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*Journal of*

# MILK and FOOD TECHNOLOGY

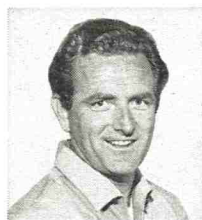
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*Official Publication*

International Association of Milk, Food and  
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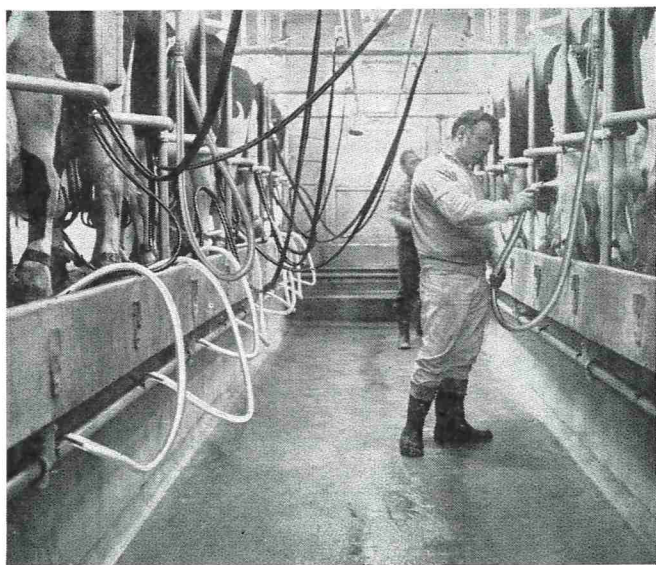
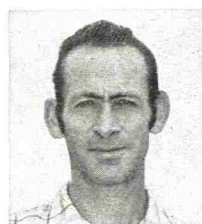
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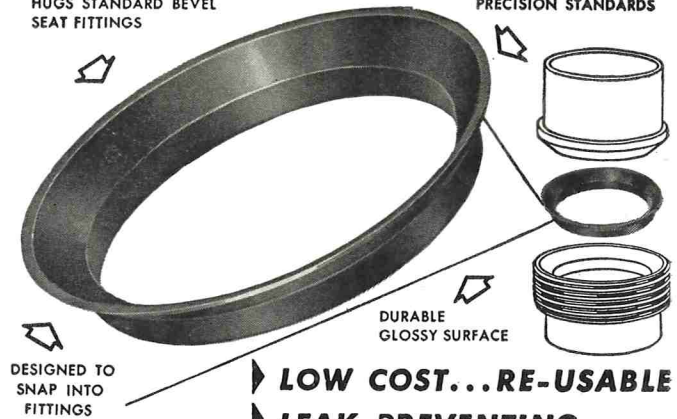


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*Journal of*

# MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION

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International Association of Milk, Food and Environmental Sanitarians, Inc.

REG. U. S. PAT. OFF.

Vol. 29

November, 1966

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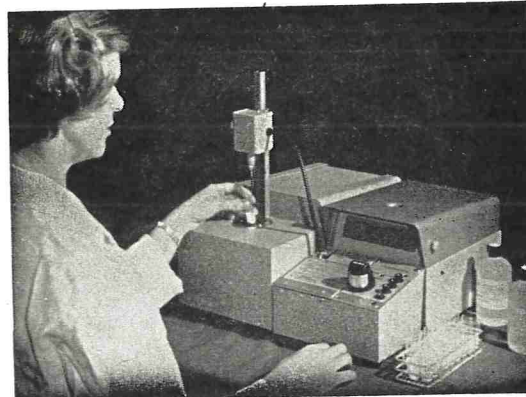
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# EFFECTS OF LEUCOCYTE DEGENERATION ON MASTITIS SCREENING TESTS<sup>1</sup>

B. SINGH<sup>2</sup> AND R. T. MARSHALL

*Dairy Department, University of Missouri, Columbia 65202*

(Received for publication August 8, 1966)

## SUMMARY

Direct microscopic leucocyte counts (DMLC) and morphological studies indicated that leucocytes disintegrate and lysis progresses rapidly from day 1 to day 2 in milk samples during storage. The average DMLC/ml decreased 34% during the first two days of storage. The reactivity of the samples to the California Mastitis Test decreased with sample age. These combined observations suggest that deoxyribonuclease (DNA), once free of the intact leucocyte, becomes less reactive or non-reactive to the test reagents. Milk samples which produced more than 20% O<sub>2</sub> gave highly reproducible results when tested by the catalase method. Those which produced less than 20% gave erratic results.

A number of publications have indicated that changes take place in milk samples during storage which influence the results of mastitis screening tests made on the stored samples. Schalm and Noorlander (5), Frank and Pounen (2), and Tucker and Paape (6) each showed that the substance reactive to the California Mastitis Test (CMT) reagent became less reactive due to storage. Frank and Pounen (2) reported increased oxygen production in stored samples tested for catalase. However, Tucker and Paape (6) did not find a significant change in catalase content with storage up to four days. Nageswararao, Blobel and Derbyshire (3) found the catalase test unaffected by storage up to three days unless there was appreciable bacterial growth. No information was available regarding changes in direct microscopic leucocyte counts (DMLC) with time of storage.

Our experiments have been designed to verify certain reported observations and to seek reasons for the results. Stability of the reactive substance in the milk, preventing production of more reactive substance, and assurance that all of the substance is available to react would appear to be of prime importance.

## MATERIALS AND METHODS

Milk samples were collected aseptically from individual quarters of cows showing various degrees of reactivity to the California Mastitis Test (CMT) which was performed on foremilk immediately prior to sampling. Samples were im-

mediately cooled at 4 C and held thereat except for the few minutes each day when aliquots were being removed for testing. Fourteen samples were collected. An additional 10 samples were later subjected to part of the tests.

Screening tests were performed initially and daily thereafter for five days. Methods used for the catalase test, the DMLC and the CMT were as described in Public Health Service Publication No. 1306 (4). Bacterial counts were made as described in Standard Methods (1). Reactions to the CMT were scored 1, 2, 3, 4 rather than T, 1, 2, 3 so that numerical averages could be calculated. Studies on morphological changes of leucocytes contained in milk were made during the first and second days after collection using phase-contrast and light microscopes.

## RESULTS AND DISCUSSION

The majority of the samples used in these experiments contained relatively low numbers of leucocytes. However, they are thought to be representative of an equal number of bulk herd milk samples.

TABLE 1. AVERAGE CMT SCORE PER DAY DURING STORAGE COMPARED TO ORIGINAL SCORE

Number of samples Per group	Days of storage					
	0	1	2	3	4	5
6	1	0.7	0.2	0.2	0	0
6	2	1.5	1.2	1.0	0.5	0.3
1	3	3.0	2.0	3.0	2.0	1.0
1	4	4.0	3.0	2.0	2.0	2.0
Mean	1.8	1.4	0.9	0.9	0.5	0.4

Table 1 shows the changes in average CMT scores with storage time. The results indicate a somewhat faster rate of decline in score than observed by Tucker and Paape (6). However, this may be due to the fact that we were observing fewer numbers of leucocytes initially. The stronger CMT reactions involve millions of leucocytes; whereas, the lower ones may involve only a few hundred-thousands per milliliter. Our results indicate that the lesser reacting samples decline faster in reactivity when a system of daily averages is used.

Analyses of the same samples by DMLC (Table 2) helped to explain the loss in CMT reactivity. A daily decrease in leucocyte counts was observed for each sample. The greatest decrease occurred between

<sup>1</sup>Contribution from the Missouri Agricultural Experiment Station. Journal Series Number 4066.

<sup>2</sup>Present Address: University of Pittsburgh, Graduate School of Public Health.



TABLE 2. AVERAGE DMLC PER DAY DURING STORAGE COMPARED TO ORIGINAL COUNT (GROUPED DATA)

Count range of group (thous.)	Number of samples/group	Days of storage					
		0	1	2	3	4	5
10-100	4	44 <sup>a</sup>	43	18	12	10	9
101-500	7	160	130	79	41	12	9
501-2000	2	1600	1400	950	550	420	110
19,000	1	19,000	18,000	13,000	12,000	12,000	8,600
Mean	14	1,680	1,560	1,110	960	930	640

<sup>a</sup>Counts expressed as thousands per milliliter

days one and two of storage for samples in each count range. Decreases averaged about one-third after two days storage. Numbers declined at a faster rate among samples containing the lower number of cells. The point of most importance is that countable numbers of leucocytes in 2-day old milk can be expected to have decreased by more than 34 percent. Therefore, leucocyte counts for most bulk samples would be expected to have decreased an intermediate amount, since some of the milk would be two days old while some would be relatively fresh. Based on our data a decrease of 20% would seem to be a realistic estimate. These observations are in contrast to those of Nageswararao, Blobel and Derbyshire (3) who reported that leucocyte counts remained constant for at least three days, but the proportion of live leucocytes decreased rapidly. Figure 1 shows photomicrographs of leucocytes taken during the first and second days after collection. The leucocytes had enlarged in size by the second day of storage. Observations using phase-contrast lenses indicated that the spherical nuclei did not have their usual lobed appearance. The swollen state, vacuolization of cytoplasm, deformity and altered staining of the nucleus suggested progressive lysis and disintegration of the leucocytes.

Data shown in Table 3 suggest that difficulties may

arise in securing day-to-day uniformity of catalase test results. There were statistically significant differences between mean test values for days of storage in the initial experiment. Means for days 0, 1 and 4 were not significantly different, but means for days 2, 3 and 5 were significantly higher ( $P < 0.05$ ). The differences were small in magnitude in relation to the current interpretation of the test, wherein classes of milk are based on ten percent-wide ranges. It was expected that small daily increases would be observed due to catalase production by bacteria. The high results for day five may reflect bacterial growth. Standard plate counts run on days 0, 2, 4 and 5 indicated bacterial populations of more than 1,000,000/ml in two samples on day 5. The highest count on day 4 was 570,000/ml and the average was 190,000/ml.

