. Stallings gave an excellent picture of the overall milk supply program as it now stands and several insights into the overall milk program as it is now operating throughout the United States. It was pointed out that Tennessee and Kentucky are the leading milk producing states in the South and Tennessee has approximately 2% of the total milk in the nation. Mr. Stallings pointed out that the present program is very unclear but stressed that right answers are possible, but they will require that everyone comes forward to meet their individual responsibilities in this overall industry program.

William Arledge of Dairymen, Inc., Louisville, KY, prsented the group with a very informative discussion on the subject "Quality for the 80's". His remarks stressed the importance of protecting the quality of milk all the way from the cow to the consumers. It was pointed out that the biggest challenge now is for the industry to get back to basics as far as efficient milk production is concerned. After an excellent and most informative summary of the Dairymen quality program that is underway, Mr. Arledge challenged our new Affiliate to continue the excellent start that has been made by the Association and urged individual members to contribute articles of an educational material to the two International publications.

A most informative and educational session was conducted by Jim Thomas, Assistant Director of Food and Dairies, Tenn. Dept. of Agriculture, on the subject of "Safety in Packaging". During his discussion a brief thumbnail sketch was given on the Tylenol incident that occurred and a parallel was drawn between this incident and the importance for tamper proof labels and packaging regulations that are now becoming effective. Mr. Thomas stressed that everyone involved in the food industry must be aware of packaging problems and do everything within good management packaging to assure a safe packing for consumers.

Ms. Sarah Long of the SE Dairy Association had an interesting message "It's the Best - Let's Sell It". In her presentation, the group was given a background on her activities and the scope of her program as far as reaching consumers with the milk and milk products message.

The afternoon session was chaired by Mrs. Dempsey Thornton, Manager of the Madison County Milk Producers, Jackson, TN. The first speaker on our afternoon session was David Mayfield from Mayfield Dairy Farms, Athens, TN. Mr. Mayfield gave a most interesting discussion on the subject "What's in the Yellow Jug?". In his presentation background information was given as to why his company chose to go to a yellow plastic jug for all of their milk and milk products. This was in an effort to reduce or eliminate light that very adversely affects the flavor of milk. The experience that they have received up to date has been most encouraging and laboratory and taste panel results were presented to show beyond a doubt that the flavor of good milk is protected in the colored jugs.

A most informative session concerning the activities of the International Association and also plans for the 1985 Annual Meeting in Tennessee was presented by Ruth Fuqua of Dairymen, Louisville, KY. Ruth is our Archivist for the Tennessee Affiliate and has been a very strong promoter and leader in getting and keeping the Tennessee Affiliate moving along. Tennessee will host the 1985 International meeting at the Hyatt Regency in Nashville, TN and hope that many of you will make your plans to attend all of this meeting. The 1984 meeting will be held in Edmonton, Alberta, Canada. As Ruth summed it up "Be Alive - Be in Nashville in '85".

Following a most enjoyable social hour during which time we all had an opportunity to visit informally with one another, a very enjoyable banquet was held. Emily McKnight, the new President for next year, was Toastmistress for this occasion. Following the Invocation by Dr. J. T. Miles, University of Tenn., our entire group heard a very inspirational talk by Robert M. Reeves, Director, Food and Dairy Div., Tenn. Dept. of Agriculture. Mr. Reeves' subject "America the Beautiful" challenged each of us to not only stop and think about the benefits that we enjoy here in this country but to also accept our individual responsibility in seeing that these rights are preserved.

Our Tuesday morning session was conducted by Carl Moore, AMPI, Martin, TN. Carl is the President Elect

AFFILIATE NEWSLETTER . . .

next year and he introduced Dr. David Hunter, Agriculture Economist from the University of Tenn. Dr. Hunter gave a very inspiring presentatin and during his talk gave a very factural appraisal of the dairy situations in Tennessee. Dr. Hunter listed several reasons why our current milk surplus exists and appraisal of some of the efforts being considered to correct the condition. It was stressed that the immediate picture is one of weaker prices in order to reduce milk production but the long range picture in dairying appears very stable for those efficient operators. It appearrs that it could take as much as 3-4 years to get the supply and demand back in line.

Dr. Richard Hall, University of Tenn. Extension Veterinarian for Tenn., discussed antibiotics and other inhibitors in food. Dr. Hall had a very informative handout that covered the subject and he stressed that the responsibility was in the hands of the dairy farmer to protect the quality of raw milk before it goes to the plant.

Dr. John Ragan, State Veterinarian with the Tenn. Dept. of Agriculture, gave an excellent summary on the status of the Brucellosis program in Tenn at this time. It was interesting to hear that during the past three years the newly Brucellosis infected herds that have been found has shown a marked reduction. Tennessee compares most favorable with only 1.9 infected herds per 1,000 across the state and this places the state in an excellent relative position with all other SE states. Progress in the Brucellosis program is determined by attitude, according to Dr. Ragan, and every effort must be made to see that this progress is contiued if Tenn. is to maintain its position as a dairy state.

Officers for next year will be as follows: President - Emily McKnight; President Elect - Carl Moore; Vice President - Robert Reeves; Secretary-Treasurer - Cecil E. White; Archivist - Ruth Fuqua.

During our business discussion it was pointed out that we need to increase our membership and participation in the area of water and foods. Also, our Affiliate needs to continue our work toward hosting the 1985 International Meeting in Nashville, Tennessee.

The following Committee Chairmen for hosting the 1985 meeting have been appointed by President Holt: General Chairman - Ruth Fuqua; Co-Chairman - Kenneth Whaley; Registration - Herbert Holt; Finance - Cecil E. White; Special Events - Emily McKnight.

Our individual membership was encouraged to volunteer to participate on these committees and if they have a preference on which committee they would like to work with, they should contact Emily McKnight.

The Tennessee Association appreciates the continued support of all of our members and we encourage additional membership and hope that you will be responsible for getting at least one new member to join our Association during 1983-84. After our meeting was adjourned, our entire group had the opportunity to attend the American Dairy Association's "June Dairy Month Kick-Off Luncheon" and program at the Ellington Agricultural Center. Following a very delightful meal, a very inspirational talk was given by John Ward, UT "Voice of the Vols".

Harton Wins in Membership Contest

Congratulations to James Harton, Indianapolis, Indiana, who received free registration, including banquet ticket, at the 70th IAMFES Annual Meeting in St. Louis, MO, Aug. 7-11, 1983, for supporting 8 new people into state and international membership during the IAMFES Membership Contest.

Left to right, Herbert Holt, Past President; Emily McKnight, President; Carl Moore, President Elect.

Ruth Fuqua, Chairman for the 1985 IAMFES Annual Meeting in Nashville, TN.

Dairy Quality

Reprinted from Capsule Laboratories Newsletter, Dairy Quality Update

THE SIGNIFICANCE OF GRAM NEGATIVE BACTERIA IN PASTEURIZED FLUID MILK

This month's DAIRY QUALITY will discuss a common problem affecting the microbiological quality of pasteurized milk; namely, post-pasteurization contamination. The aim is to discuss a group of bacteria (gram negative bacteria) that are most commonly found as post-pasteurization contaminants that have an ability to adversely affect the quality of pasteurized fluid milk. Certainly the dairy processing plant that is experiencing a short shelflife product (10 days or less) and/or high 5 or 7-day counts (greater than 50,000), can first look for post-pasteurization contamination with gram negative bacteria as the primary problem.

Bacteria can be classified according to the size, shape, and staining properties. A useful staining procedure (the gram stain) was developed nearly 100 years ago by Christian Gram. The gram stain procedure involves heat fixing a smear on a microscope slide followed by staining with Crystal Violet. The slide is then treated with Gram Iodine (I_2KI) mixture to fix the stain. The stain is then washed with alcohol or acetone and finally counterstained with Safranin (a red stain). Gram positive bacteria will retain the Crystal Violet stain and appear purple/blue in color. However, gram negative bacteria will be decolorized by the alcohol and then will be counterstained with Safranin; thus, appearing red. The primary difference in the two organisms is the composition and permeability of the cell wall.

