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# *Dairy and Food Sanitation*

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*A Publication for Sanitarians and Fieldmen*

- The Retail Food Store Sanitation Code — An Update
- Quality of Butter and Blends of Butter with Oleomargarine
- Cleaning Large Bulk Tanks and Pipeline Systems
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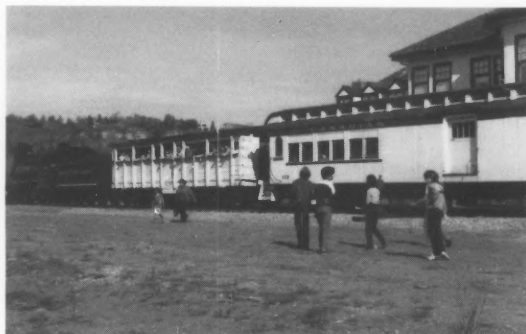
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## CLEANING LARGE BULK TANKS AND PIPELINE SYSTEMS

PHILIP W. PARSONS

*Maryland and Virginia Milk Producers Association Inc., P.O. Box 9154, Rosslyn Station (1530 Wilson Blvd), Arlington, VA 22209*

*Proper cleaning procedures are essential in order to produce a quality raw product. The wash cycle temperature should start at approximately 160 degrees F, 170 degrees if several plastic parts are in the milk system, followed with a rinse of an acid solution and a sanitizing solution just prior to milking. The milk truck driver must manually rinse the tank to remove the heavy residue of milk and foam prior to washing. The orifices on the spray stick must be maintained open in order that proper water coverage is achieved. The average milking system being installed in my area is a double-slope, three-inch low line with 12 milk units, in-place washers and automatic take offs. In order to clean a milking system such as this we run a one and one-half inch water pick up line to the three inch line. A restrictor is installed in this line with an air injector, in this way we can build a three inch slug of water and maintain coverage through out the three inch system.*

In order for the dairy industry to supply the consumer with a product of good flavor and good quality, it is absolutely imperative that the raw product be of excellent quality.

Proper cleaning procedures are essential in order to produce a quality raw product. The very large farm bulk tanks and the sophisticated milking systems of today make correct cleaning procedures even more critical. In

our organization we have been insistent that the milk tank truck driver manually rinses the tank with a hose in order to get the heavy residue of milk and foam out of the tank. I believe all tank washers today, have a pre-rinse cycle, but they are primarily there to raise the temperature of the inner walls of the tank. The wash cycle temperature should start at approximately 160°F followed with a rinse of an acid solution. Sanitizing of the farm bulk tank, of course, is completed just prior to milking.

In my field area most of the farm bulk tanks are of the same manufacturer. It does seem though that cleaning problems of farm bulk tanks are about the same regardless of the manufacturer. It is our experience that the spray stick of the washer should be three inches off the floor of the tank in order to maintain proper water coverage in the tank. Some of the problems of cleaning of the farm bulk tanks are associated with inadequate and/or irregular pressure of the water system. Inadequate or irregular water pressures of the farm water system may present a problem with the drain valve of some of the automatic washers. Most of these drain valves require approximately 15 pounds PSI. If the water pressure is too low the drain valve on the washer will not stay in a closed position as the tank is filling. Certainly on any tank washer it is extremely important that the orifices on the spray stick are maintained opened and clean in order to provide water coverage to all surfaces of the tank. Although there are many problems as-

sociated with the proper cleaning of the large farm bulk tanks, these problems can be overcome relatively easily as compared to the cleaning of a three-inch, double-slope milkline. Proper installation of the washlines is absolutely necessary in order to assure the proper cleaning of such a milkline.

The average milking system being installed in my field area is probably a double-slope, three-inch lowline with 12 milk units, in-place washers, automatic take offs with perhaps milk meters.

In order to clean a milking system such as this we have found that it is necessary to run a one and one-half inch water pickup line from the wash vat to the three-inch line, close to the receiver. At the receiver it is necessary to divert the water around the three-inch line. This can be done with a tee and a plastic plug. On the water

pickup line it is necessary that it be ferruled in order that a one-half inch restrictor can be placed in this line. Immediately above this an air injector is connected. Our experience has indicated that an air injector is an absolute necessity. If milk meters are part of the systems, we recommend a two-inch water pickup line to the parlor, then split into a one and one-half inch line running down both sides of the parlor feeding the meters through the unit washers. An air injector would also be installed on the two-inch line. Both air injectors should operate from the same control in order that both would open and close at the same time. This type of installation facilitates getting the water in the meters back into the system and helps eliminate the flooding of the trap which, of course, would shut down the wash cycle. This type of installation may

also need a restrictor. We have found that the water usage in this type of an installation is approximately 35 gallons. My experience has been that this type of a washer installation seems to stay in balance which means that a more consistent job of cleaning is done on a day-to-day basis.

Experience has indicated that in order to keep the plastic parts within the milking system clean, a starting temperature of 170°F to 180°F is necessary.

What is clean? In order for any surface to be regarded as clean, there has to be an absence of all discoloration and certainly there can be no indication of any fat. This is easy to accomplish with the proper water temperature, proper amount of chemical, proper volume of water, and total contact with the system in the wash cycle.

*This is an update of the status report on the Model Retail Food Store Sanitation Ordinance presented to the 1979 Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians by FDA's K. J. Baker. This document has since been jointly revised by FDA and the Association of Food and Drug Officials (AFDO) and was published in 1982 by AFDO. Training programs have been developed by FDA for regulators and by the Food Marketing Institute for the retail food industries. The Code has been officially adopted by a few jurisdictions and is under consideration by others. It has served as the basis for formal sanitation programs developed by much of the food retailing industry. The Code is being kept current through FDA's issuance of interpretations covering extensions of our understanding of potential food hazards (such as sulfiting of foods) or changing merchandising practices in retail food stores (such as bulk display of unpackaged foods for customer self-service). The primary benefit of this document probably lies more in serving as a vehicle for consensus amongst regulators and industry as to the relative sanitation hazards in food retailing than in the actual reduction of food-borne disease.*

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## THE RETAIL FOOD STORE SANITATION CODE -- AN UPDATE

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ROBERT L. WINSLOW

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### BACKGROUND

Four years ago, at the 1979 Annual Meeting of this International Association of Milk, Food and Environmental Sanitarians, FDA's K. J. Baker (2) reported on the Status of the Model Retail Food Store Sanitation Ordinance. He discussed its background and its perceived need, its basis in various state documents used for enforcing retail food store sanitation and in an Association of Food and Drug Officials' (AFDO's) model ordinance, as well as in discussions held by FDA with both AFDO and industry representatives. He spoke of formal and informal drafts of the document that were circulated by FDA for comments, and of his hope in the summer of 1979 that the document might be approved before the end of that year. He referred not only to industry suggestions for improvement of the document but also to industry's concrete actions to develop and strengthen sanitation programs for their stores.

Instead of the desired 1979 approval with 1980 publication, the document apparently was temporarily lost in



FDA's priority maze until its reappearance as a 1981 revision at AFDO's St. Louis Annual Conference. FDA turned the document back over to AFDO for further revision prior to a joint working session when representatives of FDA, AFDO, and the food retailing industry sat down together to develop a final, mutually acceptable version. This version was at last approved by FDA and its parent Department of Health and Human Services as well as by AFDO in 1982 for publication by AFDO in the fall of 1982 as the AFDO/HHS 1982 Retail Food Store Sanitation Code (1). The published version can now be purchased from the Association of Food and Drug Officials, P.O. Box 3425, York, PA 17402.

### IMPLEMENTATION

At the 1982 AFDO Annual Meeting at which the Code was finally approved I was privileged to discuss (3) the Code. At that time I expressed the hope that the excellent industry-regulatory cooperation evident in the drafting of the Code's final version might be continued into the development of training programs for its application by regulatory jurisdictions and the retail food industry. As industry and FDA developed their respective training programs they coordinated their efforts, working together through the AFDO Education and Training Requirements Committee, so that common understandings and interpretations were reached (4). The Food Marketing Institute (FMI) developed their training program entitled "The Necessary Step" which is designed to express the entire Code in "food store language" and to highlight for special attention by store personnel those sections of the Code having greatest impact on consumer protection (the 4- and 5-point items on the inspection sheet). The FDA training program works through the inspection report form with the inspectors, referring to specific Code sections by the use of overhead projections and by illustrating points with slides. For improved understanding and clarification, industry personnel have been invited to actively participate in a number of regulatory training sessions, leading to regulator comments indicating how very helpful this has been. Either or both of these training programs may be obtained for use by either regulatory or industry personnel.

The Code was developed for adoption and enforcement at the local, rather than the federal, level. In its first year it has already been adopted by a few jurisdictions and it is under consideration in several others. Although a few jurisdictions had already adopted earlier drafts of the Code it is hoped these will now update their regulations since the current version represents the latest thinking on the topic of retail food store sanitation.

During the ten years that this Code was under development, the industry was not standing idly by. As discussed by Baker (2) and by Winslow (3,4), they were organizing formal sanitation programs—hiring and/or training key sanitarians, developing procedures, developing and utilizing various training materials, and training store operating

employees in the procedures and attitudes that assure operation of sanitary stores.

The 1982 Code has not yet been in effect long enough in any jurisdiction for stores to be able to fairly evaluate its full effect on their operations. However, several of our stores have now been regulated on the basis of an earlier draft version of it. These stores have faced no unreasonable problems in compliance, since they had been operating for some time under a basic sanitation program which had been considerably influenced by evolving versions of the Code. In stores where there has been little concern for sanitation, it would not seem unreasonable to anticipate need for increased attention to such factors as temperature control, pest control, and housekeeping in order to comply with the Code. However, it would also seem reasonable to anticipate that such improvements in a sanitation program would more than repay their costs as will be seen when we later consider the store's benefits from the Code.

### UPDATING

To maintain viability of the Retail Food Store Sanitation Code the FDA has devised a plan for issuance of "interpretations" to provide regulators and industry with guidance relating to changes that occur in our understanding of potential health hazards or in our methods of food distribution, display, and merchandising. Thus, in the year since the Code has been approved, FDA has issued an interpretation relative to the tagging of shellfish. As we have come to recognize the hazards posed for a small proportion of our population by the sulfiting of foods, FDA has issued another interpretation involving a store's posting of signs notifying customers of any foods which have been sulfited at store level. Recently FDA has been involved in development of yet a third interpretation—this one relating to a much heavier emphasis by some retailers on the bulk display of unpackaged foods for self-service by the customer.

For a number of years bulk food displays have been quite common in "health food" or "natural food" stores or in such sections of supermarkets. Recently many retailers have expanded their bulk food lines to include up to 400-500 different food items, often including baked goods, salad bars, and sometimes even liquid and semi-liquid foods. Most retailers shield their bulk food against chance contamination and avoid the bulk display of potentially hazardous foods (with the possible exception of some iced ingredients in salad bars). This extension of product presentation has received enthusiastic acceptance by many consumers who generally find substantial savings over prices of corresponding products in pre-packaged form, who have appreciated the freedom and convenience of purchasing in desired amounts rather than being limited to pre-packaged quantities which may not fit their particular needs, and who have not found such foods to be any more hazardous for their use than were the same foods in pre-packaged form. These consumers have considered it well worthwhile to expend a little additional time and effort to do their own packaging and to forego some of the "aesthetics" of purchasing pre-packaged foods. Meanwhile,

for those of their fellow-shoppers who preferred the aesthetics and did not mind the higher costs, the same or similar foods were still available in pre-packaged form on shelves elsewhere in the same store.

With the expansion of bulk food merchandising, local regulators have asked FDA for guidance as to its impact on their role in the protection of the public health. I have been quite interested and pleased with the approach FDA has taken for the resolution of this challenge. Basically, it is very similar to that used for finalization of the Retail Food Store Sanitation Code. While the Code does speak to the display of bulk foods, many local jurisdictions feel a need for further guidance so FDA is developing an interpretation in the form of guidelines. The agency has discussed this with representatives of the retailing industry and with local regulators. They have reviewed drafts of guidelines as proposed by the industry and several other drafts proposed by various regulators and groups of regulators (including AFDO). The agency is developing their draft guidelines to be released to all interested parties for comment. After these comments are reviewed, the document is to be revised for review by a committee comprised of FDA and AFDO personnel (including some Associated AFDO members from the retail industry). It is hoped that from this committee will come a final draft which will be acceptable to FDA, AFDO, and to retailers for issuance to local jurisdictions as FDA's official "interpretation" of the Code as it pertains to bulk food display. While the above procedure would seem rather cumbersome for most interpretations for the Code, it does appear to be a very good approach for one as fraught with varied, strong points of view as the bulk food issue.

#### BENEFITS

When we consider the benefits derived from the development of this Code, one of the most significant would surely be the stimulation which it has already provided for the industry to develop sound store sanitation programs in the process of re-evaluation and improvement of general levels of sanitation throughout their operations. The prioritizing and collecting into one single source representing a generally accepted guide to those factors of significance in store sanitation has simplified and considerably aided in the establishment of effective sanitation programs. With such improvements the store stands to gain from improved customer satisfaction, reduced customer complaints, improved shelf life of perishables, and reduced shrink.

Both the store operator and the sanitarian benefit from the development of a generally accepted compilation of the most current concepts regarding food store sanitation and the relative significance of various points to the safety of the customer. Industry input during the Code's development has helped to keep it practical and thus minimize opportunities for misunderstanding and disagreement between industry and regulatory personnel.

The regulatory jurisdiction which adopts this Code can feel confident it is operating under regulations that are as current and comprehensive as any in the nation, based as

it is on the combined wisdom of regulators and food store operators from across the country over a ten-year period during which it was being repeatedly evaluated and re-evaluated.

