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Dairy and Food Sanitation

A Publication for Sanitarians and Fieldmen

- Rancidity: An Increasingly Common Milk Flavor Problem
- Sodium in Foods
- Assessment of Raw Milk Quality in New York State
- United States Food Laws and Regulations: An Overview

A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

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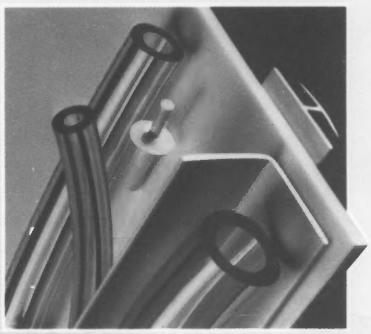

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RANCIDITY: AN INCREASINGLY COMMON MILK FLAVOR PROBLEM

DAVID K. BANDLER

Many variables are involved in the steady decline of milk consumption in New York State. One of which is possibly the flavor quality of milk which is progressively getting worse. Dairymen and their leaders are urged to set standards to produce higher quality milk.

The per capita consumption of fluid milk in New York State has shown a slow but steady decline in recent years. As a result, Class II utilization now exceeds fluid sales during most months of the year. This of course lowers the blend price and the final return to producers.

Why are fluid milk sales going down? Many factors could be cited, including the consumer's response to the cholesterol issue, advertising, and price competition from other beverages. Needless to say, the flavor of milk and its keeping quality are also considerations in the decision to buy or not buy fresh fluid milk.

Milk flavor research, sponsored jointly by the New York State Milk Promotion Order and Cornell University, has provided important information on the status of milk quality and its impact on consumption. From these studies, a direct correlation can be seen between the flavor of milk and level of consumption. The consumption rate was actually 30% lower when milk flavors were consistently poor.

For the most part, it was found that off-flavors were not caused by consumers, but created during production and/or processing; that off-flavors are becoming more severe and are often caused by new methods of mechanical handling of milk and automatic cleaning of equipment; and that overall quality control may not be satisfactory to meet the demands of marketing through stores and schools.

Bacteria counts, sediment tests, and barn and plant inspection scores set the standards for milk quality. However, as far as the consumer is concerned, the true measure of milk quality is good flavor and keeping quality. While milk of low bacteria count and low sediment content may well have good flavor, this is not always true. In fact, milk can be rancid and at the same time relatively free of bacteria.

A rancid flavor in milk is characterized by a sharp, unclean, astringent taste that lingers (as an unpleasant aftertaste). It is accompanied by a strong odor when the off-flavor is intense. The rancid flavor and odor are often associated with stale nutmeats and certain cheeses such as blue or roquefort. It is caused when the enzyme lipase catalyses a chemical reaction of milk fat. The triglycerides that constitute most of the milk fat split into its basic components of glycerol and free fatty acids. The lower molecular weight fatty acid that are fed during this chemical reaction cause the milk to have a rancid flavor.

In normal milk, the fat globule is protected by a membrane of lecithin

and protein which prevents the lipase from "attacking" the fat. Whenever the fat globule membrane is weakened or disturbed, lipase makes contact with fat, resulting in hydrolytic rancidity. This membrane damage is caused mechanically by violent agitation, such as excessive pumping, pipeline obstructions, freezing or homogenization of raw milk. The membrane also is usually in a less protective state in the last stages of lactation.

Natural lipases in raw milk normally are not a problem if the fat globule membranes remain intact. However, when the globule surface is broken, through rough treatment, fat is exposed and hydrolysis begins. This is called *induced* lipolysis and is the principal problem with farm milk supplies. It can be induced anywhere during production and storage up to the time of pasteurization or heat treatment. The degree of rancidity is definitely limited by the quantity of fat globules with damaged membranes.

It takes some time for rancid flavor to develop after lipase action upon fat has been initiated. Usually with fluid milk, several hours will pass before any off-flavor is detectable, and up to three days before the peak intensity of off-flavor is reached. Pasteurization retards further natural lipase activity, but it does not remove or reduce the off-flavor already present in the milk.

Rancidity in milk can be measured both chemically and by the sense of taste. A chemical test is often useful in confirming low threshold or questionable levels of rancid flavor. The most common chemical test is known as the "acid degree value" or "ADV". Normal milk has an ADV of 0.4 to 0.8. A person sensitive to rancid flavor will not generally detect any rancidity until the ADV reached about 1.0. Some will not notice this flavor until the ADV is well above 1.5. Milk with an acid degree value above one (1.0) is usually rancid or well on its way to becoming so. However, the ADV is not a complete measure by itself. It must be confirmed by a reliable flavor evaluation of the milk. In 1978, the average acid degree value of milk on the farm was about 0.9. (Table 1). Studies in 1981 indicated that by the time milk reached the processing plant it had an ADV of 1.16. This increased to 1.7 when stored at a constant 44°F (6.7°C) until the product "sell-by" date (Table 2).

Many rancid milk problems can be traced to situations which exist on the farm. In some cases, it has been found that individual cows spontaneously produce rancid milk regardless of stage of lactation. However, it is more generally the case that stripper cows, or cows in late lactation, are the main sources of milk which is rancid at time of milking. This is apparently due to misformed fat globules and an inadequate protective coating of lecithin.

Often the influence of the cow on rancidity can be reduced by proper farm management. The following recommendations can be helpful:

1) Avoid long intervals between milking (There should be equal interval between evening-morning and morning-evening milkings).
2) Dry off cows in late lactation and low production.
3) Spread calving over the entire year to avoid a peak in number of late lactating cows.
4) Cull cows that produce spontaneously rancid milk.
5) Avoid feeds that may cause or impart a rancid flavor. (High concentrations of liquid protein supplement can give a rancid-like taste to milk.)

By far the greatest damage takes place in handling of milk after it is taken from the cow. Equipment should be designed and operated to insure a gentle flow to the bulk tank to reduce breakup of globules. Milk is most susceptible to damage while it is warm and the fat is liquid. Care must be taken to eliminate as much air and foamage as possible.

1) Check pipelines for leaking gaskets and fittings.
2) Limit air intake at teat cup clusters to the minimum.
3) Avoid sudden breaks in vacuum during milking.

The milking system should be engineered to produce milk that would have acid degree values no higher than that of hand milking. Farmers should get this assurance from the dealer at the time of

purchase. Items to look for in a properly designed system are:

1) Piping of large enough diameter to handle milk volume.
2) Milk line kept as low as possible to minimize lift at stall or parlor.
3) Milk should enter milk line at side or top.
4) No risers.
5) Proper slope all the way to releaser jar.
6) Proper controls to prevent pumps from running in a starved condition. (Pump chamber must be full.)
7) Inline filter placed on discharge side of pump.
8) Bulk tank of proper size. (If tank is too large, agitation will be impossible at first milking.) Avoid foaming of the milk in the bulk tank.

TABLE 1. *Average Acid Degree Values of Milk Samples.*

Year	Collected at		Fresh Pasteurized Milk Samples	Shelf-Life Samples*
	Farm	Transfer Station		
1975	0.71	0.83	0.9	-
1976	0.87	0.93	1.03	1.5
1977	0.95* *	-	1.1	1.7
1978	0.90* *	-	1.1	1.6
1979	-	-	0.9	1.8
1981	-	-	0.95	1.7

* Fresh pasteurized milk samples held at 44°F (6.7°C) until sell-by date.

* * Studied same farms in 1977 and 1978.

NOTE: The ADV is a measure of the free fatty acids liberated when the enzyme lipase attacks unprotected milk fat. The values can be interpreted as follows: 0.4-0.8 Normal; 0.8-1.0 Slightly activated - no detectable flavor; 1.0 - 1.4 Rancid taste to sensitive people; 1.5 - Rancid to most people.

TABLE 2. *Acid Degree Values of Fluid Milk Samples - 96 New York State Plants. May 1978 - December 1981.*

ADV Range	Samples From				Samples at Sell-by Date*	
	Plant		Store			
	#	%	#	%	#	%
1.0	331	77.2	48	53.6	48	8.4
1.1 - 1.4	85	19.8	51	46.4	155	27.3
1.4	13	3.0	11	10.0	366	64.3
TOTAL	429	100.0	110	100.0	569	100.0
Range	0.54 - 1.5		0.64 - 2.2		0.60 - 4.8	
Average	0.95		1.1		1.7	

* Samples held at 44°F (6.7°C) until sell-by date.

9) Milk not allowed to freeze on refrigerated surface of tank. (Freezing will disturb fat globule membrane. If milk "freeze-on" is a problem, start compressor for bulk milk *after* milk has reached the agitator. If milk does not reach the agitator *before* the end of the first milking, other measures must be taken.)

Similar care must be exercised by the bulk tank driver to prevent rancid flavor development. Milk can be easily damaged by the following practices:

1) Partial pick-ups, leaving the remainder for another one or two days.
2) Extending the collecting period to more than every other day.
3) Pumping air and foam when farm tank is empty. Truck pump should not run more than 30 seconds at end of pick-up.
4) Transporting partial tank loads over long distances.
5) Excessive agitation to mix tank loads prior to sampling.

There appears to be a cumulative effect in each step of assembling a milk supply. Everyone involved must do his share to minimize the damaging effects of mechanical handling.

Certain practices in the plant also contribute to further rancid flavor development. Storage of raw milk in silo tanks with excessive agitation prior to pasteurization are the major factors.

It was assumed, until recently, that pasteurization prohibited subsequent hydrolytic rancidity in processed milk products. First, there is some evidence that pasteurization does not destroy all lipase and this might be responsible for some rancid flavor in stored milk. Second, some species of bacteria produce lipases. Certain species of *Pseudomonas, Archromobacter, Aerobacter, Bacillus, Flavorbacterium,* and *Micrococcus* (broadly referred to as psychrotrophs) are known to produce these enzymes.

Many of these organisms can be harbored in crevices of pipelines, gaskets, and filters, the result of poor cleaning and incomplete sanitizing. Recent studies have shown increases in acid degree values and rancid flavor in milk samples held for shelf-life testing. In a similar manner, high bacteria counts in aged milk contributed to off-flavors in pasteurized milk.

Checking Milk for Rancid Flavor

The fastest (and often most effective) way to check milk for rancidity is to taste it. (It should be remembered that smokers and people with allergies often have an impared sense of taste and smell). The sample should be placed in a jar or bottle with a tight fitting top. It should be smelled and tasted at a temperature of 60° to 70°F (15-20°C). The sample should also be heated (in a closed bottle) to 135°F (55°C). If the milk is rancid, it will have a sharp odor.

To see if a particular farm is part of the rancid flavor problem, take a sample of Monday's milk and store it in the refrigerator. On Friday, obtain another sample from the bulk tank. Taste them together. If the first one doesn't taste as fresh as the last, you may be contributing to the milk flavor problem.

Rancid flavor problems have a way of developing slowly over a long period of time. Regular tasting by a critical flavor judge is the only way to stay on top of the problem. Individual farmers, coop leaders, plant managers, and quality control directors must think "rancidity prevention" and avoid all practices that could contribute to the flavor.

The incentive to produce good tasting milk is really a matter of life and death. The flavor quality of milk is definitely getting worse. Unfortunately, the producer has the most to lose when the consumer stops buying. It therefore is up to dairymen and their leaders to set standards and develop programs that will reward producers of high quality milk, and perhaps penalize those who don't meet the standards. In the end, the consumer will have the final say.

Dairy and Food Sanitation, Vol. 2, No. 8, Pages 316-317 (August 1982)

SODIUM IN FOODS

LESTER HANKIN and J. GORDON HANNA

A cooperative study by The Connecticut Agricultural Experiment Station and the Connecticut Dept. of Consumer Protection.

"This information allows consumers to make informed judgements on how much salt they consume and which type of product to purchase."

The data in this study show the sodium in a range of common foods. They allow consumers to compare the amount of sodium in products purporting to be low in sodium with the ordinary product so that they may select their purchases according to their nutritional needs.

Excessive sodium intake is of utmost interest to the medical field. Physicians counsel patients on the possible relationship between excessive sodium (salt) consumption and hypertension. They urge decreased sodium intake, especially for cardiac and hypertensive populations. The Food and Drug Administration has stated that one of its priorities is to find ways to lower the sodium content of processed foods and to educate the public concerning excessive use of sodium.

The Recommended Daily Dietary Allowance for sodium for adults is 1100-3300 milligrams per day (1.1-3.3 grams). This amount is equivalent to about 3 to 8 grams of sodium chloride, common table salt.

Small quantities of sodium occur naturally in many unprocessed or raw food products. During processing manufacturers add salt (usually sodium chloride) for flavor as in canned vegetables or soups, or as part of a preservative process, as in prepared meats and fish not destined to be canned. In products containing hydrolyzed vegetable protein, large quantities of salt may be present. Salt is formed if the protein is hydrolyzed with acid and the acid is neutralized with alkali.

This study is on the sodium content of some common foods as compared to products purporting to be low in sodium with the ordinary products usually not making any claim. When possible we obtained the same brand for both types of product and selected products which would show the range of sodium intake for like products with dissimilar claims for sodium. This information allows consumers to make informed judgements on how much salt they consume and which type of product to purchase.

METHODS

Samples were collected in food stores in Connecticut in February, June, and August, 1981. When required, samples were refrigerated for transport to the laboratory and then refrigerated or frozen until analyzed. Samples were ground (as with crackers) or blended (as with canned vegetables) before analysis. Sodium was determined by Atomic Absorption Spectrophotometry (1).

RESULTS AND DISCUSSION

For some of the foods examined the amount of sodium per 100 grams was not stated on the label but all showed the amount of sodium in a serving. There are no labelling requirements for ordinary products, but many of those collected stated on the labels the amount of sodium per serving.

Consumers purchase for dietary reasons, foods purporting to be low

Adapted from Bulletin #801 of the Connecticut Agricultural Experiment Station. New Haven. CT.

in sodium (generally labelled as low sodium, no salt added, salt-free, or "for sodium-restricted diets"). Overall, percentages ranged from a low-salt product with 98% less sodium than the ordinary product to one with only 5% less sodium than the ordinary product. In two cases, spaghetti and melba toast, the amount of sodium in the low-salt product was greater than in the ordinary product. The actual amounts per 100 grams of product, however, were small. The crackers with unsalted tops averaged about 31% less sodium than saltines with salted tops, but the range was wide, varying from 5 to 48%.

Thirty-six samples made a claim on the label for milligrams sodium per 100 grams of product. Only 44% were found to be within 20% of the claimed amount. In some of these examples the product contained less than 100 milligrams sodium per 100 grams, an amount probably not excessive except for those on the strictest low-sodium regimens.

Serving sizes are not always comparable between low-salt and ordinary products since the serving size was usually obtained from the label. For example, in canned beans, beets, carrots, peas, corn, and mixed vegetables, the serving size for the low sodium product is one-half cup and for the ordinary product it is one cup. The serving size for low-sodium tuna fish was stated as being about one-half that of ordinary tuna fish. For low-sodium pretzels the serving size was listed as 5 grams, about one-sixth of an ounce. We considered this to be unrealistic and calculated the sodium in 28.4 grams, a one-ounce serving.

The sodium content of table salt (sodium chloride) is about 39%. Thus, to approximate how much common table salt a product contains the milligrams of sodium per 100 grams is multiplied by 2.5. This value divided by 1000 will give the percentage of salt in the food. For example, in ordinary bread, 725 milligrams sodium per 100 grams times 2.5 divided by 1000 equals 1.8% salt. For regular beef broth 4220 milligrams sodium per 100 grams times 2.5 divided by 1000 equals 10.6% salt.

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Lester Hankin is Biochemist (Department of Biochemistry and Genetics) and J. Gordon Hanna is Chief Chemist (Department of Analytical Chemistry) at The Connecticut Agricultural Experiment Station, New Haven. Sodium analyses were made by Mary Alice Illig (Department of Analytical Chemistry). Edward Hawley, Chief of the Food Division of the Connecticut Department of Consumer Protection, arranged for collection of samples by inspectors Frank Zullo and Louis Palumbo. Requests for additional copies of this Bulletin should be addressed to Publications, Box 1106, The Connecticut Agricultural Experiment Station, New Haven, CT 06504.