A second series of 10 samples was tested by the catalase method. Averages of these observations are shown in the last line of Table 3. A similar pattern of test results was observed. However, mean differences were smaller.

Examination of the individual results indicated that the samples with the lower initial oxygen production caused the increases at the 2 and 3-day storage times. When the samples were divided into two groups, those producing less than and those produc-

TABLE 3. AVERAGE PERCENT OXYGEN PER DAY DURING STORAGE COMPARED TO INITIAL RESULT USING GROUPED DATA

% O <sub>2</sub> per group	Number of samples/group	Days of storage					
		0	1	2	3	4	5
0-10	5	7 <sup>a</sup>	9	12	10	8	13
11-20	3	15	19	22	18	15	19
21-30	3	26	29	30	29	27	33
31-50	3	39	37	37	36	33	40
Mean	14	19.0	21.0	23.5	21.5	19	24.5
Second Series <sup>b</sup>	10	23.3	24.1		25.1	24.6	

<sup>a</sup>Percent oxygen

<sup>b</sup>Ten samples tested to confirm findings of first series. Individual results not included in table.



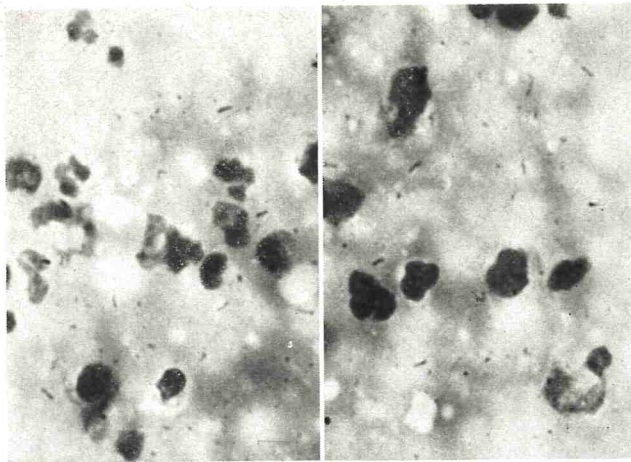


Figure 1. Photomicrographs of stained leucocytes in milk freshly taken (left) and the same sample held refrigerated 24 hr (right).

ing more than 20% oxygen, the group producing less than 20% was found to account completely for the mean day-to-day variation. Means for those in the above 20% group were identical for days 0 and 2 or 0 and 3. Since control programs use values greater than 20%, the variations observed among the higher quality samples should present no problem. These results are in agreement with the relatively consistent results for catalase determinations presented by Tucker and Paape (6) when tests were made of milk highly active to the catalase test.

Nageswararao, Blobel and Derbyshire (3) believed that "below 20% O<sub>2</sub> production, the concentration of

substrate was relatively too high, causing rapid inactivation of the enzyme." It is uncertain as to how this relationship could have influenced our experiments, since the same conditions should have existed each day. It is possible that the degeneration of leucocytes which takes place at a high rate after 2-3 days storage could be a factor in the high activity of the samples on those days. This would theoretically increase the enzyme concentration available immediately upon addition of the peroxide to the milk, thus offsetting to some extent the inactivating of the substrate.

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### NEW FASPEEL REDUCES LYE PEELING TIME

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The manufacturer states that in a series of tests, very small quantities of Faspeel added to lye solutions reduced peeling time from 40% to over 60% on tomatoes, apples, and pears. Comparable results can be expected for beets, chili peppers, mangle peppers, eggplant, potatoes, onions, apricots, grapefruit membrane, peaches—any vegetable or fruit that can be lye-peeled. Faspeel is manufactured by J. B. Ford Division, Wyandotte Chemicals Co., Wyandotte, Mich.

### RESIDUAL CHLORINE CONTROL SYSTEM

A control system for continuous measurement of free residual chlorine has been introduced by the Foxboro Co., Foxboro, Mass. Although it is used chiefly in municipal potable-water treatment plants, several applications are found in food processing plants, refineries, chemical plants and other industries where cooling water is chlorinated.

Primary function of the system is to control chlorine addition by regulating a chlorine feeder. It consists of a Model D. Amperometric Cell for measurement and instrumentation for readout and/or control. The cell, a simple device requiring no external energy source or reagent pumps, is designed for field or surface mounting. It continuously monitors the free chlorine level of the process fluid and transmits a proportional signal to an electronic recording-controlling device. The Foxboro analyzer can be used to measure free chlorine as low as 0.1 parts per million or as high as 0.50 parts per million, full scale.



## A LIMITED STUDY ON THE SANITATION OF FISHING TRAWLER HOLDS

ROBERT E. LEVIN AND F. MILES SAWYER

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and

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Technological Laboratory, Gloucester, Massachusetts 01930*

(Received for publication September 1966)

### SUMMARY

The bacterial load on surfaces of wooden fish pens was uniformly in excess of  $10^8$  per square inch prior to cleaning. Conventional hand scrubbing and rinsing with harbor water failed to reduce the count, whereas the application of a hot jet of detergent followed by rinsing with potable water effected over a 100-fold reduction over most of the hold surfaces. The effect of harbor water versus tap water for rinsing was not studied.

The efficient cleaning of fish-hold compartments and penboards used for holding fish during iced storage at sea is necessary to maintain high quality of product and to prevent the development of bilgy fish. Castell (1) and MacCallum (2) have shown that this type of spoilage results from the contact of fish with slime-soaked wooden penboards.

This limited study was undertaken to compare two methods for removing slime and reducing the bacterial flora on hold surfaces of a commercial New England trawling vessel.

### EXPERIMENTAL METHODS

The first cleaning method studied was that usually employed by local fishermen and consisted of conventional hand scrubbing followed by liberal hosing and flushing with untreated harbor water. The second cleaning method consisted of application of a heated (180 F) chlorinated detergent ("Sanitizer," Casco Chemical Company, Beverly, Mass.) under pressure (280 psi) with a hydraulic jet cleaner (Model B-1250, Sellers Injector Corp., distributed by the Marsh Co., Nashua, New Hampshire) followed by rinsing with potable water<sup>1</sup>. All operations were performed on the same commercial fishing vessel and in the same hold. The second cleaning method was applied 25 days after the first and after the vessel had completed several fishing trips.

Swab samples were taken at 13 locations on fish pen surfaces in the hold immediately after the cargo of fish was unloaded, and again from 13 surfaces adjacent to the former, immediately after cleaning. Swab samples of 1-inch square areas of wooden hold surfaces were taken using stainless steel templates and sterile calcium alginate wool swabs. They were transferred aseptically to 10 ml of 1% Calgon for dis-

solution. Serial 1:10 dilutions of dissolved swabs were prepared in broth composed of yeast extract (Difco), 0.20%; tryptone (Difco), 0.20%; dextrose, 0.20%; sodium chloride, 0.25%; and distilled water at pH 7.0. Dilutions were plated in duplicate in the above medium containing 1.5% agar, and the plates incubated at 20 C for 5 days.

### RESULTS AND DISCUSSION

After hand scrubbing, fish storage compartment surfaces, which were heavily coated with slime and debris after the fish had been unloaded, appeared visually clean and free of slime. The data in Table 1 indicate, however, that hand scrubbing with harbor water failed to remove the heavy load of microorganisms even though the surfaces were visually clean. The heavy load of microorganisms on the hand-scrubbed compartments was undoubtedly due to slime entrapped in the grossly pitted surfaces of the wood. The use of untreated harbor water might also be expected to contribute to the bacterial load.

The application of hot detergent with a force of 280 psi reduced the bacterial load over most of the hold surfaces by 100 times. The greatest reduction achieved was 99.89% with only two samples failing to show at least a tenfold reduction in count.

The difficulties in efficiently reducing the bacterial load on wooden surfaces and the resulting effect on quality are evidenced in previous work. MacCallum (2) found that all fish stored against heavily contaminated wood surfaces became bilgy within 7 days and that fish de-slimes and then placed in contact with a previously hand-scrubbed penboard developed bilgy odors in 2 days under ice. In contrast, he found fish in contact with steam-sterilized boards, fresh wood, and aluminum sheeting showed no bilgy odors under similar storage periods and recommended the use of aluminum sheeting in fish pen holds. Spencer (2) observed that wooden fish boxes coated with a urea-formaldehyde resin were less contaminated and more efficiently cleaned than uncoated boxes. These results and those reported herein clearly indicate that conven-

<sup>1</sup>The use of trade names is to simplify descriptions; no endorsement is implied.