There are two primary shapes of bacteria that are important in the dairy industry. These are rod shaped organisms and spherical shaped organisms referred to as cocci. Gram positive bacteria found in milk can be found as rods or cocci; whereas, gram negative bacteria in milk will be rods.

The following characteristics of gram negative rods found in milk make them important to the fluid milk industry:

(1) Gram negative rods are normally very heat sensitive (*4*). Gram negative bacteria found in milk will be completely inactivated during the pasteurization process unless they are found at extremely high populations (populations greater than 1,000,000/ml) (*4*).

(2) Gram negative bacteria found in the dairy industry are normally psychrotrophic. These organisms usually demonstrate an ability to grow relatively fast at refrigeration temperatures as compared to other bacteria.

(3) These organisms are normally lipolytic or proteolytic producing off-flavors in milk at relatively low levels of growth. Unclean, bitter, putrid, and fruity flavors can be found in pasteurized fluid milk when gram negative organisms grow to populations as low as 5,000,000/ml.

(4) Gram negative bacteria can be found in water, soiled dairy equipment (with rubber contact surfaces being a major contributor), condensation, air, and compressed air.

(5) Gram negative bacteria are adversely affected by drying. For example, Maxcy (*2*) reported that when cells of *Pseudomonas fluoroscens* are washed with water and inoculated on a dry stainless steel surface, only 7.5% survived. Then after 2 hours of drying only 2% survived, and less than 1% survived after 7 hours of drying.

(6) It has been shown that the levels of post-pasteurization contamination by gram negative organisms is quite low (*1,3*). For example, Maxcy (*3*) examined 246 isolates from plates of freshly pasteurized milk and found only 2 to be coliforms and did not find other gram negative rods. This would indicate that the contamination rate was less than 1/ml. However, relatively rapid growth rates of gram negative organisms in milk at refrigeration temperatures, even at an extremely low level of past-pasteurization contamination, can result in severe quality problems.

The gram negative rods most frequently found in processed fluid milk usually belong to the genera *Pseudomonas, Alcaligenes, Achromobacter, Aeromonas,* and *Flavobacterium*. Other gram negative rods encountered in fluid milk include *Escherichia coli* and *Enterobacter aerogenes*. These organisms are more commonly known as coliforms to the dairy industry.

In summary, post-pasteurization contamination by gram negative psychrotrophic bacteria is one of the biggest problems plaguing the fluid milk industry. These organisms can have a severe economic impact on the fluid milk industry. They can produce quality defects and dissatisfied customers by reducing the shelf-life of milk.

(1) Marshall, R. T. and R. Appel. 1973. Sanitary conditions in twelve fluid milk processing plants as determined by use of the rinse filter method. J. Milk Food Technol. 36:237.

(2) Maxcy, R. B. 1975. Fate of bacteria exposed to washing and drying on stainless steel. J. Milk Food Technol. 38:192.

(3) Maxcy, R. B. 1967. Nature and growth response of the microflora of pasteurized packaged milk. J. Milk Food Technol. p.213.

(4) Weckback, L. S. and B. E. Langlois. 1977. Effect of heat treatments on survival and growth of a psychrotroph and on nitrogen fractions in milk. J. of Food Protection. 40:857.

Holders of 3-A Symbol Council Authorizations on August 15, 1983

Questions or statements concerning any of the holders authorizations listed below, or the equipment fabricated, should be addressed to: Robert E. Holtgrieve, Ass't. Sec'y.-Treasurer, W255 N477 Grandview Blvd., Suite 100, Waukesha, Wisconsin 53186

01-06 Storage Tanks for Milk and Milk Products

115 Alfa-Laval, Ltd. (9/28/58)
(not available in USA)
113 Park Street South
Peterborough, Ontario, Canada K9J 3R8

28 Cherry-Burrell Corporation (10/3/56)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

102 Chester-Jensen Co., Inc. (6/6/58)
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016

2 Crepaco, Inc. (5/1/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

117 DCI, Inc. (10/28/59)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

76 Damrow Company (10/31/57)
(A Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

109 Girton Manufacturing Co. (9/26/58)
Millville, Pennsylvania 17846

127 Paul Mueller Co. (6/29/60)
P.O. Box 828
Springfield, Missouri 65801

31 Walker Stainless Equipment Co., Inc. (10/4/56)
Elroy, Wisconsin 53929

02-08 Pumps for Milk and Milk Products

325 Albin Pump, Inc. (12/19/79)
1260 Winchester Pkwy., Suite 209
Smyrna, Georgia 30080

65R Alfa-Laval, Inc. (5/22/57)
(Flow Equipment Division)
5718-52nd St.
Kenosha, Wisconsin 53141

214R Ben H. Anderson Manufactures (5/20/70)
Morrisonville, Wisconsin 53571

212R Babson Brothers Co. (2/20/70)
2100 S. York Rd.
Oak Brook, Illinois 60521

29R Cherry-Burrell Corp. (10/3/56)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar rapids, Iowa 52406

63R Crepaco, Inc. (4/29/57)
100 South CP Ave.
Lake Mills, Wisconsin 53551

205R Dairy Equipment Co. (5/22/69)
1919 S. Stoughton Rd., P.O. Box 8050
Madison, Wisconsin 53716

377 Energy Service Co. (2/4/83)
B200 Walker Bldg., 734 15th St., NW
Washington, DC 20005

348 ITT Jabsco Ltd. (12/3/81)
(A Unit of ITT MARC Div.)
3200 Bristol St., Suite 701
Costa Mesa, California 92626

145R ITT Jabsco Products (11/20/63)
1485 Dale Way
Costa Mesa, California 92626

314 Len E. Ivarson, Inc. (12/22/78)
3100 W. Green Tree Rd.
Milwaukee, Wisconsin 53209

372 The Kontro Co., Inc. (12/20/82)
450 W. River St., P.O. Box 30
Orange, Massachusetts 01364

26R Ladish Co., Tri-Clover Div. (9/29/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

373 Luwa Corporation (12/27/82)
4404 Chesapeake Dr.
Charlotte, North Carolina 28216

364 M D Pneumatics, Inc. (7/28/82)
4840 W. Kearney
Springfield, Missouri 65803

319 Mono Group, Inc. (3/21/79)
847 Industrial Dr.
Bensenville, Illinois 60106

375 Pasilac, Inc. (1/25/83)
660 Taft St., NE
Minneapolis, Minnesota 55413

241 Puriti, S.A. de C.V. (9/12/72)
(not available in USA)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

148R Robbins & Myers, Inc. (4/22/64)
1895 W. Jefferson St.
Springfield, Ohio 45506

306 Stamp Corporation (5/2/78)
2410 Parview Rd.
Middleton, Wisconsin 53562

332 Superior Stainless, Inc. (12/10/80)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115

370 Texas Process Equipment Co. (11/9/82)
5880 Bingle Rd.
Houston, Texas 77092

72R L. C. Thomsen & Sons, Inc. (9/14/57)
1303-43rd St.
Kenosha, Wisconsin 53140

219 Tri-Canada, Inc. (2/15/72)
6500 Northwest Dr.
Mississauga, Toronto
Ontario, Canada L4V 1K4

175R Universal Milking Machine Division (12/26/65)
Universal Cooperatives, Inc.
1st Ave. at College
Albert Lea, Minnesota 56007

329 Valex Products Corp. (6/10/80)
20447 Nordhoff St.
Chatsworth, California 91311

52R Viking Pump Division (12/31/56)
Houdaille Industries, Inc.
406 State St.
Cedar Falls, Iowa 50613

5R Waukesha Foundry Division (5/6/56)
Abex Corporation
1300 Lincoln Avenue
Waukesha, Wisconsin 53186