For the consumer, the application of this Code should result in more pleasant, sanitary surroundings in which to shop for the family food supply. Store improvements in such things as temperature control and cleanliness of product-contact surfaces may also give some improvement on the home shelf-life of perishable products amongst the customers' purchases. While any effect on food safety should be a positive one, it does not seem realistic to expect that widespread adoption of this Code would result in a measurable reduction in incidence of food-borne disease. With only about 1% of food-borne disease outbreaks reported to the U.S. Center for Disease Control (CDC), their epidemiological data is not sufficiently sensitive to show any significant involvement of retail food stores in outbreaks of food-borne disease. Due to extremely low involvement of food stores in food-borne illnesses and of gross under-reporting of such diseases to CDC, it seems unreasonable to anticipate that the Code's effect could be measured either by epidemiological data or in dollar cost savings for health care.

#### FUTURE REVISIONS

Presumably the Retail Food Store Sanitation Code will be subject to future periodic revisions, just as the Food Service Sanitation Manual and the manual covering The Vending of Food and Beverages have been revised periodically in the past. Since this is a joint document, it is presumed its revisions will also involve the combined efforts of FDA, AFDO, and the regulated industry much as its original development did. Certainly one would anticipate these revisions would represent the opportunity for incorporating interim interpretations into the body of the document. A concept which may well merit consideration for inclusion in a future revision is that of CDC's Dr. Frank Bryan who has suggested during private conversation that perhaps the inspection report weighting system might be modified to give even greater emphasis to those sanitation factors, such as temperature control and product-contact surface cleanliness, which might have a significant effect upon protection of the consumer against potential food-borne disease exposure.

#### SUMMARY

In summary, this update of the present status of the AFDO/HHS Retail Food Store Sanitation Code has recognized that its development and publication have provided the industry and regulatory agencies with a single, generally accepted guide for sanitary operation of retail food stores and for their regulation upon adoption of the Code by local jurisdictions. It has considered mechanisms for interim updating and future revisions of the Code and has briefly considered a few of the benefits which this document is, or is capable of, providing.

## ACKNOWLEDGMENTS

Presented at the 70th Annual Meeting of International Association of Milk, Food and Environmental Sanitarians, St. Louis, Missouri, August 7-11, 1983.

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## Quality of Butter and Blends of Butter with Oleomargarine

LESTER HANKIN and J. GORDON HANNA

*A cooperative study by  
The Connecticut Agricultural Experiment Station and  
The Connecticut Department of Consumer Protection*

*The origin of butter-making is unknown, but presumably it was in prehistoric stages of animal husbandry. Since then man has commonly used butter as a spread and as a fat for cooking.*

*Butter is made from cream, the fatty portion of milk. In the United States only cream from cow's milk is used for commercial butter production but the cream from milk of other animals can also be made into butter. When the cream is churned, the fat droplets coalesce and form progressively large clusters of fat globules. These globules eventually break away from the liquid portion and form the semi-solid or plastic material we call butter. The butter may then be washed, colored, salted and then packaged in a variety of shapes and sizes, even in individual servings called pats. Regulations state that butter must contain at least 80% fat. Whipped butter has air incorporated into the butter to make it spread more easily.*

*Although the per capita consumption of butter in the United States has declined over the past 40 years, many consumers continue to prefer butter over margarine for cooking or as a spread because of its distinctive flavor, aroma and cooking attributes.*

*Although commercially produced butter is made from pasteurized cream, microorganisms such as bacteria or yeasts and molds can be introduced into the product from processing or packaging. The flavor of good butter is very delicate and even small amounts of microbial growth can damage its pleasant flavor and aroma. If butter is kept refrigerated below 40°F, organisms in the butter multiply slowly. On the other*

*hand, should the butter be stored above 50°F, contaminating organisms can multiply quickly and deteriorate the product.*

*In this study we examined both butter and blends of butter with oleomargarine for microorganisms as well as for nutrients.*

### METHODS

Thirty-five samples of butter or blends of butter with oleomargarine were collected at retail stores by inspectors of the Connecticut Department of Consumer Protection. Twenty-three samples were regular butter (one pound blocks or quarter pound sticks), nine were whipped butter, and three were blends of butter with oleomargarine. The Standard Plate Count and tests for coliform bacteria and enterococci were according to Standard Methods for the Examination of Dairy Products (5), chemical analysis by AOAC methods (3), and sodium by atomic absorption spectrophotometry (2). Lipolytic and proteolytic organisms were detected as previously described (1).

### RESULTS AND DISCUSSION

The results of microbiological and chemical analyses of the 35 samples

of butter and blends of butter with oleomargarine are shown in Table 1.

**Microbial.** A standard test for bacterial contaminants in dairy products is the test for coliform bacteria. All samples contained less than 2 coliform bacteria per gram which usually indicates good manufacturing practices. It has been suggested, however, that coliform bacteria may die easily in stored butter and that a test for enterococci may be more valid in assessing sanitary quality (4). Only samples 23 and 34 contained enterococci, 220 and 22 per gram, respectively. A standard of not more than 10 per gram has been suggested (4,5).

The number of bacteria per gram (Standard Plate Count) also provides some information about manufacturing techniques. There are no standards for total numbers of bacteria in butter, but in Connecticut, for example, 100,000 per gram (Standard Plate Count) is allowed in ice cream. Only 5 samples of butter had more than this number (Table 1).

Because butter is stored at a low temperature, a measure of the number of psychrotrophic bacteria is important. Psychrotrophic bacteria are those able to grow, albeit slowly, at low temperatures and cause deterioration of the butter. Although only sample 23 contained a considerable number of

Table 1. Microbial and Nutrient Analysis of Butter and Blends of Butter with Oleomargarine.

Sample Number	Brand and Type	Standard Plate Count <sup>a</sup> CFU/g <sup>b</sup>	Psychrotrophic Bacteria CFU/g	Proteolytic Bacteria CFU/g	Lipolytic Bacteria CFU/g	Yeasts and Molds CFU/g <sup>c</sup>	Fat, %	Casein, %	Sodium, mg/100g <sup>c</sup>	Cholesterol mg/100g	Calories No./fat <sup>d</sup>	Sample Number
1	A & P butter, lightly salted	8,700	<10	1,600	55	<2	81.4	1.29	468	209	36	1
2	Breakstone's butter, lightly salted	40	<10	20	25	<2	81.0	1.78	724	254	35	2
3	Breakstone's butter, sweet	1,500	<10	30	20	<2	81.0	1.90	643.5	199	35	3
4	Breakstone's whipped butter, lightly salted	80	<10	10	40	<2	81.1	0.78	635	189	27	4
5	Breakstone's whipped butter, sweet	90	<10	10	40	<2	81.1	0.78	635	189	27	5
6	Cabot Vermont butter	52,000	190	51,000	1,000	200	82.6	1.42	515	188	37	6
7	Finest butter	200,000	180	1,000	74	74	80.8	1.61	927	182	36	7
8	Grand Union Creamery butter, lightly salted	620,000	<10	60,000	>300,000	<10	80.3	1.75	655	201	36	8
9	Grand Union Creamery butter, lightly salted	80	<10	30	70	<2	80.9	1.75	655	201	36	9
10	Grand Union Creamery butter, lightly salted	80	<10	30	70	<2	80.9	1.75	655	201	36	10
11	Hood butter, lightly salted	320	36	130	100	6	81.0	1.63	408	190	27	11
12	Hotel Bar Blend margarine—40% butter	14	<10	<10	<10	<2	80.3	1.52	620	203	36	12
13	Hotel Bar butter, lightly salted	45,000	<10	4,000	2,100	<2	80.3	1.52	620	203	36	13
14	Hotel Bar butter, lightly salted	14	<10	<10	<10	<2	80.3	1.52	620	203	36	14
15	Land O'Lakes butter, sweet	100	66	85.9	26	<2	80.2	1.03	604	196	38	15
16	Land O'Lakes whipped butter, lightly salted	260	<10	110	34	<2	80.6	1.12	550	207	37	16
17	Land O'Lakes whipped butter, sweet	970	760	10	70	<2	80.1	0.26	611	217	37	17
18	Land O'Lakes Country Morning Blend	140	<10	70	18	<2	79.8	0.81	611	217	35	18
19	Land O'Lakes Country Morning Blend	140	<10	70	18	<2	79.9	1.09	611	217	35	19
20	Real Gold butter—40% butter	70	<10	20	36	<2	80.5	1.22	589	177	36	20
21	Real Gold butter, lightly salted	40	<10	20	42	<2	80.5	1.22	589	177	36	21
22	Stammark butter, lightly salted	89,000	18	7,000	13	<2	84.1	0.41	391	147	36	22
23	Shop Rite butter, sweet	6,000	72,000	>300,000	26	590	80.0	1.25	511	185	35	23
24	Shop Rite whipped butter, lightly salted	>300,000	>300,000	>300,000	>300,000	>300,000	80.0	1.25	511	185	35	24
25	Shop Rite whipped butter, sweet	64	<10	50	40	<2	80.6	1.22	596	191	37	25
26	Shurline butter, lightly salted	25	<10	10	28	<2	81.6	1.22	600	213	37	26
27	Shurline butter, lightly salted	550,000	750	150,000	88	<10	81.6	1.36	600	213	37	27
28	Slate Brand butter, lightly salted	4,400	<10	2,100	<10	<2	81.2	1.20	682	176	36	28
29	Summer Maid butter	3,400	12,000	2,700	80	<2	80.0	0.86	627	213	36	29
30	Sun Glory butter	<10	30	<10	<10	21,000	80.0	0.86	660	197	35	30
31	Sweet Life butter, lightly salted	1,000	3	<10	30	<2	76.3	1.33	445	212	36	31
32	Waldbaum's butter, lightly salted	1,400,000	<10	<10	1,000	1,700	83.1	1.60	667	247	37	32
33	Waldbaum's butter, sweet	30	<10	20	26	<2	82.6	1.33	667	247	37	33
34	Waldbaum's whipped butter, lightly salted	120	<10	25	26	15	79.7	1.31	772	184	26	34
35	Waldbaum's whipped butter, sweet	15	<10	10	<10	<2	81.8	1.23	772	184	26	35

<sup>a</sup> Standard Plate Count is number of aerobic bacteria reported as number of colony forming units (CFU) per gram. Yeast and mold count is reported as colony forming units per gram.

<sup>b</sup> A pat is individual serving of regular butter is 5 grams. For whipped butter it is 3.8 grams.

<sup>c</sup> g. Fat is mg. milligrams.

psychrotrophs (>3 million), sample 22 was also high (over 50,000) (Table 1).

The two other microbial tests for detecting contaminating organisms were for lipolytic bacteria, those that degrade fat, and proteolytic bacteria, those that attack proteins. Essentially only samples 8, 23, 26, and 32 contained a high number of lipolytic bacteria and only samples 6, 8, 23, and 26 contained a high number of proteolytic bacteria. Only samples 23, 29, and 32 contained an appreciable number of yeasts and molds.

We do not attach significance to health to the number of microorganisms found in these butter samples. The tests we conducted are useful in detecting organisms that help evaluate manufacturing and packaging techniques and the findings help to assess potential keeping quality of the product.

**Nutrients.** The average fat content in all samples was 81.1%. The nine whipped butters averaged 80.0% and the three blends 80.9%. Only sample number 30, with 78.3% fat was below standard (Table 1). Although less than 80% fat is shown for five other samples in Table 1 (79.5 to 79.9%), the values conform to the 80% minimum when rounded to the nearest whole number. The three blends of butter with oleomargarine, samples 12, 18, and 19, claimed 40% butter and 41.0, 41.7, and 41.3% butterfat was found respectively. None of the butter was adulterated with vegetable oil.

Butter contains small amounts of protein (designated as % casein in Table 1). The average protein content of the 32 butter samples was 1.35% but the range was wide. The amount of casein left in the butter after churning the cream depends on how much the butter is worked and washed. The three blends averaged 1.04% protein.

Fat provides about 9 calories per gram, about twice that supplied by protein or carbohydrate. We show in Table 1 the calories provided by a pat of butter, an individual serving. A pat of regular butter weighs 5 grams and a pat of whipped butter weighs only 3.8 grams since it contains some air. The number of calories per gram of regular

and whipped was the same, but the whipped butter contained less per pat (36.1 per pat of regular butter versus 27.1 per pat of whipped) because each pat weighed less. The blends contained about the same calories as regular butter.

Some people are concerned about cholesterol in butter. The milligrams (mg) cholesterol per 100 grams of butter is shown in Table 1. The average in the 32 butter samples was 195 mg and in the three blends was 81 mg, since the blends contain only 41% butter. One serving (a pat) of regular butter contains about 10 mg cholesterol. For comparison, one egg contains about 270 mg cholesterol.

Sodium interests those who wish to restrict their salt intake. The sodium in the nine sweet butters and blends averaged 9.3 mg per 100 grams (Table 1). Those labelled as lightly salted or unlabelled as to salt contained 572 mg. There was little difference in average sodium content between those labelled lightly salted (18 samples averaged 586 mg per 100 grams) and those unlabelled as to salt (8 samples averaged 541 mg). A pat of butter contains 20 to 30 mg of

sodium which is about the same as in a saltine.

### CONCLUSIONS

Thirty-two regular and whipped butters and three blends of butter with oleomargarine were tested for microorganisms and nutrients. Although there are no microbial standards for butter, only five samples of the 35 examined were considered to contain an excessive number of contaminating microorganisms. Two samples contained many psychrotrophic bacteria which can grow at temperatures in a refrigerator. All samples contained less than two coliform bacteria per gram.

All samples, except one, contained at least the 80% fat that is required by regulation. Blends of butter with oleomargarine claiming 40% butter actually contained about 41%. Protein content averaged 1.35% for butter and 1.04% for the blends. The butter averaged 195 mg cholesterol per 100 grams and the blends with 41% butter 81 mg.

The number of calories in a single serving of butter ranged from 27 to 36. The sodium content of the sweet

butters and blends averaged 9.3 mg per 100 grams and those labelled as lightly salted or unlabelled as to salt averaged 586 mg.

### ACKNOWLEDGMENTS

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## **The Scientists Tell Me . . .**

# **USDA Quality Grades Can Predict Beef Flavor**

**ROBERT L. HANEY**

*TAES Science Writer  
Texas Agri. Experiment Station  
College Station, TX.*

If you want beef that has exceptional flavor, chances are best when you buy beef in the better USDA grades, according to meat scientists at Texas A&M University.