TABLE 1. EFFECT OF CLEANING METHOD ON TOTAL COUNT PER SQUARE INCH OF HOLD SURFACE

Sample no.	Hand-scrubbed and rinsed with untreated sea water			Hot jet detergent application followed by rinsing with potable water		
	Bacterial count before cleaning	Bacterial count after cleaning	Percent change	Bacterial count before cleaning	Bacterial count after cleaning	Percent change
1	23 x 10 <sup>7</sup>	63 x 10 <sup>7</sup>	+173.91	125 x 10 <sup>7</sup>	14 x 10 <sup>5</sup>	-99.89
2	26 x 10 <sup>7</sup>	32 x 10 <sup>7</sup>	+23.07	29 x 10 <sup>7</sup>	13 x 10 <sup>5</sup>	-99.55
3	22 x 10 <sup>7</sup>	31 x 10 <sup>7</sup>	+36.36	88 x 10 <sup>7</sup>	52 x 10 <sup>5</sup>	-99.41
4	42 x 10 <sup>7</sup>	28 x 10 <sup>7</sup>	-33.33	67 x 10 <sup>7</sup>	29 x 10 <sup>5</sup>	-99.57
5	27 x 10 <sup>7</sup>	12 x 10 <sup>7</sup>	-55.56	32 x 10 <sup>7</sup>	71 x 10 <sup>6</sup>	-77.81
6	34 x 10 <sup>7</sup>	39 x 10 <sup>7</sup>	+14.70	35 x 10 <sup>7</sup>	23 x 10 <sup>6</sup>	-93.43
7	42 x 10 <sup>7</sup>	35 x 10 <sup>7</sup>	-16.69	25 x 10 <sup>7</sup>	26 x 10 <sup>5</sup>	-98.96
8	21 x 10 <sup>7</sup>	39 x 10 <sup>7</sup>	+85.71	192 x 10 <sup>7</sup>	8 x 10 <sup>7</sup>	-95.84
9	30 x 10 <sup>7</sup>	34 x 10 <sup>7</sup>	+13.33	40 x 10 <sup>7</sup>	16 x 10 <sup>5</sup>	-99.60
10	9 x 10 <sup>7</sup>	22 x 10 <sup>7</sup>	+144.49	48 x 10 <sup>7</sup>	11 x 10 <sup>5</sup>	-99.77
11	45 x 10 <sup>7</sup>	38 x 10 <sup>7</sup>	-15.56	61 x 10 <sup>7</sup>	18 x 10 <sup>5</sup>	-99.70
12	13 x 10 <sup>7</sup>	7 x 10 <sup>7</sup>	-53.86	22 x 10 <sup>7</sup>	29 x 10 <sup>7</sup>	+3.18
13	26 x 10 <sup>7</sup>	8 x 10 <sup>7</sup>	-69.24	85 x 10 <sup>7</sup>	17 x 10 <sup>5</sup>	-99.80
Mean	28 x 10 <sup>7</sup>	30 x 10 <sup>7</sup>		65 x 10 <sup>7</sup>	37 x 10 <sup>6</sup>	

tional hand scrubbing of porous wooden surfaces with untreated harbor water fails to remove the bacterial population satisfactorily. The application of hot pressurized detergent was found far more efficient in reducing bacterial numbers on porous wooden pen surfaces. The use of aluminum sheeting or the application of presently available plastics such as polyphenols, polyurethane, and urea-formaldehyde resins to wooden fish pen surfaces to render them impervious to bacteria and to facilitate efficient reduction of the bacterial load would appear to offer considerable advantage in the sanitation of fish pen holds.

## ACKNOWLEDGMENTS

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## REPORT OF PROGRESS<sup>1</sup>—

### STANDARD METHODS FOR THE EXAMINATION OF DAIRY PRODUCTS, 12TH EDITION

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In 1905 Professor S. C. Prescott of the Massachusetts Institute of Technology reported on "The Need for Uniform Methods in the Sanitary Examination of Milk" at a meeting of the laboratory section of the American Public Health Association in Boston. In his presentation he mentioned that differences in composition of the culture medium employed, variations in methods, amount of dilution, temperature and duration of incubation, as well as other minor differences, all tended to produce results which were valueless for comparison. At his suggestion a committee was appointed to study the various methods used for the bacteriological examination of milk and to recommend a uniform procedure. The first report of the Committee on Standard Methods of Bacterial Milk Analysis was published by the American Public Health Association in 1910.

In subsequent editions of "Standard Methods" a committee sought and obtained the cooperation of committees of other associations interested in the sanitary control of milk. Cooperating agencies included the American Dairy Science Association, The International Association of Dairy and Milk Inspectors, The Society of American Bacteriologists and the American Association of Medical Milk Commissions.

The 7th edition, published in 1939 with Robert S. Breed as Chairman, was called *Standard Methods for the Examination of Dairy Products*. In recent years the preparation of "Standard Methods" has been under the general supervision of the Coordinating Committee on Laboratory Methods which in turn is under the Committee on Evaluation and Standards of the American Public Health Association.

The 12th edition of *Standard Methods for the Examination of Dairy Products* which hopefully will appear in 1966 has been the work of many individuals representing numerous organizations. In the early planning stages definite attempts were made to have geographical representation as well as quality control people from industry, representatives of regulatory agencies and research-oriented university personnel on each sub-committee. This was not always possible, unfortunately, because of interest and com-

mitments of some who were requested to serve. The majority of people have been most conscientious in the detailed and time-consuming requirements of committee membership. A large number of the sub-committee chairmen as well as the membership of the committees are also members of the International Association of Milk, Food and Environmental Sanitarians. Those who have had the main responsibility for editing the manuscripts and compiling the various materials involved are most appreciative of the cooperation and aid of members of this association.

#### BASIC PHILOSOPHY

The basic philosophy regarding the preparation of this new edition was outlined at the start along these lines: "No new method or modification of an old method should be introduced unless it has undergone careful comparative testing in several laboratories, with the data available to the committee and to any other interested parties, preferably by publication in a recognized scientific journal. Notice of intention to include or modify should appear in print in several places with enough time to present evidence for or against to be submitted by any interested party with recommendations." Several outstanding examples in which these policies were followed will be found in the case of approving the use of plastic pipettes for the agar plate count, the selection of 32 C incubation temperature for the agar plate method, the shortening of the incubation period for standard plate counts on dry milk from 72 to 48 hours, and the inclusion of the dialysis phosphatase test.

On the basis of numerous recommendations a definite attempt was made to prepare chapters in a more concise manner than previously with the anticipation that the book would be more useful for the laboratory worker. In addition much of the interpretive material has been eliminated since it was felt that this is not the responsibility of "Standard Methods" but of regulatory agencies. In most instances references at the end of chapters have been carefully scrutinized with many being deleted and other more pertinent and up-to-date citations added.

It is likely that many laboratory workers interested in "Standard Methods" are more aware of changes and have had more to say regarding changes than

<sup>1</sup>Presented at the 53rd Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., in Minneapolis, Minnesota, August 15-18, 1966.



in any previous edition. In the last three years special sessions have been held at annual meetings of the American Public Health Association, American Dairy Science Association, American Society for Microbiology and The International Association of Milk, Food and Environmental Sanitarians. In addition there have been several publications in different journals relating to proposed changes as in the case of the 32 C versus 35 C incubation for the agar plate method and the 48 versus 72 hr incubation for dry milk plates.

#### SPECIFIC CHANGES IN THE 12TH EDITION

Chapter 1, Quality Tests, presents some of the guiding principles followed in this edition. In an attempt to recognize a standard or reference test as a basis for official control actions, some procedures have been placed in an appendix. These latter methods often have considerable merit for control of dairy products because of simplicity, speed, cost or other advantages over the reference procedure. The appendix serves in some instances for "phasing in or out" a technic from the standard method or reference category.

In past editions many chemical procedures have been reprinted from publications of the *Association of Official Analytical Chemists* (AOAC), but in the 12th edition many of these chemical tests are cited by reference. In other cases, chemical procedures which have not already been approved by AOAC are incorporated in "Standard Methods" because of their particular applicability to a situation or product.

In the 11th edition, Chapter 8 was entitled Detection of Pathogens and numerous methods were given for isolating and identifying specific pathogens found in milk and dairy products. In the present edition this material is covered in Chapter 2 entitled Significant Pathogens in Dairy Products. No methods for the detection of pathogens are included but a broad presentation of those organisms which may have milk as a vehicle is given. Although all will not agree, this has considerable merit because in many instances there is no standard method of detection of a specific pathogen. Numerous references are presented which will enable the laboratory worker to find suggested technics that may be of assistance.

Chapter 3, Collection of Milk and Cream Samples, has been completely rewritten and condensed to give greater emphasis in procedures involved in bulk tank samples and plant line samples. General instructions are included which has eliminated repetition of some of this material in subsequent chapters.

The authors of Chapter 4, Agar Plate Method, have prepared this material in a very useable form

for the laboratory analyst. Plastic pipettes meeting certain specifications are permitted as well as plastic petri dishes. Incubation of plates is specified at  $32\text{ C} \pm 1\text{ C}$  rather than 32 or 35 C. Certain sections relating to preparation of media, and tests for growth inhibition or stimulation have been placed in an appendix. These changes make for greater facility in performing the various steps in the agar plate method.

In so far as possible attempts have been made to designate one method as the standard method. This was not possible in all cases as illustrated in Chapter 5 on Coliform Bacteria. Use of both solid and liquid media have been included with incubation at 32 C.

Chapter 6 concerns Thermotolerant, Thermophilic and Psychrophilic Bacteria. In determining numbers of psychrophilic bacteria a temperature of  $7\text{ C} \pm 1\text{ C}$  for ten days has been adopted rather than the previous 5-7 C for 7-10 days. The Oval Tube or Bottle Culture Method previously included in this chapter has been transferred to Chapter 19 and the Storage Quality Test to the appendix.

Chapter 7 is new and entitled Detection of Inhibitor Substances in Milk. This chapter outlines the procedure for the Disk Assay Method to detect inhibitory substances in milk.

Chapter 8 concerns Microbiological Methods for Concentrated Milk and Dry Milk but excludes cultured milks which are now relegated to another chapter. Only the Levowitz-Weber stain is acceptable for direct microscopic counts of dry milk and only clump counts are to be reported. A standard plate count of dry milk is to be made at 32 C for 48 hr  $\pm 3$  hr instead of the 72 hr as required in the previous edition.

Chapter 9 concerns Microbiological Methods for Butter and in this edition the phosphatase test, Burri slant method and mold mycelia determinations are deleted. The incubation of plates for yeast and mold counts now is  $23\text{ C} \pm 2\text{ C}$  instead of 21 or 25 C as in the previous edition. Likewise the incubation of plates for proteolytic counts has been changed from 21 to  $23\text{ C} \pm 2\text{ C}$ . Also such plates for proteolytic counts on butter are to be flooded with 1% HCl or 10% acetic acid before counting.