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Dairy and Food Sanitation, Vol. 2, No. 8, Pages 318-320 (August 1982)

Assessment of Raw Milk Quality in New York State

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High bacteria counts and lipolysis in raw supplies can affect processed milk and dairy products. Psychrotrophs in particular with their heat resistant enzyme systems are of concern. Activation of the milk lipase system is evident in raw bulk tank milks and commingled bulk tank truck milk supplies.

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INTRODUCTORY STATEMENT

Quality deterioration and spoilage often start on the farm. Increased mechanization and prolonged storage have resulted in problems with regard to production of a good clean milk free of off-flavor. In particular, with the introduction of the farm bulk tanks, extended storage times and shipment of raw milk long distances, conditions have favored the growth of psychrotrophic bacteria.

Psychrotrophic bacteria produce enzymes which breakdown milkfat and protein with subsequent off-flavors and other deteriorations of quality. While these organisms are not generally believed to be capable of surviving pasteurization temperatures, the enzymes produced have been found to be heat resistant (1,3,4,10,12,14,17). The resulting proteolysis and lipolysis by the enzymes create off-flavor problems in dairy products and reduce yields of cheese. In addition, some psychrotrophs produce spores which are capable of surviving processing and then germinating and growing in finished products (2,19).

Lipolysis (rancidity) has also been found to increase due to many of the same factors which contribute to bacterial growth. The pipelines, hoses, milking claws, filters, milk recording devices, and other interconnected gadgetry of automated milking devices result in aeration, agitation, foaming, and mechanical manipulation. These conditions result in damaging the fragile milk fat globule and activating the milk lipase system (7,8,13,18).

The objectives of the New York State Milk Quality Improvement Project include the identification of the principal causes and factors leading to off-flavors. To accomplish these objectives, studies were conducted to assess the raw milk quality at the farm and upon arrival at processing plants. Each sample was evaluated by Standard Plate Count (SPC) (11), Psychrotrophic Bacterial Count (PBC) (11), and Acid Degree Value (ADV) (16).

OBSERVATIONS

Samples were collected from the farm bulk tanks of over 200 producers immediately before collection for transport to processing plants. The average log SPC and distribution of bacterial counts for raw farm supplies to six processing plants are shown in Table 1. The situation is quite good with over 85% of the farms reporting SPCs 50,000 or less and only about 5% exceeding 100,000. However, some plants have more problems than others. In one processing plant, approximately 30% of the raw supplies exceeded 50,000. By comparison, Table 2 shows the distribution of psychrotrophic bacteria of the same raw supplies. These counts were found to be lower than the SPCs and indicate that psychrotrophs amount to 15% of the total bacterial population in raw bulk tank milks. However, the numbers here are deceiving since psychrotrophs have been found to double every 5-8 hours at refrigeration temperatures depending on species of organisms (5,6). Thus with the average of PBC of $\sim$ 1900 in the producers tested, this population would increase to $\sim$ 15,000 in 24 hours, $\sim$ 120,000 in 48 hours, and $\sim$ 960,000 in 72 hours assuming 8 hour generation time at 5°C (40°F).

Therefore, with transportation to processing plants, pumping, additional contamination, temperature increases and storage, milk of good microbial quality could easily exceed 10^6 by the time of processing in some cases. All through production, handling and processing, psychrotrophs may grow and produce enzymes which will cause subsequent deterioration of both raw and finished products.

Aside from bacteriological problems, some farms contribute to significant lipolysis as shown in Table 3. Good milk supplies should have ADVs of <1.0 and preferably ≤ 0.8; however, over 30% of the farm supplies tested exceeded an ADV of 1.0. Some supplies even exceeded 1.4 which has been reported to be the flavor threshold (7,8,9). Where raw farm milk has an ADV of 1.0, it becomes difficult to keep finished product from exceeding the flavor threshold during normal shelf-life and storage conditions. Earlier research by project members (15) has indicated that the residual milk lipase (approximately 1%) from milk processed at 76.7°C (170°F) for 16 seconds will result in an increase in ADV of about 0.4 in milk stored 7 days at 5°C (40°F). If lower pasteurization temperatures are employed, the increase in ADV would be greater. Thus, to protect against lipolytic off-flavor development in finished product, an ADV of <1.0 is almost a necessity in producer milk. With most plant employing a shelf-life of greater than 7 days, a producer ADV of ≤ of 0.8 is desirable.

"Project researchers also assessed the quality of bulk tank truck raw supplies (commingled milks) upon arrival at the processing plant. Raw milk for this purpose was collected from 30 bulk tank trucks at randomly selected processing plants. Table 4 shows the distributions of SPCs and PBCs. The bacterial counts of these commingled raw supplies were higher than the individual producer supplies noted earlier. Psychrotrophic bacteria now account for 33% of the total bacterial count and are the predominant bacterial group in over 50% of the commingled raw supplied. The acid degree values for commingled supplies are shown in Table 5. The ADVs of these tank truck samples show a smaller percentage of values exceeding 1.2 than in the raw farm tank samples mentioned earlier. However, since the samples do not correspond to each other, a cross comparison cannot be made. Also, commingled supplies tend to blend out the highs and lows found in individual farm bulk tank raw milk. Notably, a relatively high percentage (>25%) of the commingled supplies did not exceed an ADV of 1.0."

TABLE 1. *Distribution of Standard Plate Counts (SPC) of raw farm bulk tank milks.*

Distribution (by SPC)	# of Producers	% of Producers
< 1,000	1	.5
1,000-10,000	96	47.3
10,000-50,000	78	38.4
> 50,000-100,000	17	8.4
>100,000	11	5.4

TABLE 2. *Distribution of Psychrotrophic Bacterial Counts (PBC) of raw farm bulk tank milks.*

Distribution (by PBC)	# of Producers	% of Producers
< 1,000	60	29.6
1,000-10,000	126	62.0
> 10,000-50,000	11	5.4
> 50,000-100,000	4	2.0
>100,000	2	1.0

TABLE 3. *Distribution of Acid Degree Value (ADV) of raw farm bulk tank milks.*

Distribution of ADVs	# of Producers	% of Producers
<0.8	70	46.1
≥0.8 <1.0	32	21.1
≥1.0 <1.2	25	16.4
≥1.2 <1.4	13	8.5
≥1.4	12	7.9

CONCLUSIONS

The general quality of raw milk studied indicates considerable room for improvement to provide a high quality finished product. In producer milks, 33% had either high bacterial counts or acid degree values. In some cases, both bacterial counts and acid

TABLE 4. *Distribution of Standard Plate Counts (SPC) and Psychrotrophic Bacterial Counts (PBC) in commingled raw milk supplies.*

Bacterial	SPC		PBC	
Distribution	#	%	#	%
< 1,000	0	0.0	3	10.0
1,000-10,000	4	13.3	11	36.7
> 10,000-50,000	15	50.0	9	30.0
> 50,000-100,000	2	6.7	2	6.7
>100,000	9	30.0	5	16.6

degree values were high. Commingled supplies were found to have higher bacteria counts than producer milks with ~ 50% having high bacterial counts, acid degrees values or both. Such lower quality milk could damage good raw supplies and contribute to deterioration in processed dairy products.

TABLE 5. *Distribution of Acid Degree Value (ADV) in commingled raw milk supplies.*

ADV Distribution	#	%
<0.8	8	26.7
≥0.8 <1.0	14	46.7
≥1.0 <1.2	7	23.3
≥1.2 <1.4	1	3.3
≥1.4	0	0.0

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United States Food Laws and Regulations: An Overview

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ABSTRACT

This paper briefly describes the comprehensiveness and complexity of U.S. food laws and regulations. It discusses the need for food legislation and the function and objectives of the major laws and regulations controlling the food supply. The history of the Food and Drug Administration (FDA) is traced from its inception within the U.S. Department of Agriculture (USDA) to its current status in the U.S. Department of Health and Human Services. Emphasis is given to legislation enforced by the FDA and USDA. Major provisions in the Federal Food, Drug and Cosmetic Act, The Fair Packaging and Labeling Act, the Agricultural Marketing Act and nutritional labeling regulations are outlined.

On June 30, 1906, the first comprehensive food legislation, The Food and Drug Act of 1906, was signed into law. In a brief overview covering more than 75 years of activity, four points must be emphasized: 1) why we need food laws and regulations, 2) major agencies involved in the regulatory process, 3) functions and objectives of these agencies, and 4) laws and regulations needed to meet the agencies' objectives.

In the United States, the food industry is the most heavily controlled industry, and regulations controlling this industry are comprehensive and complex. The complexity is easily illustrated by noting the many federal agencies that promulgate regulations which directly affect the food industry. They are Department of Agriculture, Department of Health and Human Services, Department of the Treasury, Department of Commerce, Federal Trade Commission, Environmental Protection Agency, and Consumer Product Safety Commission. The comprehensiveness of food laws is illustrated by information in Table 1, which gives a small sample of major legislation affecting the food industry.

The system of food regulation enforcement that exists today is not a system well designed by an architect, but rather a system which developed through the years and was influenced by many historical events. If the opportunity to start again presented itself today, with our current knowledge, a far less complex system to control the safety of food supply could be developed. A single agency involved in questions of food safety would be far more efficient than the involvement of numerous agencies, as is true today.

Before looking closer at the two major agencies involved in food regulatory process, the question, "Why do we need food laws?" should be answered.

A review of dates when food legislation was passed will show that few regulations were promulgated as we entered the 20th century. Major technical advances within the food industry occurred from 1900 to 1950, and with these advances came major food legislation. A flood of regulations appeared in the period of 1950-1980, making it difficult to keep up. The need for the increase in legislation, in part, can be attributed to: 1) the consumer no longer bought ingredients but instead bought prepared foods; 2) most of the population is no longer on the farm population and therefore no longer is self-sufficient; and 3) the relationship of food diseases and health was not as well understood as it is today.

Recognizing these changes and recognizing that a government has a duty to protect the public's health, it is easy to see why food legislation is

TABLE 1. *Major legislation affecting the food industry.*

AGRICULTURAL MARKETING ACT
FEDERAL MEAT INSPECTION ACT
POULTRY INSPECTION ACT
FAIR PACKAGING AND LABELING ACT
FEDERAL FOOD, DRUG AND COSMETIC ACT
CONSUMER PRODUCT SAFETY ACT
FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT
FEDERAL WATER POLLUTION CONTROL ACT
FEDERAL TRADE COMMISSION ACT
THE PUBLIC HEALTH SERVICE ACT
FEDERAL ALCOHOL ADMINISTRATION ACT
INTERNAL REVENUE ACT

needed. It is difficult to define in a few words the concept of public health. Public health is applying science to prevent diseases, prolong life, promote physical health, control the environment, control community infections and develop a system which will ensure that each individual has a standard of living adequate for maintenance of health.

If one recognizes the relationship between foods and health, then development of food laws and regulations, and agencies to enforce them is not surprising. Involvement of the two federal agencies (FDA and USDA) in the enforcement of food regulations can be traced to two historical events.

First, the meat industry change from local distribution of its products to national distribution, thereby exposing the consumer to greater danger if products were mishandled. In addition, the export of meat to Europe became an important factor in the overall growth of the industry. Rumors in Europe of gross insanitary conditions in the meat industry caused a significant reduction in sales volume. Furthermore, bad press through articles, editorials and books attesting to the insanitary conditions severely damaged the market both here and abroad.

Second was the activities of the Bureau of Chemistry in the U.S. Department of Agriculture. Under the leadership of Dr. Harvey Wiley, the Bureau developed methodology to detect adulterants in foods. Many of the methods developed to detect foreign material in foods are still used today. In addition Dr. Wiley, in his written and oral presentations, attempted to promote better consumer protection by strongly supporting efforts to establish food legislation. The overall result of these events was the passage of two federal acts, The Food and Drug Act of 1906 and The Meat Inspection Act of 1906.

The responsiblity for the enactment of all laws passed by Congress must be given to an agency of the government. The answer to the question of which agency should be named to enforce the two acts was obvious. The Department of Agriculture, because of its history in food related activities, was given the responsibility to enact the laws; hence its secretary, the administrator and the Bureau of Chemistry became the enforcing agency.

It is noteworthy that the two acts passed in 1906 distinguished between meat and other foods. This situation still exists today, but when the acts were passed all activities related to food safety were handled within one department of the government.

The Food and Drug Act of 1906 dealt with two aspects of food protection: adulteration and misbranding. The act had limited powers, and eventually, for many reasons, a new comprehensive act, the "Federal Food, Drug and Cosmetic Act," was passed in 1938. No doubt this is the most important act among our present food laws. The law is enforced by the Food and Drug Administration (FDA), an agency of the Department of Health and Human Services.

Figure 1 illustrates how the Federal Food and Drug Administration was transferred from the Department of Agriculture to the Department of Health and Human Services.

In 1927, the USDA formed a new agency known as the Food, Drug and Insecticide Administration. This agency was intended to enforce the Food and Drug Act of 1906. The name of the agency was soon shortened to the Food and Drug Administration (FDA). In the early 1940s the FDA was transferred from the USDA to the Federal Security Agency. With this move, the USDA remained the enforcing agency of the Meat Inspection Act but no longer was responsible for the Federal Food, Drug and Cosmetic Act. The Federal Security Agency in 1953 became the Department of Health, Education and Welfare, which in 1980 became the Department of Health and Human Services. The FDA derives its authority to control the food supply from several federal statutes (Table 2). The Federal Food, Drug and Cosmetic Act is, no doubt, the most comprehensive of these and its purpose is to ensure the consumer that foods are pure and wholesome, safe to eat, produced under sanitary conditions

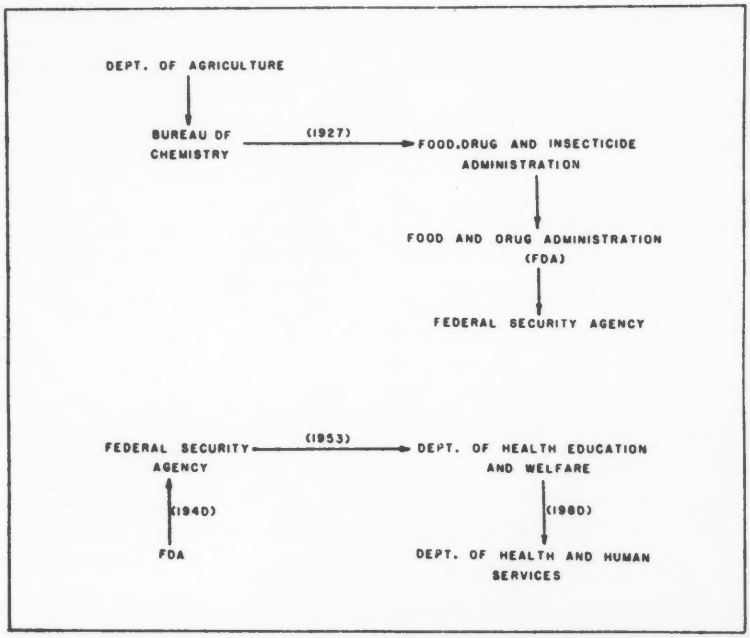

Figure 1. *Schematic of the transfer of Federal Food and Drug Administration from the U.S. Department of Agriculture to the U.S. Department of Health and Human Services. (PDP = Principal Display Panel)*

and that the packaging and labeling are truthful.

To accomplish these objectives there are many provisions in the act that required interpretive regulations or additional acts. The major amendments to the Federal Food, Drug and Cosmetic Act are the Food Additive and Color Additive Amendments and major additional legislation include the Fair Packaging and Labeling and the Federal Insecticide, Fungicide and Rodenticide Acts. The major provisions in the original act are the establishment of food standards and the safeguarding against adulterated and/or misbranded foods.

The law provides for promulgation of definitions and standards of identity, standards of quality and/or standards of fill of container. Foods for which one or all three standards have been established can be found in Title 21 of the Code of Federal Regulations. The food groups for which such standards exist and their Title 21 Part Number are listed in Table 3.

Adulteration of foods is a complex matter. It deals with health safeguards and also economic safeguards. A food is considered adulterated: 1) if it contains harmful substances which *may* render it injurious to health, or 2) if the food is prepared, packed or held under insanitary conditions which *may* render it injurious to health, or 3) if any part of a food is filthy, putrid or decomposed, or 4) if a food contains portions of diseased animals. These are obvious health hazards but a food is also adulterated if damage or inferiority is concealed; the label is misleading; a valuable substance is omitted; or the container is misleading. The latter causes of adulteration have economic rather than health consequences.