It wasn't always that way but has apparently evolved over time. If USDA quality grades were intended originally to predict the palatability of cooked beef, it is interesting that the first official grade standards in 1926 do not say that; no mention is made in those standards of "expected palatability," according to Dr. Gary Smith, Head of the Animal Science Department of Texas A&M University.

In fact, Smith says, the words "palatability," "juiciness," "tenderness" do not appear in the original information on grades. The expressed intent of grading at that time was "to have comparability between the reports (wholesale meat market news service) issued from different markets."

Gradually, over the years, the definition of official grade standards has changed to identify differences in characteristics associated with eating quality. By 1975, the official grade standards defined "quality grade" (not just "quality") as the "palatability-indicating characteristics of the lean."

A team of meat scientists, including Smith, involved in meats research for the Texas Agricultural Experiment

Station, (TAES) sought answers to two beef-grade-related questions: 1) Are USDA quality grades related to beef flavor, and, if so, how strong is the relationship? and 2) By what mechanism or through what means - physical and/or chemical - do the grades of individual components of the grade relate to differences in beef flavor?

Besides Smith, the research team included Dr. Z. L. Carpenter, formerly head of animal science and presently director of the Texas Agricultural Extension Service; Dr. J. W. Savell, Texas Agricultural Experiment Station Meat and Muscle Biologist; and Dr. H. R. Cross, Professor in Meat Science at Texas A&M.

Earlier research in the 1970's had concluded that USDA quality grade, USDA marbling score, and intramuscular fat content had "low to moderate" relationships to sensory panel ratings for flavor. However, the most recent research has clarified the relationship of USDA's quality grades and palatability of cooked beef.

In *quality grade*, the average flavor desirability ratings for loin and top round steaks from carcasses of each USDA quality grade showed that loin steaks and top round steaks from carcasses of higher USDA quality grade were significantly more desirable in

flavor in 87.5% of comparisons with steaks from carcasses of lower USDA quality grade.

There were significant differences in flavor desirability of loin steaks between Prime and Choice, Choice and Good, and Good and Standard. These are the four USDA quality grades for which youthful carcasses (those of A and B maturity), most often qualify, and as grade decreased, flavor desirability of loin steaks decreased significantly.

For top round steaks from carcasses of A and B maturity, Prime had significantly higher flavor desirability ratings than did Choice, but here was no difference in flavor desirability among round steaks from Choice, Good and Standard.

These are four additional USDA quality grades - Commercial, Utility, Cutter, and Canner - that are usually assigned to mature (C, D, and E maturity) carcasses. There were significant differences in flavor desirability of loin steaks between Commercial and Utility and between Utility and Canner, but not between Cutter and Canner.

For top round steaks, flavor desirability differed significantly between Commercial plus Utility vs. Cutter plus Canner, but not between Commercial and Utility or between Cutter and Canner.

In general, as the grade increased flavor desirability increased, with intergrade and adjacent-grade differentials more consistent for loin steaks than for top round steaks.

*Maturity* was also found to affect quality. Assignment of a specific USDA quality grade to a beef carcass is made on the basis of the physiological age of the animal at the time of slaughter (which relates to USDA overall maturity group) and on the basis of intramuscular fatness of the animal (which relates to USDA marbling score).

If USDA quality grade is related - and it appears that it is - to flavor desirability of loin steaks and top round steaks, then it follows that either or both maturity and marbling would be related to desirability of flavor in cooked beef.

Beef carcasses of A maturity produced loin steaks that were significantly more desirable in flavor than those from carcasses of B, C, or E maturity and flavor quality declined as maturity increased.

Beef carcasses of A maturity produced top round steaks that were significantly more desirable in flavor than those from carcasses of C or E, but not B, maturity. Top round steaks from carcasses of E maturity were significantly less desirable in flavor than

were those from carcasses of A, B, or C maturity.

Research showed that more youthful (A or B maturity) beef is more desirable in flavor than mature (C or E maturity) beef and that, generally, as maturity increases, flavor desirability decreases.

*Marbling*, a measure of fat content between lean fibers, was more significant in loin steaks than in round. For loins steaks, both maturity and marbling were related to differences in flavor desirability. For top round steaks, differences in flavor desirability. For top round steaks, differences in flavor desirability were more closely related to differences in carcass maturity than they were to differences among carcasses in marbling score.

*Intramuscular fat* (marbling) is within the muscle and determined by chemical fat content assay. It was found that in general, loin steaks - but not top round steaks - can be stratified into meaningful flavor desirability groupings by use of intramuscular fat percentage levels.

*Subcutaneous fat* is found between the muscle and the skin and has been thought by many to have no effect on palatability of meat. However, research shows that for loin steaks,

those with fat thicknesses of 0.30 inches or more produced steaks with significantly higher flavor desirability ratings than those with fat thicknesses of 0.24 inches or less.

*Diet* also affects flavor. It was found that any period of grain feeding (30 days or more) significantly improves flavor desirability of loin steaks and that optimal flavor desirability appears to coincide with about 100 to 130 days of grain feedings.

In summary, Smith says that it now seems quite likely that present USDA quality grade is related to flavor of beef because grade indirectly assesses the extent to which flavor and/or aroma compounds are likely to be present in high vs low concentrations in the meat.

Carcasses from older animals, leaner animals, and animals not fed large amounts of grain - animals for which there is high likelihood that they would produce meat that is less desirable in flavor - are assigned low USDA quality grades, while carcasses from young animals, fatter animals, and animals fed large quantities of grain - animals for which there is a likelihood that they would produce meat that is "beefy" and more desirable in flavor - are assigned high USDA quality grades.



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## 1983 IAMFES Secretary-Treasurer Candidates



**Bob Gravani**

Bob Gravani is a native of the Garden State (New Jersey) and was graduated from Rutgers University with a B.S. degree in Food Science. He obtained his M.S. and Ph.D. degrees in Food Science at Cornell University where he also minored in Microbiology and Marketing-Management.

From 1973 to 1975, he was Assistant Director of the Institute of Food Science and Marketing at Cornell and was involved in Sea Grant research investigating the utilization of filleting wastes from flounder for human and pet food.

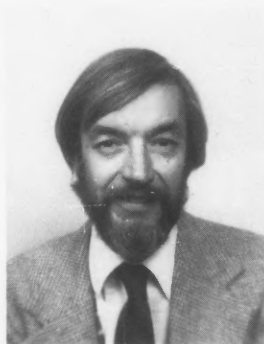
In 1975, he became Science Director of the Cereal Institute in Chicago, where he dealt with issues relating to breakfast cereals.

In 1978, Bob returned to Cornell University as Assistant Professor of Food Science; the position he currently holds. He is active in extension, research, and teaching programs at Cornell. His extension activities include a diversified program with food processors, retailers, the food service industry and regulatory agencies. He has developed a series of practical and informative training programs and has produced several innovative video tapes currently being used by FDA for state training programs. In addition to conducting seminars, short courses, and workshops, Bob also writes a monthly publication called Food Science Facts that is sent to every licensed processing establishment in New York State as well as to New York State food inspectors and Health Department Sanitarians.

His research interests are in food microbiology and sanitation. He has participated in the New York State Milk Quality Improvement Research Project and has completed two research projects on *Yersinia enterocolitica*.

Bob is also active in the department's teaching program and gives lectures in several courses including: Food Sanitation As It Relates To Public Health; Food Choices and Issues; Topics in Food Science; and Food Science for Industry.

In addition to his academic responsibilities, Bob has also been active in the New York IAMFES affiliate. He has actively participated on the Annual Meeting Conference Committee, the Food Program Committee and the Membership Committee. He has also participated in the IAMFES Annual Meetings for the last several years and has written for *Dairy and Food Sanitation*.



**David L. Collins-Thompson**

David L. Collins-Thompson is presently an Associate Professor in the Environmental Biology Department at the University of Guelph, Guelph, Ontario, Canada. He has been involved in teaching and research since 1957.

David is a B.Sc. graduate from Polytechnic of the South Bank in London. He received his M.S. and Ph.D. from the University of Illinois Food Science Department.

He has been a member of the IAMFES for 10 years. For 5 years he has been a member of the Ontario Food Protection Association and has served on their board of directors. Since 1982 he has been a member of the *Journal of Food Protection* Editorial Board.

David is also a member of the Canadian Society of Microbiology, the National Academy of Sciences Food and Nutrition Board, the International Standard Organization Microbiology Committee, the Section Editor of the Canadian Journal of Microbiology, and is a member of the editorial board for the International Journal of Food Microbiology.

Over the past 5 years he has received research funding from 5 different agencies.

As a co-author of 25 printed papers, Collins-Thompson has also written 3 chapters for three books.

Married, with three children, he enjoys working with computers and being active outdoors.

## News and Events

### Leland H. Lockhart

We regret to inform you of the death of Leland H. Lockhart, Chief, Bureau of Milk and Dairy Foods Control, California Dept. of Food and Agriculture, on Sunday, August 28, 1983, of a heart attack at his home in Woodland, California. Mr. Lockhart was 68. He was a graduate of the University of California at Davis, and was employed by the Department for 40 years. He was Chief of the Bureau since 1974. Mr. Lockhart was active in many state, regional, and national associations.

Memorial services were held on September 1, 1983. Mr. Lockhart is survived by his wife, Wilmienna, (1720 El Paseo Drive, Woodland, CA 95695, a daughter, two sisters, and five brothers. The family requests any memorial be made to a charity of the donor's choice.

### Whey Products Institute Publishes New Bulletin

The Whey Products Institute is pleased to announce the availability of its publication "1983 Whey Products, A Survey of Utilization and Production Trends", a yearly compilation of whey products utilization. Data assembled and published in this bulletin reflect the results of the Institute's eighth industry-wide survey of end-uses for whey products. The survey included Whey Products Institute members, other cooperating processors, and resellers, and reflects approximately 86% of the USDA-reported whey solids processed during 1982.

Comparisons of reported end-uses for whey and whey products in both human foods and animal feeds are shown for 1981 and 1982, as is a 4-year (1979-1982) summary of domestic sales by distribution outlet.

The publication is available for purchase at \$4.00 per copy. For further information about this publication, or the production and use of whey and whey products, contact the Whey Products Institute, 130 North Franklin Street, Chicago, IL 60606, 312-782-5455.

### Kampelmacher Elected Vice-President of WVA

Prof. Dr. E. H. Kampelmacher, Scientific Director of Rijksinstituut voor de Volksgezondheid in Bilthoven, Netherlands has been elected as one of the seven nominated Vice-Presidents of the World Veterinary Association (WVA).

The election took place during the 22nd World Veterinary Congress organized in Perth, Australia, August 21-26, 1983. Prof. Kampelmacher is Hon. President of the World Association of Veterinary Food Hygienists (WAVFH). He is responsible for the Organizations of Specialists within the WVA.

### American Public Health Association Honors Committee

The American Public Health Association (APHA) recently honored members of the Technical Committee preparing the 15th Edition of Standard Methods for the Examination of Dairy Products. The eight member committee received plaques in recognition of meritorious service which covered more than five years. The APHA Committee on Laboratory Standards and Practices approved the awards which were presented during the last official meeting of the Technical Committee. Howard L. Bodily, APHA project officer and Ralston B. Read, Jr., FDA Contract officer were also honored for their significant contributions during the project. The Technical Committee met in Park City, Utah on 17 to 19 August 1983 to finalize details for the 15th Edition. The newest edition of this manual is due to be published in mid 1984.



*Technical Committee members recently recognized for contributions to the Fifteenth Edition of Standard Methods for the Examination of Dairy Products. Front: Elmer H. Marth, James W. Messer, Gary H. Richardson, Ronald A. Case, and John C. Bruhn. Back: H. Michael Wehr, Roy E. Ginn, Howard L. Bodily, project officer, Ralston B. Read, Jr., contract officer, and Robert T. Marshall.*

### USDA Manual Now Available for Detection of Salmonella in Poultry

A new USDA lab manual for quick and accurate detection of Salmonella in Poultry has just been released under the title "Procedure for Isolation and Identification of Salmonella From Poultry Carcasses". It was written by N. A. Cox, J. E. Thomson and J. S. Bailey.

It features step-by-step illustrated instructions; color photos showing typical salmonella colonies and biochemical reactions on testing media; and comparison of typical salmonella reactions on testing media with those of other Enterobacteriaceae.

Copies may be purchased for \$2.50 each, or \$52.00 per hundred from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

## Brucellosis Vaccines

Two types of brucellosis vaccines are now available to Minnesota farmers, the regular Strain 19 vaccine and a new, reduced-dose Strain 19 vaccine, according to Raymond Solac, University of Minnesota Agricultural Extension Service veterinarian.

"The reduced-dose vaccine reportedly allows veterinarians to distinguish between vaccination titers and brucellosis infection titers sooner," Solac says. "It's also supposed to minimize the problem of retained vaccination titers--that animals might be suspect as having brucellosis after a certain age and need to be retested. And, calves reportedly have less of a reaction to the reduced-dose vaccine."

Biological products containing active or infective agents of communicable, infectious livestock diseases can be sold in Minnesota only if they are licensed by the US Department of Agriculture (USDA). The USDA has licensed the reduced-dose vaccine of one company that is now entering trade channels and two other companies are expected to have similar vaccines on the market soon.

The legal distribution of the Strain 19 vaccine, both the regular and the reduced-dose forms, have not changed in Minnesota, Solac reports. And, the age when calves may be vaccinated remains the same: dairy calves may be vaccinated from two to five months of age; beef calves, from two to seven months of age.

"Although these calf ages may differ from those on the product label, they are, nevertheless, the authorized vaccination ages in Minnesota," Solac says.

Only five quarantined cattle herds keep Minnesota from becoming a bovine brucellosis-free state. Minnesota has already been designated a swine brucellosis validated-free state.

## Pfizer Announces New Product

Neutral Lactase, the enzyme lactase derived from *Candida pseudotropicalis*, a common food yeast, is now available from the Milwaukee Operations of Pfizer, Inc.

Pfizer's Neutral Lactase can be used to reduce the lactose content of non-standardized fluid milk, flavored dairy drinks, yogurt, ice cream and sweet whey, according to the announcement.