Chapter 10 on the Microbiological Methods for Cheese now includes other cultured products. The membrane filter technic has been deleted for these products.

Chapter 11 now combines material on ingredients of ice cream and related products and ice cream and related frozen products into the one chapter entitled Microbiological Methods for Ice Cream and Related Frozen Products. This arrangement eliminates much duplication of sampling equipment, care of and preparation of samples, plating, incubating, and count-



ing of plates. Chemical tests involved are cross-referenced to another chapter. Methods for sweetening agents are referenced to AOAC and egg and egg products procedures are referenced to the APHA, *Recommended Methods for the Microbiological Examination of Foods*, 2nd edition.

The next section considers chapters not directly related to microbiological plating methods. Chapter 12 on the Direct Microscopic Method permits only one stain (Levowitz-Weber). The use of the loop for making smears has now been relegated to the appendix as a screening method. Plates I and II concerning microscopic appearance of raw and pasteurized milk have been deleted since they are no longer as useful as in earlier editions. Limitations have been included relative to acceptability of certain types of microscope lamps. The use of microscopes with factors of less than 500,000 and with eyepieces having less than 10 X magnification are no longer acceptable.

In the Reduction Methods described in Chapter 13 the incubation temperature is now stipulated as  $36 \pm 1$  C. Also both the "triple reading" and "one hour" resazurin reduction tests are included.

Chapter 14 includes Microbiological Tests for Equipment, Water and Air. This chapter combines methods previously included in two different chapters, but omits procedures for surface agar counts of bottle caps, hoods and gaskets. The disintegration method for paper materials and standards for these have been omitted. The basic container rinse method is expanded to include flexible wall containers, and the basic large equipment rinse methods include CIP equipment.

The "swab contact method" now permits only insoluble cotton swabs and the use of soluble swabs is indicated in an appendix.

General methods for the microbiological examination of water supplies and of membrane filter procedures are omitted from the present edition and are referenced to the 1965 edition of *Standard Methods for the Examination of Water and Wastewater*.

Chapter 15 concerns Sediment in Fluid Milk. The preparation of sediment standard disks is referenced rather than giving detailed directions (11th edition of APHA "Standard Methods" and 10th edition of AOAC).

New photographic grading charts prepared by USDA in cooperation with FDA and APHA are recommended.

Provision is made for two methods of grading (a) to the nearest standard disk of those previously available, (b) above or below a particular standard disk of the new USDA charts. An increase in temperature for filtering of mixed milk samples to 32.2-37.8 C is required.

In Chapter 16 relating to Phosphatase Methods to Determine Pasteurization, it was originally hoped that this could be limited to one method. The Sanders-Sager, Gilcreas-Davis, and Scharer lab methods have been deleted. The Scharer rapid method was retained from the previous edition but the modified Scharer, the Cornell (1 hr test) and the dialysis test (Kosikowski) methods were also added. This chapter has been rewritten and reorganized to provide for methods for each product. Also included is the method for detection of raw admixed with heated milk.

Chapter 17 is entitled Miscellaneous Chemical Methods. Much of the material from the previous edition has been retained and full recognition of the chemical methods published in *Official Methods of Analysis* of the AOAC is acknowledged and referenced.

Chapter 18 on Radionuclides in Milk is a new chapter and includes a modified method suitable for routine monitoring for determination of four radionuclides: total radiostrontium, strontium-90, barium-140, and cesium-137 in ash from one liter of milk. Also a simplified method is given for the determination of iodine-131.

Chapter 19 concerns Simplified Technics for Viable Counts in Raw Milk. This is a new chapter and includes (a) the oval tube or bottle culture method, (b) the plate loop method, and (c) the roll tube method. These are considered standard methods because of their rather widespread use but are grouped at this point because of their specific use for raw milk.

#### APPENDICES

Extensive use has been made in this edition of appendices.

Appendix A includes material taken from various chapters of the previous edition and combined under the heading Culture Media and Preparation. Because of the increased interest both by manufacturers and users of laboratory media two different methods for productivity tests for standard methods agar are given. It is anticipated that in the future additional media will be checked for productivity by these or modified technics.

Appendix B has various Miscellaneous Microbiological Control Methods which previously were included in different chapters. For example, several screening tests for TTC reduction, reverse-phase disc assay, large equipment, air sedimentation, and psychrophilic microorganisms in water supplies are discussed. Also appearing in this appendix are suggestions for cleaning glassware and the microbiological testing for growth inhibition, preparation of buf-



ferred distilled water, the microbiological testing for toxicity and the testing for distilled water suitability.

Appendix C describes Chemical Auxiliary or Screening Methods such as the Gerber method for fat and frozen dessert and the Babcock method for fat in homogenized milk. A screening test is also given for pesticide residues in milk.

Appendix D describes Screening Technics for the Detection of Abnormal Milk. These include the modified Whiteside test, the California mastitis test, the catalase test, the Wisconsin mastitis test, and the Feulgen-DNA measurements of total somatic cells. Possibly others should have been included but the editorial decision was to limit the number of tests since this was the first edition in which such technics have appeared.

#### ACKNOWLEDGMENTS

Although it may seem that many changes have been made in the 12th edition actually a great deal of material from the previous edition has been re-

tained. Since the 7th edition in 1939, outstanding chairmen of this publication such as Drs. Breed, Robertson, and Black and their committees have made many contributions to the progress of standard procedures for the examination of dairy products. Each group has made changes and deletions in line with laboratory findings and the demands of the dairy field. Public health as well as industrial and regulatory interests have been considered and decisions made, not always popular with everyone, for the good of the public. It is hoped that the vast amount of time and effort expended by the 48 subcommittee members as well as many other interested individuals has been as thorough and will prove to be as worthwhile as the contributions of our predecessors. To those of you of this Association who have cooperated in many ways please accept my personal thanks as well as those of the American Public Health Association and those who will use the 12th edition of *Standard Methods for the Examination of Dairy Products*.

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### SALMONELLOSIS CONTROL URGED BY AVMA COUNCIL

Because salmonellosis, a form of food poisoning, now affects more people—an estimated 2 million yearly in the United States—than any other disease, there is need for concerted action leading to its control and prevention by officials of industry, agriculture, and public health agencies.

This is the principal point made in two reports prepared by veterinarians in the U. S. Departments of Agriculture and Health, Education and Welfare for the Council on Public Health and Regulatory Medicine of the American Veterinary Medical Association. The reports state that "industry and government need to give increasing, continuous emphasis to the prevention of contamination and recontamination of feed and feed ingredients in rendering plants, feed mills, and on-the-farm utilization and storage of feeds."

Salmonellosis varies in severity from a mild infection to a serious ailment which may even be fatal to the very young or elderly. It has been estimated that one percent of the population of the United States becomes infected each year. Studies of fresh poultry in retail markets have revealed that 42 percent of the samples examined were contaminated with salmonellae.

Though all warm-blooded animals, including man, and many cold-blooded ones are potential harborers of salmonella organisms, the most common "home-sites" of the infection are dogs, cats, chicks, ducklings, parakeets, canaries, and most recently, turtles. Not to be overlooked, however, according to the reports are contaminated farms, vehicles, animal concentration points, and slaughter and processing plants. Also, infected persons transmit the disease to livestock, poultry,

and other persons. The infection sometimes is spread further by contaminated animal feed and protein supplements made from animals and animal parts.

Authorities agree that the heat of rendering at rendering plants kills salmonellae but, they warn, recontamination is possible after processing especially during storage or in transport. Therefore, rigid sanitation in the production and handling of processed products is essential.

Since modern agricultural methods make for a greater number of animals being produced on fewer, highly specialized farms, the reports strongly recommend increased attention by producers to strict sanitation practices. The centralization of food processing and the speed and ease of widespread food distribution are other factors aiding in the increased dissemination of salmonella-contaminated food and food products.

To combat the problem, the veterinarians recommend that "control activities be directed toward eliminating salmonella contamination of animal feedstuffs, applying terminal pasteurization or other bactericidal treatment to human foods and food ingredients, developing food manufacturing and distribution methods to prevent salmonella contamination and bacterial growth, and training food handlers and food processors in the principles of strict sanitary measures, including personal hygiene."

The veterinary practitioner especially is advised to stress the importance of sound disease prevention and sanitation practices in the management of livestock and poultry and in the housing and care of pets.



# LATEST DEVELOPMENTS IN RESEARCH ON BOTULISM<sup>1</sup>

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## SUMMARY

Research on *C. botulinum* is proceeding throughout the world at a pace never before equalled, with greatest emphasis on type E. It is now clear that this organism is widely distributed in the aquatic environment and may be a frequent contaminant of fish and other marine animals. Much is still to be learned about its ecology and why it occurs in higher concentrations in some environments than in others. Although a large body of information has accumulated about the organism's characteristics, there is still much to be done before the public can be protected with certainty against further outbreaks.

Research on botulism received a dramatic stimulus in 1963. For the several preceding decades only 5 to 15 recognized outbreaks involving 20 to 25 cases occurred annually in the United States (27). The great majority of these incidents were traced to under-processed home-canned fruits and vegetables. Commercial food processors, though generally aware of botulism's potential hazards, were not seriously concerned. Long experience had demonstrated the efficacy of modern food processing methods in protecting the consumer against this dread disease.

Our attitude of complacency was rudely shattered in 1963, when there were four distinct and well-publicized outbreaks of botulism for which the vehicles were commercially processed foodstuffs (28). In fact, for the first time in 38 years commercially prepared foods were responsible for more cases of botulism in the United States than home-processed foods (27).