These statements of what constitutes adulteration are precise but sometimes are extremely difficult to interpret or to enforce. What is meant by, "a food *may* become contaminated if held under insanitary conditions? What are sanitary conditions?" What is misleading? With the law being nonspecific, efforts by the FDA to get interpretive regulation or laws are understandable.

A good example of such interpretive regulations is the Current Good Manufacturing Practices (GMPs) which attempt to define sanitary conditions. This regulation is often referred to as the "umbrella GMP." It too is difficult to enforce because it is vague and uses such terms as "adequate," "proper," "sufficient," etc. which require that judgment be exercised. The major objective of the "umbrella GMPs" is to give industry guidance on good manufacturing practices for plant facilities, equipment and general processing practices. The FDA has expanded the concepts of the GMPs by promulgating specific regulations applicable to a specific segment of the industry. The low-acid canned food GMPs for the canned food industry serve as an example.

As with adulteration, statements in the Act under which a food shall be deemed misbranding are precise but vague. A food is deemed misbranded if the label fails to give adequate information, fails to give mandatory information or gives misleading information.

What is adequate information? What is misleading? What is mandatory information?

The answers can be found in the provisions of the Federal Food, Drug and Cosmetic Act, the Fair Packaging and Labeling Act (FPL Act) and the Nutritional Labeling regulations.

A major change in product labeling came with the passage in 1966 by Congress of the FPL Act which became effective July 1, 1967. The Act was designed to prevent use of unfair or deceptive methods of packaging or labeling of packaged consumer products. Its main objective is to insure that the consumer can obtain from the package or label accu-

TABLE 2. *Federal Statutes administrated by the FDA.*

THE FEDERAL FOOD, DRUG AND COSMETIC ACT
THE FAIR PACKAGING AND LABELING ACT
THE PUBLIC HEALTH SERVICE ACT
THE RADIATION CONTROL FOR HEALTH AND SAFETY ACT
FEDERAL MEAT INSPECTION ACT
POULTRY PRODUCTS INSPECTION ACT

TABLE 3. *Definition and standards of identity, quality and/or fill of container of food groups established under the Federal Food, Drug and Cosmetic Act and published in the Federal Code of Regulations Title 21.*

Part No.	Food Group
Part 131	Milk and cream
Part 133	Cheese and related cheese products (processed cheese, cheese spreads)
Part 135	Frozen desserts
Part 136	Bakery products
Part 137	Cereal flours and related products
Part 139	Macaroni and noodle products
Part 145	Canned fruits
Part 146	Canned fruit juices
Part 150	Fruit butters, jellies, preserves and related products
Part 152	Fruit pies
Part 155	Canned vegetables
Part 156	Vegetable juices
Part 158	Frozen vegetables
Part 160	Egg and Egg products
Part 161	Fish and shellfish
Part 163	Cocoa products
Part 164	Tree nuts and peanut products
Part 165	Nonalcoholic beverages
Part 166	Margarine
Part 168	Sweeteners
Part 169	Food dressings and flavorings

rate information as to quantity or content, which will facilitate value comparison.

The Act requires no additional information than what was already mandatory under Sec. 403 of the Federal Food, Drug and Cosmetic Act (FFDC Act). Specific information required for each food is: the name and address of the manufacturer, distributor or packer (including zip code), the name of the food, the net quantity or content, and a statement of ingredients listed by common or usual name in order of decreasing predominance.

The difference between the FPL Act and Sec. 403 of the FFDC Act is that the FPL Act requires this information to appear in a uniform location. The name of the food and the net quantity content must appear on the "Principal Display Panel" (PDP). Principal Display Panel is defined as the side of the package most likely to be displayed and seen and large enough to accommodate all mandatory information. For a rectangular package, the PDP is one side (height × width), for a cylindrical package, the PDP is 40% of the height × circumference and for packages of other shapes, the PDP is 40% of the total surface area. The information panel is the side immediately to the right of the PDP. The net content must be in legible type and in distinct color contrast: The size of type must be in relation to the size of the PDP and in the lower 30% of the PDP. The type size specifications and two examples of how a quantity statement must be expressed are shown in Table 4. The name and address of the manufacturer and the list of ingredients may appear anywhere on the label, but the information panel has been recommended. A sample label for a retail container is illustrated in Figure 2.

Nutritional information is mandatory only for those foods which have any added vitamins, minerals, or protein, or for those foods for which a nutritional claim is made. Inclusion of nutritional information on the label for other foods is voluntary.

All nutrient information is expressed in terms of a serving, with size and total number of servings in the container being stated. First in the nutrient listing is the number of calories per serving. Calories are expressed in 2-calorie increments up to and including 20 calories, 5-calorie increments from 30-50 calories, and 10-calorie increments above 50 calories.

Next is a list of protein, carbohydrate and fat contents expressed to the nearest gram. The lower portion of the nutrition label gives the percentage of the US Recommended Daily Allowances (RDA) for protein, vitamin A, vitamin C, thiamine, riboflavin, niacin, calcium, and iron. Percentages of the US RDA for 12 additional essential vitamins and minerals may also be listed if they are present in the product, and must be listed when they are added to a food. The optional nutrients are: vitamin D, vitamin E, zinc, copper, biotin, pantothenic acid, B_6, folic acid, B_{12}, phosphorus, iodine and magnesium.

The US RDA are stated in 2 percent increments up to and including 10 percent, 5 percent increments above 10 percent and up to and including 50 percent, and 10 percent increments above 50 percent. The US RDA used for nutritional labeling and examples of typical nutrition information are listed in Table 5 and 6.

More could be said about the FDA's role in assuring a safe food supply, but a brief overview of food laws and regulations must mention the activities of the US Department

TABLE 4. *Size type specifications and examples of quantity statements as required under the Fair Packaging and Labeling Act.*

Size Type Specification	
PDP (in^2)	letter size (in)
5 and smaller	1/16
5-25	1/8
25 and larger	3/16

Quantity Statement

Example 1. 1 1/2 lbs. weight
Net weight 24 oz. (1 lb. 8oz.)
or 24 oz. (1.5 lb.)
or 24 oz. (1 1/2 lb.)

Net weight over 4 lbs. are stated in pounds and remaining ounces only.

Example 2. 1 3/4 quart
Net volume 56 fl. oz. (1 quart 1 1/2 pint)
or 56 fl. oz. (1 quart, 1 pint, 8 oz.)

Volumes larger than 1 gal. are stated in gal. and quarts only.

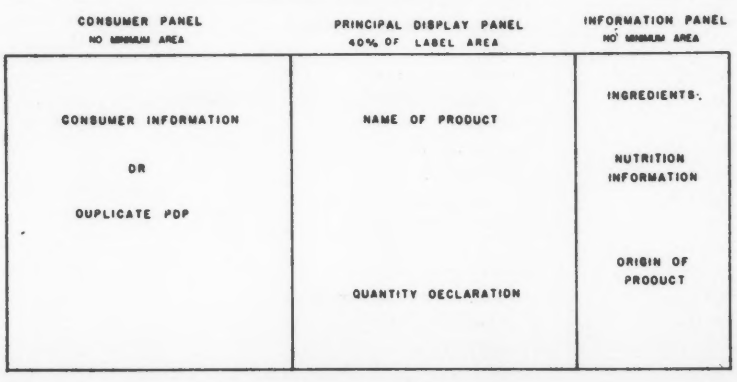

Figure 2. *A suggested sample label for a retail container.*

TABLE 5. *US Recommended Daily Allowances (US RDA) for adults and children over 4 years of age.*

Nutrients			
Protein	45 or 65 g*	Vitamin B_6	2.0 mg
Vitamin A	5,000 IU	Folic Acid	0.4 mg
Vitamin C (Ascorbic Acid)	60 mg	Vitamin B_{12}	6 mcg
Thiamine (Vitamin B_1)	1.5 mg	Phosphorus	1.0 g
Riboflavin (Vitamin B_2)	1.7 mg	Iodine	150 mcg
Niacin	20 mg	Magnesium	400 mg
Calcium	1.0 g	Zinc	15 mg
Iron	18 mg	Copper	2 mg
Vitamin E	30 IU	Biotin	0.3 mg
Vitamin D	400 IU	Pantothenic Acid	10 mg

*45 grams if protein quality is equal to or greater than milk protein, 65 grams if protein is less than milk proteins.

g = gram IU = International Unit mg = milligram mcg = microgram

TABLE 6. *Two examples of nutritional information as it appears on the information panel of a table.*

Example 1. Nutritional Labeling

Nutritional Information:

Serving Size	2/3 cup
Servings per Package	12
Calories	120
Proteins	3 grams
Carbohydrate	27 grams
Fat	0 gram

Percentage of US Recommended Daily Allowances(US RDA):

Protein	4	Riboflavin	
Vit. A	*	Niacin	8
Vit. C	*	CU	*
Thiamine	15	Fe	8

*Contains less than 2% of the US RDA of these nutrients.

Example 2.

Nutritional Information Per Portion

Portion Size	1/2 cup
Portion Per Container	3-1/4
Calories	170
Protein	9 grams
Carbohydrate	12 grams
Fat	10 grams

Percentage of US Recommended Daily Allowances (US RDA)

Protein	20	Niacin	*
Vitamin A	4	Calcium	35
Vitamin C	*	Iron	*
Thiamine	2	Vitamin D	25
Riboflavin	20	Phosphorus	25

*Contains less than 2% of US RDA of these nutrients.

NOTE: This product was fortified with Vitamin D. Therefore nutritional labeling for this product is mandatory and Vitamin D must be listed. In addition to this the product has a significant amount of phosphorus present which may be delcared.

of Agriculture as they relate to the food regulatory process. The USDA derives its authority to promulgate food regulations from several federal acts. The major acts are the Agricultural Marketing Act, Federal Meat Inspection Act, Poultry Product Inspection Act, and Egg Products Inspection Act.

The Agricultural Marketing Act authorizes the USDA to perform many functions, and one of the most important is the grading, inspection and certification of all agricultural products.

US Grades are levels of quality and US Grade standards define the requirements that must be met by a product to obtain a particular grade designation. A score chart for one of many products is illustrated in Table 7. It shows 1) factors considered in obtaining a grade, 2) grade designations to be used, and 3) points assigned for each grade designation.

Factors used to establish a grade for a product differ among product groups (dairy, meat, vegetable, fruit, etc.). All US grade standards define the food product to be graded, give grade designations to be used and list factors and total points to be used to assign grades.

US grades are helpful in contracts between buyer and seller and to establish a value for insurance claim. They form the basis for market news and advertising, and help plants obtain a certain uniformity in production and quality of their products.

To date the USDA has established grading standards for several product categories: fruits, vegetables, eggs, poultry, dairy and meat products. Recently the consumer has made greater use of these grading standards in the purchase of foods. That this use was not an original intent becomes clear if one looks at some examples of grade designations used today.

Such variation in designations can only lead to confusion. A school system which uses the grades A, B and C etc. obviously creates a student

TABLE 7. *Score chart for canned apples.*

Factors	Points Maximum	Grade A Fancy	Grade C Standard	Substandard
Color	20	17-20	14-16*	0-13*
Uniformity of size	20	17-20	14-16	0-13*
Absence of defects	20	17-20	14-16*	0-13*
Character	40	34-40	28-33*	0-27*
Minimum score	100	85	70	

*Limiting Rule - Apples falling in this classification cannot earn higher grade regardless of total score.

TABLE 8. *Some of the grade designations in use today.*

Product	Grades			
Vegetable	US Fancy or US Grade A	US Standard US Grade C	Substandard	
Meat	US Prime	US Choice	US Good	US Standard
Eggs	US Grade AA	US Grade A	US Grade B	
Dairy (Dry Whole Milk)	US Premium	US Extra	US Standard	

with a bias toward the letter "A." Yet for some foods "AA" is the top quality grade. There is no doubt if the consumer continues to make use of the grading system, a uniform grade designation is needed.

Another major responsibility of the USDA is enforcement of the Federal Meat Inspection Act, the Poultry Products Inspection Act and the Egg Products Inspection Act. Under these acts the USDA promulgates mandatory regulations whose purpose is to assure wholesomeness of these products.

The major requirements of the Meat Inspection Act will illustrate how this objective is met. Requirements of the Act are: ante-postmortem inspection of all animals used for meat, prohibition of the distribution of adulterated or misbranded meat products, regulation of all labels and markings and inspection of all prepared meat products and meat processing facilities.

It is clear from these requirements that, as with the Federal Food, Drug and Cosmetic Act, interpretation of what is required is needed and the interpretive regulations or laws discussed earlier also apply here.

It should by no means be concluded that this brief discussion has touched on all the activities of these two federal agencies. Nothing has been said about standards of identity which are of interest to both agencies. However, it is hoped that the reader has gained some understanding of the complexity and comprehensiveness of US Food Law and Regulations.

ACKNOWLEDGMENT

A contribution from the College of Agriculture and Life Sciences, University of Wisconsin-Madison, Madison, WI 53706.

Committee Reports

REPORT ON MODIFIED INSPECTION PLAN

by
One Farm Inspection Per Year Study Committee

National Conference on Interstate Milk Shipments
May 17-21, 1981
Arlington Hotel
Hot Springs, Arkansas

The National Conference on Interstate Milk Shipments authorized a Study Committee named, "One Farm Inspection Per Year". The conference requested that the committee report back to the conference at their 1981 meeting.

It was necessary to develop much of the committee's study and planning by phone and correspondence. Appreciation is extended to all of the National Conference on Interstate Milk Shipments voting delegates and members for answering questionnaires, submitting ideas, and assisting the committee in concluding this report.

ONE FARM INSPECTION PER YEAR STUDY COMMITTEE REPORT

The purpose of this study was to develop an improved and less costly system for the inspection and surveillance of dairy farms producing milk in conformance to the Grade A Pasteurized Milk Ordinance and the Interstate Milk Shippers Program.

The study had two objectives:

1. To determine the reason for making farm inspections and assembling background information obtained through a questionnaire mailed to voting delegates of the Conference.

2. To estimate the cost savings of an improved system of farm inspection.

The primary purpose of making farm inspections is to achieve a supply of milk of consistent quality among states. The efforts of inspection and certification agencies, as well as the producer-processor are all directed toward this goal. However, quality milk has a broad definition, which includes concern for public health and commercial quality.

The public health programs assure quality through preventing pathogenic microorganism and toxic substances in milk. These programs include pasteurization standards and animal health programs to control and eradicate tuberculosis and brucellosis. Also, with the increased use of chemicals in industry and pesticides on farms, chemical-pesticide residue has become an increasing problem in milk production.

Good flavor, extremely low bacterial counts, farm milk temperatures below 45°F., and long shelf life of finished products are all characteristics of commercial qualities over and above public health standards.

Some of the same basic sanitary standards of milk production and processing are directed toward both public health and commercial qualities of the finished product.

What Is Now Being Done in States

To obtain information on the inspection programs now in effect in all states, a mail survey was used. The questionnaire asked for information on frequency of inspection, inspection done by industry or regulatory agencies, and asked each delegate to rank inspection, sampling and testing functions as they relate to the importance in producing quality milk. Space was provided for additional comments by delegates. The committee felt that the survey should be limited to persons attending and registered as voting delegates at the National Conference on Interstate Milk Shipments.

A total of 54 out of 61 questionnaires were returned. It was interesting to note that there are many states exceeding the present minimum frequency of two inspections per year. Eighteen delegates stated that their states are now exceeding this minimum frequency. Other items (ranked in descending order of importance) which delegates felt affected milk quality and safety are:

1. Producers own concern with milk quality and safety.
2. Sampling of milk by hauler at each pickup for testing by certified laboratory. (Currently required by PMO.)
3. More than two regulatory inpsections per year.
4. Dairy plant concerns and inspection by dairy plant fieldmen.
5. Survey be certified agencies. (Currently required by PMO.)

Note that the first two items rated by the delegates pinpoint the producer's concern with milk quality and safety and sampling. More than two regulatory inspections were also indicated as important concerns.

It should be remembered that the questionnaire reflects on what is being done by states at the present time. A complete summary of the questionnaire report is available from any of the committee members.

Cost Savings

With travel cost increasing and state budgets being limited, controlling inspection budgets has become increasingly important in some states. The study committee was asked to address itself to this problem in considering changes in the frequency of mandatory inspection requirements.