David Diffor, Product Manager, said lactase provides the dairy industry with an opportunity to improve both the quality and cost of existing products while unlocking marketing potential for entirely new specialties.

The Neutral Lactase development program required seven years of intensive research and efficacy testing by Pfizer Central Research in Groton, Connecticut and by the Milwaukee Technical Development staff.

Packaged in five-gallon polyethylene containers, Pfizer Neutral Lactase will be handled by Milwaukee dairy sales representatives under the direction of Gavin L. Hansen, Sales Manager.

Pfizer Milwaukee Operations, 4215 North Port Washington Avenue, specializes in enzymes, culture media, coagulants, color and related products for the dairy and food processing industries.

## NASFT Holds Show

The nation's specialty food industry is growing at a rate of 20% a year, confirming the emergence of a new American food lifestyle.

That dramatic growth rate, usually reserved for new industries, suggests why the 29th Annual International Fancy Food & Confection Show continues to break records year after year.

Held by the National Association for the Specialty Food Trade at the new Washington Convention Center, June 26-29, the show occupied 132,000 square feet, compared to last year's top mark of 96,000 in New York. And 21 nations enhanced the event with their own exhibits in the International Pavilion, up from 15 last June.

The marketing study showing the industry's growth was made by the British Trade Development Office from its New York office. It was released at a joint press conference with NASFT at the show. Hugh Bidwell, president of the British Food Export Council, announced plans based on the study to "wage a full-scale marketing effort" in the U.S.

"The Best of Britain" campaign, with an initial budget of about \$620,000 for the first few months, is slated to start in September to reach "the greatest market in the world," Bidwell said.

The industry's nationwide impact is reflected in the growth of NASFT's 9th Winter International Fancy Food & Confection Show. It will be held at the Moscone Convention Center in San Francisco, February 26-28, 1984. Even at this early date there are signs it will surpass last year's winter show, Kushner said.

## Hold-Over Refrigerating Plates From Dole Refrigerating Company

Dole Refrigerating Company of Lewisburg, Tennessee, notes that many Jamaican residents and tourists are enjoying cool, refreshing ice cream and cold milk; thanks, in part, to Hold-Over refrigerating plates from Dole Refrigerating Products Limited of Oakville, Ontario, Canada.

The economical and efficient Hold-Over plates are charged at night and keep products at a constant temperature during the next day's deliveries.

Dole's Plates were installed by Thermo-Router of St. Laurent, Ontario, Canada into truck bodies by Champion of St. Laurent. Sixteen of Champion's specialized, 100% aluminum ice cream vans and seven milk trucks, all with Dole Refrigerating systems, were shipped to four customers in Jamaica this spring. For more information contact: Kathy Hazlett, Dole Refrigerating Company, 1420 Higgs Road, Lewisburg, TN 37091, 1-800-251-8990.

## Spanish-Language Bulletin Describes Calcium Hypochlorite For Water Treatment

A new Spanish-language bulletin from PPG Industries describes the technical characteristics of Pittclor calcium hypochlorite for use in water treatment and other sanitization applications.

Sections of the bulletin give information on the chemical's properties, uses, available grades and forms, handling and storage, packaging and shipping, technical service assistance and required health precautions.

Calcium hypochlorite is used by municipalities to purify water, and by textile and paper mills, tanneries and petrochemical producers to treat wastewater effluents. Other calcium hypochlorite uses include sanitization by food and beverage producers, dairies, restaurants, hospitals and farms.

The bulletin, "Pittclor hipoclorito de calcio," may be obtained by writing PPG Industries, 10 North, One Gateway Center, Pittsburgh, PA 15272.

## New Quality Assurance Symbol Added to All Dederich Corporation Products

A new visual symbol of the company's commitment to highest quality has been added to all fluid products shipped from the Dederich Corporation, Germantown, Wisconsin.

The new gold-colored tag picturing the company logo represents the commitment of every employee to providing "championship quality cheese ingredients", according to Carl Dederich, President.

Dederich is a leading producer of culture media, microbial and animal rennet and other ingredients for cheesemaking.

The medallion-like symbol is also being shown in all of Dederich's advertising and sales promotion material,

to publicly emphasize the company's commitment to product purity, consistency and overall high quality, Dederich said.

Now in its tenth year of research, development and production of ingredients and food processing aids for the food and dairy industry, Dederich has recently added to its production facilities in Germantown to increase its ability to respond to its customers.

## Light n' Lively Yogurt Packaged in Conoffast Containers

Kraft Dairy Group, a division of Kraft, Inc., began packaging its Sealtest Light n' Lively Yogurt in new six-pack, 5-ounce containers produced by its recently installed Conoffast line. The product is the first major introduction in the U.S. of yogurt in multi-packs using the form, label, fill and seal method.

Developed by Continental Can Company, the Conoffast system offers the food processor the kind of diversity that helps position its products in the market place.

Frank J. Mechura, general manager, Conoffast, explains this concept: "Continental has a total systems approach to packaging which can benefit processors greatly. Continental believes that any new packaging product must consider the food being processed, the processing method, how the product gets to market and consumer perception of the product. In a period of change with new food products, changing lifestyles, differing consumption patterns and many other influential variables, this comprehensive approach is imperative. Kraft used our container design lab to work through the development of a package that was ideal for their purposes."

Although Kraft's current plans call for use of the system only in its normal form-label-fill-seal mode recommended for use to package refrigerated products, the Conoffast system is capable of running in 2 additional modes. The super clean Flash mode cleans incoming container and lid stock with a brief burst of radiant heat. Forming, filling and sealing take place at room temperature in a sterile environment, minimizing contamination and adding significantly to shelf life.

The aseptic operating mode, called the Neutral Aseptic System, is utilized for aseptically packaging shelf stable products. Without the use of chemical sterilants of any kind, sterility is achieved through the use of a patented, multi-layer coextruded plastic sheet.

Continental Can Company is a unit of The Continental Group, Inc.

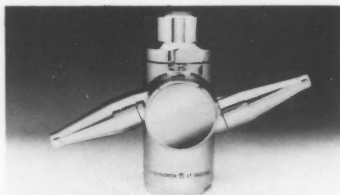
## New Product News

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

Butterworth has introduced a new, stainless steel LT Tank Cleaning Machine for use in cleaning tanks, vats, tubs and silos in the beverage, food processing and chemical industries. The lightweight, fixed-in-place machine is ideal for any cleaning requirement where resistance to caustic acids and sterility are important considerations. It's designed with a number of features which make it fast, reliable and easy to maintain.

The Butterworth LT machine is made of the highest-quality contamination-proof stainless steel and corrosion resistant material. Designed with twin nozzles, the LT unit rotates in two perpendicular axes, producing a criss-crossing "ball of twine" spray pattern. Concentrated jets of water or other solutions are projected in four variable cycles from light to heavy wash. The mechanical precision of the rotating pattern results in extremely efficient cleaning action, and the selection of wash-cycle pressures permits the operator to use only the amount of cleaning fluid needed.

For more information contact: Butterworth Systems (UK) Ltd., 123 Beddington Lane, Croydon CR9 4NX England; phone 01-684-4049; Telex: 946524. Or., Butterworth, Inc., 3721 Lapas Drive, Box 18312, Houston, TX 77223, 800-231-3628 or 713-644-3636.



*Butterworth Introduces  
New Tank Cleaning Machine*

The Clow Corporation of Florence, Kentucky now offers its complete line of "Poly Filter Dewatering System" filter presses for use in the food processing industry. The Clow plate and frame filter pressed are used for the clarification of fats, oils, honey and the reduction or removal of pulp from fruit juices, as well as other liquids/solids separation applications.

Clow also offers complete testing facilities to determine the feasibility of liquid/solid separation of customers materials, as well as pilot sized units which are available on a rental basis.

For more information contact: Dave Eddy, Marketing Coordinator, Clow Corporation, PO Box 68, Florence, KY 41042, 606-283-2121.

Safety rules often are not properly respected because their purposes seem remote. Now IDESCO Corporation has innovated a solution: Personalize a safety tag for each maintenance man by mounting his photo on an Idesco Q-Tag.

When others recognize that their co-worker's life is "on the line", your safety rules will get immediate and total respect. In 15 seconds you can make your own laminated Real-Life Tags easily and economically with the Idesco Q-Tag System.

This versatile system has also proven itself on many other operational applications such as Preventive Maintenance, Hazardous Materials, Valve Numbering, Start-Up Instructions, etc.

For more information contact: Idesco Corp., 25 W. 26th St., New York, NY 10010, 212-889-2530.



*Idesco Q-Tag from the Idesco Corp.*

The Nestle Company (NZ) Limited, has substantially increased its share of the instant coffee market in New Zealand with its new "Fine Blend" Nescafe coffee packaged in a reusable glass container and refill pouch.

The new mild flavor instant coffee was announced in May 1981 with a strong television and in-store promotional campaign. Eighteen months after its introduction, Nestle had gained a 15 percent market share.

Most of the instant coffee sold in New Zealand is packaged in glass, but Nestle decided to introduce this new product using a combination glass jar and flexible film pouch. According to Nestle officials, consumers like the idea of buying the glass jar only once. Then for all subsequent purchases, they buy the pouch and store the contents in the reusable container. The new soft pack also offers consumers a 10 percent savings compared with the equivalent glass pack.

The Nescafe pouch is made of Du Pont metallized "Mylar" MMC laminated to clear "Mylar" LBT. The package provides an outstanding barrier to air and moisture, keeping the instant coffee fresh and dry. Nestle reports that shelf life with the pouch is almost equivalent to the traditional glass packs.

Flexographically printed, the four-color graphics offer excellent point-of-purchase sales appeal. According to Nestle officials, the larger surface area and the high quality design and printing give the soft pack an advantage on the supermarket shelves.

Package printing was supplied by Whitcoulls, Christchurch, NZ, and won best of show for wide web printing in the American Flexographic Technical Association's International Competition.

Damrow, a pioneer and leader in the manufacture of dairy and food processing equipment and Alton, a recognized leader in the design and manufacture of corrugated packaging have combined their talents, knowledge and field proven experience to produce and market a corrugated container system for the repacking of 640 lb. blocks of cheese.

The complete system is designed to provide a high return on investment by reducing the amount of working capital, labor, inventory and freight costs in repacking 640 lb. blocks for aging, shipping or sales.

Damrow with its broad technical knowledge in the design, engineering and complete fabrication of cheesemaking equipment has incorporated this system into its automated packaging of 640 lb. blocks.

For more information contact: J. Gunning, Geer Murray Advertising, 219 Washington Ave., PO Box 140, Oshkosh, WI 54902, 414-231-9550.

•British-made equipment, which gives highly accurate analyses of bacterial growth in blood, urine and food, as well as determinations of antibiotic sensitivity, is said to be the fastest system available.

The Microbiological Growth Analyser can analyze blood in one day (9 days faster than with the radioactive food method). Levels of bacterial growth in food can be precisely measured in three hours, instead of the 24 or more needed with conventional methods. Antibiotic sensitivity can be determined in one working day instead of the two or three needed for optical measurement.

The analyzer measures bacterial growth in culture by monitoring the change in the electrical conductance of the growth medium.

Tubes containing working volumes of 10 ml or 100 ml of culture are immersed in a water bath maintained to within a few millidegrees of the required temperature. Two platinum electrodes are immersed in the culture, and because of the phase-sensitive detection and a measuring frequency of 10 kHz, conductance changes of about 0.1 microseconds can be measured. Analog voltage to 10 V is generated by these changes and is directly proportional to them and to the amount of growth in the sample.

Conductance of cultures, in 112 or 128 sample cells, is repeatedly monitored in sequence. Scan times are programmed from 4 minutes to 30 minutes. Data is collected, stored and processed by the system's built-in computer. Software is available for many common microbiological applications, including antibiotic sensitivity, minimum inhibitory concentration (MIC) and threshold levels. Results can be monitored on a chart recorder on the eight-channel system or shown in graphic or tabulated form on a visual display.

The system can be extended for screening blood and urine cultures, testing for antibiotic sensitivity, monitoring threshold levels for food spoilage, and providing precise data on factors affecting rate or patterns of microbial growth. Five water-heated incubators (each may be set to a different temperature) can be supported by one system.

Operating costs are low because sample cells, each with its own associated reusable electrodes, can be autoclaved repeatedly.

Inquiries from potential US customers, agents or distributors are welcomed by the company: Malthus Instruments Ltd., (Contact Roger Jukes, Director and General Manager), William Clowes Street, Burslem, Stoke-on-Trent, ST6 3AT, England.

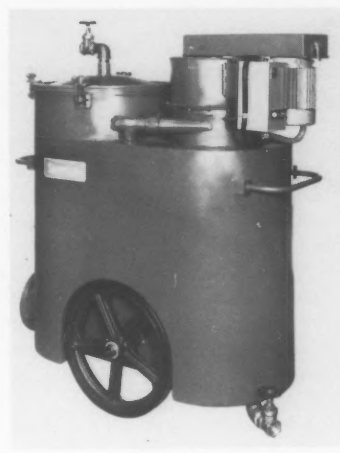
•Cleanup of liquids and slurry from food processing sites is easy with the Mobile SumpVac from Spencer Turbine Company.

Designed for easy one-man operation, the narrow, center-wheeled unit is only 28.5 inches wide and capable of 360° turning for easy maneuverability amongst processing equipment.

Difficult to handle liquids and slurry are picked up in one operation at a rate of up to 15 gallons per minute. A fine mesh filter separates sludge and liquid for later disposal and/or reclamation. A wide range of cleaning tool attachments are available or can be fabricated to meet any specific application.

Additional features include a continuous duty ODP, TEFC or explosion proof motor, spark resistant aluminum fans and fabricated steel weldment construction. Standard tank sizes are 55 to 125 gallons, with larger capacities available. All units incorporate an automatic shut-off when tank is full.

For more information on the Mobile SumpVac contact: John Sousa, The Spencer Turbine Company, 600 Day Hill Road, Windsor, CT 06095, 800-243-8160.