The publicity surrounding these incidents alerted the public to the danger of botulism, and it also caused severe harm to certain segments of the food industry.

Although much was known about botulism and its causal organism in 1963, it soon became clear that more information was needed before we could confidently prescribe reliable preventive measures. The proceedings of a conference arranged by the Public Health Service in January, 1964, reviewed the state of our knowledge up to that time (26). The succeeding years have seen a vast increase in the volume of research on botulism both in this country and abroad. The current interest in *Clostridium botulinum* centers

around type E, undoubtedly because 3 of the 4 outbreaks of 1963 were caused by type E.

Type E botulism has been recognized as a problem associated with fish products in certain areas of the world for at least 20 years. Prior to 1964, however, only three or four laboratories in the United States were actively working with this organism. Notable among these were the groups of Dr. C. F. Schmidt of the Continental Can Company, Dr. L. L. Kempe of the University of Michigan, and the Food and Drug Administration in Washington, D. C. At the present time at least 24 groups in 21 universities, companies, or governmental installations in the United States alone are working on type E botulism. It is not possible to review all of the work being done since the results are only now beginning to appear in scientific journals. However, an overall view of the world's research effort was presented at a "Symposium on Botulism" held in Moscow, U. S. S. R. on July 20-22, 1966. Much of the substance of this review is from this symposium.

## OCCURRENCE OF *C. botulinum* IN NATURE

The natural habitat of *C. botulinum* probably is the soil. Early surveys by K. F. Meyer and his associates in California revealed the spores of types A and B in soil specimens from many parts of the world. Later work by Dolman in Canada, Johannsen in Sweden, and several Japanese investigators similarly showed the widespread occurrence of type E, particularly in marine sediments and the intestinal contents of fish from northern waters. Johannsen (19) mentions especially British Columbia, Alaska, Japan, the Soviet Union, Scandinavia, and Western Europe. However, he also named Israel, the Mediterranean Sea, and the Gulf of Mexico as sources of the organism (18).

Recent reports have extended and amplified our knowledge of the distribution of *C. botulinum* type E in nature. Nickerson and associates have demonstrated the organism in fish intestines and mud samples from the Gulf of Maine (36). Cabelli and Richards found it in shellfish, mud and soil from marine estuaries in Rhode Island (5). Ward and co-workers have found it in shrimp and bottom sediments from the U. S. Gulf coast (36, 39).

In the Pacific Northwest, Craig and Pilcher have

<sup>1</sup>Presented at the 53rd Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., at Minneapolis, Minnesota, August 15-18, 1966.



demonstrated type E in fish and mud from the Columbia River and along the coast of Oregon (36). Eklund and Poysky found it in dungeness crab and in marine mud samples all the way from California to Alaska (36).

Moving west, Japanese workers are still finding type E in Hokkaido and Northern Honshu (H. Iida, personal communication). Kravtchenko and Shishulina have reported that 10% of some 4,242 soil samples tested in the Soviet Union were positive for *C. botulinum* (36). Type E was the most common, occurring in 62% of the positive samples, whereas type B was found in 28%, type A in 8%, and type C in 2%. Almost one third of 1365 fish intestines also proved to carry *C. botulinum*.

The only area that has consistently failed to yield type E is the British Isles. Soil and shorelines samples there have been uniformly negative, as have fish from the North Sea and shellfish from British coastal waters (Cann et al., 36; G. Hobbs, personal communication).

In 1960 smoked fish from Lake Superior caused an outbreak of type E botulism in Minneapolis. Later, in 1963, two other outbreaks in this country were traced to smoked fish which probably came from Lake Michigan. These events strongly suggested that type E spores may occur naturally in the Great Lakes and constitute a previously unrecognized hazard to public health.

Since 1963 the people in our laboratory have been studying the ecology of type E in the Great Lakes. The organism has been found in fish from all four of the westernmost lakes, although its incidence was highest in fish from Lake Michigan and lowest in those from Lake Superior (3). The presence of type E in these waters has been confirmed by Graikoski and co-workers at the Ann Arbor laboratories of the Bureau of Commercial Fisheries (J. Graikoski, personal communication) and by Pace and associates at the Milwaukee City Health Department (36). Type E has been found in fish from Lake Cayuga in New York State (7) and in a lake of the Tennessee Valley (16).

The work of Johannsen (18) revealed an unusually heavy concentration of type E spores in the Baltic Sea and particularly in the sound separating Denmark from Sweden. A similar heavy concentration exists in Green Bay of Lake Michigan (3). Well over half the fish and practically all of the mud samples from this bay have proved to harbor type E. Currently we are trying to learn why certain bodies of water are more heavily contaminated than others.

There is no reliable way to quantitate type E organisms in samples from nature. The usual expression of concentration is a percentage of positive samp-

les among the total tested. Unequivocal demonstration of type E toxin in an enrichment culture is sufficient evidence to indicate the presence of the organism, but a negative test for toxin is not necessarily proof that the organism is absent. Other microorganisms in the sample may inhibit the growth of type E or they may destroy the toxin as it is formed. Therefore, on the basis of evidence now available it must be assumed that *C. botulinum* type E may be a contaminant of fish from any waters whether fresh or salt. Therefore, protection against botulinum poisoning requires processing and handling methods that will insure either (a) destruction of the organism, or (b) prevention of its growth.

#### GROWTH OF *C. botulinum* TYPE E IN FOODS

Johannsen (17) was the first to report that type E grows poorly if at all in certain foodstuffs. It produced toxin readily in fresh or cooked herring and cod, but not in shrimp, crabmeat, and a variety of cured meat and fish products. Pivnick and Barnett (36) in Canada also inoculated several cured meats with type E spores and observed toxin formation only in one, a jellied ox tongue containing 1.5% salt. Folmer Nielsen and Pederson (36) could not obtain type E toxin in smoked salmon and attributed this to inhibition by formaldehyde absorbed during smoking. Likewise, Abrahamsson (36) did not find toxin in smoked eel after inoculation with spores and incubation at 20 C for 10 days. On the other hand, Cann et al. at the Torry Research Station in Scotland obtained toxin formation in several fish products, including smoked salmon, after inoculation and storage at 40 F (6). In our experience smoked chub readily support growth and toxin formation if the salt content is minimal.

The occurrence of type E toxin in lightly salted smoked fish products naturally has led to consideration of possible hazards in cured meats. Under conditions of abuse many of these products will support the growth of *C. botulinum* types A and B (Pivnick and Barnett, 36), yet billions of pounds of cured meats have been marketed in the U. S. without incident. The explanation may be the lack of contamination with spores of *C. botulinum*. Greenberg and co-workers at Swift & Company (36) recently examined 2,358 samples of beef, pork, and poultry from packing plants in the U. S. and Canada. Three-fourths of the specimens carried less than 3 putrefactive anaerobic spores per gram, and the most heavily contaminated sample of all contained only 115 P. A. spores per gram. Of 19,727 clostridial cultures isolated, the single *C. botulinum* identified was a type C.



## FACTORS AFFECTING GROWTH

One of the unique features of *C. botulinum* type E is its ability to grow at low temperatures. First Schmidt and his associates (31) and later Kempe (24) observed growth of type E at 37-38 F, well within the normal range for storage of refrigerated foods. These experiments were run with large inocula of spores in favorable culture media.

There is, of course, a relationship between size of inoculum and conditions necessary to prevent growth. Large numbers of spores may be expected to tolerate more salt or more acid than small numbers. Combinations of two or more unfavorable (but not necessarily limiting) conditions should be more effective than either one alone. Ample support for these assumptions has appeared recently.

Spencer (36) inoculated cured meat with 100 spores per gram of *C. botulinum* types A, B and E and varied the concentrations of curing ingredients. The amounts of salt and nitrite necessary to prevent outgrowth were lower than had been reported previously with larger inocula. Riemann (36) also showed that large numbers of type E spores can tolerate and grow in higher concentrations of salt than small numbers. Furthermore, large numbers of spores will grow at a lower pH than small numbers. Segner, Schmidt and Boltz (32a) observed growth down to pH 5.21 with 2 million type E spores per tube and pH 5.03 with 20 million.

Several workers have demonstrated a relationship between two or more environmental factors. Ohye, Christian and Scott (36) found the limiting concentration of salt for one strain of type E to be: 5.8% at 25 and 30 C; 5.1% at 20 C; and 4.3% at 15 C. According to Segner, Schmidt and Boltz (32a), 5% salt was required to prevent growth at 16 to 30 C but only 4.5% was necessary at 8 to 10 C. Outgrowth time naturally is delayed as the salt concentration approaches the limiting value (32a; Pivnick and Barnett, 36). Riemann (36) found that type E could tolerate less salt as the pH approached 5.0. At 8 C Segner, Schmidt and Boltz (32a) observed growth at pH 5.9 but not at pH 5.7. However, at 30 C the organism grew at pH 5.2.

Attempts to find reliable chemical additives to prevent toxin production in foods—especially smoked fish—have received considerable attention. Those tried with some success include the antibiotic, Tylosin (33), benzoate and nitrite (32). Unfortunately it is not yet possible to assure uniform distribution of salt and other inhibitory chemicals in the tissues of intact foods such as fish (40).

Vacuum packaging of food products has increased rapidly during the past decade. The involvement of vacuum packaged smoked fish in two outbreaks of

botulism has suggested to some that vacuum packaging may be responsible for the growth of *C. botulinum*.

Several groups of investigators have compared the rates of growth of *C. botulinum* in vacuum packaged and non-vacuum packaged cured meats (8; 37; Pivnick and Barnett, 36), smoked fish (22), irradiated fresh fish (1), and various other foods (17). All reports are in general agreement that *C. botulinum* grows about the same whether the food is vacuum packaged or not. In other words, the composition of the food and other environmental conditions regulate growth, not the type of package.