At the present time, Wisconsin has 23,500 Grade A farms that are inspected at least twice per year. A total of 26.1 employees are used to complete these inspections. By following the projected reduced minimum inspections, the number of persons needed to complete Wisconsin inspections would be 13.75. This would result in an approximate saving of 47% of the total inspection cost.

Conclusions

Nearly all states have adopted the Pasteurized Milk Ordinance as their state law. Therefore, the legal requirements for items of public health concern such as pasteurization and monitoring for toxic substances are almost identical among states.

However, it is quite evident that many of the commercial qualities of milk are regulated in different ways in different states. Temperature of milk at the farm below the standard specified in the Pasteurized Milk Ordinance is incorporated into state laws at the insistence of dairy plants or are met through dairy plant procurement standards.

In addition, some plants have additional bacterial standards which producers must meet before milk will be accepted by plants. These voluntary standards can best be enforced by the dairy plant themselves rather than any enforcement agency.

Many of the public health programs, such as tuberculosis and brucellosis control and eradication, are a part of states overall legislative programs and are usually not assisted by more mandatory inspections. Also, in reviewing positive pesticide cases in milk, most of the detection has been found through producer-veterinarian-dairy communication and, seldomly ever, are found through a routine farm inspection.

It appears that the fundamental purpose of farm inspections is to counsel with the dairy farm operator and to determine the ability of the dairyman to produce milk that meets the standards of the Interstate Milk Shippers Conference. Inspections must be of sufficient frequency to allow the supervisory agencies to determine if minimum standards have been met.

In conclusion, it does appear that there is one uniform law among all states for production and processing of pasteurized milk. However, states and local agencies differ in the way certain aspects of this program are carried out.

In some states the dairy industry meets most of the requirements, including those of farm inspection. In other states the regulatory agencies meet most of the requirements, including some routine non-regulatory field service. Responsibility for quality is shared by state divisions of health and state departments of agriculture, county and municipal health departments, certified laboratories, certified industry fieldmen, non-certified industry fieldmen, plant managers and producers. It is the consensus of the Committee that flexibility is necessary and desirable to have a strong, efficient and workable national program for quality milk.

Recommendations for Committee Consideration

Based on differences in state programs, it would seem logical that additional improvements would allow various segments of the quality milk production program to perform functions that are best suited for those regulated and those regulating.

The committee suggests the following:

1. Continue the inspection of each dairy farm prior to the issuance of a permit as outlined in section 5, 1978 PMO.

2. Continue to inspect each farm that has been degraded during the prior year or those with an inspection score of less than 90% at least once every six months.

3. Inspect all other Grade A dairy farms once per year:

a. Detailed records are to be kept on all farms as required by the 1978 PMO. These records must be retrievable for continuous use in utilizing inspection resources effectively.

b. Dairy plants would make farm calls as necessary to assure quality standards are met. Regulatory agencies should regularly examine plant records to identify farm problems for microbiological and WMT reports.

c. Regulatory agencies should be allowed to randomly conduct inspections on an additional 5% of farms it deems necessary to assure quality milk production. These farms might be selected from all farms or those that have been previously degraded and are being inspected two or more times a year.

Milk Memos

Preventing Chemical Flavors of Milk

Dairy farmers want to sell more milk. To do this, milk must be free of objectionable off-flavors. Chemical flavors were responsible for about 70% of all poor tasting samples purchased from stores the past two years. Provide these brief explanations to dairy farmers to correct or prevent problems.

RANCID FLAVOR OF MILK

Sidney E. Barnard
Professor of Food Science Extension
The Pennsylvania State University

A soapy-bitter taste continues to be detected in about 10% of farm milk samples. In retail milk saples, rancidity accounted for about 55% of the objectionable flavors in 1980 and less than 30% in 1981. Rancid milk is objectionable to some consumers, who think that the milk is sour or spoiled.

Rancid flavor is a chemical development which continues until the milk is pasteurized. It involves the lipase enzyme and the fatty acids in milkfat particles. The key to prevention is to have intact protein membranes around milkfat particles which are not broken prior to processing.

Causes of rancid flavor are those things which result in a weakened or broken milkfat particle membrane. These include feeding inadequate protein to cows, milking cows more than 305 days after freshening, air leaks in pipeline milkers, flooding of pipeline milkers, and anything which causes excessive agitation and foaming.

When we find retail samples of milk which are rancid, you should collect and taste samples of all loads received at a plant. Usually, you will find that one or more farm samples on a load is strongly rancid.

In most cases, you will find it necessary to make a farm visit, frequently at milking time. Check these items and make recommendations.

1. Look at DHIA records or freshening dates and insist that milk from all cows milked more than 305 days not be put in the bulk tank unless cow samples are tasted as in item 6. Note somatic cells counts for the herd and individual cows.
2. Check all fittings on pipeline milkers for tightness and close fit. Minimize air injection at claws and avoid overmilking cows.
3. Be sure that no more than two units are used on a 1 1/2 inch pipeline milker for each slope - two units on each side of the barn or parlor for double slope lines.
4. Observe the pipeline and receiver jar to see if excessive foaming occurs or the pump runs continuously.
5. Note quantity and quality of feed, especially protein sources. Inquire about the amount of protein supplement - soybean, cottonseed, which is fed. Recommend forage analysis and feed programming if other causes for rancid flavor are not apparent.
6. In extreme cases, collect individual cow samples direct from all four quarters after other corrective measures are made. Hold these at 40°F. for 48 hours and taste.
7. Check bulk tank for evidence of freezing, churning or excessive agitation.

OXIDIZED FLAVOR OF MILK

Sidney E. Barnard
Professor of Food Science Extension
The Pennsylvania State University

This flavor originates in raw milk and has a metallic, cardboard-like taste. It is more of a problem during winter months or whenever cows are eating stored feeds. Green feed provides vitamin E which is an antioxidant. Between 5 and 10% of farm samples have an oxidized flavor.

Light exposure of milk in glass and plastic bottles in stores and homes causes a similar flavor, called light induced. Once it has developed the source of the problem cannot be determined. It may have occurred during distribution or production.

Corrective or preventive measures on farms include the following:

1. Be sure that all milk contact surfaces are clean. Any fat or protein left in the bulk tank, pipeline or milker units readily oxidizes. Clean all surfaces after each use. Sanitize with chemicals prior to use and drain all solutions.
2. Check your water supply to be sure that it contains *no* iron or sulfure. As little as 0.2 ppm will cause a problem. Treatment is necessary, but may be expensive.
3. Use plastic rather than copper pipes, if your water supply is acid. A pH of less than 7.0 causes removal of some copper from the tubing and its suspension in the water.
4. Use iodine rather than chlorine sanitizers at proper strength. Iodine is less active and will not percipitate minerals as readily.
5. Provide some green feed to milking cows from May to October, if possible. Cows on stored feed for the entire year may require supplemental feeding of vitamin E.
6. When other possible causes have been eliminated feed 1,000 I.U. of supplemental vitamin E to each cow. Do this for 10 days, then reduce to a level of 400-500 I.U. per animal per day until cows receive green feed

AFFILIATE NEWSLETTER . . .

This page has been devoted to YOU, the IAMFES affiliates. Your input is needed on whether you feel this page should be a regular feature to serve as a communication source between the state and international office. Please respond.

AT LEAST . . . once a year, I'd like to say **THANKS** to all the editorial board members, book reviewers, authors and all other contributors for your continued work on *Dairy and Food Sanitation*. Any suggestions or ideas are always appreciated. Kathy Hathaway, Editor.

The spring meeting of the Connecticut Association of Dairy and Food Sanitarians, Inc. was held May 19, 1982 at Manchester, CT. Subjects of speakers included pest control, psychrotrophs, health stress among executives, and processed meats and sausages.

The 1982 Sanitarians Award was presented to Robert Rynecki now Director of Quality Control for Kraft at Walton, NY. He was formerly with Kraft at Hartford, CT. Bob was cited for his contributions to the Connecticut Association and for his work in dairy quality control.

The next meeting of the Connecticut Association is the annual summer outing and conference on August 25, 1982.

THE HOT DOG

A man lived by the side of the road and sold hot dogs. He was hard of hearing, so he had no radio. He had trouble with his eyes, so he had no newspapers. But he sold good hot dogs.

He put up a sign on the highway to tell how good they were. He stood by the side of the road and cried, "Buy a hot dog, mister?"

And people bought.

He increased his meat and bun orders. He bought a bigger store to take care of his trade. He got his son home from college to help him. But then something happened.

His son said, "Father, haven't you been listening to the radio? There's a big depression on. The European situation is terrible. The domestic situation is worse."

Whereupon the father thought, "Well, my son has been to college, he reads the papers and listens to the radio and he ought to know."

So the father cut down on his meat and bun orders, took down his advertising signs, and no longer bothered to stand on the highway to sell hot dogs. And his hot dog sales fell almost overnight.

"You're right, son," the father said to the boy. "We are certainly in the middle of a great depression."

Keep IAMFES growing!

Affiliate Newsletter continued . . .

WHO WERE the IAMFES Award Winners for the past 20 years?

1960 Sanitarians Award, James C. Barringer, Evansville
Citation Award, Luther A. Black, Cincinnati
1961 Citation Award, Harold S. Adams, Indiana University
Sanitarians Award, Martin C. Donovan, Dade Co.
Honorary Life Membership, Sarah Vance Dugan
1962 Citation Award, Franklin Barber
Sanitarians Award, Larry Gordon
1963 Citation Award, Dr. Merle P. Baker
Sanitarians Award, J. L. Cooper
Life Membership, C. K. Johns and Harold Macy
1964 Citation Award, W. K. Moseley
Sanitarians Award, No award given
1965 Citation Award, H. L. "Red" Thomasson
Sanitarians Award, Harold R. Irvin
1966 Citation Award, Dr. J. C. Olson, Jr.
Sanitarians Award, Paris B. Boles
Honorary Life Membership, Dr. M. R. Fisher
1967 Citation Award, William V. Hickey
Sanitarians Award, Roger L. Stephen Logan
Honorary Life Membership, C. A. Abela and Luther Black
1968 Citation Award, A. K. "Kelly" Saunders
Sanitarians Award, Roy L. Olson
Honorary Life Membership, M. P. Baker and Dr. W. C. Frazier
1969 Citation Award, Karl Johnson
Sanitarians Award, W. R. McLean
Life Membership, John Faulkner
1970 Citation Award, Ivan E. Parkin
Sanitarians, No award given
1971 Citation Award, Dr. L. Wayne Brown
Sanitarians Award, Shelby Johnson
Life Membership, William V. Hickey
1972 Citation Award, Ben Luce
Sanitarians Award, Ambrose P. Bell
Life Membership, C. W. Dromgold and E. Wallenfeldt
National Fieldman's Award, Professor M. P. Dean
Shogren Award, Iowa Affiliate
1973 Citation Award, Samuel O. Noles
Sanitarians Award, No award given
Industry/Educator, Professor Walker A. Krionke
Honorary Life Membership, Fred E. Uetz
Shogren Award, Kentucky Affiliate
1974 Citation Award, John C. Schilling
Life Membership, H. L. Thomasson and K. G. Weckel
Shogren Award, Washington Affiliate
Sanitarians Award, Clarence C. Luchterhand
Industry/Educator, Richard P. March
1975 Citation Award, A. Richard Brazis
Life Membership, Arthur E. Parker
Shogren Award, Illinois Affiliate
Sanitarians Award, Samuel C. Rich
Industry/Educator, Dr. K. G. Weckel
1976 Citation Award, James Meany
Honorary Life Membership, Ben Luce
Shogren Award, Wisconsin Affiliate
Sanitarians Award, M. W. Jefferson
Industry/Educator, Burdet Heinemann
Samuel J. Crumbine Award, Region VI, NM Environmental Improvement Agency
1977 Citation Award, No award given
Life Membership, Harold Heiskell
Shogren Award, Minnesota Affiliate
Industry/Educator, Elmer Marth
1978 Sanitarians Award, Orlowe M. Osen
Industry/Educator, James B. Smather
Life Membership, Karl K. Jones
Citation Award, Raymond A. Belknap
Certificate of Recognition, Pat J. Dolan
1979 Industry/Educator, Joseph E. Edmondson
Sanitarians Award, Balus Walker, Jr.
Citation Award, Harold E. Thompson, Jr.
Life Membership, Joseph C. Olson, Jr.
Shogren Award, New York Affiliate
1980 Sherman Award, Frank Bryan and Thomas W. McKinley
Industry Educator, James R. Welch
Life Membership, Alvin E. Tesdal
Citation Award, Don Raffel
Sanitarians Award, John A. Baghott
Shogren Award, Pennsylvania Affiliate
1981 Sanitarians Award, Paul Pace
Industry/Educator, Francis F. Busta
Citation Award, Henry V. Atherton
Life Membership, Robert M. Parker
Sherman Award, David Zalkin and O. B. Kaplan
Shogren Award, Missouri Affiliate

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Book Reviews

Dairy Microbiology: R. K. Robinson, ed. Volume 1: The Microbiology of Milk. 258 pp. Volume 2: The Microbiology of Milk Products. 333 pp. 1981.

This two volume multi-authored text has a total of fourteen chapters, each written by one or more authors who are known for their expertise in the area of dairy science. With the current trend of teaching dairy microbiology as a part of food microbiology, microbiological aspects of milk and milk products are not covered very extensively in most food microbiology texts. However, production, processing and marketing of milk and milk products have unique microbiological implications and importance that are different in many respects from other foods. Considering this, a text like this one that includes current understanding of dairy microbiology will definitely be useful for people with interest in dairy science.

However, being a multi-authored book, this text has several disadvantages, especially if one wants to use it as a text to teach a course in dairy microbiology. As each chapter has been written as a review in a specific area, there is complete lack of uniformity in presentation between chapters. As a reference text this does not pose a problem; but in a text to be used for teaching, uniformity in presentation helps in better understanding of the materials. In many chapters the author or authors also have tried to include materials that are directly or indirectly related to the particular topics; this has resulted in repetition of materials again and again. This not only has affected its suitability as a text, but also has increased its volume. Use of photographs that are not directly related to microbiology have also aided in thie increase in volume. In several chapters, the processing part has taken more space than the microbiological part. Also being written by authors from different countries, many information such as technical terms, microbiological and other standards, testing procedures, etc., have been included for the country of the author(s) affiliation. This can create confusion if the volumes are to be used as a text for a course in any country.

Other specific disadvantages (and advantages) are discussed below for each chapter. Chapters in Volume 1: "*Milk and Milk Processing*": The materials included are composition of milk and brief descriptions of processing of milk and milk products. The second part is repetition of materials discussed in chapters dealing with specific products. "*Microorganisms Associated with Milk*": The materials include brief descriptions of bacteria, fungi and viruses that could be associated with dairy products. Although the necessary information is there, a uniform format such as morphology, growth and biochemical characteristics, sources and importance in dairy products, influence of processing and handling, etc., could aid in its use as a text. Correction of typographical mistakes (Myobacterioaceace - p. 64) changing of bacterial name (Lactobacillus jugurti - p. 61) are necessary. "*Control and Destruction of Microorganisms*". The materials are poorly organized for a text. There is repetition and also several typographical and technical mistakes (appeciable - p. 78; *Achromobacter* - no longer in use; colony count/ml in tables - p. 87; reference - Westhoff and Doors - 1975 or 1976 - p. 87, 116, etc.). "*Microbiology of Raw Milk*": The materials are well organized, however, use of terms such as total bacterial count, total colony count(s), standard plate count, plate count agar, milk count agar could create confusion if used as a text. Several corrections are also necessary (*Aerobacter, Achromobacter, Campylobacter coli* - p. 135, Panes (1979) and Panes et al. (1979) - p. 121). "*Microbiology of Market Milk*": In general the materials are well organized. There is repetition of materials both within the chapter (viz. about psychrotrophs) and with other chapters (viz. detection methods). Terms such as microbiocidally, microbiocidal (microbicidal?), non-normal, total counts, *Achromobacter*, etc., could be confusing. "*The Microbiology of Dried Milk Powder*": This chapter is written as a short review paper in contrast to some other chapters and lacks data in the form of tables or figures on the microbiology of dried milk. Terms such as total colony count, standard colony count, truer counts, coli-aerogenes group, etc., need standardization. "*The Microbiology of Concentrated Milk*": This is also a short review paper like the previous one. The last two chapters should have been in Volume 2 as they are products.