04-03 Homogenizers and High Pressure Pumps of the Plunger Type

344 Alfa-Laval, Inc. (8/23/81)
2115 Linwood Ave.
Ft. Lee, New Jersey 07024

390 American Lewa, Inc. (6/9/83)
11 Mercer Rd.
Natick, Massachusetts 01760

247 Bran & Lubbe, Inc. (4/14/73)
512 Northgate Pkwy.
Wheeling, Illinois 60090

87 Cherry-Burrell Corp. (12/20/57)
(A Unit of AMCA Int'l., Inc.)
2400-6th St., SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

37 Crepaco, Inc. (10/19/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

75 Gaulin Corporation (9/26/57)
44 Garden St.
Everett, Massachusetts 02149

256 Liquipak Int'l. Inc. (1/23/74)
2285 University Ave.
St. Paul, Minnesota 55114

309 Rannie Tech, Inc. (7/19/78)
1050-29th Ave. SE
Minneapolis, Minnesota 55414

05-13 Stainless Steel Automotive Milk Transportation Tanks for Bulk Delivery and/or Farm Pick-up Service

379 Bar-Bel Fabricating Co., Inc. (3/15/83)
RR 2
Mauston, Wisconsin 53948

70R Brenner Tank, Inc. (8/5/57)
450 Arlington Ave., P.O. Box 670
Fond du Lac, Wisconsin 54935

66 Dairy Equipment Co. (5/29/57)
1919 South Stoughton Rd.
P.O. Box 8050
Madison, Wisconsin 53716

388 Frell, Inc. (5/24/83)
1313 Corn Products Rd.
Corpus Christi, Texas 78408

45 The Heil Co. (10/26/56)
3000 W. Montana P.O. Box 593
Milwaukee, Wisconsin 53201

297 Indiana Tank Co., Inc. (8/29/77)
P.O. Box 366, N. Main St. Rd.
Summitville, Indiana 46070

201 Paul Krohnert Mfg. Ltd. (4/1/68)
(not available in USA)
811 Steeles Ave., P.O. Box 126
Milton, Ontario Canada L9T 2Y3

305 Light Industrial Design Co., Inc. (3/23/78)
8631-A Depot Rd.
Lynden, Washington 98264

338 Murphy's, Inc. (4/20/81)
Box 18, Route 2
Avon, Minnesota 56310

40 Penske Tank Co. (10/20/56)
900 Sixth Ave. SE
Minneapolis, Minnesota 55414

85 Polar Manufacturing Co. (12/20/57)
Holdingford, Minnesota 56340

121 Technova, Inc. (12/9/59)
(not available in USA)
1450 Hebert St. CP758
Drummondville, Quebec
Canada J2C 2A1

189 A & L Tougas, Ltee (10/3/66)
(not available in USA)
1 Tougas St.
Iberville, Quebec, Canada

25 Walker Stainless Equipment Co. (9/28/56)
New Lisbon, Wisconsin 53950

08-17 Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products

349 APN, Inc. (12/15/81)
400 W. Lincoln
Caledonia, Minnesota 55921

291 Accurate Metering Systems, Inc. (6/22/77)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

67R Alfa-Laval, Inc. (6/10/57)
Flow Equipment Div.
5718-52nd St.
Kenosha, Wisconsin 53141

322 Alfa-Laval, Ltd. (7/16/79)
(not available in USA)
113 Park Street South
Peterborough, Ontario
Canada K9J 3R8

380 Allegheny Bradford Corp. (3/21/83)
P.O. Box 264
Bradford, Pennsylvania 16701

79R Alloy Products Corp. (11/23/57)
1045 Perkins Ave., P.O. Box 529
Waukesha, Wisconsin 53187

245 Babson Bros. Company (2/12/73)
2100 So. York Rd.
Oak Brook, Illinois 60521

284 Bristol Engineering Co. (11/18/76)
210 Beaver St., P.O. Box 696
Yorkville, Illinois 60560

82R Cherry-Burrell Corp. (12/11/57)
(A Unit of AMCA Int'l. Corp.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

260 Crepaco, Inc. (5/22/74)
100 South CP Ave.
Lake Mills, Wisconsin 53551

271 The Foxboro Co. (3/8/76)
38 Neponset Ave.
Foxboro, Massachusetts 02035

369 IMEX, Inc. (11/3/82)
6733 So. Sepulveda Blvd.
Suite E
Los Angeles, California 90045

203R ITT Grinnell Valve Co., Inc. (11/27/68)
Dia-Flo Division
33 Centerville Rd.
Lancaster, Pennsylvania 17603

34R Ladish Co., Tri-Clover Div. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

389 Lee Industries, Inc. (5/31/83)
P.O. Box 537
Port Matilda, Pennsylvania 16870

239 Lumaco, Inc. (6/30/72)
P.O. Box 688
Teaneck, New Jersey 07666

200R Paul Mueller Co. (3/5/68)
1600 W. Phelps St., Box 828
Springfield, Missouri 65801

374 Pasilac, Inc. (1/25/83)
660 Taft St., NE
Minneapolis, Minnesota 55413

295 Precision Stainless Products (8/11/77)
5636 Shull St.
Bell Gardens, California 90201

242 Puriti, S.A. de C.V. (9/12/72)
(not available in USA)
Alfredo Nobel 39
Industrial Puente de Vigas
Tlalnepantla, Mexico

149R Q Controls Subsid. of Cesco Magnetics (5/18/64)
93 Utility Court
Rohnert Park, California 94928

376 Rollix Bearings, Inc. (1/25/83)
810 Cardinal Lane
Hartland, Wisconsin 53029

350 Rosista, Inc. (1/7/82)
808 No. Central Rd.
P.O. Box 685
Wood Dale, Illinois 60191

287 Sanitary Processing Equipment Corp. (1/14/77)
P.O. Box 178, Salino Station
Syracuse, New York 13201

334 Stainless Products, Inc. (12/18/80)
1649-72nd Ave., Box 169
Somers, Wisconsin 53171

391 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

300 Superior Stainless, Inc. (11/22/77)
611 Sugar Creek Rd.
Delavan, Wisconsin 53115

357 Tanaco Products (4/16/82)
3860 Loomis Trail Rd.
Blaine, Washington 98230

73R L. C. Thomsen & Sons, Inc. (8/31/57)
1303-43rd St.
Kenosha, Wisconsin 53140

191R Tri-Canada, Inc. (11/23/66)
6500 Northwest Dr.
Mississauga, Ontario
Canada L4V 1K4

250 Universal Milking Machine Div. (6/11/73)
Universal Cooperatives, Inc.
408 First Avenue, So.
Albert Lea, Minnesota 56007

304 VNE Corporation (3/16/78)
1415 Johnson St., P.O. Box 187
Janesville, Wisconsin 53547

278 Valex Products Corp. (8/30/76)
20447 Nordhoff St.
Chatsworth, California 91311

383 Walker Stainless Equipment Co. (5/4/83)
601 State Street
New Lisbon, Wisconsin 53950

384 Walker Stainless Equipment Co. (5/4/83)
601 State Street
New Lisbon, Wisconsin 53950

86R Waukesha Specialty Co., Inc. (12/20/57)
Hwy 14
Darien, Wisconsin 53144

09-07 Instrument Fittings and Connections Used on Milk and Milk Products Equipment