*Mobile Sump Vac by Spencer Turbine Co.*

•The Bell-Mark Corporation of East Orange, New Jersey is pleased to introduce to those companies utilizing aseptic packaging systems, a printing system to code, date or imprint any message at any stage of the packing operation. Bell-Mark, a leader in the field of coding and marking for 25 years, has just adapted its full line of equipment for printing on roll stock, pre-formed packages, shrink wrapped trays or cartons in conjunction with aseptic packaging.

Unlike most competitive imprinting systems, the Bell-Mark UC-300 and US-4001 Imprinters require no heat or expensive roll-leaf tape. In addition, they were designed to withstand any

•Mars Air Doors, the world's largest producer of air curtains, has announced a new line of heated and unheated models housed in new polycarbonate cabinets of various sizes.

Manufactured of molded high density polycarbonate, the new cabinets are resistant to high heat and all chemical and weather exposure. Because of its high impact strength the cabinet is guaranteed against breakage which translates into no replacement costs and long term economy. The new cabinets are designed to fit any type of architecture and the sound has been reduced in the motor fan assembly.

Mounted over doorways, Mars Air Doors have a powerful internal blower to direct an invisible curtain of air downward to keep out insects, dust, dirt and fumes. In addition, the curtain of air helps keep warm or cold conditioned air from escaping.

Mars Air Doors are used over receiving and warehouse doors, customer entrances and pass through windows. Mars Air Doors comply with USDA regulations and are the only air doors with National Sanitation Foundation and Underwriters Laboratory listing.

For more information contact: Mars Air Doors, 114 Sheldon St., El Segundo, CA 90245, 213-772-3321.



*Mars Air Door Polycarbonate Cabinet*

wash down procedure that is found in a typical dairy or beverage plant.

All of Bell-Mark's imprinting systems are the most cost efficient systems available that consistently deliver a high quality impression. They are designed to be low maintenance, dependable machines that will deliver a high return on the dollar in terms of service and performance. For more information contact: Loren J. Young, Bell-Mark Corporation, 444 William Street, East Orange, NJ 07017, 201-674-7711.

# IAMFES Annual Meeting Committee Reports

## FROM THE AMES OFFICE...

Earl O. Wright, Executive Secretary of the IAMFES retired after the 70th Annual Meeting in August, which was held in St. Louis.

Kathy R. Moore Hathaway, Associate since December of 1981, succeeded Wright in the position of Executive Secretary.

Hathaway earned her B.A. degree from the University of South Dakota, Vermillion. Since that time she has been employed in radio and publishing management, writing, marketing and public relations capacities.

The IAMFES office in Ames is staffed by three people. Suzanne Trcka is Administrative Assistant; and Jeanine Strotzman is Circulation Manager.

Please contact the IAMFES office for any suggestions, problems or questions you might have.

IAMFES, Inc., PO Box 701, 5th & Burnett, Ames, Iowa 50010. 515-232-6699.

## COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN

Last year the committee completed a manual "Procedures to Investigate Arthropod-borne and Rodent-borne Illness". This manual is companion to "Procedures to Investigate Foodborne Illness" and "Procedures to Investigate Waterborne Illness". It contains step-by-step procedures for sanitarians and others to use in investigating cases and outbreaks of suspected or confirmed arthropod-borne and rodent-borne illnesses. This includes methods of handling illness reports, interviewing persons, collecting and shipping specimens, developing case definitions, conducting vector surveys, analyzing data, and reporting cases and outbreaks. Tables summarize important vectorborne diseases, reactions to stings and bites,

supplies and equipment to use during field investigations. Forms suitable for recording data about cases, specimens, and surveys are provided.

The committee is beginning to revise the manual on "Procedures to Investigate Foodborne Illness" major additions or changes will cover developing a foodborne disease surveillance section, collecting specimens, developing case definitions, recommending or taking precautionary actions during the investigation phase of an investigation, conducting hazard analysis at places where foods most likely were mishandled, analyzing data, and testing for statistical significance. Some forms will be revised and the table of diseases and references will be updated.

## AFFILIATE COUNCIL REPORT

Chairman Leon Townsend called the meeting to order at 3:01 p.m., and asked individuals present to identify themselves. At the same time, Secretary Clem Honer circulated a sign up sheet for all delegates and guests to sign, indicating Affiliate representing, a member of the Executive Board, or guest. Members also were asked to provide the dates or dates of their next annual Affiliate meeting.

Affiliates present were: Leon Townsend, Kentucky; Ivan W. Redcay, Pennsylvania; Howard Eastham, California; Edith Mazurck, Texas; Kenneth W. Whaley, Tennessee; Bob Demott, Tennessee; Ruth Fuqua, Tennessee; Cecil White, Tennessee; Helene Uhlman, Indiana; Hugh Munns, Minnesota; Harold J. Schultz, South Dakota; Lloyd O. Luedecke, Washington; Dave Bandler, New York; Wendell Smith, Virginia; Robert Farst, Ohio; James Steele, Alberta; Neil M. Vassau, Wisconsin; Erwin Gadd, Missouri; Clem Honer, Illinois; Phil Hermens, Illinois; John Norris, Missouri; Roy G. Chapin, Michigan; Gary Teimmer, Michigan; J.F.

Sheehan, Michigan; Lowell Allen, Michigan; and Dick Whitehead, Mississippi.

Members of the Executive Board present were: Richard Brazis, Nebraska; Robert Marshall, Missouri; Harry Haverland, Ohio; Sidney Barnard, Pennsylvania, Leon Townsend, Kentucky; and Kathy Hathaway, Iowa.

Helene Uhlman made a motion to accept the minutes of the August 23, 1982 meeting as read since these were previously circulated among the members. Kenneth Whaley seconded the motion. Motion carried.

Chairman Townsend called upon President Robert Marshall to address the delegates. Dr. Marshall presented some results of the recent Executive Board Meeting. 1, Kathy R. Hathaway had been appointed as Executive Secretary of IAMFES, replacing the retiring Earl Wright. 2, Dr. Marshall indicated a reactivation of the foundation fund representing a portion of the sustaining membership supporting funds. 3, The Executive Board voted to support the second annual National Conference on Food Protection for the year 1984. 4, That the efforts to change the name of the association (IAMFES) has been tabled for the present time. 5, Marshall expressed concern that some State Affiliates had only a few International members. He felt that this could be a source of additional members for IAMFES.

Chairman Townsend thanked Dr. Marshall for his comments and called upon Earl Wright for a few words. Earl made note of the fact that this would be his last active meeting with IAMFES and took the opportunity to thank everyone for the last ten years. "I've enjoyed every minute," Wright commented.

Chairman Townsend then asked Kathy Hathaway for her comments. She thanked the Affiliates for the increased information provided regarding meeting notices, and pointed out the availability of using the IAMFES exhibit for affiliate meetings. She ac-



knowledgeable Indiana's result in bringing in additional IAMFES members. She also pointed out the role that the Ames office has available for billing dues, and urged all Affiliates to take advantage of the service. For 1984, she asked every member to sign another member. Packets were then handed out for each State/Province delegate.

Chairman Townsend called upon Phil Hermesen for a membership report. Hermesen reported an increase of 16 members in 1983 over 1982. He also urged that the Secretary of Affiliates be assigned membership duties.

Leon Townsend then urged all affiliates to let IAMFES do their billing. "Kentucky tried the method and are very satisfied with it," he added.

Delegate Honer asked for suggestions from others regarding procedures used to maintain membership interest. In response, Harold Eastham said the California Affiliate had hired a full-time secretary that helped considerably in keeping the members informed and interested in the association. The New York delegate stated that including the pesticides group with the sanitarians helped. Helene Uhlman mentioned the value of issuing continuing education units (CEU's) in maintaining membership interest. Others pointed to the advantage of splitting milk and food sanitarians with specific programs at the affiliate meetings.

Earl Wright lamented the fact that affiliate associations were very remiss

in getting local publicity regarding local meetings.

James Steele presented a plug for all members to attend the 1984 IAMFES meeting in Canada.

Chairman Townsend called for nominations for Chairman and Secretary. Helene Uhlman was nominated for Chairman by Dave Bandler. Honer made a motion that the nominations be closed. Motion carried. Edith Mazurck nominated Clem Honer for Secretary, seconded by Uhlman.

Chairman Townsend adjourned the meeting at 4:48.

Respectfully submitted,  
Clem Honer, Secretary

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<input type="checkbox"/> Sustaining Membership	\$300 entitles you to both journals for one year			

\*State dues vary. Please contact us if you do not know what your state dues are.

Foreign and Canada add \$7 per journal for postage

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- Procedures to Investigate Waterborne Illness  
1-24 copies \$1.75  
25-99 copies \$1.50  
over 100 copies \$1.15 each
- Procedures to Investigate Arthropod-borne and Rodent-borne Illness  
1-24 copies \$2.00  
25-99 copies \$1.75  
over 100 copies \$1.50
- Procedures to Investigate Foodborne Illness  
1-24 copies \$1.50  
25-99 copies \$1.25 each  
over 100 copies \$.90

#### Check those you need: (payment must be enclosed)

- 3-A SANITARY STANDARDS**
- Complete set 3-A Dairy \$20 each  
 Complete set 3-A & Egg Stds. \$25  
 Egg 3-A Stds. \$15 each
- Five Year Service on 3-A Sanitary Standards (updates)**
- 3-A Standards \$12  
 Egg 3-A Standards \$6

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# NCIMS Goat Milk Task Force

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**HENRY V. ATHERTON, Chairman**  
*NCIMS Goat Milk Task Force*

## INTRODUCTION AND CHARGE

The 1981 National Conference on Interstate Milk Shipments recognized that recent evidence indicates there may be basic differences between cow and goat milk which requires study to determine if separate standards should apply to each in the area of somatic cell counts, fat, cryoscope, etc. The conference further recommended that a Task Force be appointed to review this issue as it relates to the PMO, and make a report at the next Conference in 1983.

Chairman Boosinger recommended and the Executive Board concurred in the appointment of the following people to serve on the Task Force, with Leland Lockhart serving as Chairman in organizing the Committee:

Paul Ashbrook, President-American Dairy Goat Assn., Portage, Wisconsin; Henry Atherton, University of Vermont, Burlington, Vermont; Ann Dulin, USDA Research Station, Beltsville, Maryland; Joe W. Hall, S.C. Dept. of Health & Env. Control, Columbia, S.C.; Lynn Hinkley, University of Connecticut, Storrs, Conn.; Judy Kapture, ADGA-Milk Laws Committee, Shawnee, Kansas; Leland Lockhart, California Dept. Food and Agric., Sacramento, Cal.; Robert N. Mullen, Vermont Dept. of Agric., Montpelier, Vermont.

## APPROACH

The Task Force has held two scheduled meetings and has exchanged numerous phone and written communications. An organizational meeting was held in Louisville, KY during the IAMFES Annual Meeting in August 1982. Henry Atherton was elected to Chair the Task force. Lynn Hinkley agreed to review the literature on Somatic Cells in goat milk, in particular that relating to current methodology for somatic cell estimates. A second meeting of the Task Force in Louisville in February, 1983 permitted a review of information collected to date and a start toward preparing the report to be presented to NCIMS in May.

At the August meeting, it was suggested that a survey be made of pertinent information in the agencies responsible for regulatory control of retail goat milk sales in the 50 states. At the same time, a request was made for the Directors of these state agencies to furnish the Task Force with any information of activity or interest relating to this problem in their respective states. At the same time, a request was made for the Directors of these state agencies to fur-

nish the Task Force with any information of activity or interest relating to this problem in their respective states. They were asked to furnish the Task Force with any regulations in their respective states relating to goat milk production and marketing and to let us know of any research activity or reports which could be useful in Task Force deliberations.

The Task Force appreciates the splendid cooperation of the Directors of the State Agencies and for the interest they have shown by providing us with solid information to complete our responsibility to the IMS Conference. Returns were received from 47 of the 50 states, giving us valuable information on both regulatory requirements relating to goat milk production and sales as well as statements concerning pertinent activity or attitude in their respective states. Several sent DHIA summaries and/or results of other studies which have been most valuable in developing this report.

## THE SITUATION

There is ample evidence of increasing interest in the dairy goat industry in the United States. Haenlein (1981) notes there are at least 143 dairy goat associations and clubs in 31 states. There were 1450 dairy goat herds on DHI official test in the U.S. in 1980. Further, he reported the number of youngsters in 4-H dairy goat activities in the U.S. increased from 3530 in 1972 to 16,618 in 1980. Holsinger (1982) observed there were 32,459 registered goats in the U.S. in 1976, up nearly 900% from 1955. The DHIA Policy Board reestablished its Dairy Goat Committee in 1981 with 13,400 does in 1400 dairy goat herds in the DHIA system. Such widespread interest in the goat industry in the U.S. would seem to mandate serious consideration be given to establishing suitable and separate sanitation and composition standards which recognize the natural differences between cows' milk and goats' milk.

Marketing goat milk normally does not follow well established procedures for processing and handling cows' milk. Most goat dairies market fluid milk only and in relatively small quantities. Fat percentages do not seem to be a major consideration of goat milk purchasers. Goat milk dairies have no reason to adjust the normal milk fat concentration of their milk and few have equipment to do so.

## RESULTS OF TASK FORCE STUDY

The Goat Milk Task Force was appointed because voting members of NCIMS became aware of at least two major areas of continuing concern among goat milk producers

and some regulatory agencies working with the retail goat milk industry. These were:

- 1) Are DMSCC levels established by NCIMS and presently in the PMO valid for milk produced by the caprine species? and
- 2) Are minimum fat percentages established within the PMO and most state regulatory codes suitable when applied to goat milk?