Chapters in Volume 2: "*Microbiology of Ice Cream and Related Products*": The materials include important information. The format used viz. most materials are discussed under a major heading "Ice cream legislation" will be difficult to follow in a text to be used for teaching. "*Microbiology of cream and dairy desserts*": It is relatively well written but not so well organized for a text. It includes repetition of materials (viz. psychrophilic and psychrotrophic - p. 54; *Pseudomonas* - p. 57; microbiological examination part - p. 62, also in other chapters). Terms such as cow-derived pathogens, contaminated water infecting milk, total count, total colony count, total viable count, *Achromobacter, Aerobacter,* testing for coli, etc., could be confusing in a text. "*Microbiology of Butter*": This is a very short review with relatively little microbiology. "*Microbiology of Starter Cultures*": This is a very well organized and well written chapter. It could be enriched by including biochemical reactions for acid, flavor, gas and other important metabolite production along with methods of their

analysis and techniques in developing new starter strains. A little more discussion of bacteriophages viz. specific phages of starter organisms, life cycle and importance in starter, etc., could also be of practical importance. "*Microbiology of Cheese*": It is also a well written chapter. However, the need of listing media for microbiological examination of cheese is unnecessary as it has not been used in other chapters (p. 160). Again use of terms such as *Achromobacter, Acinetobacter, Aerobacter,* etc., needs to be standardized. "*Microbiology of Fermented Milks*". It is a fairly well written chapter and could include (if not included in the chapter on starter culture) discussion on biochemical pathways in fermentation (metabolite production), analysis of metabolites, phage problem, etc. Typographical mistakes (10^{-6} in Table III); abbreviated names (Table IV: TGV, etc.,) need to be corrected. "*Quality Control in the Dairy Industry*": This is also a well written chapter. Unfortunately, many of these materials have been presented separately in other chapters. The part on examination for pathogenic organisms viz. *Salmonella* might need more information and also should include other important pathogens such as *Yersinia enterocolitica* and *Campylobacter fetus* spp. *jejuni*.

In its present form it could be used as a good informative reference text. Use of a uniform format, good editing to reduce repetition and to standardize technical terms, and probably reduction in volume could definitely make it a good text for use in teaching.

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Food Selection and Preparation, by Jean Still, 1981, MacMillan Publishing Co., Inc., New York.

Food Selection and Preparation, by Jean Still, is an excellent introductory text dealing with the aspects of food purchasing, food storage, safety, equipment, nutrition, time management, and the interrelationship of these elements involving safe food preparation for profit or pleasure.

The text deals with food safety and reviews various aspects of keeping clean wholesome food safe in the raw, preparation, cooking, serving and storage stages. Also discussed are several important foodborne illnesses, causes of food contamination, the importance of proper selection and cleaning of kitchen equipment and dishes, and personal hygiene in preventing foodborne illness. Most of the twenty-four chapters have food safety tips involving important aspects of keeping food safe while making it nourishing and attractive to eat. The book reviews meat, poultry and vegetable grading and inspections done by the Department of Agriculture. The proper refrigeration of cakes and pastries filled with potentially hazardous fillings is presented. A list of valuable kitchen safety instructions is provided. Also discussed are various aspects of food preservation and canning. The sanitary handling of food is stressed and a thorough discussion of *Clostridium botulinum* is presented in regards to home canning.

At the conclusion of each chapter is a list of learning activities and review questions. The learning activities provide an excellent opportunity for readers of the text to learn more about what was discussed in the chapter by doing certain activities described. These activities allow for hands on experience. The review questions allow for student reinforcement of the material by answering the listed questions.

Food Selection and Preparation, by Jean Still, would be an excellent introductory text in food preparation courses, a reference for experienced professionals in the food service field, and could serve as a reference book to professional sanitarians. Considering the latter, it would provide some up-to-date information concerning the selection, preparation and storage of foods we eat. The book is written in easy to understand terminology and has excellent photos, tables, figures and charts to complement its easy to read style.

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Developments in Food Preservation -1; Edited by Stuart Thorne; Applied Science Publishers, London and New Jersey; 272 pages.

DEVELOPMENTS IN FOOD PRESERVATION -1 is a collection of eight articles focused on various food preservation technologies. The articles, edited by Stuart Thorne, range from food preservation in developing countries to the use of reverse osmosis for preparation of fruit juice concentrates.

Other than applying to some aspect of food preservation the eight articles in this text have little in common. If all the articles were centered around a central theme such as preservation techniques in developing countries it would enhance the use of this publication as a reference. Even though each article is well written and presents emerging information from current research, the end result offers no more than a periodic technical journal.

For individuals that might have an interest in one of the subject areas presented, here is a listing of the contents of DEVELOPMENTS IN FOOD PRESERVATION -1: Preservation Technology in Developing Countries;

Cooling of Horticultural Produce with Heat and Mass Transfer by Diffusion; Preparation of Fruit Juice Semi-concentrates by Reverse Osmosis; Effects of Microwave Processing; Freeze Drying; Exstrusion Processing; Effect of Temperature on Deterioration of Stored Produce; and Thermal Sterilisation of Foods. Each of the authors is an authority in their respective fields of interest and come from renowned centers of learning such as the University of London and the Budapest Food Research Institute. Hence the British spelling of sterilisation.

For the field sanitarian this collection would have little value. The cost of the publication would be better spent on a subscription to our own journal. As an individual who does research on the current literature, I would have found DEVELOPMENTS IN FOOD PRESERVATION - 1 of greater use if a central subject matter or specific preservation technology had been used as a focal point. If the dash 1 indicates that the publishers intend to develop further texts in this series I highly recommend that a central focus be used in latter issues.

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News and Events

DFISA Elects New Directors

Two new directors and an incumbent director were elected by the membership of Dairy and Food Industries Supply Association to three-year terms on the DFISA board of directors at its 63rd Annual Meeting at Palm Springs, Calif., April 19-21, 1982.

New directors are Thomas L. Parker, President, Big Drum, Inc., Columbus, Ohio, who was elected director of the packaging commodity group, and Walter R. Comfort, President, Harper Associates Inc., Tampa, Fla., who won the seat as director of the services section.

Re-elected as an at-large director was Thomas R. Case, Manager, Food Industry Marketing, Reliance Electric Co., Toledo.

Five members retired from the board. They were: H. Bruce Ellison, Diversey Wyandotte, Corp., Wyandotte, Mich.; James M. McCullough, Soltex Polymer Corp., Houston; Peter Miller, Chester-Jensen Co., Inc., Chester, Pa.; Leroy M. Mommsen, CREPACO, Inc., Chicago, and F. Heath Schroeder, Kelvinator Commercial Products, Inc., Lake Oswego, OR.

DFISA is the national trade association of 545 equipment and supply companies serving the dairy, food and beverage processing industries.

Foster, Atwater Memorial Lecturer

Edwin M. Foster, an internationally known expert on food safety and technology, was the 1982 W. O. Atwater Memorial Lecturer sponsored by the U.S. Department of Agriculture's Agricultural Research Service.

Foster's lecture, "Is There a Food Safety Crisis?," convened at the Institute of Food Technologists annual meeting in Las Vegas, Nev. June 22. At the meeting, Foster, who is director of the University of Wisconsin's Food Research Institute, received the Atwater memorial medal and a $1000 honorarium.

Foster has pioneered research in food microbiology, especially in the role of microorganisms in the processing of meat and dairy products and in the spoilage of foods. His work led to the develoment of practical methods for detecting salmonella and for detecting and characterizing bacterial and viral toxins in foods.

His posts in professional and scientific societies include past presidencies of the American Society for Microbiology and the American Academy of Microbiology.

Whitmer Appointment

ITT Jabsco Products, a unit of International Telephone and Telegraph Corporation, has appointed Thomas W. Whitmer as Industrial Product Line Manager.

Prior to joining ITT Jabsco, Whitmer was Chief Engineer for the Tri-Clover Division of the Ladish Company, a supplier of sanitary centrifugal pumps for the food and dairy industries. He has held various management positions in the dairy processing field, including assignments in Europe and the Far East. In his new position Whitmer will report to A. H. Houghting, ITT Jabsco Director of Marketing.

ITT Jabsco Products manufactures a complete line of pumps for dairy and food processing, including Pureflo® sanitary stainless steel pumps.

ACSH Concerned with Advertising Scare Tactics

The increasing use of health fears, misinformation, and innuendo in advertising will prove unhealthy for both consumers and industry, the American Council on Science and Health (ACSH) said today.

Writing in the May/June issue of *ACSH News & Views*, Dr. Whelan charges, "Advertisers often weave health worries into the promotion of their products by emphasizing that, unlike the competition, their product doesn't contain something that the public perceives to be unhealthful, such as preservatives or caffeine. In most cases, the alleged hazard isn't a scientifically proven health risk. It's merely something that people have learned to fear--often as a result of unfortunate publicity reinforced by ill-chosen advertising strategies."

ACSH objects to this type of scare tactic in advertising because it spreads misconceptions and increases the public's fear of consumer products and the environment. It is also harmful to industry in general, since fear of technology tends to be generalized, not limited to a particular product or ingredient.

ACSH is a nonprofit, independent educational association promoting scientifically balanced evaluations of food, chemicals, the environment, and human health. ACSH has offices in New York, New Jersey, and Washington, D.C.

Copies of *ACSH News & Views* are available from ACSH, 47 Maple St., Summit, NJ 07901. Phone: 201-277-0024.

Hycor Introduces Rotostrainer

Food processors now can effectively separate suspended solids down to 250 microns from waste or in-process water or industrial liquids with the Rotostrainer® unit by Hycor Corporation.

Separating out solids before the liquid is discharged from the plant can mean a reduction in sanitary sewer surcharges, the recovery of potentially saleable by-products and the recovery of liquids for reuse. Thus a Hycor screen can save money and provide a complete return on the investment.

With the Rostostrainer unit, liquid is fed over the screen externally from a headbox that is specially-designed to reduce turbulence and create an even flow rate.

As the liquid passes through the Rotostrainer cylinder, the solids are captured on the surface of the screen and removed by a discharge doctor blade. The force of the filtered water cascading through the screen washes the ascending portion of the screen. This automatic self-cleaning action makes it possible to use higher hydraulic and solids loading with the Rotostrainer screen than with other types of screens and results in substantial capital and operating cost savings.

Rotostrainer units are especially cost effective in meat, poultry or seafood processing plants; rendering plants; processed food plants; chemical or petrochemical facilities.

Complete information on the uses of the Rotostrainer screen in manufacturing (processing) applications is available from Hycor corporation, the pioneer in the development of rotary screens for liquid/solids separation, 29850 N. Highway 41, Lake Bluff, IL 60044, 800-323-9033. (in Illinois 312-473-3400).

Forage Important to Dairy Farmers

Growing and harvesting top quality forage will become even more important for dairy farmers. The reason is the ever-familiar cost squeeze, says Jim Linn, dairy specialist with the University of Minnesota's Agricultural Extension Service.

"As world population continues to grow, demand for American grain for food will grow," Linn says. "Exports and processing of grain into sugar and other products will increase grain prices. This means that tommorrow's dairy producer will rely more on forages to supply the nutrients necessary for milk production," Linn says.

Early cut forages can sustain 45 to 50 pounds of milk production with little or no grain. But late cut, mature forages require 25 percent to 35 percent grain in the diet. "This means feed costs increase by 40 percent or more to achieve the same production level," Linn says.

"In many diets--especially with high producing cows--grain can't substitute for the detrimental effects of low quality forages," he adds.

Getting maximum use of forage in dairy cattle rations involves two main factors--intake and digestibility. With alfalfa or grasses, both of these factors are directly related to forage maturity at harvest.

As you delay harvest and maturity increases, intake and digestibility decline and ability of alfalfa or grasses to support milk production is reduced. And the same problem results with corn silage when harvest is delayed beyond physiological maturity.

Intake of a forage is directly related to its cell wall content, Linn says. Alfalfa and other legumes are lower in cell walls and have a higher intake potential than grasses or corn silage.

Two things happen as cell wall contents of forages decrease:

--You can substitute more forage for grain in the ration.

--Forage dry matter digestibility increases.

"As grain and other production costs increase, froage quality becomes more important," Linn says. "This means you can't afford to lose dollar value of forages by delaying harvest," he adds.

"It costs little if any more to harvest top quality forages compared to low quality forages. Low quality forage means extra costs for grains and other feeds to compensate for nutrient loss.

"The most economical route is to test forages so you know what the nutrient content is. Then purchase feeds to supplement any deficiencies," Linn says.

For more information contact: Jim Linn, 612-373-1014.

IAMFES WANTS YOU- See page 309

Meat Inspection and Grading

Though often confused with one another, meat inspection and grading are related but are distinct in intent and purpose.

"Neither state nor federal meat inspection directly affects the price level, but the type of inspection certainly dictates the distribution area," says Dr. Edward Uvacek, economist in livestock marketing with the Texas Agricultural Extension Service, Texas A&M University System.

The Meat Inspection Act, passed by the U.S. Congress in 1906, required federal inspection for cleanliness and wholesomeness of all meat moving in interstate and foreign commerce, Uvacek explains. Shortly after the Act passed, similar state and municipal sanitary regulations extended protection to consumers for meat not slaughtered and processed under federal supervision.

"It must be understood that meat passed under federal inspection is wholesome at the time of inspection," Uvacek says. "The meat inspection stamp denotes a piece of meat was checked by a federal inspector and found free from disease or contamination."

All interstate commerce meat must be federally inspected, though livestock may be slaughtered and meat sold within a state with only state inspection, the economist points out. Prepared and processed meat items also are subject to federal inspection if the products are for interstate movement.

In December, 1967, Congress passed the Wholesome Meat Act, which allowed each state three years to improve the quality of state inspection systems to the same level as federal standards.

"If a state didn't comply within that time period, the Federal Meat Inspection Division of the U.S. Department of Agriculture had the power to take over the state program," Uvacek notes. "States passing a mandatory state inspection system equal to federal standards could receive federal assistance up to 50 percent of the cost of such inspection."

Federal meat grading, on the other hand, influences price levels of meat. In fact, federal beef grades are designed to facilitate communication between sellers and buyers on the quality of the graded product.

"Grading is a classification system process which separates beef carcasses into distinct groups based on physical factors such as color, texture, firmness, marbling and estimated yields," says Uvacek.

Marbling--the flecks of fat found throughout carcass muscles--is the chief characteristic in beef grading and an indicator of palatability. Color, texture and firmness are also associated with consumer acceptability.

Federal beef grading is an activity of the U.S. Department of Agriculture. It is voluntary and is paid for by meat packers, Uvacek explains.

"In this grading system, the higher the degree of marbling, color and texture, the higher the grade," he continues. "The four most familiar quality beef grades are USDA Prime, Choice, Good and Standard."

Only about half the commercially produced beef is federally graded, notes the economist. Carcasses not federally graded are usually graded by the staff of a large meat distributor or supermarket chain. These distributors often use their own standards, which may or may not be the same as USDA grades, says Uvacek.

Silo Storage Tanks Offer Lowest Installed Cost Per Gallon

Stainless steel silo-type storage tanks ranging in capacities from 4,000 to 60,000 gallons are reported to offer the industry one of the lowest installed costs per gallon of storage. All units meet or exceed 3A standards.

The tanks are engineered and constructed by Walker Stainless Equipment Co., Holding Tank Division, Elroy, Wisconsin. The storage tanks may be installed inside, outside, alcove through-wall, or through-roof, with the lower portion of the tank in the room.

Outside installations save space and permit versatility of placement. For easy access and control inside the building, the alcove is installed to project through the building wall. Alcoves for access to single or multiple tank installations provide greater control center convenience.

All Walker silo-type storage tanks feature a venting system which prevents damage from overfilling, and insures positive cleaning in place by utilizing a removable spray unit mounted in the head.

For further information or quotation on sketches, drawings, or specifications on silo-type vertical or horizontal stainless steel tanks, contact Walker Stainless Equipment Co., Holding Tank Division, Elroy, Wisconsin or call 608-462-8461.

Food and Dairy Expo '83

Space reservations to exhibit at Food and Dairy Expo '83 will be accepted starting September 1, 1982, Dairy and Food Industries Supply Association announced.