321 Anderson Instrument Co., Inc. (6/14/79)
RD #1
Fultonville, New York 12072

315 Burns Engineering, Inc. (2/5/79)
10201 Bren Rd., East
Minnetonka, Minnesota 55343

206 The Foxboro Co. (8/11/69)
38 Neponset Ave.
Foxboro, Massachusetts 02035

367 RdF Corporation (10/2/82)
23 Elm Ave.
Hudson, New Hampshire 03051

285 Tank Mate Div. (12/7/76)
Monitor Manufacturing
P.O. Box AL
Elburn, Illinois 60119

32 Taylor Instrument Co. (10/4/56)
Div. Sybron Corp.
95 Ames St.
Rochester, New York 14601

10-00 Milk and Milk Products Filters Using Disposable Filter Media, as Amended

371 Alloy Products Corp. (12/10/82)
1045 Perkins Ave., P.O. Box 529
Waukesha, Wisconsin 53187

35 Ladish Co., Tri-Clover Div. (10/15/56)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

296 L. C. Thomsen & Sons, Inc. (8/25/77)
1303 43rd St.
Kenosha, Wisconsin 53140

11-03 Plate-type Heat Exchangers for Milk and Milk Products

20 APV Equipment, Inc. (9/4/56)
395 Fillmore Ave.
Tonawonda, New York 14150

316 Agric Machinery Corp. (2/7/79)
2 Green Village Rd., P.O. Box 6
Madison, New Jersey 07940

17 Alfa-Laval, Inc. (8/30/56)
2115 Linwood Ave.
Ft. Lee, New Jersey 07024

120 Alfa-Laval, Ltd. (12/3/59)
(DeLaval Agric. Div.)
11100 No. Congress Ave.
Kansas City, Missouri 64153

326 American Vicarb Corp. (2/4/80)
77 Oriskany Dr.
Tonawanda, New York 14150

30 Cherry-Burrell Corp. (10/2/56)
(A Unit of AMCA Int'l. Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

14 Chester-Jensen Co., Inc. (8/15/56)
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016

38 Crepaco, Inc. (10/19/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

362 Kroeze Dairy Equipment, Inc. (7/20/82)
14393 Euclid Ave.
Chino, California 91710

15 Kusel Equipment Co. (8/15/56)
820 West St., P.O. Box 87
Watertown, Wisconsin 53094

360 Laffranchi Wholesale Co. (7/12/82)
P.O. Box 698
Ferndale, California 95536

365 Pasilac Therm, Inc. (9/8/82)
1050 29th Ave., SE
Minneapolis, Minnesota 55414

279 The Schlueter Co. (8/30/76)
112 E. Centerway
Janesville, Wisconsin 53545

12-04 Tubular Heat Exchangers for Milk and Milk Products

307 Alfa-Laval, Inc. (5/2/78)
Flow Equipment Div.
5718-52nd St.
Kenosha, Wisconsin 53141

248 Allegheny Bradford Corp. (4/16/73)
P.O. Box 264
Bradford, Pennsylvania 16701

243 Babson Bros. Company (10/31/72)
2100 So. York Rd.
Oak Brook, Illinois 60521

103 Chester-Jensen Co., Inc. (6/6/58)
5th & Tilghman Sts., P.O. Box 908
Chester, Pennsylvania 19016

217 Girton Manufacturing Co. (1/31/71)
Millville, Pennsylvania 17846

252 Laffranchi Wholesale Co. (12/27/73)
P.O. Box 698
Ferndale, California 95536

238 Paul Mueller Co. (6/28/72)
P.O. Box 828
Springfield, Missouri 65801

96 C. E. Rogers Co. (3/31/64)
So. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

298 Sanitary Processing Equipment Corp. (2/4/83)
P.O. Box 178, Salino Station
Syracuse, New York 13208

392 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

393 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

394 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersery 08876

395 Stork Food Machinery, Inc. (6/9/83)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

13-06 Farm Milk Cooling and Holding Tanks

240 Babson Bros. Company (9/6/72)
2100 So. York Rd.
Oak Brook, Illinois 60521

11R Crepaco, Inc. (7/25/56)
100 South CP Ave.
Lake Mills, Wisconsin 53551

119R DCI, Inc. (10/28/59)
P.O. Box 1227
St. Cloud, Minnesota 56302

4R Dairy Equipment Co. (6/15/56)
1919 So. Stoughton Rd.
Madison, Wisconsin 53716

49R DeLaval Agric. Div. (12/5/56)
Alfa-Laval, Inc.
11100 No. Congress Ave.
Kansas City, Missouri 64153

10R Girton Manufacturing Co. (7/25/56)
Millville, Pennsylvania 17846

336 Merle D. Haberer (2/3/81)
P.O. Box 220
Bowdle, South Dakota 57428

179R Heavy Duty Products (Preston) Ltd. (3/8/66)
(not available in USA)
1261 Industrial Rd.
Cambridge (Preston)
Ontario Canada N3H 4W3

12R Paul Mueller Co. (7/31/56)
1600 W. Phelps, P.O. Box 828
Springfield, Missouri 65801

16R Zero Manufacturing Co. (8/27/56)
811 Duncan Ave.
Washington, Missouri 63090

16-04 Evaporators and Vacuum Pans for Milk and Milk Products

132 APV Equipment, Inc. (10/26/60)
395 Fillmore Ave.
Tonawanda, New York 14150

277 Alfa-Laval, Inc. (8/19/76)
Contherm Division
P.O. Box 352, 111 Parker St.
Newburyport, Massachusetts 01950

254 Anhydro, Inc. (1/7/74)
165 John L. Dietsch Square
Attleboro Falls, Massachusetts 02763

356 Damrow Co. (3/10/82)
(Div. of DEC Int'l. Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

273 Niro Atomizer Food & Dairy, Inc. (5/20/76)
1600 County Rd F
Hudson, Wisconsin 54016

107R C. E. Rogers Co. (7/31/58)
So. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

299 Stork Food Machinery, Inc. (11/17/77)
7 Finderne Ave., P.O. Box 816
Somerville, New Jersey 08876

387 Unitech Div. of the Graver Co. (5/13/83)
2720 Hwy. 22
Union, New Jersey 07083

186R Marriott Walker Corp. (9/6/66)
925 E. Maple Rd.
Birmingham, Michigan 48011

311 Wiegand Evaporators, Inc. (8/28/78)
8940 Rt. 108
Columbia, Maryland 21045

17-06 Fillers and Sealers of Single Service Containers for Milk and Milk Products

366 Autoprod, Inc. (9/15/82)
12 So. Denton Ave.
New Hyde Park, New York 11040

346 B-Bar-B, Inc. (10/21/81)
E. 10th & McBeth, P.O. Box 909
New Albany, New York 47150

382 Blocpak Canada, Inc. (4/15/83)
Suite 1818, 130 Adelaide St. West
Toronto, Ontario, Canada M5H 3P5

351 Brik Pak, Inc. (1/7/82)
P.O. Box 402605
Dallas, Texas 75240

192 Cherry-Burrell Corp. (1/3/67)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

324 Conoffast (11/29/79)
711 Jorie Blvd.
Oak Brook, Illinois 60521

137 Ex-Cell-O Corp. (10/17/62)
850 Ladd Rd., Bldg. "A"
Walled Lake, Michigan 48088

352 GMS Engineering (1/12/82)
1936 Sherwood St.
Clearwater, Florida 33515

220 Liquipak International, Inc. (4/24/71)
2285 University Ave.
St. Paul, Minnesota 55114

330 Milliken Packaging (8/26/80)
White Stone, South Carolina 29353

281 Purity Packaging Corp. (11/8/76)
800 Kaderly Dr.
Columbus, Ohio 43228

211 Twinpak, Inc. (Canada) (2/4/70)
2225 Hymus
Dorval, Quebec, Canada H9P 1J8

19-03 Batch and Continuous Freezers for Ice Cream, Ices, and Similarly Frozen Dairy Foods, as Amdended

146 Cherry-Burrell Corp. (12/10/63)
(A Unit of AMCA Int'l., Inc.)
2400-6th St. SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

141 Crepaco, Inc. (4/15/63)
100 South CP Ave.
Lake Mills, Wisconsin 53551

286 O. G. Hoyer, Inc. (12/8/76)
201 Broad St.
Lake Geneva, Wisconsin 53147

355 Emery Thompson Machine & Supply Co. (3/9/82)
1349 Inwood Ave.
Bronx, New York 10452

22-04 Silo-type Storage Tanks for Milk and Milk Products

262 Alfa-Laval, Inc. (11/11/74)
11100 W. Congress Ave.
Kansas City, Missouri 64153

164 Cherry-Burrell Corp. (6/16/65)
(A Unit of AMCA Int'l, Inc.)
575 E. Mill St.
Little Falls, New York 13365

154 Crepaco, Inc. (2/10/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

160 DCI, Inc. (4/5/65)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

181 Damrow Co. (5/18/66)
(Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

155 Paul Mueller Co. (2/10/65)
1600 W. Phelps, P.O. Box 828
Springfield, Missouri 65801

312 Sanitary Processing Equipment Corp. (9/15/78)
P.O. Box 178, Salino Station
Syracuse, New York 13201

165 Walker Stainless Equipment Co., Inc. (4/26/65)
Elroy, Wisconsin 53929

23-01 Equipment for Packaging Frozen Desserts, Cottage Cheese, and Similar Milk Products, as Amended