The Task Force members reviewed pertinent literature describing the composition and properties of goat milk. They surveyed state agencies responsible for regulatory control in the production and marketing of retail goat milk. The results of these studies follow:

#### A. Direct Microscopic Somatic Cell Count.

State laboratories use a variety of procedures approved for cows' milk samples for determining DMSCC levels in goat milk. Several no longer use the Optical methods for goat milk. The following information is available in dairy literature relating to somatic cell counts in goat milk:

- I. It has been reported that somatic cell counts on milk from normal goats are higher than those on milk from normal cows. 2-5, 8-11, 13, 14, 16, 18.
- II. The milk secretion system of cows is merocrine while the system in goats is apocrine. 1, 3, 17.
  - a. Apocrine secretion results in the release of cytoplasmic particles. 1, 3, 17.
  - b. These particles have been studied by several groups. 1, 3, 9, 10, 17, 19.
  - c. Merocrine secretion does not release these particles. 1, 6, 7, 17, 20.
- III. It had been reported that cytoplasmic particles are a result of normal secretion in the goat and as such they must not be included in somatic cell counts. 3, 9, 10, 18, 19.
- IV. However, some counting methods do not distinguish cytoplasmic particles.
  - a. coulter counter. 3, 12.
  - b. direct microscopic somatic cell count (DMSCC) using Levowitz-Weber modification of the Newman-Lampert stain. 3, 9, 10.
- V. There are methods which do distinguish cytoplasmic particles from nucleated cells.
  - a. DMSCC using differential strains.
    1. Pyronin Y-methyl green stain 3 (to be published in next edition of Standard Methods for the examination of Dairy Products).
    2. modified Wright's stain 9, 10.
    - b. membrane filter -DNA 3.
    - c. Fossomatic cell counts 3.
    - d. California Mastitis Test (CMT) 15, 17, 18.
    - e. Wisconsin Mastitis Test (WMT) 3.

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#### B. Milkfat percentages in goat milk.

Overwhelming evidence was obtained from Regulatory and DHIA records and from Experiment Station data to conclude low seasonal milkfat percentages are common and normal in goat milk. These data show:

- I. Lactation averages for all dairy goat breeds would appear to be well above legal minimums established for cows' milk in the several states and in the PMO.
- II. Lactation records (DHIA), monthly experimental data, and laboratory results of periodic testing by regulatory agents responding to the survey show it is not unusual for fat percentages to be well below legal minimums for one to three months of the year. For example:

#### Fat Content

- a. Missouri - Goat Retail Samples - Official Test - 1 Herd (08/27/80 - 10/12/82) 18 samples - ave. 3.50% (2.6-7.2), 5 samples - 3.0% or below.

b. Vermont 1980 - 11 producers - monthly sampling - herd averages

(Vt. Agr. Exp. Sta.) (Unpublished data) 2.70-5.11% fat range 1.10-6.50  
9 of 11 herd samples tested 3.0% or below at least 1 month.

1981 - 9 producers-monthly-herd averaged 2.8-5.80% fat

1982 - 11 producers-monthly-herd averaged 2.75-5.50% fat range 2.50-6.00% fat  
7 of 11 tested 3.0% or below at least once

c. The average fat content of goats' milk is 4.14%. In practice, many producers report values below 3.25% (Holsinger). Fat content may vary by 2% and SNF by 1% (Holsinger).

d. Venezuela (1970) - TS 11.5% (11.0-13.0%)  
Fat 3.36% (2.0-5.0%)  
Protein 2.9% (2.3-3.9%) Le Jaouen (1972)

Yugoslavia (1973) - Fat 3.07% (2.5-4.4%)  
Protein 3.51 (2.97-4.26)  
TS 11.95% (10.71-12.44%)  
Casein 2.46 (1.94-2.97)  
SNF 9.12% (8.11-9.78)  
Ash 0.88 (0.83-0.98%)

Quoted in IDF Dec 140 (1981) Composition of Ewes' and Goats' milk

e. California DHIA results - (Laurelwood Acres) '79-'80 - monthly averages - fat.

31- 35 UCD Alpine	ave	3.55% fat	(3.20-4.33)
122-164 Toggenburgs		3.31%	(2.98-3.67)
106-151 Saanen		3.51%	(3.24-3.95)
44- 80 Nubian		4.38%	(3.70-4.89)
275-358 Alpines		3.52%	(3.18-3.83)
79-110 Lamanches		3.79%	(3.42-4.08)
58- 84 Grades		3.53%	(3.27-3.92)
717-968 Total		3.57%	(3.23-3.88)

f. Florida-Official Samples 1 goat herd 1976-82  
72 samples raw 4.20%-4.56%  
37 samples past. 4.26%-4.77%

### C. Other areas of interest.

There is general agreement that differences between cows' milk and goats' milk are evident in respect to milkfat and DMSCC. A third property of milk, freezing point, appears to differ consistently, also, for example:

I. A three year study of milk samples from 19 goat dairies in Vermont showed normal freezing point depression was much greater in goats' milk than has been reported in cows' milk. In 1980, average freezing point data for eleven goat dairies ranged from  $-0.572^{\circ}$  to  $-0.623^{\circ}$  with monthly herd samples ranging from  $-0.546^{\circ}$  to  $0.795^{\circ}$ . In 1981, 14 herds averaged from  $-0.538^{\circ}$  to  $-0.580^{\circ}$  with monthly herd averages ranging from  $-0.515^{\circ}$  to  $-0.598^{\circ}$ . In 1982, 11 herds averaged  $-0.553^{\circ}$  to  $0.590^{\circ}$  with monthly herd averages from  $-0.548^{\circ}$  to  $-0.670^{\circ}$ .

II. Results from one herd tested in Missouri gave an average freezing point of  $-0.575^{\circ}$ , with range of  $-0.544^{\circ}$  to  $-0.586^{\circ}$ .

These results are well below published values for cows' milk and indicate extensive adulteration with water could occur before freezing point values would rise to  $0.525^{\circ}$ , the established legal maximum for cows' milk samples.

Task force members have been made aware of other characteristics that seem to differ between goats' milk and cows' milk. The Task Force has inadequate data to confirm the validity of these possible problem areas. Further study should be encouraged to verify or lay aside these suggested differences.

Areas of possible concern needing further clarification include:

I. The use of the phosphatase test to assure proper milk pasteurization. Dr. Frank Pinkerton, Director of the International Dairy Goat Research Center, Prairie View A & M, Prairie View, Texas noted the phosphatase enzyme inactivation curves for goats' milk are parallel with *Coxiella*, Q-fever and tuberculosis. Also, the low amount of alkaline phosphatase enzymes in goats' milk results in failure of the phosphatase test to distinguish between raw and pasteurized product. A test involving ultrafiltration - concentration to 2X solids followed by the phosphatase test appears to work properly. Workshop on goats' milk, USDA SEA-CRRC, Philadelphia. Aug. 11-12, 1981.

Data from one goat herd in Missouri did not indicate any problem with false positive reaction during a two-year study period.

II. Is there a "natural inhibitor" in goats' milk that will cause a false-positive reaction with the *Bacillus stearothermophilus* disc assay procedures for antibiotic? Several states have reported questionable results with no apparent reason for antibiotic to be present. Vermont studies have not found any false-positive samples to date. Is the problem with the 14-16 mm zone which has been addressed by NCIMS recently? Information received from Canada recently points to a rather consistent problem with false positives in goats' milk.

III. Use of ring test to detect brucellosis in goat herds has been questioned. Information available suggests ring test has suitable reliability in checking individual goat's sample but causative agent dilutes very rapidly in mixed milk sample. U.S. Animal Health Assn. questions need for brucellosis testing in dairy goats because *B. melitensis*, the causative agent in goats, is not present in the U.S.

IV. What is effect of freezing on goats' milk? Kapture reports freezing surplus summer milk for use in winter was common in earlier years. California permits practice of freezing in their regulations. Dr. Phillip Smith (ERRC) notes freezing in bulk tanks

can cause rancidity (Baker letter). Dr. Douglas (ERRC) is studying freezing as means of long term preservation of goat milk.

- V. What is the solids-not-fat content of goat milk? (Kapture). Does goat milk behave as cows' milk does? If milk fat content is lowered, should not SNF requirement be lowered also? Should be studied.
- VI. Is there a relationship between milk fat level and flavor of goat milk? Kapture notes no evidence of consumer response. Dr. Smith (ERRC) suggests lower percentage of milk fat may be related to more "goaty" flavor.

Other compositional differences between goats' milk and cows' milk.

- I. Jenness (1981) reported goat milk has been shown to be deficient in C, D, B<sub>12</sub>, folacin, and possibly B<sub>6</sub> (pyridoxine). A major cause of goat milk anemia in infants is lack of adequate folacin which is needed for the synthesis of haemoglobin. Several cases of anemia traced to goats' milk diets were cured by added folic acid.
- II. Holsinger (1982) indicates the major protein in goats' milk is the B-caseins. A  $\kappa$ -1-casein, the major casein of cows' milk is absent in goats' milk. Absence of a  $\kappa$ -1-casein in goats' milk makes it possible to detect adulteration of goats' milk with cows' milk. It has been reported that as little as 1% of cows' milk may be detected in goats' milk by gel electrophoresis.

"Adulteration of goat milk with cow milk is easily detectable. In research in England they were able to detect a five percent adulteration with cow milk. I believe I could pick up a two percent adulteration fairly easily." Dr. Marvin Thompson - USDA. Quoted in Dairy Goat Guide. April 1980.

#### Rapid Detection of Cows' Milk in Goats' Milk.

A rapid cellulose acetate electrophoretic system is described for the detection of cows' milk in goats' milk. The system is suitable for the detection of as little as 5% (v/v) of cows' milk in goats' milk. By precipitating the casein and doubling its original concentration the level of detection was lowered to 1% (v/v). (Aust. Jour. Dairy Tech. pp. 15-16. March 1980. DRD, 10:10). 10/80.

#### Detection of Cows' Milk in Goats' Milk by Immunoelectrophoresis.

A simple, reliable and accurate method for detecting cows' milk added to goats' milk is described. The method is rocket immunoelectrophoresis employing anti-cows' milk serum produced by a goat. Using this

technique, cross-reaction between goats' milk and the antibody is almost totally absent and the tedious purification of the antiserum which is essential when the antibody is developed in other laboratory animals such as rabbits is avoided. Rocket immunoelectrophoresis provides a quantitative non-ambiguous indication of adulteration of goats' milk, in a form which is easily preserved as a permanent record. (Aus. J. Dai. Tech. pp. 144-146. Dec. 1981. DRD 12:6.)

### RECOMMENDATIONS

Information made available to the Task Force indicates there are basic differences in milk produced by bovine and caprine species that should not be ignored. Task Force members believe these differences in composition and properties of goat milk preclude the continued reference of a single set of legal standards regulating the sale of cow milk and goat milk to the consuming public.

There appear to be major predicatable differences in at least three normal constituents and properties of goats' milk and cows' milk. The NCIMS Goat Milk Task Force recommends separate compositional and/or analytical procedures should be established by the voting membership of NCIMS for regulations of goat milk in relation to:

1. Regulations concerning milk acceptability based on total somatic cell count. Some methods used to determine this count lack the specificity to differentiate somatic cells from the cytoplasmic particles which have been proven to be a normal component of goat milk. This discrepancy may result in the erroneous classification of normal goat milk as unacceptable milk. Therefore, regulations dealing with somatic cell count in goat milk must clearly state that only nucleated cells, as opposed to cytoplasmic particles, should be counted and that only methods which distinguish these cells may be used in determining the somatic cell count. It is the consensus of the Task Force members that if such clarification of DMSCC methodology is accepted by voting members of the NCIMS, then a uniform somatic cell count standard for cows' milk and goats' milk would be justified.
2. Regulations concerning minimum milkfat requirements for goats' milk: A lower milkfat percentage should be established for goats' milk. Normal amounts of milk fat produced within a lactation cycle vary widely and consistently. Goat herd and individual doe (DHIA) average milk fat percentages frequently drop to less than 3.0% for one or two months of each lactation cycle. Few goat dairies are equipped to determine milk fat percentages and standardization is not common in the industry. Goat milk which is mechanically standardized should conform to acceptable milk fat standards for cows' milk.
3. Determination of adulteration by adding water to goat milk. Limited data indicate normal freezing

points of goat milk samples may be much lower than is the case with cows' milk. Further study should be made to determine appropriate freezing point standards to detect water adulteration of goats milk.

4. The Task Force members believe the Executive Board of NCIMS should request its Laboratory Committee to appoint a Subcommittee which would continue the work of this special Task Force to monitor developments in determination of the properties of goat milk and to evaluate methodology recommended for making such determinations.

Respectfully submitted,  
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**Editors Note:** We regret that since this Committee Report, Leland Lockhart has passed away. See page 465.



**N.M.C.**

NATIONAL MASTITIS COUNCIL

#### Teat Dipping Pays

The bottom line of teat dipping is it pays! Explaining how it pays under every dairy farm situation is very difficult. A herd with a high somatic cell count has a different measurement than herds with a low somatic cell count. One must remember that the calculation of money returns is not simple or straight forward because benefits are determined by prevention of udder infection.

A conservative estimate suggests that mastitis can cost dairymen \$160 per cow, per year. Each infected quarter will lose 30% or more of milk production, because milk producing tissue is destroyed by mastitis pathogens. In fact, 70% of the dollars lost from mastitis are due to reduced milk production. The dairy farmer never sees this lost production because it is never harvested. He only sees and remembers those heavy producing cows that develop clinical mastitis which requires treatment, causes milk to be dumped, and a very measureable loss of production. The dairyman cannot see production lost from infected quarters that are not clinical and this is milk that is stolen from infected quarters by the dairyman's worst enemy...subclinical mastitis. Almost all clinical cases of mastitis develop from subclinical mastitis. The key to mastitis management is to control subclinical mastitis with a strong prevention program.

When teats are not dipped, an additional infection per cow can develop during lactation. Dipping every teat after every milking is an effective program that prevents at least 50% of these new udder infections.

Measuring results of teat dipping varies depending on the current SCC (somatic cell count) of a herd.

Positive results can occur more rapidly in high SCC herds and especially when cell counts are near a million. Rate of new infection is high in these herds and teat dipping prevents most of them. In problem herds, all management practices need to be reviewed and greater emphasis placed on milking procedures, dry cow therapy, and procedures for treating clinical cases, as well as environmental and nutritional factors.