The five-day Expo will be held at McCormick Place in Chicago from Saturday, October 22, through Wednesday, October 26, 1983.

Equipment, supply and service firms selling to the food and dairy processing industries are eligible to exhibit. Exhibits will include processing systems, components, and handling equipment; ingredients; packaging equipment, materials and containers; refrigeration equipment and promotion materials; cleaning and sanitizing systems and products; over-the-road refrigerated transport equipment; computer technology; general supplies, and business and professional services.

A prospectus will be available on September 1 which will describe eligibility requirements, booth rental procedures, profile of Expo attendance, market analysis, exhibit categories, names of past exhibitors and hall information.

Expo attracts more than 350 exhibiting companies and total attendance of 16,000.

For information contact Fred J. Greiner, Executive Vice President, Dairy and Food Industries Supply Association, 6245 Executive Boulevard, Rockville, Md. 20852, telephone 301-984-1444, telex: 908706-DFISA ROVE.

NSF Assessment Services Program

The National Sanitation Foundation's Assessment Services program provides scientific and objective evaluations, analyses, special testing, and studies for government, manufacturers, trade associations, service companies, and individuals. Assessment services are being offered so that interested parties with products, services or needs not addressed by the Listing or Certification programs can take advantage of NSF's unique expertise and capabilities, group problem solving approach, and reputation for objectivity.

A new brochure describing the Assessment Services program is available free. Special evaluations, testing, and research are not new to NSF, but these activities are now identified as Assessment Services. The brochure lists examples of past and current assessment activities in the areas of drinking water, hazardous wastes, and onsite wastewater treatment systems, and in other areas related to public health and environment.

NSF is a non-profit organization best known for its public and environmental health standards, testing, and listing programs for food equipment, plastic piping system components, wastewater treatment devices, and many other types of products.

Write to Assessment Services, National Sanitation Foundation, PO Box 1468, Ann Arbor, Michigan 48106 or phone 313-769-8010 for a free copy of "Facts about Assessment Services".

Frozen Food Convention

More than 50 booths have been reserved at the Exposition being held in conjunction with the 1982 National Frozen Food Convention.

The Convention, being held Nov. 7-10 in New Orleans, Louisiana, is sponsored by the American Frozen Food Institute (AFFI) and the National Frozen Food Association (NFFA).

The Exposition, being held Nov. 7-9 at the New Orleans Marriott, the Convention's headquarters hotel, offers companies -- for the first time since 1977 -- a chance to reach an elite audience of over 3000 from all segments of the frozen food industry. The Exposition will be open from noon until 5:00 P.M. each day. Companies interested in exhibiting their products, supplies or services should act now to ensure that they receive exhibit space. Information on exhibit space is available from Trade Associates, Inc., Suite 105, 4701 Willard Avenue, Chevy Chase, Maryland 20815; 301-656-5794.

For more information on the Convention, call or write to: National Frozen Food Convention, 1700 Old Meadow Road, McClean, Virginia 22102; 703-821-0770.

See Page 309

ADSA 77th Annual Meeting Highlights

The Pennsylvania State University, University Park, hosted the 77th Annual Meeting of the American Dairy Science Association, June 27-30, 1982. Highlights of the meeting were the opening session at which the 1982 recipients of the ADSA Distinguished Service and Award of Honor were named, presentation of 12 awards to outstanding scientists, and installation of the President Elect and Directors to represent the interest of the Production and Dairy Foods Research Divisions.

The opening session for the 77th Annual Meeting was held in the Eisenhower Auditorium, Pennsylvania State University with Dr. L. W. Specht presiding. Following the presidential address by Dr. James H. Martin, Clemson University, Clemson, South Carolina, the ADSA Award of Honor was presented to Dr. Walter L. Dunkley, Department of Food Science and Technology, University of Claifornia, Davis. The Distinguished Service Award was presented to Mr. Erik Lundstedt, International Dairy Products Consultant, Boca Raton, Florida. Citations for these awards were read by Dr. L. G. Harmon, Department of Food Science and Human Nutrition, Michigan State University, East Lansing.

The Award of Honor is presented for recognized, unusually outstanding contributions to the welfare of the Association for distinguished service to the Association. The Distinguished Service Award is made to recognize unusually outstanding and consistent contributions to the welfare of the dairy industry, either directly or indirectly. The award is based upon broad, even nonscientific contributions. Thus, outstanding achievements by those in industry, public administration, or academic administration may qualify. The contribution may be national or international.

The American Feed Manufactures Award consists of a plaque and monetary award. It is presented to stimulate research in dairy cattle nutrition. The 1982 recipient was Dale E. Bauman, Department of Animal Science, Cornell University, Ithaca, New York.

The Bordon Foundation Award consists of a medal and monetary award. This award is presented to recognize outstanding research in dairy production or manufacturing, contributing to improvement or care of dairy cattle, development and improvement processes, products, equipment, methods, handling and sanitation. The 1982 recipient was A. Eugene Freeman, Iowa State University, Ames.

The Dairy Research Foundation Award consists of a plaque and monetary award. It is presented to recognize a researcher actively engaged in basic investigations on milk or milk products which are applicable to a solution of a dairy industry problem. The award is based on the best original basic milk or milk product research conducted at a public institution and published during the five calendar years prior to the year in which the award is presented. The 1982 recipient is Larry L. McKay, University of Minnesota, St. Paul.

The Alfa-Laval, Inc., DeLaval Agricultural Division Award consists of a plaque and monetary award. It is presented to recognize contributions for dairy extension in the broad areas of production, manufacturing, marketing and youth work. The recipient must be actively engaged in and identified with dairy extension work at the time of nomination. The 1982 recipient was D. L. Bath, University of California, Davis.

The Kraft, Inc., Award in dairy manufacturing consists of a monetary award and plaque. The award is presented for outstanding ability as an undergraduate teacher of dairy science in an accredited college or university. The recipient must be an active teacher at the time of nomination preceded by not less than a total of ten years of active teaching. The 1982 recipient was W. Frank Shipe, Cornell University, Ithaca, New York.

The J. L. Lush Award sponsored by the American Breeders Service consists of a monetary award and plaque. The award is for important research contributions in any area of animal breeding and genetics that has or has the potential for improvement of dairy cattle. It is based on original published research in the 10 calendar years immediately preceding the year in which it is presented. The 1982 recipient was C. R. Henderson, Cornell University, Ithaca, New York.

The Miles-Marshall International Dairy Science Award consists of a monetary award and plaque. Presented to recognize outstanding accomplishments in research and development outside the USA and Canada in chemistry, biochemistry, technology and engineering pertaining to the dairy foods industries. The 1982 recipient was J. Stadhouders, The Netherlands Institute for Dairy Research, Ede, The Netherlands.

The Richard M. Hoyt Memorial Award sponsored by the National Milk Producers Federation consists of a plaque and monetary award. It is presented to recognize research efforts with direct application to problems of dairy industry. The 1982 recipient was

Lamin Kung, Jr., Michigan State University, East Lansing.

The Pfizer, Inc. Award consists of a monetary award and plaque. It is presented to recognize outstanding accomplishments in chemistry, biochemistry, microbiology and engineering pertaining to the cheese and cultured dairy production industries. The 1982 recipient was Miloslav Kalab, Agriculture Canada, Ottawa, Ontario, Canada.

The Ralson Purina Company Teaching Award in Dairy Production consists of a plaque and monetary award. It is presented for outstanding ability as an undergraduate teacher of dairy science in an accredited college or university. The recipient must be an active teacher of not less than 10 years. The 1982 recipient was J. Murray Elliot, Cornell University, Ithaca, New York.

The Upjohn Physiology Award consists of a plaque and monetary award. Presented to recognize research work relating to dairy cattle physiology published during the five calendar years prior to the year in which the award is presented. Research can pertain to any area of dairy cattle physiology. The 1982 recipient was Jack H. Britt, North Carolina State University, Raleigh.

The West Agro Chemical Company Award consists of a plaque and monetary award. It is presented to recognize outstanding research of milk quality as affected by control of mastitis, management of milking and practices in production of milk. The 1982 recipient was Roger P. Natzke, University of Florida, Gainesville.

Yenca 2,500th Red Lobster Manager to Complete NIFI Sanitation Course

Bill Yenca, an assistant manager in the Lanham, Md., Red Lobster restaurant, was presented a plaque acknowledging him as the 2,500th Red Lobster manager to complete the NIFI Applied Foodservice Sanitation Course.

In ceremonies in the U.S. Senate Building, officers of the National Institute for the Foodservice Industry and Red Lobster President Bill Hattaway made the presentation. The NIFI course has become the national standard in sanitation training programs for foodservice management.

Applied Foodservice Sanitation provides: an appreciation of the dangers and costs of food borne illness; knowledge of practical sanitary techniques in foodservice preparation and facility maintenance; information in the training and motivation of employees in sanitary food handling practices; guidance in the development of a self-inspection system to insure a consistently sanitary operation.

Red Lobster has certified 99 percent of all restaurant managers in 316 restaurants in 35 states nationwide. The Orlando, Fla.-based dinnerhouse is America's largest system of full-service restaurants, with over $580 million in annual sales. During the past 12 months, 72 million guests were served 49 million pounds of seafood.

The recognition ceremony included Florida Congressman Bill Nelson, NIFI President Bill Stratton, NIFI Executive Vice President Chester Hall, and representatiaves of the Division of Retail Food Protection, Food and Drug Administration.

Florida Senator Paula Hawkins was the official hostess for the breakfast meeting, and guests included Dee Clingman, Red Lobster Director of Quality Control, and Sam Jones, the restaurant company's training instructor who has certified the 2,500 managers.

USDA Offers Deli Factsheet

Workers in delicatessens and other establishments where deli-type meats are sold should take special precautions to prevent food poisoning, according to a new factsheet issued by the U.S. Department of Agriculture.

The publication -- designed for food service workers in delicatessens and at supermarket "deli" counters, restaurants, cafeterias and similar outlets -- gives special handling instructions to prevent contamination with Salmonella.

"The factsheet was prompted by several recent outbreaks of food-borne illness traced to Salmonella contamination of roast beef and corned beef products in the Northeast United States," according to Donald L. Houston, Administrator of USDA's Food Safety and Inspection Service. "Contamination can occur at any point in the food chain -- from the time of manufacture to consumption," Houston said.

He emphasized that although delicatessen meats are pre-cooked, they are susceptible to Salmonella poisoning so food handlers must take precautions.

The factsheet provides essential information for the handling of delicatessen products, including tips for safe storage preparation, display and service. Food handlers are urged to keep product either hot (140°F or above) or cold (40°F or below), and to avoid cross contamination between raw and cooked product.

Copies and reproducibles of the factsheet, "Food Safety Tips for Handling Delicatessen Meats," are available from: FSIS Information, Room 1163, Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Poultry . . . Still a Bargain

What food can be purchased in the local supermarket for about 10 cents a pound more than it cost in 1954, almost 30 years ago?

The answer, of course, is poultry. Ready-to-cook chicken sold at the back dock of processing plants in 1954 for about 37 cents per pound. Today the price is about 46 cents. And chicken in the supermarket was about 39 cents "on sale" in 1954. Today's "on special" chicken sells for about 49 cents per pound.

"This is a remarkably small price increase over the last 30 years," points out Dr. James H. Denton, poultry marketing specialist with the Texas Agricultural Extension Service, Texas A&M University System.

Why is this nutritious product being offered to the American consumer at such an attractive price?

"The main reason is the highly productive and efficient poultry industry," says Denton. "All phases of the poultry marketing industry, including genetics, nutrition, production, management, processing and distribution, have contributed to this phenomena."

Due to genetic improvements birds grow to be heavier in a shorter period of time than was previously possible. In addition, relative proportions of the breast, thigh and drumstick -- the meaty portion of the chicken -- have increased greatly due to improvements in commercial strains of broiler-fryers available today. All commercial broilers today are basically Cornish cross strains which are processed at seven weeks of age at a weight of 4 to 4-1/2 pounds, notes the specialist.

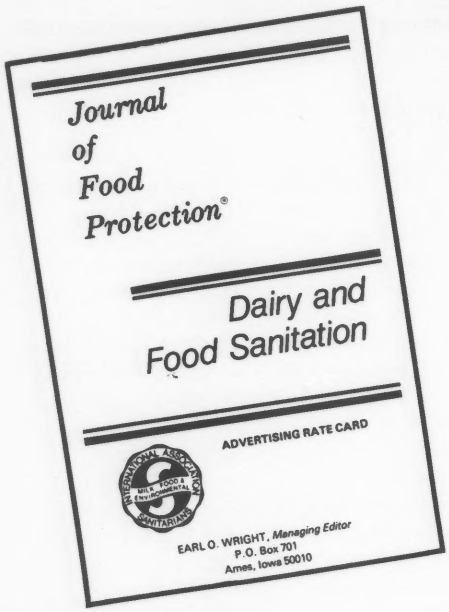
Advances in poultry nutrition have led to a basic diet for chicken broilers composed mostly of corn and soybeans, 60 percent and 40 percent, resepctively. This is supplemented with small amounts of other ingredients to insure a complete balance of amino acids, vitamins and minerals. In addition the energy, or caloric, content is closely monitored to achieve the maximum growth rate, good fleshing and uniformity of the entire flock.

As far as production and management factors are concerned, all birds are raised in confinement houses, feed intake is controlled and clean water is provided at all times. Environmental factors such as temperature and ventilation are monitored closely to insure bird comfort.

Poultry processing today is vastly different and greatly improved from the days when slaughter and dressing was done using hand labor, says Denton. The slaughtering operation, including scalding to loosen feathers and picking to remove them, evisceration (removal of intestines), USDA inspection, washing and chilling is fully mechanized. This greatly improves operational efficiency and the cleanliness of the product, notes the specialist. Present processing systems insure a uniform wholesome product available the year round.

Modern packaging methods which use refrigeration to the maximum also have contriubted to the poultry industry's success by almost eliminating economic losses due to spoilage. Chicken now is available in a variety of forms, including whole, cut-up, breast portions and leg quarters. In addition, a host of cooked products can be found in most supermarkets.

"Even if the price of poultry was double what it was in 1954, the consumer would still come out the winner," contends Denton. "Considering price increases for most items since that time, especially cars, clothes and homes, poultry is 'a steal' today."



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Calendar

1982

Aug. 13---SANITATION THROUGH DESIGN: Vanderbilt Holiday Inn, Nashville, Tennessee. Food Sanitation Institute, Jean Day, Coordinator, 1019 Highland Avenue, Largo, FL 33540.

Aug. 22-26---IAMFES ANNUAL MEETING. Galt House, Louisville, KY. Contact: Earl Wright, IAMFES, PO Box 701, Ames, IA 50010, 515-232-6699.

Sept. 1-2---THIRD ANNUAL JOINT EDUCATION CONFERENCE. Program Theme "Focus On Our Future." Sheraton Inn, Madison, WI. For more information contact: Jon R. Dresser, P.O. Box 7883, Madison, WI 53707, 603-266-3109.

Sept. 1-2---"PROSPECT FOR FOOD". The Summer Symposium of the Institute of Food Science and Technology will be held at the University of York and will be on the theme "Prospect of Food", dealing with aspects of nutrition, storage and raw materials. Details and registration forms available on request from: Dr. K. C. Yates, Hon. Secretary, IFST North of England Branch, Kelloggs Co., of Great Britain Limited, Park Road, Stretford, Manchester, *M32 8RA*.

Sept. 15-16---1982 NINETEENTH ANNUAL MARSCHALL INVITATIONAL ITALIAN CHEESE SEMINAR, Dane County Exposition Ctr., Fairgrounds Drive, Madison, WI 53713. For more information contact: Seminar Co-Chairman, Marschall Products, Miles Laboratories, Inc. PO BOX 592, Madison, WI 53701.

Sept. 15-17---20th YANKEE CONFERENCE ON ENVIRONMENTAL HEALTH. Cromwell, Connecticut. Contact: Leon F. Vinci, P.O. Box 1300, Middletown, CT. 06457.

Sept. 15-18---3rd INTERNATIONAL CONGRESS OF THE NATURE INTERNATIONAL ACADEMY, Spoleto, Italy. For more information contact: Mrs. C. Rotoli Fucci, N.I.A. Via Enamuele Filiberto, 271 00185, Rome, Italy.