174 Anderson Bros. Manufacturing Co. (9/28/65)
1303 Samuelson Rd.
Rockford, Illinois 61101

209 Doboy Pkg, Mach. Div. of Nordson Corp. (7/23/69)

215 No. Knowles Ave.
New Richmond, Wisconsin 54017

302 Eskimo Pie Corp. (1/26/78)
530 E. Main St.
Richmond, Virginia 23219

343 O. G. Hoyer, Inc. (7/6/81)
201 Broad St.
Lake Geneva, Wisconsin 53147

222 Maryland Cup Corp. (11/15/71)
Owings Mills, Maryland 21117

24-00 Non-coil Type Batch Pasteurizers

161 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

158 Crepaco, Inc. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

187 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

166 Paul Mueller Co. (4/26/65)
P.O. Box 828
Springfield, Missouri 65801

25-00 Non-coil Type Batch Processors for Milk and Milk Products

162 Cherry-Burrell Corp. (4/5/65)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

159 Crepaco, Inc. (3/24/65)
100 South CP Ave.
Lake Mills, Wisconsin 53551

188 DCI, Inc. (9/26/66)
P.O. Box 1227, 600 No. 54th Ave.
St. Cloud, Minnesota 56301

177 Girton Manufacturing Co. (2/18/66)
Millville, Pennsylvania 17846

167 Paul Mueller Co. (4/26/65)
P.O. Box 828
Springfield, Missouri 65801

202 Walker Stainless Equipment Co. (9/24/68)
New Lisbon, Wisconsin 53950

26-02 Sifters for Dry Milk and Dry Milk Products

173 Blaw-Knox Food & Chemical Equip. Co. (9/20/65)
P.O. Box 1041
Buffalo, New York 14240

229 Russell Finex, Inc. (3/15/72)
156 W. Sandford Blvd.
Mt. Vernon, New York 10550

363 Kason Corp. (7/28/82)
231 Johnson Ave.
Newark, New Jersey 07108

185 Rotex, Inc. (8/10/66)
1230 Knowlton St.
Cincinnati, Ohio 45223

172 SWECO, Inc. (9/1/65)
6033 E. Bandini Blv.
P.O. Box 4151
Los Angeles, California 90051

176 Sprout-Waldron, Koppers Co., Inc. (1/4/66)
Muncy, Pennsylvania 17756

27-01 Equipment for Packaging Dry Milk and Dry Milk Products

353 All-Fill, Inc. (3/2/82)
40 Great Valley Pkwy.
Malvern, Pennsylvania 19355

347 Hubbard Consultants, Inc. (10/28/81)
1531B W. Irving Pk. Rd.
Suite 211
Itasca, Illinois 60143

313 St. Regis Paper Co. (10/10/78)
Pkg. Mach. Group
1881 W. North Temple
Salt Lake City, Utah 84116

28-00 Flow Meters for Milk and Liquid Milk Products

272 Accurate Metering Systems (4/2/76)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

253 Badger Meter, Inc. (1/2/74)
4545 W. Brown Deer Rd.
P.O. Box 23099
Milwaukee, Wisconsin 53223

223 C-E Invalco (11/15/71)
Combustion Engineering, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

265 Electronic Flo-Meters, Inc. (3/10/75)
P.O. Box 38269
Dallas, Texas 75238

359 Emerson Elec. Co. (6/11/82)
Brooks Instrument Div.
P.O. Box 450, North 301
Statesboro, Georgia 30458

226 Fischer & Porter Co. (12/9/71)
County Line Rd.
Warminster, Pennsylvania 18974

224 The Foxboro Co. (11/16/71)
38 Neponset Ave.
Foxboro, Massachusetts 02035

320 Max Machinery, Inc. (3/28/79)
1420 Healdburg Ave.
Healdburg, California 95448

378 Micro Motion, Inc. (2/16/83)
7070 Winchester Circle
Boulder, Colorado 80301

270 Taylor Instrument Co. (2/9/76)
Div. Sybron Corp.
95 Ames St.
Rochester, New York 14601

386 Turbo Instruments (5/11/83)
2133 Fourth St.
Berkeley, California 94710

29-00 Air Eliminators for Milk and Fluid Milk Products

340 Accurate Metering Systems, Inc. (6/2/81)
1731-33 Carmen Dr.
Elk Grove Village, Illinois 60007

30-00 Farm Milk Storage Tanks

257 Babson Bros. Company (2/7/74)
2100 S. York Rd.
Oak Brook, Illinois 60521

31-00 Scraped Surface Heat Exchangers, as Amended

274 Alfa-Laval, Inc. (6/25/76)
Contherm Div.
P.O. Box 352, 111 Parker St.
Newburyport, Massachusetts 01950

323 Cherry-Burrell Corp. (7/26/79)
(A Unit of AMCA Int'l., Inc.)
2400-6th St., SW, P.O. Box 3000
Cedar Rapids, Iowa 52406

290 Crepaco, Inc. (6/15/77)
100 South CP Ave.
Lake Mills, Wisconsin 53551

361 Damrow Co. (7/12/82)
(A Div. of DEC Int'l., Inc.)
196 Western Ave., P.O. Box 750
Fond du Lac, Wisconsin 54935-0750

32-00 Uninsulated Tanks for Milk and Milk Products

264 Cherry-Burrell Corp. (1/27/75)
(A Unit of AMCA Int'l., Inc.)
575 E. Mill St.
Little Falls, New York 13365

397 Crepaco, Inc. (6/21/83)
100 South CP Ave.
Lake Mills, Wisconsin 53551

268 DCl, Inc. (11/21/75)
600 No. 54th Ave., P.O. Box 1227
St. Cloud, Minnesota 56301

354 C. E. Rogers Co. (3/3/82)
So. Hwy #65, P.O. Box 118
Mora, Minnesota 55051

339 Walker Stainless Equipment Co., Inc. (6/2/81)
601 State St.
New Lisbon, Wisconsin 53950

33-00 Polished Metal Tubing for Dairy Products

310 Allegheny Bradford Corp. (7/19/78)
P.O. Box 264
Bradford, Pennsylvania 16701

289 Ladish Co., Tri-Clover Div. (1/21/77)
9201 Wilmot Rd.
Kenosha, Wisconsin 53141

308 Rath Manufacturing Co., Inc. (6/20/78)
2505 Foster Ave.
Janesville, Wisconsin 53545

368 Gordon J. Rodger & Sons Ltd. (10/7/82)
P.O. Box 186
Blenheim, Ontario Canada N0P 1A0

335 Stainless Products, Inc. (12/18/80)
1649-72nd Ave., Box 169
Somers, Wisconsin 53171

345 Trent Tube Div., Crucible, Inc. (9/16/81)
2188 Church St.
East Troy, Wisconsin 53120

331 United Industries, Inc. (10/23/80)
1546 Henry Ave.
Beloit, Wisconsin 53511

35-00 Continuous Blenders

292 Waukesha Div., Abex Corp. (8/25/77)
1300 Lincoln Ave.
Waukesha, Wisconsin 53186

36-00 Colloid Mills

293 Waukesha Div., Abex Corp. (8/25/77)
1300 Lincoln Ave.
Waukesha, Wisconsin 53186

37-00 Presure and Level Sensing Devices

318 Anderson Instrument Co., Inc. (4/9/79)
R.D. #1
Fultonville, New York 12072

317 C-E Invalco (2/26/79)
Combustion Engineering, Inc.
P.O. Box 556
Tulsa, Oklahoma 74101

396 King Engineering Corp. (6/13/83)
P.O. Box 1228
Ann Arbor, Michigan 48106

328 Rosemount, Inc. (5/22/80)
12001 W. 78th St.
Eden Prairie, Minnesota 55344

38-00 Cottage Cheese Vats (In Press)

385 Stoelting, Inc. (5/5/83)
P.O. Box 127
Kiel, Wisconsin 53042-0127

40-00 Bag Collectors for Dry Milk and Dry Milk Products

381 Marriott Walker Corp. (4/12/83)
925 E. Maple Rd.
Birmingham, Michigan 48011

Calendar

1983

Sept. 20-22---NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITATION ANNUAL MEETING. Hotel Syracuse, Syracuse, NY. For more information contact: David Bandler, Stocking Hall, Cornell University, Ithaca, NY 14853.