It is true, as many have observed, that vacuum packaging prevents the growth of certain aerobic spoilage organisms and thereby may deny the consumer a possible warning sign that the product has been mishandled. It must be remembered, however, that non-vacuum packaged foods also may become toxic without showing obvious signs of spoilage. Therefore, the elimination of vacuum packaging would not guarantee safety from botulism.

Most of the work with type E is done with complex natural media, but a chemically defined medium is needed for nutritional studies of sporogenesis and toxigenesis. Several investigators have prepared synthetic media in which type E will multiply, but growth is sparse and morphology of the cells is atypical. Recently Snudden and Lechowich of Michigan State University have developed a chemically defined medium in which type E is said to grow with normal morphology, produce toxin and sporulate (36). The medium is a modification of Difco's tissue culture formula No. NCTC109.

## RESISTANCE OF BOTULINUM SPORES AND TOXIN

Another distinctive feature of type E is the relatively low heat resistance of its spores. Decimal reduction values (D values) at 80 C usually are less than 2 minutes (29) when the spores are heated in water, buffer or culture media. They are somewhat more resistant in fish and other protective materials, but still are far more sensitive than the spores of the other types of *C. botulinum*. The possibility that small numbers of resistant spores exist among a majority of relatively sensitive ones has been suggested (13) and has not yet been ruled out with certainty.

Spores of *C. botulinum* type A are among the most resistant of all microorganisms to ionizing radiations. Exposures on the order of 4.0 to 5.0 Mrad are required for destruction of  $10^{12}$  spores (12 D), the commonly accepted baseline. Low intensity radiation of fresh fish to extend refrigerated storage life has shown considerable promise, but the low tem-



perature growth potential of *C. botulinum* type E has stimulated interest in the radiation resistance of both its spores and its toxin.

Radiation D values on the order of 0.12 to 0.17 Mrad have been obtained for type E spores (29), placing their resistance close to that of types A and B. The radiation resistance of type E toxin also approaches that of type A toxin ( $D = 2.1$  Mrad), suggesting the impracticality of detoxifying food products with ionizing radiation (35). Miura and co-workers (G. Sakaguchi, personal communication) have shown that proteins and certain other nitrogenous compounds protected type E toxin against inactivation by radiation. The purer the toxin, the more easily it was inactivated.

Ito and others in California (36) have shown that chlorine is an effective lethal agent for *C. botulinum*. Exposure of the spores to 4.5 ppm free available chlorine in phosphate buffer at pH 6.5 caused 99.99% reduction of viable type E spores in 4 to 6 minutes and of types A and B in 3 to 8 minutes.

#### CHARACTERIZATION OF BOTULINAL TOXINS

As in the past, there is still much interest but uncertainty in the nature of the botulinal toxin, that unique "most poisonous poison" (25). Type A toxin as originally crystallized is a protein of molecular weight 900,000. This toxin preparation is a complex in intimate association of the specific neurotoxin and a red blood cell agglutinating (hemagglutinating) factor, these being separable by appropriate procedures. In addition, the toxin can be dissociated into toxic particles of low molecular weight (38). Recently, Boroff and associates who have presented evidence that tryptophane is necessary for toxicity (2) reported the separation of crystalline type A toxin by chromatography into 2 fractions of greatly different toxicities (36). The possibility that the molecular weight of nearly one million of the crystalline type A toxin is the result of aggregation of smaller molecular weight units was presented on the basis that a different purification procedure gave essentially pure toxin molecules of around 12,000 molecular weight (12). However, Schantz and Spero have recently calculated that the molecular size of toxin of type A (and other toxin types) as they are found in the crude toxic culture fluids is close to that found for the crystalline type A toxin (36).

Type E toxin also is receiving attention, partly, no doubt, because of its unique property of activation by certain proteolytic enzymes. Treatment of the toxin as found in cultures with trypsin increases its lethality for mice by 10 to 100 fold.

Dolman's group in Canada (11) give the molecular weight of the purified toxin as 14,000 to 16,000, and

that of the activated product after treatment with trypsin as 10,000 to 12,000. Sakaguchi's group in Japan, on the other hand, estimate the molecular weight of purified type E toxin as more than 200,000 (30). Under their conditions, treatment with trypsin caused no reduction in the molecular size. Similar results were obtained both with toxin from pure cultures and from "izushi." Thus further work will be necessary to reconcile the differences and to clarify the mechanism of trypsin activation.

On the subject of toxin, Grecz and Lin (36) have reported the presence of heat resistant toxin in type A spores but not in types B and E. It was calculated that each spore contained about 500 molecules of toxin as compared with 500,000 molecules in a vegetative cell. As few as 50,000 young spores were lethal to mice, although their toxicity decreased on storage.

#### METHODS OF ISOLATING AND IDENTIFYING *C. botulinum*

Detecting *C. botulinum* in natural materials is complicated by the presence of other organisms, which may interfere with its growth. For this reason it once was customary to heat a sample to 80 C for 10 minutes to eliminate non-spore forming bacteria. However, this procedure cannot be used with type E because its spores are extremely sensitive to heat.

It is now clear that mud, soil and similar materials often contain organisms that strongly inhibit the growth of type E and interfere with its detection by existing methods. Kautter and co-workers (23) have described several bacteria that do this. In addition to their inhibitory property, some of these cultures exhibit all of the morphological, physiological and biochemical characteristics of type E except toxigenicity. We have encountered similar organisms, as have many other investigators (4, 14; K. Yamamoto, personal communication; H. Iida, personal communication).

The so-called "E like" organisms also complicate the isolation of toxigenic type E cultures from enrichment cultures in which the toxin has been clearly demonstrated. The "E like" colonies are indistinguishable from those of toxigenic type E organisms even on the liver veal egg yolk agar used in the "alcohol procedure" of Johnston and co-workers (21). This procedure is excellent with certain materials, but it has not proved useful with mud and fish samples from the Great Lakes.

Many attempts have been made to adapt the fluorescent antibody technique to the identification to *C. botulinum*, especially type E, in mixed cultures. Thus far the method has not proved useful for this purpose.



A method of detecting botulinum toxin without employing test animals has just been described by Johnson and co-workers (20). In this procedure, formalinized sheep red blood cells are sensitized with type specific antitoxin. When homologous toxin is added, hemagglutination occurs. As little as 0.75 to 1.3 mouse LD<sub>50</sub> of type A toxin or 2.3 LD<sub>50</sub> of type B toxin could be detected with this system. Further work on this procedure is under way in our laboratory with two main objectives: (a) adaptation to type E, and (b) detection of botulinal toxin in foods.

#### ANIMAL BOTULISM

Outbreaks of type C botulism in mink have occurred recently in Russia (Bulatova et al. 36) and in Japan (H. Iida, personal communication). Skulberg (34) also reported outbreaks caused by type E in Norway and Denmark.

In the U. S. there has been considerable interest in the possibility that large "die offs" of gulls and other fish-eating birds in Lake Michigan might be caused by type E toxin. Kaufman and associates (36) were able to kill gulls by feeding 60,000 to 140,000 mouse intraperitoneal LD<sub>50</sub> doses of type E toxin. Jensen and Gritman, on the other hand, were unable to intoxicate ducks and gulls by feeding as much as 3,000,000 mouse lethal doses (36). They did, however, observe an adjuvant effect when types C and E toxins were fed simultaneously.

#### C. botulinum TYPE F

This type was recognized in 1959 as the cause of a single small outbreak in Denmark. There have been no other known incidents, although the organism has been isolated from marine mud taken off the Pacific coast (10) and in a salmon from the Columbia River (9).

According to Walls (36), type F will grow and produce toxin at temperatures as low as 4 C (39 F). The toxin is activated by trypsin like that of type E. The type F toxin and the "precursor" is apparently formed intracellularly since rupturing young cells results in their release (15).

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## ADVANTAGES CLAIMED FOR SANI-GUIDE SYSTEM

The Kendall Company, manufacturers of Kendall Sani-Guide Pipe-Line Inserts, claim that their Sani-Guide system offers a number of advantages as a practical bulk milk quality check.

In-line filtration has accompanied the growth of bulk tank milk handling and, according to the Company, this also has created problems. Too often large quantities of milk per unit of filtration overload the capacity of the product and high velocity pumps, introduced for in-place cleaning and used also for moving milk through filtering media, frequently cause breakage of single service filters. Usage of woven reusable filter media to solve the breakage problem has created a greater evil in terms of bacteria build-up. It was known that nylon had properties of catching hair, lint and insect parts and this led to experimenting with a proper nylon

mesh mounted between paper gaskets, resulting in a device know as Sani-Guide Pipeline Inserts.

Among the advantages claimed is the fact that the producer can readily check his own operation by examining the inserts. Also, field and inspection personnel no longer accept excuses about tests being confused with those of neighbors or that extraneous material has blown into the tank truck during loading and delivery. There is proof whether or not the producers are maintaining adequate control by the material shown on the Sani-Guide.

Good results have already been achieved by segments of the dairy industry who have used the Sani-Guide program, the manufacturer states. A number of state and local health departments are using the program for spot-checking producers.



## PREPARING LOCAL HEALTH DEPARTMENTS TO COPE WITH FOODBORNE DISEASE OUTBREAKS<sup>1</sup>

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When a suspected foodborne disease outbreak is reported the local health officer and certain members of his staff must be prepared to swing promptly into action if they expect to determine whether in fact there has been a foodborne disease outbreak and, if so, the causative agent and the food which served as the vehicle. While the services of an epidemiologist and other specially trained personnel can usually be secured from the state health agency, much valuable time can be lost before state level personnel can arrive on the scene.