September 24---1982 FOCUS ON FOOD SCIENCE SYMPOSIUM IV. Kansas State University, Manhattan, KS. For more information contact: F. E. Cunningham.

Sept. 27-28---1st ANNUAL MIDWEST FOOD PROCESSORS CONFERENCE. Hyatt Regency, Minneapolis, MN. For more information contact: Tom Aspelund, ISU Dairy Industry Report Cooperative Extension Service, Ames, IA 50011.

October 13---IOWA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS FALL EDUCATION MEETING. Holiday Inn, Cedar Rapids, IA. For more information contact: Jack Schoop, 602 East 1st St., Des Moines, IA 50307, 515-286-3929.

Oct. 21-22---WHEY PRODUCTS CONFERENCE, Hamilton Hotel, Itasca (Chicago O'Hara area) IL. For more information contact: Dr. Warren S. Clark, Jr. Executive Director, Whey Products Institute, 130 N. Franklin St. Chicago, IL 60606.

Nov. 7-10---NATIONAL FROZEN FOOD CONVENTION, New Orleans, LA. For more information contact: Scott Ramminger, 703-821-0770.

Nov. 15-19---PACK EXPO 82, INTERNATIONAL PACKAGING WEEK. McCormick Place, Chicago, IL. Contact: Packaging Education Foundation, Reston International Center, Reston, VA 22091, 703/620-2155.

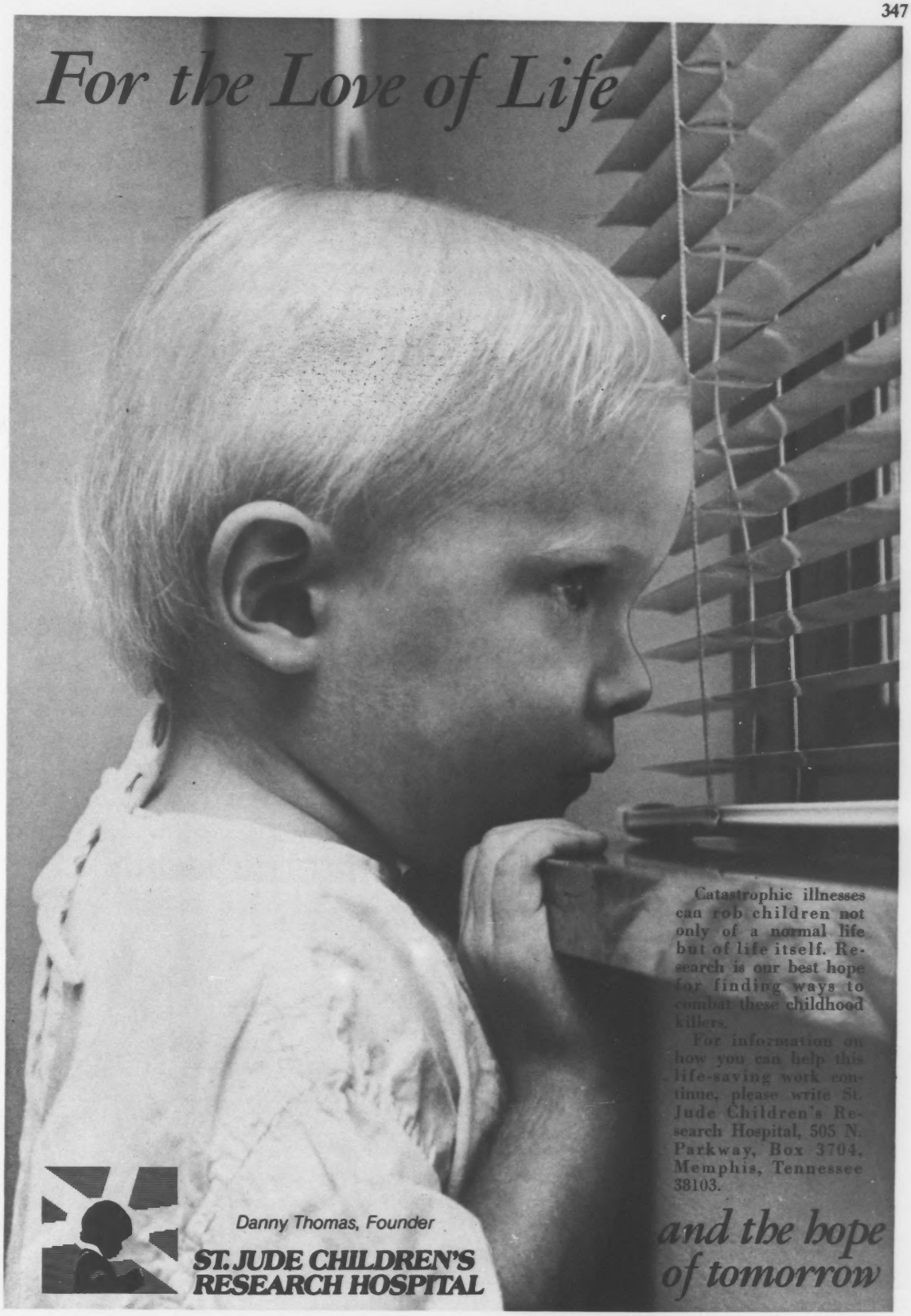
1983

August 6-11, 1983---IAMFES ANNUAL MEETING, Stouffers, St. Louis, MO.

Aug. 14-19, 1983---5th WORLD CONFERENCE ON ANIMAL PRODUCTION, Nihon Toshi Center, Tokyo, Japan. For more information contact: The 5th WCAP Conference Secretarial, c/o National Institute of Animal Industry, Tsukuba Norindanchi, PO Box 5, Ibaraki 305, Japan.

1984

August 3-9, 1984---IAMFES ANNUAL MEETING, Edmonton, Alberta, CN.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JFP Abstracts

Abstracts of papers in the August Journal of Food Protection

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Cheese Slurry in the Acceleration of Cephalotyre "Ras" Cheese Ripening, A. A. Abdel Baky*, A. M. El Fak, A. M. Rabie and A. A. El Neshewy, Food Science Department, Faculty of Agriculture, Zagazig University, Zagazig, Egypt

J. Food Prot. 45:894-897

A method has been adopted for the acceleration of Cephalotyre "Ras" cheese ripening. Ras cheese slurry incubated at 30°C for 7 d was added to cheese milk before addition of the starter or to the cheese curd before hooping. Flavor development, protein degradation and fat hydrolysis were enhanced in cheeses with added slurry. Moreover, the ripening period was reduced to 2 months compared with 4 months required for the control cheese. The effect of cheese slurry was more remarkable when it was added to the curd.

Comparison of the Stomacher with other Systems for Breaking Clumps and Chains in the Enumeration of Bacteria, Kurt E. Deibel and George J. Banwart*, Department of Microbiology, The Ohio State University, 484 West 12th Avenue, Columbus, Ohio 43210

J. Food Prot. 45:898-902

Five systems were compared for their ability to break up chains and clumps of organisms for enumeration. The highest aerobic plate counts of *Bacillus cereus* were obtained by mixing the organism in the Waring blendor or the Osterizer. Significantly lower counts were obtained by stomaching, shaking or shaking with beads. Results similar to those of *B. cereus* were obtained when *Staphylococcus aureus* and *Streptococcus faecalis* were prepared for enumeration using these five systems. There was no significant difference in aerobic plate counts obtained by using the five systems with *Yersinia enterocolitica* as the test organism.

Fate of Aflatoxin M_1 in Cottage Cheese, Rhoná S. Applebaum and Elmer H. Marth*, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 45:903-904

Two batches of long-set cottage cheese were prepared from milk naturally contaminated with aflatoxin M_1. Cottage cheese was stored for 2 weeks at 7°C. Analyses for pH, moisture content and AFM_1 were done on days 0, 3, 7, 10 and 14 of storage. In comparison with the initial curd concentrations (18.3 and 20.5 μ of AFM_1/kg of cheese for trials 1 and 2, respectively), AFM_1 concentrations in the finished product did not decrease appreciably during storage. Overall average concentrations of AFM_1 in trials 1 and 2 from day 0 to day 14 were 15.0 and 20.5 μg of AFM_1/kg of cheese, respectively.

Analysis of Gamma Radionuclides in Selected Farm Produce of Oka, Quebec - A Nioblum Mining Community, A. Boudreau[1]* and J. Turcotte[2], Département de sciences et technologie des aliments, Faculté des sciences de l'agriculture et de l'alimentation; Centre de recherche en nutrition, Pavillon Comtois; and Département de chimie, Faculté des sciences et de génie, Université Laval, Sainte-Foy, Québec, Canada G1K 7P4

J. Food Prot. 45:905-908

An investigation of the gamma emitting radionuclides present in selected farm produce of Oka, Quebec, was conducted. In the three categories of foodstuffs, such as cheese, apple and maple sugar, obtained from the immediate vicinity of niobium mill tailings piles, distinguishable radioactivity from natural sources and worldwide fallout was evident. Except for lead-214 and radium-226, the tailings spectrum showed a typical pattern of natural background value. With the exception of lead-212, uranium-235, thallium-208 and actinium-228, all radionuclides in farm produce were near or below levels of detection. There was no significant difference in the radiation level of food samples grown in control areas.

Heat Resistance of Spores of Non-Proteolytic Type B *Clostridium botulinum*, Virginia N. Scott* and Dane T. Bernard, National Food Processors Association, Washington, D.C. 20036

J. Food Prot. 45:909-912

The heat resistance of spores of non-proteolytic type B *Clostridium botulinum* was compared to that of type E and proteolytic type B spores. Spore suspensions were produced in a biphasic medium consisting of beef heart agar overlaid with a liquid phase containing trypticase, peptone, glucose, starch and cysteine. Thermal death time curves were established for seven strains heated in phosphate buffer. In general, spore suspensions of non-proteolytic type B strains had greater thermal resistance than type E strains. Decimal reduction times at 82.2°C, established by linear regression analyses of data, ranged from 1.49 to 32.3 min, but the higher heat resistances were not obtained consistently, even with different spore suspensions of the same strain. None of the spore suspensions of non-proteolytic, type B *C. botulinum* demonstrated heat resistance comparable to that of the proteolytic type B spores.

Thermal Resistance of Microorganisms and Polyphenol Oxidase as Related to Solar Pasteurization of Concord Grape Juice[1], H. K. Leung*, B. G. Swanson[2], T. L. Aw.[2], D. C. Davis [3] and G. A. Kranzler[3], Department of Food Science and Technology and department of Agricultural engineering, Washington State University, Pullman, Washington 99164

J. Food Prot. 45:913-918

Pasteurization conditions for grape juice were examined and the concept of pasteurizing grape juice utilizing solar energy was explored in this study. The z-values of four selected microorganisms in grape juice were approximately 5-8 C, whereas polyphenol oxidase in fresh grapes had a z-value of 8.0 C at pH 3.4. Using a 0.5 m^2 solar collector test module constructed for this study, 2.5 h were required to heat the grape juice from 10 to 85 C. The solar pasteurized juice and commercially pasteurized juice were different in flavor and color but not in pH, titratable acidity or soluble solids.

Gas-Liquid Chromatographic Differentiation Between *Salmonella gallinarum* and *Salmonella pullorum*, E. R. Richter*, M. C. Burns[1], G. J. Banwart, and M. S. Rheins, Department of Microbiology, The Ohio State University, Columbus, Ohio 43210
J. Food Prot. 45:919-922

Salmonella gallinarum and *Salmonella pullorum* have been considered as one serovar, *S. gallinarum-pullorum* or *S. gallinarum.* This serovar possesses group D somatic antigens with no flagellar antigen. Reportedly *S. gallinarum* differs from *S. pullorum* in dulcitol fermentation. This reaction is positive, but delayed up to 5 d for *S. gallinarum* and negative for *S. pullorum.* Gas-liquid chromatography of organic acid by-products from a dulcitol medium was performed on 10 isolates of each biovar. Viable plate counts confirmed approximately the same number of organisms per ml of culture. Results of pH determinations supported gas-liquid chromatographic analysis of more acid formation in all *S. gallinarum* cultures as compared with the *S. pullorum* cultures after incubation for 24 h. A quantitative measurement of succinic acid resulted in confirmation of the differences in metabolic function of both biovars. The additional test procedure of gas-liquid chromatography of organic acid by-products aids the clinician or researcher in rapidly and accurately distinguishing these two similar biovars.

Formation of Lysino-Alanine in Alkaline Extracts of Chicken Protein, R. A. Lawrence and P. Jelen*, Department of Food Science, University of Alberta, Edmonton, Alberta, Canada T6G 2P5
J. Food Prot. 45:923-924

Bone residues from mechanical deboning of chicken backs, necks and spent layers were extracted at pH 9.2, 10.0, 10.7 and 11.5. The centrifuged liquid protein extracts were kept at 22, 35 and 50°C for 1, 4 and 16 h. Determinations of lysino-alanine (LAL) were made after freeze-drying and fat extraction of the treated samples. No LAL was detected in any samples treated for 1 h. Samples treated for 4 h showed measurable amounts of LAL only at pH 11.5 at all three temperatures used, and at pH 10.7 at 50°C. After 16 h, LAL was produced at all pH treatments at 50°C; small amounts were also formed at 22 and 35°C at pH 10.7 and 11.5. It is concluded that the proposed alkali extraction procedure would not produce LAL in the protein extract under technologically optimal conditions.

Influence of pH and Phosphate Buffer on Inhibition of *Clostridium botulinum* by Antioxidants and Related Phenolic Compounds, N. R. Reddy and Merle D. Pierson*, Department of Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24016
J. Food Prot. 45:925-927

The compounds butylated hydroxyanisole (BHA); butylated hydroxytoluene (BHT); tert-butylhydroquinone (TBHQ); nordihydroguaiaretic acid (NDGA); 2', 4', 5'-trihydroxybutyrophenone (THBP); 8-hydroxyquinoline; isoamyl and isobutyl esters of gallic acid; ethyl, propyl, and butyl esters of p-hydroxybenzoic acid; thymol; 2-isopropylphenol; 2-tert-butylphenol; and 2-tert-butyl-4-methylphenol were tested for their antibotulinal activity in prereduced Thiotone-yeast extract-glucose (TYG) broth with and without hosphate buffer (0.05 M, pH 6.0 and 7.0). Isoamyl gallate, isobutyl gallate, propyl ester of p-hydroxybenzoic acid, NDGA, BHA, 8-hydroxyguinoline, and 2-tert-butylphenol were more inhibitory when phosphate buffer (pH 7.0(was added to prereduced TYG. The propyl and butyl esters of p-hydroxybenzoic acid and 2-isopropylphenol were more effective at pH 6.0 than at pH 7.0, whereas thymol and 8-hydroxyquinoline were slightly more active at pH 7.0 than at pH 6.0 NDGA at 50 μg/ml was the most effective compound tested for delaying growth and toxin production.

Usefulness of the Benzalkon-Crystal Violet-ATP Method for Predicting the Keeping Quality of Pasteurized Milk, G. M. Waes* and R. G. Bossuyt, Government Station for Research in Dairying, Brusselsesteenweg 370, B-9230 Melle, Belgium
J. Food Prot. 45:928-931

Using the benzalkon-crystal violet-ATP method (BC-ATP method), post-pasteurization contamination of pasteurized milk caused by gram-negative bacteria can be determined within 24 h. This study determined to what extent the keeping quality of pasteurized milk can be predicted by applying this BC-ATP method. Results obtained with the BC-ATP method for 100 samples of pasteurized milk were compared with those recorded in the shelf-life test (total bacterial count after 10 d of storage of samples at 7°C; standard : 10^6 bacteria per ml) and the Moseley test (bacterial count after 5 d of storage at 7°C; standard : 10^5 bacteria per ml). Using the shelf life test and the Moseley test, 14 and 8% of the results, respectively, did not correspond with those obtained with the BC-ATP method. From the results obtained, it was obvious that the greater the post-pasteurization contamination of the pasteurized milk, the lesser is the keeping quality. A quantitative estimation of the degree of post-pasteurization contamination can be obtained satisfactorily by applying the BC-ATP method to 1000-, 100-, 10- and 1-ml portions. The Moseley test takes too much time to achieve a good coordination between the factory laboratory and the pasteurization and filling sections of the dairy factory. By substituting the BC-ATP method applied to 100-ml portions of pasteurized milk for the Moseley test (5 d at 7°C; standard : 100,000 bacteria per ml) almost the same information is obtained within 24 h.