Sept. 21-22, 1983 FOURTH ANNUAL JOINT EDUCATIONAL CONFERENCE, Olympic Spa & Resort, Oconomowoc, WI. For more information contact: Jon R. Dresser, PO Box 7883, Madison, WI 53707.

Sept. 30, 1983 FOCUS ON FOOD SYMPOSIUM V: Practical Food Flavor Analysis, Kansas State University. Emphasis on recent developments in flavor analysis by instruments and sensory panels. For more information contact: Dr. Richard Bassette, Dept. of Animal Science and Industry, 913-532-5654.

Oct. 2-5, 1983 EASTERN FOOD SCIENCE AND TECHNOLOGY CONFERENCE, Planning Today for Tomorrow's Foods. Host Farms, Lancaster, PA. For more information contact: Gary L. Hargus, Registration Co-Chairman, Campbell Soup Company, Campbell Place, Box 57B, Camden NJ 08101. 609-964-4000 Ext. 2882.

Oct. 4-5, 1983---1983 DAIRY INDUSTRY CONFERENCE. Holiday Inn/Airport, Fresno, CA. For more information contact: Richard Harrell, Executive Secretary, CADMS, 1554 W. 120th Street, Los Angeles, CA 90047, 213-757-9719.

October 8-11, 1983, AMERICAN MEAT INSTITUTE BIENNIAL EXPOSITION, McCormick Place, Chicago. For more information contact: American Meat Institute, Convention and Meetings Dept., PO Box 3556, Washington, DC 20007.

Oct. 22-26 FOOD AND DAIRY EXPO '83, McCormick Place, Chicago, IL. For more information contact: Dairy and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

October 26-28---WORKSHOP IN FOOD FLAVOR: A HANDS ON COURSE IN FLAVOR DEVELOPMENT, MANUFACTURE, AND USE. For more information contact: G. Reineccius, Department of Food Science and Nutrition, Univ. Of MN, St. Paul, MN 55108.

Nov. 2-4, 1983 9TH ANNUAL FOOD MICROBIOLOGY RESEARCH CONFERENCE, Chicago, IL. For more information contact: Dr. J. M. Goepfert Canada Packers, Ltd., 2211 St. Clair Avenue West, Tornonto, CN M6N 1K4.

November 3-4, 1983, DAIRY PRODUCTS FOR THE CEREAL PROCESSING INDUSTRY, An AACC Symposium. Held at the Hyatt Regency Hotel, Kansas City, MO. For more information contact: Dotty Ginsburg, AACC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121, 612-454-7250.

Nov. 7-10, 1983---UCD/FDA BETTER PROCESS CONTROL SCHOOL. University of California. For more information contact: Robert C. Pearl, Dept. of Food Science and Technology, University of California, Davis, CA 95616, 916-752-0980.

1984

February 15-16, 1984, DAIRY AND FOOD INDUSTRY CONFERENCE, The Ohio State University. For information contact: John Lindamood, Dept. of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 19-23, 1984, MID-WEST WORKSHOP IN FOOD SANITATION, The Ohio State University. For information contact: John Lindamood, Dept. of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

April 16-18, 1984---MIAMI INTERNATIONAL SYMPOSIUM ON THE BIOSPHERE. For more information contact: Ms. Grace Mayfield, Miami International Conference on the Biosphere, Clean Energy Research Institute, University of Miami, PO Box 248294, Coral Gables, FL 33124.

April 25-27, 1984 SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOC. ANNUAL MEETING. Staurolite Inn, South Dakota State University, Brookings, SD. For more information contact: Morris V. Forsting, Secretary-Treasurer, 1320 S. Minnesota Ave., Room 101, Sioux Falls, SD 57105.

May 7-11, 1984---INTERNATIONAL MILK PROTEIN CONGRESS. For more information contact: International Milk Protein Congress, Congress Secretariat, PO Box 399, 5201 AJ's-Hertogenbosch, The Netherlands.

June 10-14, 1984, 50th ANNUAL EDUCATIONAL CONFERENCE of the Canadian Institute of Public Health Inspectors. For information contact: J. Dunlop, CPHI (C), 1984 National Educational Conference Committee, Canadian Institute of Public Health Inspectors, 444 Sixth Street N.E., Medicine Hat, Alberta, Canada T1A 5P1.

August 3-9, 1984---IAMFES ANNUAL MEETING, Edmonton, Alberta, Canada.

Nov. 22-24, 1984---14th ANNUAL SYMPOSIUM ON THE ANALYTICAL CHEMISTRY OF POLLUTANTS, 3rd International Congress on Analytical Techniques on Environmental Chemistry-Expoquimia, Barcelona Spain. For more information write: Av. Reina Ma. Christina Palacio No. 1, Barcelona-4 Spain.

1985

May 20-23, 1985, FOODANZA '85, joint convention of the Australian and New Zealand Institutes of Food Science and Technology. To be held at the University of Canterbury, Christchurch, New Zealand. For more information contact: D. R. Hayes, Convention Secretary, 394-410 Blenheim Road, PO Box 6010, Christchurch, New Zealand.

JFP Abstracts

Abstracts of papers in the September Journal of Food Protection

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

Carbon Dioxide as a Controller of the Spoilage Flora of Pork, with Special Reference to Temperature and Sodium Chloride, Elizabeth Blickstad and Göran Molin, Swedish Meat Research Institute, P.O. Box 504, S-244 00 Kävlinge, Sweden

J. Food Prot. 46:576-763

The microflora of native pork and cured pork (3% NaCl) stored in air or CO_2 (89-100%) at 0°C and 4°C were studied. The flora on native pork was followed both on fat and on lean surfaces. At 0°C the time taken for the lean pork to reach 10^6 cfu/cm^2 was 6 times longer in CO_2 than in air (4 times at 4°C). The corresponding factor for cured pork was 10 at 0°C. The microflora was identified at the point of spoilage or just before. On lean and fat pork stored in air *Pseudomonas* spp. dominated. On fat significant amounts of *Alteromonas* spp. and *Brochothrix thermosphacta* were also found. The cured pork stored in air was dominated by *B. thermosphacta* while *Pseudomonas* constituted 20% of the flora. In CO_2 *Lactobacillus* spp. dominated to 100%, except on fat where *Alteromonas* spp. were also found. The combination of CO_2 and storage at 0°C suppressed growth of *B. thermosphacta, Enterobacteriaceae,* yeasts and molds. The study points to two practical implications: (*a*) storage in 100% CO_2 at 0°C gives the meat a shelf-life of about 3 months, (*b*) a combination of curing and storage in 100% CO_2 at 0°C gives the meat a shelf-life of more than 5 months.

Rapid Procedure for Biochemical Characterization and Serological Confirmation of Suspect *Salmonella* Isolates, J. S. Bailey, N. A. Cox and J. E. Thomson, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, Athens, Georgia 30613

J. Food Prot. 46:564-766

Fifty-two freshly processed broiler carcasses were examined for the presence of *Salmonella* by using a rinse method. Three selective plating media (bismuth sulfite, brilliant green sulfa and Hektoen enteric)were compared. After 24 h of incubation, typical colonies were picked from each selective plate. An 8-h procedure to biochemically characterize (Micro ID) and serologically (poly O and poly H) confirm *Salmonella* was then compared with a conventional procedure. Suspect *Salmonella* isolates were correctly classified from 63% of the carcasses with both the 8-h and conventional procedures. Of the 244 isolates confirmed to be *Salmonella* by conventional testing, 236 (97%) were also confirmed by the 8-h procedure. Brilliant green sulfa and Hektoen enteric agar were superior to bismuth sulfite agar for *Salmonella* recovery. The 8-h procedure required less incubation time (8 h vs. 48 h) after colony formation, less incubation space, and less media preparation and cleanup than the conventional procedure.