An investigation should be undertaken immediately if meaningful specimens are to be collected for laboratory analysis and if accurate information is to be secured during interviews. This means the health department should have a plan of operation to be followed when suspected foodborne disease outbreaks are reported and that at least certain basic supplies and equipment to be used in making an investigation be readily available at all times.

Legislation enacted during 1965 requires that the services of a local health department be available in all parts of Michigan. These services may be provided through city, county or district health departments. Each local health department must be under the direction of a medical doctor. Most of these medical directors have had formal training in epidemiology. Many of the sanitarians, public health engineers, public health nurses and other personnel employed by the various health agencies in the State have also had formal training in epidemiology. In addition, practically all professional personnel employed by health departments who have not had an opportunity to avail themselves to formal training in this area received considerable exposure to the techniques of epidemiological investigations through short courses and similar training programs or as a result of field training activities.

Health agencies in Michigan are in a favorable position to make intelligent and meaningful investigations of suspected foodborne disease outbreaks. However, since some departments may go for months without a suspected case of foodborne disease being

reported, there is sometimes a tendency to relax a little and not be prepared to grab the necessary investigation materials and take off on the double when the time comes for action. All too often when a suspected foodborne disease outbreak was reported containers and other materials used for collecting specimens and information were not readily available and frequently it was necessary to improvise.

One day last winter a public health veterinarian employed by one of our local health departments stopped in at our office to show us a kit he had assembled to be used in connection with the investigation of suspected foodborne disease outbreaks. A representative of the Public Health Service just happened to be visiting our Department at the same time. The upshot of the coincidence was that it was decided that every local health department in Michigan should have a kit of this type available. It was also decided that a course on epidemiology and control of foodborne diseases should be held. Funds were found to be available which could be used for purchasing the various materials necessary to make up a kit for each department as well as to cover other necessary expenditures connected with such a course.

The dates of March 1 and 2, 1966, were selected and the job of lining up speakers, securing materials, assembling the kits, reserving meeting rooms and all the other various and sundry activities necessary in organizing such a course were undertaken. An outstanding group of speakers were secured to make the various presentations. Cooperation received from the Communicable Disease Center, Training Branch and the Regional Office of the U. S. Public Health Service, as well as from the various divisions and sections within our own department, was excellent. Without this cooperation, the course could not possibly have been organized and implemented on such short notice.

While planning the course, two basic facts became obvious: (1) The kits which were being prepared should serve as the focal point for the training program; and (2) Since the medical director is the key person whenever human illness is involved, the course should be kept at a level where the presentations would prove both interesting and challenging to these highly educated public health officials.

Invitations to attend the course were extended to

<sup>1</sup>Presented at the 53rd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. at Minneapolis, Minn., August 15-18, 1966.



the directors of each local health department with the suggestion that he have a key member of his staff accompany him. In most cases this proved to be one of the sanitarians.

The kits contained the following items:

1. Three sterilized specimen bottles;
2. A sharp knife (butcher knife) wrapped, labeled and sterilized;
3. Two teaspoons, wrapped, labeled and sterilized;
4. One dessert spoon, wrapped, labeled and sterilized;
5. One pair of forceps, wrapped, labeled and sterilized;
6. One package of paper towels, wrapped and sterilized;
7. Heavy wrapping paper, folded and wrapped in an outer cover and sterilized;  
(This paper can be used for covering and transporting large items such as a carcass of a roasted turkey or a ham, or it can be used as a sterile surface on which to prepare specimens)
8. One box of Kleenex;
9. One alcohol lamp and 4 oz. bottle of wood alcohol;
10. Six hand cleaning tissues;
11. One roll of tape 1/2";
12. One marking pencil;
13. Two thermometers (1 regular 0-220° F and 1 maximum registering 0-220° F);
14. Supply of forms to be used for recording information obtained at the time of collecting specimens for laboratory examinations.

To supplement these kits the Bureau of Laboratories of the Michigan Department of Public Health has available "8 packs" of sterile food sample containers which will be furnished to local health departments at no cost. Containers for stool specimens can also be secured from the Michigan Department of Public Health.

Another key to the success of this particular program is that a considerable number of pamphlets, articles, papers, charts, etc., relating to food poisoning were accumulated and presented to the participants

in a looseleaf notebook cover so that this information could be taken back and made a part of the department's reference file. While most of the materials were furnished by CDC, some appropriate pamphlets prepared by the Michigan Department of Public Health, the National Restaurant Association and others were also included. These notebooks proved to be so popular that two dozen extra copies were necessary to fill additional requests.

In an effort to help keep the public informed regarding local health department participation in the training course, arrangements were made for pictures to be taken of each health officer being presented with a kit by the Chief of the Division of Epidemiology, Michigan Department of Public Health. These pictures, together with a short narrative, were forwarded to the local newspapers.

From all indications the program thus far has been highly successful, but the work already completed must only be considered the first step in a continuous effort. Arrangements are already being made to conduct another training program in March of 1967. This program will be expanded to three days. Additional and new information will be presented and it is anticipated that many of those who attended the last course will again want to attend the session next March. There were some health officers as well as other key personnel who could not attend the 1966 session because of previous commitments. It is impractical to extend our thinking much beyond the next training session, but it is entirely possible that we may see fit to continue this program on an annual basis for some time.

We are also thinking in terms of the kits on a continuing basis. It is anticipated that checking the availability and condition of these kits may be made a routine part of each environmental health program evaluation. Since almost invariably one of the sanitarians has been charged with the responsibility of keeping the kit in a ready condition, it seems only logical to consider it as part of the environmental health program.

In our opinion local health officials are in the best position to make prompt and meaningful investigations of foodborne disease outbreaks with the State Health Department serving in a supporting role.



# WATER QUALITY ACT OF 1965 - IMPACT ON THE DAIRY AND FOOD INDUSTRY<sup>1</sup>

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On May 10, 1966 the Federal Water Pollution Control Administration was transferred to the Department of the Interior and Secretary Stewart L. Udall immediately issued guidelines to the States for setting of water quality standards on the interstate waters. Under the Federal Water Quality Act of 1965 the States are required to set quality standards on interstate waters by June 30, 1967. If a State fails to set adequate standards they will be set by the Secretary of the Interior. By May 10th, 1966, twenty seven States had indicated their intention to meet the '67 deadline.

The guidelines require that economic, health, conservation, and aesthetic values be considered in determining the most appropriate use of a stream and that the States hold public hearings before setting quality standards. Secretary Udall said "President Johnson has made it clear that no one has the right to use America's rivers and America's waterways that belong to all the people as a sewer".

The May, 1966, guidelines for establishing water quality standards for interstate waters under the Water Quality Act of 1965, Public Law 89-234, provide that standards adopted by a State will become standards applicable if:

1. The State authorities file by October 2, 1966, a letter of intent that the State after public hearings will, before June 30, 1967, adopt water quality criteria applicable to interstate waters or portions thereof within the State, and a plan for the implementation and enforcement of the criteria;
2. The State subsequently adopts such criteria and plan; and,
3. The Secretary determines that the State criteria and plan are consistent with the purposes of the Act.

## ESTABLISHING WATER QUALITY STANDARDS

Guidelines in the Act itself indicate that in establishing quality standards considerations be given to the use and value of the water for public water supplies, propagation of fish and wildlife, recreational purposes, agricultural, industrial and other legitimate uses. Any discharge of matter into inter-

state waters which reduces the quality of such waters below the established standards (whether the matter causing such reduction is discharged directly into such waters or into tributaries and then reaches such waters), is subject to abatement. There should be a constant effort to improve the quality of a water supply. The principal objective is the orderly development and improvement of our water resources without the necessity of adversary proceedings which inevitably develop into enforcement cases. The standards should be applied on the basis of the water quality requirements of present and future uses after due consideration of all factors and variables involved.

The standards should be designed to "enhance the quality of the water" and in any case must maintain existing water quality. No standards will be approved which provide for the use of any stream for the principal purpose of transporting wastes.

No standard will be approved which allows any wastes amenable to treatment or control to be discharged into any interstate water without treatment or control or which does not require all wastes, prior to discharge into any interstate water to receive the best practical treatment or control unless it can be demonstrated that a lesser degree of treatment or control will provide for water quality enhancement commensurate with proposed present and future water uses. It is anticipated that after establishing the initial standards periodic review and revision will be required.

"Interstate waters" include all rivers, lakes and other waters which form a part of the boundary between a State and another State or foreign country, as well as coastal waters, such as those along straight ocean coasts, the waters along indented coasts which are subject to tidal flow, and the waters of the Great Lakes. The Department of the Interior does not limit "interstate waters" to those portions at the point at which they flow across or form a state boundary but the water quality standards are to apply to the entire stretch of the interstate waters within a State. Tributaries of interstate waters, not in themselves interstate waters, are not directly subject to the quality control standards but if they carry any matter into the interstate waters which reduces the quality below established standards, this is subject to abatement.

<sup>1</sup>Presented at the 53rd Annual Meeting, International Association of Milk, Food and Environmental Sanitarians, Inc., Minneapolis, Minn., August 15-18, 1966.



## NEW YORK STATE MINIMUM SPECIFICATIONS

No doubt, as in New York State, the water quality standards when established in other States will be based on the "best use" of the water now or in the near future. This "best use" may vary from drinking water, bathing, fishing to industrial, agricultural and drainage. And the requirements for waste treatment before discharge may vary from tertiary treatment and chlorination, to secondary treatment and in a few cases, primary treatment.