Manometric and Electrode-Probe Determination of CO_2 in Fish Flesh, Jim W. Conrad*, Glenn C. Roberts and Harold J. Barnett, Natinal Marine Fisheries Service, NOAA, Northwest and Alaska Fisheries Center, Utilization Research Division, 2725 Montlake Boulevard East, Seattle, Washington 98112
J. Food Prot. 45:932-934

A rapid electrometric method for determining endogenous and added CO_2 in fish products was studied using an Orion CO_2 probe and Orion ionalyzer model #801. Analytical results were compared to those using the standard Warburg manometric technique. Comparisons showed a ± 20.8% mean difference for low concentrations of CO_2 (<350 ppm) and a ± 10.7% mean difference for high concentrations of CO_2 (>800 ppm). The probe technique was found to be easier to use

and required less time for operating and cleanup procedures than the manometric method. Based on recovery studies, the specific ion probe was more accurate at all levels of CO_2 evaluated than the manometric device.

Inhibition of *Clostridium botulinum* Types A and E Toxin Production by Liquid Smoke and NaCl in Hot-Process Smoke-Flavored Fish, M. W. Eklund*, G. A. Pelroy, R. Paranjpye, M. E. Peterson and F. M. Teeny, U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Utilization Research Division, 2725 Montlake Boulevard East, Seattle, Washington 98112

J. Food Prot. 45:935-941

Liquid smoke in combination with NaCl was an effective inhibitor of outgrowth and toxin production by *Clostridium botulinum* types A and E spores in hot-processed whitefish, chub and carp stored at an abuse temperature of 25°C for 7 or 14 d. Surface-inoculated type E produced toxin in control samples containing 3.7% water-phase NaCl, but not in liquid smoke-treated samples having less than 2.0% water-phase NaCl. Liquid smoke was less effective when type E spores were injected intramuscularly. Liquid smoke lowered the concentration of NaCl required to inhibit toxin production by surface-inoculated type A from 4.6 to 2.8% in samples stored 7 d. Liquid smoke enhanced the ability of NaCl to prevent toxin production, but should not be considered a substitute for NaCl or refrigerated storage (below 3.3°C).

Sensory Qualities of Canned Peaches and Pears as Affected by Thermal Process, Sorbate and Benzoate, L. R. Beuchat and E. K. Heaton*, Department of Food Science, University of Georgia Agricultural Experiment Station, Experiment, Georgia 30212

J. Food Prot. 45:942-947

The influence of independent and combined effects of reduced processing time and two preservatives, potassium sorbate and sodium benzoate, on sensory qualities (appearance, color, aroma, texture and flavor) of canned peaches and pears was determined. Fruits were packed into 401 × 411 cans (plain, enamel ends) in 30° Brix sucrose syrups containing 0, 100, 500 or 1000 ppm of preservatives, exhausted to 96-99°C, sealed and retorted for 0, 12 or 24 min at 96-99°C. Sensory panel evaluations and laboratory analyses of fruits were made after 12 weeks of equilibration at 21°C. While preservatives had certain adverse effects on fruit, these effects were not so great as to cause the quality to be reduced to an unacceptable level. Pears were less affected by preservatives than were peaches, and, overall, more significant effects were detected in fruits retorted for 24 min compared with those receiving less heat. Neither preservative was clearly more detrimental than the other. It is suggested that it may be possible to reduce processing time without incurring significant sacrifice of sensory and microbiological quality by adding preservatives to packing syrup.

Microflora Recovered from Foods on Violet Red Bile Agar with and without Glucose and Incubated at Different Temperatures[1], J. L. Oblinger*, J. E. Kennedy, Jr. and D. M. Langston, Food Science and Human Nutrition Department, IFAS, University of Florida, Gainesville, Florida 32611

J. Food Prot. 45:948-952

Counts and taxonomic distribution of typical colonies on violet red bile agar (VRB) and VRB with 1% glucose (VRBG) incubated at 45, 35, 20, 7 and 1°C from 23 retail food samples were compared. Aerobic plate counts were also obtained at each incubation temperature. Samples included fresh meats, processed meats, frozen processed products and fresh vegetables. Overall mean VRBG counts were slightly higher than VRB counts at each incubation temperature although there was some variation according to sample type. No significant differences ($p>0.05$) between the two media were noted overall or for any food type. Highest counts for VRB and VRBG generally occurred at 20°C incubation followed by 35, 7, 45 and 1°C; counts at 20 and 35°C were not significantly different ($p>0.05$). The taxonomic distribution of typical colonies varied according to incubation temperature and sample type but there were few differences between VRB and VRBG for a given sample and incubation temperature. At 45°C, *Escherichia coli* was the most frequently recovered organism from both media overall but *Klebsiella pneumoniae, Erwinia herbicola* or *Enterobacter cloacae* predominated in many samples. *Serratia marcescens* and *Erwinia herbicola* comprised the majority of isolates from both media at 35, 20, 7 and 1°C with taxonomic diversity being greatest at 35 and 20°C.

Preventing Growth of Potentially Toxic Molds Using Antifungal Agents[1], Lisa L. Ray and Lloyd B. Bullerman, Department of Food Science and Technology, University of Nebraska, Lincoln, Nebraska 68583

J. Food Prot. 45:953-963

Mold inhibitors such as sorbates, propionates and benzoates have been used commercially for some time. Recently these and other potential inhibitors have been studied from the standpoint of their effects on growth of potentially toxic molds and mycotoxin production. In addition, other substances such as the antifungal antibiotic natamycin (pimaricin) and plant-derived products such as components of the essential oils of certain herbs and spices have recently been studied for their antifungal properties and effects on mycotoxin production. Some of these inhibitors inhibit mycotoxin production by greater than 70%, while only inhibiting growth of the mold by 25% or less. Of the organic acids, sorbic, propionic and benzoic, sorbic and its sorbate salts seems to be most effective over the widest range of conditions in preventing mold growth and mycotoxin production. Potassium sorbate is effective against toxic molds at levels of 0.10 to 0.15%. The antibiotic natamycin is very effective in preventing mold growth and toxin production at very low (0.001 to 0.005%) concentrations. A number of herbs and spices possess antifungal activity. At a level of 2.0%, in YES agar, cloves, cinnamon, mustard, allspice, garlic and oregano all completely inhibit mycotoxin production by a number of mycotoxigenic molds. Cloves, cinnamon and mustard seem to be the most effective of those tested, with complete inhibition occurring with amounts of spice less than 1%. Essential oils of orange and lemon also have antifungal properties at levels of 0.2% and higher. Certain insecticides and fumigants also inhibit mold growth and mycotoxin production. The organophosphates naled and dichlorvos are both effective inhibitors at relatively low concentrations (0.002 to 0.01%). Phenolic antioxidants, particularly BHA, also inhibit toxic

molds in concentrations of 0.025% and above. Naturally occurring methylxanthines, such as caffeine and theophylline, inhibit growth and aflatoxin production by *A. parasiticus* in concentrations of 0.1% and above. Chlorine, a commonly used sanitizer, will inactivate spores of toxic *Aspergillus* and *Penicillium* species at levels of residual chlorine commonly achieved with most sanitation procedures. Even though considerable information is available on inhibitory effects of a number of substances on mold growth and mycotoxin production, more work is needed to further define the conditions under which commercial antifungal agents are most effective in preventing growth of toxic molds and mycotoxin production.

Physical, Chemical and Biological Degradation of Mycotoxins in Foods and Agricultural Commodities, M. P. Doyle[1]*, R. S. Appelbaum[2], R. E. Brackett[2] and E. H. Marth[1,2], Food Reserach Institute and Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 45:964-971

Aflatoxin is partially or completely degraded by irradiation, heat, or treatment with strong acids or bases, oxidizing agents or bisulfite. Hydrogen peroxide plus riboflavin denature aflatoxin in milk. Mycelia of *Aspergillus parasiticus* can degrade aflatoxin, possibly via fungal peroxidase. Such degradation is affected by strain of *A. parasiticus*, amount of mycelium, temperature, pH and concentration of aflatoxin. Adsorbants, including bentonite and activated charcoal, can physically remove aflatoxin and patulin from liquid foods. Patulin is stable at low pH values but not in the presence of large amounts of vitamin C or bisulfite. Patulin can be degraded by actively fermenting yeasts and rubratoxin can be degraded by the mycelium of *Penicillium rubrum*.

Ammonia Treatment to Destroy Aflatoxins in Corn, William P. Norred, Toxicology and Biological Constituents Research Unit, USDA-SEA-ARS, R. B. Russell Agricultural Research center, Athens, Georgia 30613

J. Food Prot. 45:972-976

Aflatoxin contamination of corn can result in financial disaster to farmers, and is a serious health hazard to both livestock and human populations. Atmospheric ammoniation of contaminated corn appears to be an economically feasible detoxification procedure. Feeding trials conducted in livestock, and relay toxicity studies in which meat or egg tissue from the corn-fed livestock was fed to rats, have not revealed any adverse effects produced by ammoniation of contaminated corn. However, complete histopathologic examinations have not been completed. Other studies, including feeding corn to rats for 21 months, dosing rats with single doses of corn containing large quantities of ammoniated aflatoxin by-products, and using radiolabelled aflatoxin to determine tissue distribution and excretion of ammoniated aflatoxin, have indicated that ammoniation is an effective method for salvaging aflatoxin-contaminated corn.

Acid Tolerant Microorganisms Involved in the Spoilage of Salad Dressings, R. B. Smittle[1] and R. S. Flowers[2]*, Silliker Laboratories of New Jersey, Inc., 2353 Beryllium Road, Scotch Plaines, New Jersey 07076 and Silliker Laboratories, Inc., 1304 Halsted Street, Chicago Heights, Illinois 60411

J. Food Prot. 45:977-983

Microbiological spoilage of salad dressings and similar products generally results from the growth of a select group of microorganisms. Although frequently isolated these organisms have not been well characterized. Several isolates from spoiled products were examined. Data indicated that spoilage resulted from growth of lactobacilli, similar to the previously described *Lactobacillus fructivorans,* and yeasts, similar to *Saccharomyces bailii.* In addition to their acid tolerance, these organisms shared one other common characteristic, rapid fermentation of fructose. Addition of this carbohydrate to enumeration media resulted in improved recovery of both lactobacilli and yeasts.

Overview of Foodservice Energy Research: Heat Processing[1,2], Nan Unklesbay, Department of Food Science and Nutrition, University of Missouri-Columbia, Columbia, Missouri 65211

J. Food Prot. 45:984-992

A conceptual framework for factors affecting energy usage for heat processing in United States foodservice operations was developed and used to analyze the direction of foodservice energy research in this area. The literature was reviewed from 1930 to 1981. Most research has been related to alternate food product flows within foodservice operations and to increasing the operating efficiency of foodservice equipment. Some researchers have studied the effect of altering operating parameters upon energy expended per unit of production. Due to research cost constraints, ground beef has been a frequently studied commodity. Research using economical bentonite-water dispersions for food models during foodservice energy research was included. Activities involving the energy-modification of recipes, revealed energy savings from 11-79%. The need for research methodologies for foodservice energy research was delineated to study all variables, including microbial quality and safety, which influence energy usage during heat processing.

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"At least once a year our company experiences an unscheduled inspection of our products by a NSF representative. It certainly doesn't pose any problems for us, because we are fully aware of all the benefits of the NSF program. When our products carry the NSF seal, it tells our customers they have been thoroughly tested and have passed all sanitation requirements. And that really helps sell them!"

Mr. R. F. Knight, Vice President-Sales, Foodservice Division, Hobart Corporation, Troy, OH

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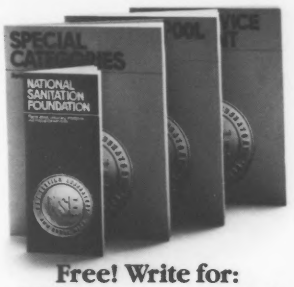

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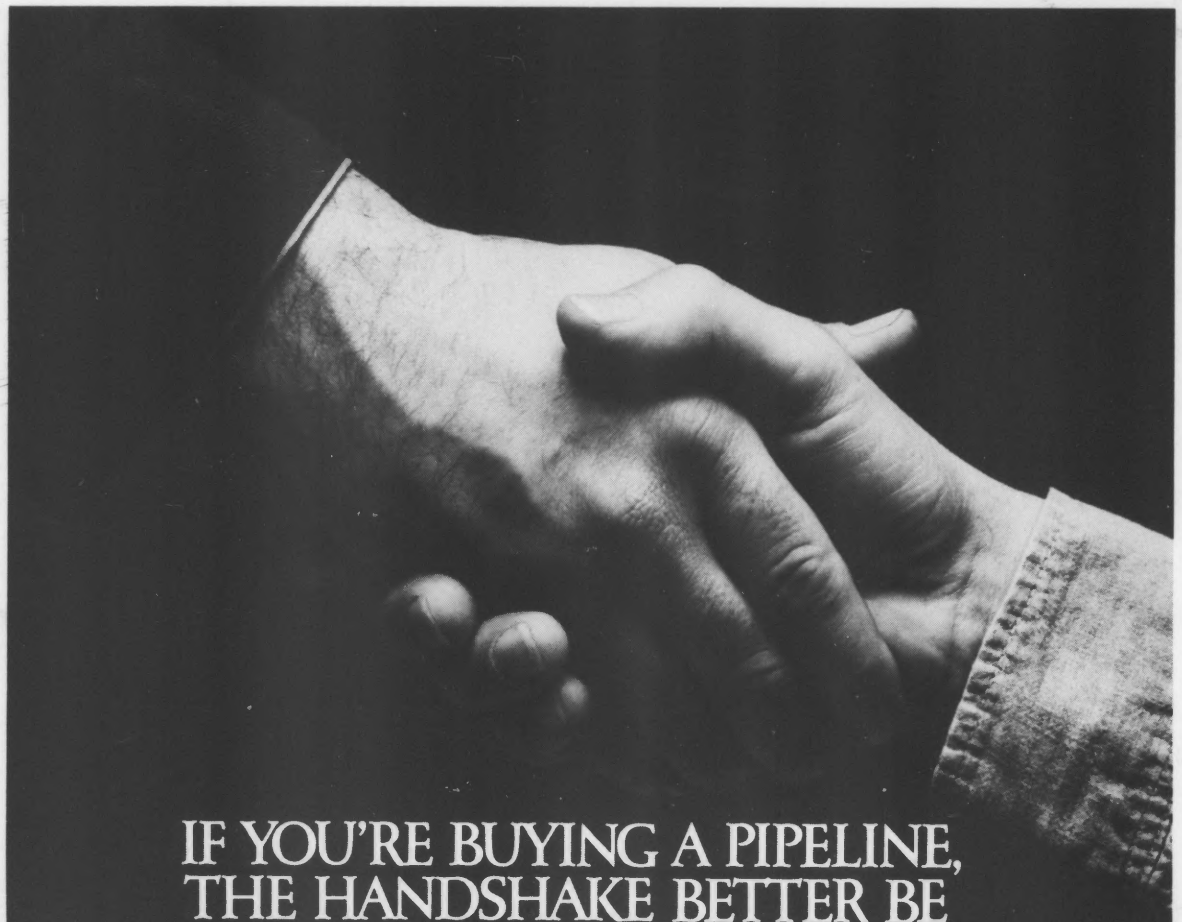

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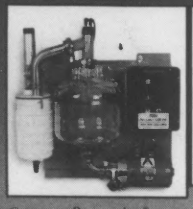

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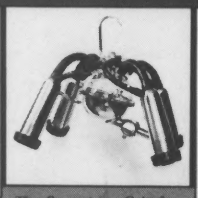

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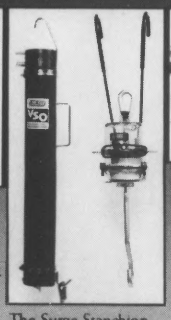

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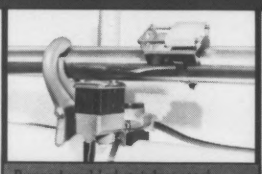

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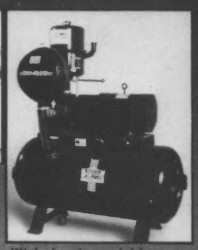

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