Limiting Conditions of Temperature and pH for Growth of "Thermophilic" Campylobacters on Solid Media, C. O. Gill and Lynda M. Harris, Meat Industry Research Institute N. Z. (Inc.), P.O. Box 617, Hamilton, New Zealand

J. Food Prot. 46:767-768

Strains of *Campylobacter* previously used for studies with meat, included strains distinguishable as *Campylobacter jejuni* and nalidixic acid-resistant thermophilic campylobacters (NARTC). The pH and temperature minima for growth on agar plates were determined for 12 strains: six strains used in the meat studies (four *C. jejuni*, two NARTC), three type strains (*C. jejuni, Campylobacter coli,* NARTC) and three strains of *C. jejuni* whose pH and temperature ranges in liquid culture had been determined by other workers. Heavy, visible inocula of most strains grew at temperatures 2°C lower and pH values 0.2 or 0.3 unit lower than the minima observed with light inocula. For all strains of *C. jejuni,* values for temperature and pH minima from heavy inocula, 32°C and pH 5.1, were comparable with those reported for growth of three strains in liquid media. The pH minima for NARTC strains (pH 5.8) were higher than those for *C. jejuni,* but temperature minima were similar.

Rapid Estimation of Total Solids Content of Reverse Osmosis Retentates Using a Cryposcope, D. M. Barbano, M. W. Dubensky and W. F. Shipe, Department of Food Science, Cornell University, Ithaca, New York 14853

J. Food Prot. 46:769-770

Rapid, simple, accurate and cost-effective analytical methods are always needed for quality control in the dairy industry. Application of reverse osmosis for concentration of milk will create a need for a method to rapidly estimate the total solids content of milk retentates. A milk cryoscope can be used for this purpose. An excellent correlation (.99) exists between observed freezing point of skim milk retentates and their total solids content. As a result, it would be possible to have a production worker actually do this total solids monitoring using a milk cryoscope while operating a reverse osmosis unit.

Survival of *Campylobacter jejuni* in Fresh and Heated Red Meat, Paul Koidis and Michael P. Doyle, The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 46:771-774

Studies were done to assess the ability of *Campylobacter jejuni* to survive in fresh ground beef during refrigerated storage and to identify time-temperature treatments needed to inactivate *Campylobacter* in ground and cubed red meat. The organism survived well in refrigerated ground beef containing large numbers of indigenous bacteria. Relatively little death (< 1.2-log_{10} reduction) occurred for 7 of 8 strains during 14 d at 4°C. *C. jejuni* inoculated into ground beef and cubed lamb meat was quite sensitive to heat treatment. D-values for inactivation of campylobacters in ground beef ranged from 5.9 to 6.3 min at 50°C and from 12 to 21 s at 58°C. D-values were generally greater when campylobacters were heated in lamb meat, ranging from 5.9 to 13.3 min and 12.5 to 15.8 s at 50 and 60°C, respectively. All strains of *C. jejuni* were more sensitive to heat than salmonellae, hence meat heated to a temperature sufficient to inactivate *Salmonella* spp. should be free of viable campylobacters.

Effect of Addition of Glucose, Citrate and Citrate-Lactic Acid on Microbiological and Sensory Characteristics of Steaks from Normal and Dark, Firm and Dry Beef Carcasses Displayed in Polyvinyl Chloride Film and in Vacuum Packages, C. Vanderzant, L. K. Chesser, J. W. Savell, F. A. Gardner and G. C. Smith, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 46:775-780

Pseudomonas spp. and *Brochothrix thermosphacta* were a major or dominant part of the microbial flora of normal and dark, firm and dry (DFD) beef steaks with or without added glucose, citrate or citrate plus lactic acid and displayed for 3 to 6 d in polyvinyl chloride (PVC) film. When normal and DFD steaks with or without the additives were displayed in high oxygen-barrier film, *Lactobacillus* and/or *Leuconostoc* spp. were dominant. Addition of glucose (50-500 μg/g meat) had little, if any, effect on the aerobic plate count (APC), pH, lean color, odor and surface discoloration scores of both normal and DFD steaks displayed in PVC or in high-oxygen barrier film. Addition of citrate or citrate plus lactic acid also had little effect on steaks except for lowering pH values and surface discoloration scores of steaks.

Comparison of Sampling Methods for *Escherichia coli* and Total Aerobic Counts on Broiler Carcasses, Huda S. Lillard and James E. Thomson, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 46:781-782

Significantly higher *Escherichia coli* and total aerobic counts were obtained from broiler carcasses when 20 g of excised breast skin were blended in peptone solution than when either whole carcasses or 20 g of excised breast skin were rinsed in peptone solution for sampling.

Overnight Enumeration of *Vibrio parahaemolyticus* in Seafood by Hydrophobic Grid Membrane Filtration, Phyllis Entis and Peter Boleszczuk, QA Laboratories Limited, 135 The West Mall, Toronto, Ontario, Canada, M9C 1C2

J. Food Prot. 46:783-786

A method was developed for direct enumeration of *Vibrio parahaemolyticus* in foods by hydrophobic grid membrane filter. The method consisted of a 4-5 h resuscitation step to recover injured cells, followed by overnight incubation at 42°C on *V. parahaemolyticus* Sucrose (VPS) agar, a new selective and differential medium. The confirmation rate of typical colonies on VPS agar was greater than 98%. The new method produced significantly higher counts of *V. parahaemolyticus* than the FDA method ($P<0.01$) when tested with chill-, freeze- or heat-stressed samples, and was equivalent to the FDA method ($P>0.05$) for recovery of osmotically stressed *V. parahaemolyticus*.

A Further Study of Effects of Glandless Cottonseed Flour on Lipid Oxidation and Color Changes in Raw Ground Beef Containing Salt, K. S. Rhee and G. C. Smith, Meats and Muscle Biology Section, Department of Animal Science, Texas A&M University, College Station, Texas 77843

J. Food Prot. 46:787-790

Defatted glandless cottonseed flour added at a level of 2 or 3% of meat weight can retard salt-promoted lipid oxidation and off-color development in raw ground beef patties containing a moderate amount (10 or 20%) of fat. These effects were apparent regardless of whether the patties were stored at 4 or -20°C. Lipid oxidation was determined by the thiobarbituric acid test and color was evaluated by determining the redness ("a") values with a Hunter color difference meter.

Shelf-Life Extension of Minced Beef Through Combined Treatments Involving Radurization, J. G. Niemand, H. J. Van Der Linde and W. H. Holzapfel, Nuclear Development Corporation, Private Bag X256, 0001 Pretoria and Department of Microbiology, University of Pretoria, 0002 Pretoria, South Africa

J. Food Prot. 46:791-796

The effect of addition of glucose, lactic acid (LA) as well as radurization on several bacterial groups in refrigerated beef was investigated. Glucose added to meat in concentrations of 2 to 10% (w/w) had little influence on the bacteria monitored. Addition of LA to a pH of 5 had a marked effect on several bacteria groups in meat; the effect became more pronounced during storage. An increased shelf life was obtained but the appearance of LA-treated samples was undesirable. Radurization (2.5 kGy) had a far greater effect on shelf life than any of the other treatments, although an overwhelming population of lactic acid bacteria developed toward the end of the storage period. Radurization also caused a significant increase in the shelf life in comparison to control, glucose-treated and LA-treated meat samples. A combiend treatment of radurization and LA had an even greater effect on the bacterial population and the shelf life of meat than that of the two separate treatments.