In low SCC herds, the economic benefits of teat dipping are obtained by prevention of new udder infections which is an insurance policy against mastitis to save milk. In such herds, when teat dipping is discontinued one can expect an increase of infected quarters and you can bring a "low" herd to a level found in "high" herds within a twelve month period when teat dipping is terminated. It has been proven that teat dipping every teat after every milking does pay.

Do not expect miracles! A mastitis control program can take twelve to eighteen months before major positive effects are demonstrated. The question you must ask... are you harvesting all the crop, or is mastitis stealing profits?

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# Dairy Quality

by **DARRELL BIGALKE**

*Food and Dairy Quality  
Management Inc.  
St. Paul, MN*

## SUGGESTED TESTING PROCEDURES TO MONITOR THE QUALITY OF PASTEURIZED FLUID MILK

The quality of a food product is always related to consumer acceptance. Certainly in the fluid milk industry, consumer acceptance is the primary objective of a dairy's quality assurance program. When defining a quality fluid milk product, several factors must be considered ... (1) the microbial population of the product, (2) the product must be safe from a public health standpoint, (3) the product must be free from any physical contaminants such as hair, straw, or other foreign materials, (4) the product must be free from physical defects such as ropiness or sweet curdling, (5) the product must maintain acceptable nutritional quality, (6) the product must be free from chemical contaminants such as detergents, pesticides, antibiotics, excessive amounts of added vitamins and the like, and (7) the product must be free from any off-flavors and have an extended shelf-life to assure consumer acceptance.

Quality control is a major management function in the dairy industry. Quality has to be built into a product and cannot be effectively or economically achieved by inspection alone. The primary objective of quality control is to oversee production, however, to assure a high level of consumer acceptance, a dairy must take quality control one step further and develop a quality assurance program. Quality assurance would include ingredients inspection and control, manufacturing and process control, and distribution control. Since dairy products usually obtain the name of the dairy producing the product, distribution control is a very necessary part of a quality assurance program.

A quality assurance program that has been successfully implemented by the food processing industry is the Hazard Analysis Critical Control Point (HACCP) concept (1,3,4,5). While HACCP was developed for food safety by the food processing industry, the HACCP concept can be applied to the dairy industry to assure both product safety and product quality.

The HACCP system is a preventive program for quality assurance designed to inform management of potential risks and what corrective action can be taken if problems are evident. The HACCP concept considers microbiological and physical hazards for ingredients, processing, and the potential for consumer abuse. This system surveys all physical and biological systems, identifies hazards, eliminates correctable hazards, and establishes control for hazards that must remain part of the process. It also selects testing procedures and establishes sampling schedules.

**CORRECTION...**Please note this particular DAIRY QUALITY was published in the November Issue incorrectly. This is a revised, corrected copy.

The objective of this month's article is to suggest testing procedures and sampling schedules that are appropriate for the fluid milk industry. The scheme suggested is not exhaustive, however, it does consider ingredients, processing, and finished product inspection. A proposed scheme for monitoring the keeping quality and consumer acceptance of fluid pasteurized milk is as follows:

### I. *Monitoring Ingredient Quality (Raw Milk)*

- A. Train each hauler to note the odor of each tank on the farm.
- B. Taste test each load as it is received. Ideally, this should be conducted by lab pasteurizing the sample at 155F for 10 minutes, cooling the sample to 60-70F, and organoleptically evaluating as suggested by Floyd Bodyfelt (2).
- C. Conduct Standard Plate Counts or Preliminary Incubation Counts and inhibitory tests on incoming loads and producer samples as often as necessary.
- D. Determine Standard Plate Counts and taste test the milk at the balance tank and on any milk held at the dairy for longer than 24 hours.

### II. *Pasteurized Milk (Process Control)*

- A. Conduct daily line sampling starting with at least two 50+ ml samples from the HTST, one 50+ ml sample from each pasteurized storage tank, and one 50+ ml sample at a site above each filler.
- B. Conduct weekly environmental analysis by determining microbial content of compressed air, glycol, sweet water and water.
- C. Conduct swab tests on suspect product contact areas.
- D. Determine microbial content of packages.

### III. *Finished Product Inspection*

- A. Conduct Standard Plate Counts and Coliform Counts on a product from each filler for each six hours of production.
- B. Taste test a sample from each machine for each six hours of production.
- C. Conduct 7-day counts on two products from each filler.
- D. Taste test two products from each filler at 7 days, at the end of code, and at 7 days beyond code for each six hours of production.
- E. Record all physical defects and any off-flavors that are present.
- F. Determine net weight, leakers, etc.
- G. Initiate an effective record keeping system -- documentation is a necessary function of a properly conducted quality assurance program.
- H. Statistics can be used to place levels of confidence on test results and determine testing frequency.
- I. Initiate a system of recording consumer complaints and follow-up on these complaints.

### IV. *Monitoring temperatures, especially fill temperatures, will be the subject of next month's article.*

An effective quality assurance program must include flavor and microbiological analyses. Each dairy should

have two or more people trained in flavor analysis. Several of the state dairy or university extension services offer courses in sensory evaluation of milk. A course such as this is essential for persons responsible for a dairy's quality control program. If these courses are not available, procedures outlined by Shipe, et. al (6) can be used to simulate off-flavors.

In summary, a good quality assurance program for the fluid milk industry must monitor and control ingredients, processes and distribution.

- (1) Bauman, H.E. 1974. The HACCP concept and microbiological hazard categories. *Food Technol.* 28(9):30,32,34,74.
- (2) Bodyfelt, Floyd. 1979. Flavor is the voice of milk. *Dairy Record*, September, 1979.
- (3) Ito, K. 1974. Microbiological critical control points in canned foods. *Food Technol.* 28(9):46-48.
- (4) Kauffman, F.L. 1974. How FDA uses HACCP. *Food Technol.* 28(9):51,84.
- (5) Peterson, A.C., and R.E. Gunnerson. 1974. Microbiological critical control points in frozen foods. *Food Technol.* 28(9):37-44.
- (6) Shipe, W.F. et. al. 1978. Off-flavors of milk: Nomenclature, standards and bibliography. *J. Dairy Science* 61(7):855-869.

## Welcome. . .New Members and Subscribers to the IAMFES Family...

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Harold D. Anderson, Jr.  
State of Wyoming  
Dept. of Agric.  
Buffalo, WY

# Calendar

1984

February 7 & 8, 1984, **FOOD PROCESSORS SANITATION WORKSHOP**. Presented through the cooperation of sanitation organizations, industry trade associations, and the University of California Cooperative Extension. Mission de Oro, Santa Nella, California. For more information contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916-752-1478.

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

Feb. 21-22, 1984, **KENTUCKY ASSOCIATION of Milk, Food & Environmental Sanitarians** spring meeting, Executive Inn, Louisville. For more information contact Dale Marcum, Box 139, Frankfort, KY 40602. 502-564-3340.

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

April 9 - 11, 1984 **BIOTECHNOLOGY OF MARINE POLYSACCHARIDES** is the topic of the third annual MIT Sea Grant Lecture and Seminar at Massachusetts Institute of Technology, Cambridge, MA. For more information contact Therese Z. Henderson, MIT Sea Grant Information Center, 77 Massachusetts Ave., Bldg. E38-302, Cambridge, MA 02139. 617-253-7041.

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

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

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

May 27-30, 1984, **THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY'S 27TH ANNUAL CONFERENCE**, Hyatt Regency Vancouver Hotel, 655 Burrard Street, Vancouver, B.C., 604-687-6543. For more information contact: Jerry Hedding, Publicity Chairman, Qwest Food Ltd., 260 E. 5th Ave., Vancouver, B.C., V5T 1H3, 604-873-2647.

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

July 14 - 21, 1984 **WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY**, at Kansas State University, Manhattan, Kansas. Dr. Daniel Fung, Dr. Nelson A. Cox and Dr. Millicent C. Goldschmidt will present lectures. The course will carry 7.2 Continuing Education Credits for the American Society for Microbiology. For more information contact: Dr. Daniel Y. C. Fung, Call Hall, Kansas State University, Manhattan, KS 66506. 913-532-5654.

July 29 - August 2, 1984 **24TH ANNUAL MEETING OF THE HOSPITAL, INSTITUTION & EDUCATIONAL FOOD SERVICE SOCIETY (HIEFSS)**, at the Riviera Hotel and

Convention Center in Las Vegas, Nevada. The HIEFSS Expo '84 will be open on July 31 and August 1, 1984. For more information contact: Carolyn Isch, Asst. Exec. Dir., HIEFSS, 4410 W. Roosevelt Rd, Hillside, IL 60162. 1-800-323-1908 or 312-440-2770.

Aug. 5-9, 1984, **IAMFES ANNUAL MEETING**, Edmonton Inn, Edmonton, Alberta, Canada. For more information contact Peggy Marce, Alberta Association of Milk, Food & Environmental Sanitarians, PO Box 8446, Station F, Edmonton, Alberta, Canada T6H 5H3.

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

1985

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

August 25-30, 1985 **9TH SYMPOSIUM OF WAVFH**. The World Association of Veterinary Food Hygienists (WAVFH) will hold their 9th Symposium in Budapest, Hungary. For more information contact: 9th WAVFH Symposium, Organizing Committee, Mester u. 81, H-1453 Budapest Pf 13, Hungary.

1986

May 26-31, 1986 **2ND WORLD CONGRESS FOODBORNE INFECTIONS AND INTOXICATIONS** will take place in Berlin (West) at the International Congress Centre (ICC). For more information contact: FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine (Robert von Osterreich-Institute), Thielallee 88-92, D-1000 Berlin 33.

## AFFILIATE NEWSLETTER . . .

### Minnesota Meeting Highlights

The Minnesota Sanitarians Association held its Annual Meeting at the Earl Brown Continuing Education Center, University of Minnesota, on September 15 and 16, 1983.

One hundred and thirty five people attended the banquet at Stroh's Brewing Co. Honorary Life Memberships were presented to W. C. Lawton, a past president of IAMFES and Hollis Beard, retired from Kraft, Inc. The Achievement Award was presented to LeRoy Carlson, a fieldman for 37 years who works for Mid America Dairymen, Inc.

New officers were elected and are: Charles Schneider, President; Dr. Michael Pullen, President-Elect; William Coleman, Vice President; and Roy E. Ginn, Secretary-Treasurer.



*Don Berg (l) presenting Honorary Life Membership to Hollis Beard (r).*



*Don Berg (l) presenting Honorary Life Membership to W. C. Lawton (r).*



*Don Berg (l) presenting Achievement Award to LeRoy Carlson (r).*

### Ohio AMFES Holds Fall Meeting

The Ohio Association of Milk, Food and Environmental Sanitarians Fall Meeting was held on October 5, 1983 at Duff's Smorgasbord in Columbus, Ohio.

Sixty-six people were registered for this interesting and informative meeting. A large number of local health department sanitarians were present. This was their best attendance to date.

There were four guests from the Food and Drug and Laboratory Services in Nigeria present, as well as one guest from the FDA in Washington, DC.

New Officers were named, they are: Dean Devore, President; Edward Leavitt, Vice-President; Emil Mikolajcik, 2nd Vice-President; Ronald H. Smith, Secretary-Treasurer; John Lindamood, Jr. Past President; F. Bryan Black, Sr. Past President; and Harry Haverland, IAMFES Advisor.



*Merry Christmas and a Blessed New Year from the Ames office. l to r Kathy Hathaway, Suzanne Trcka, Jeanine Strodman. Thank you for your support this past year.*

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## JFP Abstracts

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**Factors Affecting Protease Production by *Bacillus stearothermophilus* RM-67**, A. K. Chopra and D. K. Mathur, Division of Dairy Microbiology, National Dairy Research Institute, Karnal-132001, India

*J. Food Prot.* 46:1020-1025

Amongst the nitrogen sources, tryptone and yeast extract at 0.5% and 0.15% level, respectively, caused maximum enzyme production by *Bacillus stearothermophilus* RM-67. Addition of sodium chloride (0.5%) to the basal medium enhanced the enzyme production by 63%. Various sugars incorporated into the standardized basal medium proved inhibitory to enzyme elaboration. Maximum enzyme production was observed in the early decline growth phase of the organism in tryptone-yeast extract-salt medium (pH 6.5) when inoculated at 4% level and incubated on a rotary shaker at 55°C for 8 h and subsequently at 45°C up to 24 h.

**Use of Model Scale System for Recycling Spent Fishery Brines**, Frank W. Welsh and Robert R. Zall, Division of Biological Sciences, National Research Council, 100 Sussex Drive, Ottawa Ontario K1A 0R6, Canada and Department of Food Science, Cornell University, Ithaca, New York 14853

*J. Food Prot.* 46:1026-1031

Fishing boat hold refrigeration brines become contaminated with organic fish material. Discarding these brines may cause environmental pollution and results in the loss of nutrient-rich fluids. Bench scale experiments determined that these brines could be recycled at least five times. Purified brines were free of microbial contamination and reached chemical equilibrium after its second reuse trial. The flavor and carcass quality of the fish stored in the recycled brine were not significantly different ( $p < 0.05$ ) from similar fish stored as controls.

**Influence of Two Levels of Hygiene on the Microbiological Condition of Veal as a Product of Two Slaughtering/Processing Sequences**, Frans J. M. Smulders and Caspar H. J. Woolthuis, Department of Science of Food of Animal Origin, Section Hygiene, Faculty of Veterinary Medicine, The University of Utrecht, P.O. Box 80175, 3508 TD Utrecht, The Netherlands

*J. Food Prot.* 46:1032-1035

In two experiments involving two groups of 20 calves each, the microbiological condition of veal produced in an alternative (Electrical Stimulation/Hot Boning) and a conventional (No Stimulation/Cold Boning) slaughtering/boning sequence was investigated. Two levels of hygiene were practiced, i.e. (a) "strictly hygienic" by using surgical gloves and disinfected knives, and (b) "hygienic" by using no gloves and only one (visually) clean knife at the start of incision. All hot-boned cuts were sprayed with a 1% v/v L-lactic acid solution, vacuum packed and immersed in icewater. Hot- and cold-boned cuts were stored at 2°C, as vacuum packs during 6 d and exposed to air for an additional week. Using a destructive method, samples for microbiological examination were taken from the 8-10th rib section of the dorsal carcass surface at the end of the slaughterline as well as before boning, and from the epimysium of longissimus cuts immediately after boning, 7 d post mortem (p.m.) upon opening vacuum packs and 14 d p.m. As compared with "hygienic" boning, "strictly hygienic" boning resulted in a significant decrease in aerobic colony count on longissimus cuts from 1.9 to 1.4 log/cm<sup>2</sup> and from 2.4 to 1.4 log/cm<sup>2</sup> for alternative and conventional procedures, respectively. An effect of lactic acid decontamination could not be demonstrated earlier than 7 d after opening of vacuum packs (14 d p.m.). Counts of *Enterobacteriaceae* and yeasts and molds were extremely low under all experimental conditions. No salmonellae could be isolated from any sample.