Method for Use of a Differential Scanning Calorimeter for Determination of Bacterial Thermal Death Times, L. E. Grieme and D. M. Barbano, Department of Food Science, Cornell University, Ithaca, New York 14853

J. Food Prot. 46:797-801

A differential scanning calorimeter was used as an accurately controlled method of heat-treating suspensions of *Staphylococcus aureus* strains S6 and MF31 in 0.85% saline. D-values obtained at 52, 55, 60 and 65°C were 23.6, 9.4, 0.6 and 0.09 min, respectively, for strain S6, and 22.9, 5.0, 0.4 and 0.9 min, respectively, for MF31. Resulting thermal death time plots were linear; z-values were 5.1°C for S6 and 5.3°C for MF31. This method has potential application in milk and other liquid food systems to simulate high-temperature, short-time heat treatments. One trial of heating strain MF31 at 65°C in whole milk and in milk concentrated 1.35× (fat basis) by ultrafiltration and 1.36× by reverse osmosis showed an increase in average D-values from 8.6 s in the whole milk to 9.2 s in the ultrafiltered milk and 10.5 s in the reverse osmosis-concentrated milk. The difference in D-values between the whole milk and the reverse osmosis-concentrated milk was significant.

Non-O1 *Vibrio cholerae* in Shellfish, Sediment and Waters of the U.S. Gulf Coast, A. DePaola, M. W. Presnell, M. L. Motes, Jr., R. M. McPhearson, R. M. Twedt, R. E. Becker and S. Zywno, Gulf Coast Technical Services Unit, Food and Drug Administration, Dauphin Island, Alabama 36528 and Division of Microbiology, Food and Drug Administration, 1090 Tusculum Avenue, Cincinnati, Ohio 45226

J. Food Prot. 46:802-806

In a study conducted throughout U.S. Gulf Coastal waters, *Vibrio cholerae* non-O1 was isolated more frequently from water samples than from shellfish or sediment samples. Frequency of *V. cholerae* recovery was directly related to water temperature and inversely related to salinity. The presence of *V. cholerae* was not adequately indicated by the fecal coliform standards for shellfish-growing waters and market shellfish as established by the National Shellfish Sanitation Program. Although all cultures tested by the Y-1 mouse adrenal cell assay or by radioimmunoassay for production of a cholera toxin-like toxin were negative, 4 of 13 isolates caused diarrhea in the infant rabbit.

Acid Enhancement of *Clostridium botulinum* Inhibition in Ham and Bacon Prepared with Potassium Sorbate and Sorbic Acid, C. N. Huhtanen, J. I. Feinberg, H. Trenchard and J. G. Phillips, Eastern Regional Research Center, Philadelphia, Pennsylvania 19118

J. Food Prot. 46:807-810

The effectiveness of combinations of sorbic acid and other acids (hydrochloric, phosphoric, acetic, citric, lactic and succinic) on *Clostridium botulinum* inhibition in comminuted ham and nitrite-free bacon was studied. These acids, when added to ham to give similar pH's, did not significantly inhibit the organism, but when acetic or citric acid was added with sorbic acid, inhibition was greater than with sorbic acid alone. The acids were less effective in inhibiting *C. botulinum* when added to sorbic acid-containing bacon. A study of the effectiveness of three levels of potassium sorbate (0.10, 0.26 or 0.52%) or sorbic acid (0.08, 0.20 or 0.40%) and two levels of phosphoric acid (0.04 or 0.08%) in comminuted ham showed that the highest levels of sorbate or sorbic acid were sufficient to inhibit toxin production when incubated at 30°C for 180 d. The same degree of *C. botulinum* inhibition was afforded by 0.26% sorbate with 0.08% H_3PO_4 or by 0.20% sorbic acid with 0.04% H_3PO_4. These differences were probably due to the higher pH obtained with sorbate.

Anaerobic Methods, Techniques and Principles for Food Bacteriology: A Review, Kevin L. Anderson and Daniel Y. C. Fung, Department of Animal Sciences and Industry, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 46:811-822

Anaerobic systems for cultivation of bacteria have been studied extensively in clinical and environmental microbiology. Such studies have not received much attention in food microbiology, except perhaps in the canning industry. This review summarizes the developments of anaerobic methodology from early stages to the modern era. Theories and principles behind modern methods are presented as well as a discussion of problems that may arise. Also theoretical concepts attributing to oxygen sensitivity of anaerobes and practical use of reducing agents in the cultivation of anaerobes are considered. The purpose of this review is to provide food microbiologists with some guidelines in use and development of anaerobic methodology and cultivation systems in bacteriology.

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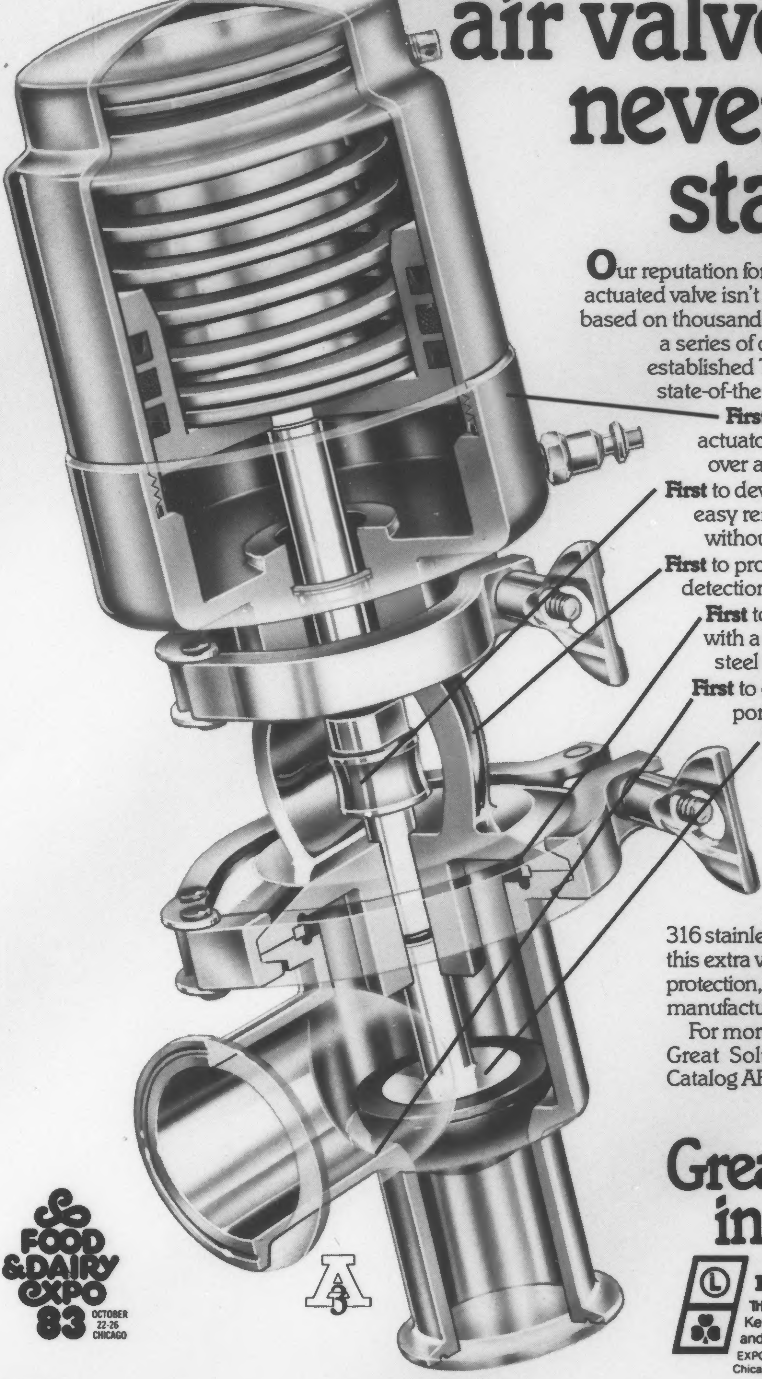

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