**Cook/Chill Foodservice Systems: Microbiological Quality and End-Point Temperature of Beef Loaf, Peas and Potatoes After Reheating by Conduction, Convection and Microwave Radiation**, C. A. Sawyer, Y. M. Naidu and S. Thompson, Department of Food Science and Human Nutrition, Michigan State University, East Lansing, Michigan 48824

*J. Food Prot.* 46:1036-1043

Microbiological quality, as estimated from temperature and mesophilic aerobic plate counts of beef loaf, instant mashed potatoes and frozen peas, was determined at point of service to compare conduction, convection and microwave reheating in a hospital-type cook/chill foodservice system. Although reheated products were similar microbiologically (mean log CFU/g = 2.3 to 3.4), internal end temperatures, even under laboratory-controlled conditions, did not meet FDA recommended standards ( $\geq 74^\circ\text{C}$ ) for reheated products in up to 83% of situations observed. Such data demonstrate the potential for foodborne illness in hospital cook/chill foodservice systems.

**Evaluation of Analytical Methods for Determination of Biogenic Amines in Fresh and Processed Meat**, J. A. Zee, R. E. Simard and L. L'Heureux, Centre de recherche en nutrition and Département de sciences et technologie des aliments, Pavillon Comtois, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4 and Lallemand Inc., 1620 Préfontaine, Montréal, Québec, Canada H1W 2N8

*J. Food Prot.* 46:1044-1049

Fifteen biogenic amines were separated and quantitated by an automated ion-exchange chromatography technique. Extraction efficiencies for amines from fresh and processed meat using trichloroacetic acid (TCA), perchloric acid and methanol were compared. In general, biogenic amines in meat and meat products were better extracted by TCA. Aliphatic amines were more efficiently extracted than aromatic amines. Type of meat and adsorption of amines on proteins probably affected the extraction efficiency. Both fresh and processed meat products contained high amounts of adrenaline, spermidine and spermine (up to 581, 280 and 685 mg/kg, respectively), but low amounts (13 to 19 mg/kg) of noradrenaline, putrescine, histamine, cadaverine and tyramine. Processed meat contained less amines than fresh meat, suggesting losses during salting and curing or microbial growth inhibition.

**Altered Free Fatty Acid Levels in Fresh or Canned Mutton as Indicators of Spoilage**, T. S. Vasundhara, K. V. Kumudavally and T. R. Sharma, Defence Food Research Laboratory, Mysore-11, India

*J. Food Prot.* 46:1050-1054

Chromatographic profiles of neutral lipids from canned mutton products can indicate the presence of spoiled meat presterilization, particularly from changes in free fatty acid levels. Gas liquid chromatography analysis of free fatty acids of lean meat showed a 15-fold increase in palmitic, stearic and oleic acid contents as a result of canning spoiled meat when compared to insignificant increases in canned fresh meat.

**Alcohol Production by Fish Spoilage Bacteria**, Aejaz Ahamed and Jack R. Matches, Institute for Food Science and Technology, College of Ocean and Fishery Sciences, University of Washington, Seattle, Washington 98195

*J. Food Prot.* 46:1055-1059

Bacterial isolates (244) identified to genera were tested for their ability to produce ethanol, isopropanol and propanol in a fish tissue extract. All of the isolates produced ethanol and 241 and 227 produced isopropanol and propanol, respectively. One high alcohol producing member of each of the groups *Moraxella*-like, *Pseudomonas*, *Flavobacterium*, *Micrococcus* and coryneforms was selected for utilization of fish components as substrates in production of alcohol. The substrates tested included four sugars, nine amino acids and lactic and pyruvic acids. Although

there were some variations in the levels of alcohols produced by the test organisms from the substrates, the organisms appeared to prefer simple 5 and 6 carbon sugars and then utilized the free amino acids. The level of oxygenation greatly affected the levels of alcohols produced.

**Combined Treatment with Hydrogen Peroxide and Ultra-violet Irradiation to Reduce Microbial Contamination Levels in Pre-formed Food Packaging Cartons**, Catherine J. Stannard, John S. Abbiss and John M. Wood, Leatherhead Food Research Association, Randalls Road, Surrey KT22 7RY, United Kingdom

*J. Food Prot.* 46:1060-1064

A treatment combining hydrogen peroxide and ultra-violet (UV-C) irradiation was assessed for reduction of microbial contamination in pre-formed food packaging cartons. There was a synergistic effect between low concentrations (0 - 5% w/vol) of hydrogen peroxide and UV-C irradiation (10 s) on spores of *Bacillus subtilis*, the maximum lethality occurring between 0.5 and 1% peroxide. A combined treatment using 1% hydrogen peroxide and 10 s of UV-C irradiation was also effective against a variety of other organisms (spores and vegetative cells). The efficiency of the treatment was dependent on the type of inner surface of the carton. A greater lethal effect was obtained against *B. subtilis* spores in polyethylene-lined cartons than in aluminium/polyethylene laminate-lined cartons (5.1 and 3.5 decimal reductions in numbers respectively, using a combined treatment with 1% peroxide and 10 s of UV-C).

**Changes in Bacteriological Quality of Raw Milk Stabilized by Activation of its Lactoperoxidase System and Stored at Different Temperatures**, M. Zajac, J. Gladys, M. Skarzynska, G. Härnulf and L. Björck, Institute of Cattle Breeding and Milk Production, Warsaw University of Agriculture, 05-840 Brwinow, Poland; Alfa-Laval Agri International AB, P.O. Box 39, S-147 00 Tumba, Sweden; and Department of Animal Husbandry, Swedish University of Agricultural Sciences, S-750 07 Uppsala, Sweden

*J. Food Prot.* 46:1065-1068

Preservation of the quality of raw milk by activation of its natural lactoperoxidase (LP) system was studied. The milk was stored at 4, 10 and 17°C for a total period of 104, 72 and 48 h, respectively. At 4°C, the LP system was activated after 48 and 96 h. At the higher storage temperatures, activation was carried



out initially and after 24 h and (at 10°C) 48 h of storage. The results show that, at 4°C, the Standard Plate Count in LP-activated milk remained fairly unchanged for at least 104 h, whereas bacterial multiplication in the controls started after 48 h. At 10°C, an activation resulted in a lag-phase of at least 72 h, but at 17°C this was reduced to below 24 h. The observed changes in the counts of coliforms and psychrotrophs followed the same general pattern. These results suggest that activation of the LP system in combination with moderate cooling (e.g., with available well water) could be a useful alternative to extend the keeping quality of raw milk. Overnight storage might then be possible, provided the initial hygienic quality of the milk is good and the milk is promptly taken care of in the morning.

**Radioimmunoassay for *Clostridium perfringens* Enterotoxin and Its Use in Screening Isolates Implicated in Food-Poisoning Outbreaks**, Gerard N. Stelma, Jr., John C. Wimsatt, Peter, E. Kauffman and Dharendra B. Shah, Division of Microbiology, Food and Drug Administration, 1090 Tusculum Avenue, Cincinnati, Ohio 45226

*J. Food Prot.* 46:1069-1073

Fourteen isolates of *Clostridium perfringens* obtained from food-poisoning outbreaks were screened for enterotoxigenicity using a radioimmunoassay (RIA) that detects 1.0 ng of enterotoxin/ml. Only four of the isolates produced enterotoxin in concentrations too low to be detected by counterimmunoelectrophoresis when grown in Duncan-Strong sporulation (D-S) medium. Substitution of raffinose for soluble starch or addition of theobromine to the medium stimulated enterotoxin production by three of the four enterotoxin-positive isolates. Raffinose and theobromine did not stimulate enterotoxin production by isolates that were enterotoxin-negative in D-S medium. Enterotoxin production by the RIA-positive strains correlated with the numbers of heat-resistant spores they produced. The RIA-negative isolates produced approximately the same numbers of spores/ml as the high enterotoxin producers, and more spores/ml than strain H8 produced under optimum conditions. Therefore, inability to sporulate is not the cause for failure of these isolates to produce enterotoxin. Rabbit ileal loop assays showed that the two isolates that were lowest enterotoxin producers in vitro were highly active in vivo.

**Measurement of Residual Hydrogen Peroxide in Preformed Food Cartons Decontaminated with Hydrogen Peroxide and Ultraviolet Irradiation**, Catherine J. Stannard and John W. Wood, Leatherhead Food Research Association, Randalls Road, Leatherhead, Surrey KT22 7RY, United Kingdom

*J. Food Prot.* 46:1074-1077

A luminometric method was used to determine the levels of residual hydrogen peroxide present in preformed food packaging cartons after a decontamination process using sterile distilled water or 0.1, 1.0 or 30% (wt/vol) hydrogen peroxide and ultraviolet (UV-C, 254 nm) irradiation. The reduction of post-process peroxide levels in the cartons by irradiation or hot air was assessed. A residual hydrogen peroxide level of approx. 100 ppb could be obtained by spraying 0.2 ml of 0.1% hydrogen peroxide into the carton. Treatment with 1% hydrogen peroxide, with or without UV-C irradiation, gave residual levels approximately tenfold higher. The level was not reduced by UV-C irradiation but could be reduced by blowing hot air into the carton. 30% hydrogen peroxide sprayed into cartons could not be reduced by heat to levels below 100 ppb. Extremely low levels of residual hydrogen peroxide were detected when water was sprayed into cartons, both with or without UV-C irradiation.

**Influence of Phosphate and Glucose Addition on some Important Spoilage Bacteria in Vacuum Packed Bologna-Type Sausage**, H.-J.S. Nielsen and P. Zeuthen, Food Technology Laboratory, Building 221, The Technical University of Denmark, DK-2800 Lyngby, Denmark

*J. Food Prot.* 46:1078-1083

Studies were done on the influence of phosphate and glucose addition on some selected spoilage bacteria in vacuum packed sliced bologna-type sausage during refrigerated storage. Batches with low pH phosphate mixture or sodium tripolyphosphate were used along with batches without phosphate addition. Addition of low pH phosphate had a pronounced influence on *Brochothrix thermosphacta* and *Serratia liquefaciens*, while the influence of glucose addition on these bacteria was small. No marked effect of phosphate type could be observed with the lactic acid bacteria, but the most profound growth happened in sausages without phosphate, and at 2°C was stimulated by glucose addition. Lactic acid accumulated more rapidly in batches without phosphate addition.

**Effect of Potassium Sorbate on Spoilage of Blue Grenadier (*Macruronus novaezelandiae*) as Assessed by Microbiology and Sensory Profiles**, Jo A. Statham and H. Allan Bremner, CSIRO Division of Food Research, Tasmanian food Research Unit, "Stowell", Stowell Ave., Hobart 7000, Tasmania, Australia

*J. Food Prot.* 46:1084-1091

Blue grenadier filets (*Macruronus novaezelandiae*), pH 6.7, which had been stored frozen for 3 wk were thawed and repacked under vacuum and in air with and without the addition of 0.1% potassium sorbate. The effects of these treatments on microbial flora were noted after subsequent storage of the filets at 4°C. Pseudomonads comprised >90% of the total flora of sorbate-treated fish, whereas *Vibrio* spp. (85%) and *Moraxella* spp. (70%) predominated in vacuum-packed and aerobically stored filets, respectively. Sensory profiles of odor and flavor of the stored material were constructed. The acceptability of the aerobically stored filets had significantly decreased after 7 d of storage. Vacuum packaging in conjunction with 0.1% potassium sorbate results in a minimal extension of shelf-life.

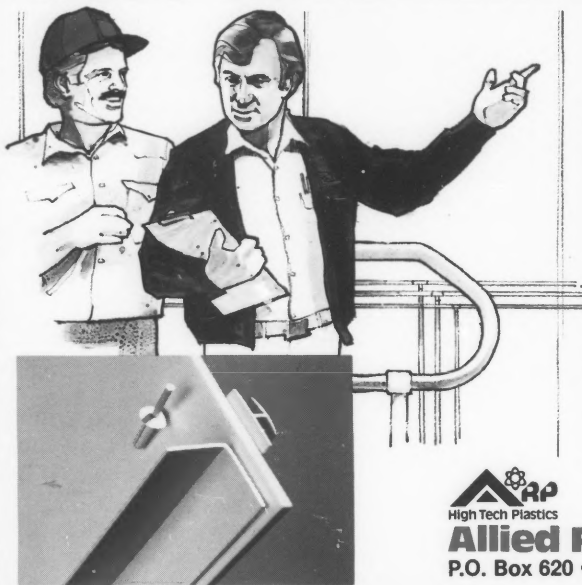
**Microbial Contamination of the Hen's Egg: A Review**, Francis J. Mayes and Mustafa A. Takeballi, Poultry Department, Loughry

College of Agriculture and Food Technology, Cookstown BT80 9AA, Co. Tyrone, Northern Ireland

*J. Food Prot.* 46:1092-1098

The hen's egg is susceptible to microbial attack in a number of ways. The yolk or the albumen may be contaminated before the egg is laid. After the egg has been laid the possibility exists of microbial penetration from the outside. In this review, both these possibilities are discussed together with the defences, both physical and chemical, that the egg has against microbial contamination. Most eggs contain no bacteria when they are laid and only become contaminated subsequently. The shell membrane offers the best protection against bacterial penetration, but once inside the egg their growth and multiplication is slowed due to the viscous nature of the egg white proteins, their pH, and the bactericidal properties of lysozyme and conalbumen.

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