The minimum water quality standards in New York apply to the "receiving waters after opportunity for reasonable dilution and mixture with the waters discharged thereto" and include the following items and specifications:

ITEMS	SPECIFICATIONS
1. Floating solids; settleable solids; sludge deposits.	None which are readily visible and attributable to sewage, industrial wastes and other wastes or which deleteriously increase the amounts of these constituents.
2. Sewage or waste effluents.	None which are not effectively disinfected for drinking, culinary or food processing, or for bathing.
3. pH	Range between 6.0 and 9.5 for agricultural or source of industrial cooling or process water. Range between 6.5 and 8.5 for higher uses.
4. Dissolved oxygen.	Not less than 3.0 ppm for agricultural or source of industrial cooling or process water. For higher uses, not less than 4.0 ppm for non-trout waters; not less than 5.0 ppm for trout waters.
5. Toxic wastes, deleterious substances, colored or other waters or heated liquids.	None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to prevent fish survival or impair the waters for any other best usage as determined for the specific waters.
	Maximum concentrations of certain toxic pollutants in non-trout waters of 80 ppm alkalinity or more may be:
Ammonia or Ammonium compounds	2.0 ppm (NH <sub>3</sub> ) at pH 8.0 or above
Cyanide	0.1 ppm (CN)
Ferro — or Ferri-cyanide	0.4 ppm Fe(CN <sub>6</sub> )
Copper	0.2 ppm (Cu)
Zinc	0.3 ppm (Zn)
Cadmium	0.3 ppm (Cd)

Thus the water quality standards established under the Federal Water Quality Act of 1965 may apply to all interstate waters and by extension to all waters which flow into interstate waters. All municipal and industrial wastes which discharge into these waters must be treated. This treatment in nearly all cases will be at least secondary treatment and in an increasing number of cases tertiary treatment.

## DISPOSAL OF DAIRY AND FOOD PLANT WASTES

For the dairy and food plant this means disposal of the plant wastes either in such a way that the wastes do not pollute any water which in turn may pollute interstate water, or treatment in combination with municipal wastes or in a separate industrial waste treatment plant.

In New York State the "basic policy is to eliminate pollution economically although effectively. This can generally best be served by the construction of one plant serving municipal and industrial needs rather than those needs being served by separate plants. A municipal sewage treatment plant may be designed to receive an unlimited percentage of industrial wastes and the municipally remain eligible to receive state aid for construction and operation and maintenance". State aid may amount to 30 per cent of the construction cost and 30 per cent of the costs of operation and maintenance.

Federal aid for the construction of plants for the treatment of municipal wastes with industrial wastes may be available up to 30 per cent of the construction cost and if the plant is part of a comprehensive regional plan, an additional 3 per cent of the construction cost may be available. Thus a considerable portion of the construction costs for a combined municipal and industrial waste treatment plant may be available. In such cases combined treatment may be very advantageous.

Milk is a nearly perfect food for people and microorganisms. The organic matter from milk in waste water stimulates growth of microorganisms and the consequent use of roughly 1 pound of dissolved oxygen for each pound of organic milk solids.

The pollutional effects of dairy wastes in streams and lakes are (1) mainly the reduction in dissolved oxygen below the levels at which normal aquatic life will thrive, and also (2) the creation of suspended solids which may interfere with oxygen transfer in fish gills or may settle as a sludge blanket on the stream bottom and so prevent the growth of the normal biota, and rarely (3) a shift in pH, temperature and/or concentration of toxic matter in the water so that it no longer supports normal aquatic life.

The dairy industry is well aware of operating costs



and so has investigated and tried many variations in methods of dairy waste treatment which appeared to offer more satisfactory treatment with lower costs. Many dairy and food processing plants are located in areas where it is not economically practical to discharge the wastes to a municipal waste treatment plant and it then becomes necessary to provide industrial waste treatment. Industrial wastes have been treated satisfactorily by many different methods including land irrigation, lagooning, activated sludge treatment and trickling filter treatment. The most economical, satisfactory and desirable waste treatment for a specific plant will depend upon local conditions.

#### CURRENT METHODS OF WASTE TREATMENT

Usually it will be desirable to segregate the liquid wastes before disposal. Sanitary wastes from toilets and washrooms in most cases should go to municipal sewers or to a septic tank and underground drain field. Strong wastes, such as surplus skim milk, butter milk and whey, should be collected and preferably used for human or animal feeding in the liquid state or after concentrating and/or drying. Frequently other strong wastes may be disposed of on isolated land satisfactorily at less expense than by treatment. Clean cooling waters may be discharged to storm sewers or directly to the stream. Contaminated wash waters, equipment and floor rinsings should be treated.

Every practical effort should be made to reduce avoidable waste to a minimum by an effective waste prevention and waste savings program which has the whole-hearted support of plant management.

Preferably after the plant has segregated the wastes and practiced waste savings and waste prevention so that it is a normal operation, a waste survey should be made to determine the volume and BOD<sub>5</sub> strength of floor wastes to be treated. This survey should cover a sufficient time to show the variations during the week, particularly for the periods when there is insufficient supervision. This survey data should include production data so that the results can be projected for the period of 7 to 10 days of peak production. These calculations for waste flow and BOD<sub>5</sub> during peak production should be used for the design of waste treatment by various methods.

Originally it was reported that with spray irrigation of dairy wastes the limiting factor was the hydraulic load and that the BOD content had little or no effect. Now after thirteen years experience it is apparent that microbial growth in the pore space of the soil is stimulated by high BOD concentrations and may greatly reduce the infiltration rate. So far this problem has not been reported with low con-

centrations of BOD, 200 to 500 ppm, in the applied waste. Much land will permit an initial average waste application of 6,000 gallons per wetted acre per day.

Ridge and furrow or seepage trench systems initially may handle 3 to 5 gallons of waste per day per square foot of wetted area and due to microbial growth in the soil after one to three years handle only 1.0 to 1.5 gallons per day per square foot of wetted area in spite of annual removal of sludge from the furrows or trenches. The initial cost of irrigation systems may be relatively low but the maintenance problems in cold weather or in sludge removal can be expensive. Odor problems may occur while the trench system is being dried and during the removal of up to 0.4 cubic foot of wet sludge per square foot of trench bottom.

Trickling filters have been used for many years for treating dairy waste and have a relatively high capital cost, a relatively low operating cost, a reported good ability to absorb shock loads and have given BOD reductions of about 80 to 93% based on raw waste and clarified effluent. High BOD concentrations in the applied waste tend to cause excessive slime growth on the filter media and ponding unless there is adequate hydraulic flow to remove the excess growth. High-rate, two-stage recirculating trickling filters have given better results than standard rate filters. Clarifiers and sludge digesters or other methods of excess sludge disposal are required.

For the treatment of dairy waste the standard activated sludge method has undergone many modifications. Retention time in the aeration tank has been increased from about six hours for domestic sewage to one or two days in many dairy waste treatment plants and to more than five days in others in order to reduce the BOD concentration of strong raw wastes to 40 pounds BOD<sub>5</sub> or less per 1000 cubic feet in the aeration tank. Then the clarifier can operate satisfactorily even with a sludge volume index of 200. With complete return of sludge to aeration the active sludge mass and volume in the aeration tank give good equalization of "slug" loads of raw waste.

The air supply should be adequate to maintain a minimum of some DO (dissolved oxygen) except for short periods of time, up to six hours per day. Many ways have been used to introduce air into the waste. With dairy waste the clogging of porous air diffusion devices has been a serious problem and various proprietary devices have been used. Penberthy educators using recirculated mixed liquid with air under blower pressure (pressure jets) or under atmospheric pressure (suction jets) have been used satisfactorily except for clogging problems. As a result a number of treatment plants have ceased to recirculate liquid



and use the jets for air only and claim satisfactory results.

#### USE OF MECHANICAL SURFACE AERATORS

Mechanical surface aerators have enjoyed recent popularity. In non-freezing weather they appear to be non-clogging and be reasonably efficient in oxygen transfer. However, in sub-zero weather there have been reports of severe icing problems.

Unfortunately, endogenous respiration will not burn up all of the new protoplasm formed and at 20 C about 5% of protoplasm is oxidized daily to insoluble inert organic matter which tends to add to the sludge mass in the system. Unless circumstances permit the discharge of considerable suspended sludge solids in the clarifier effluent, it will be necessary to provide facilities for excess sludge. These may be a sludge digester or holding tank, sludge lagoons, polishing ponds, sand beds, or direct disposal on land.

Lagoons with natural aeration are being used extensively for domestic waste, combined domestic and dairy waste, and a few cases for dairy waste only. Exceeding the design load reportedly has been the cause of odor problems and unsatisfactory treatment. Where the organic load has been less than 30 pounds of BOD per acre per day under Minnesota operating conditions, results appear to be satisfactory.

Mechanical surface aerators have made it possible to greatly increase the BOD loading in shallow lagoons and to decrease the retention time. A Florida citrus plant with a 3.9 acre mechanically aerated lagoon 4 feet deep has handled more than 1000 pounds BOD per day per acre with about 40-HP per acre, and a retention time of 12 days and shown a BOD reduction of more than 93% in the lagoon.

When supplied with adequate air and agitation, biological activity apparently continues at a sufficient rate at temperatures just above freezing to give a more than 90% reduction in BOD as shown by the January, 1965, study of the Glenwood, Minnesota, oxidation ditch sewage treatment plant by the Minnesota Department of Health. Mechanically aerated basins have been used for dairy waste at one plant in Wisconsin and one plant in Illinois. Results appear to be promising.

With wastes from dairy by-products plants it is desirable for normal sludge growth to determine the relative amounts of BOD<sub>5</sub>, total phosphorous, and total nitrogen and preferably to provide nutrient supplementation if the ratio is less than 100 to 1 to 6, respectively.

#### SUMMARY

Under the Water Quality Act of 1965 the States are required to establish quality standards on interstate waters and a plan for implementation and enforcement which is acceptable to the Secretary of the Interior or he will do so. These standards are to enhance the quality of the water and to be subject to periodic review and revision. It is expected that at least secondary treatment of all industrial and municipal wastes will be required before discharge to a watercourse.

Dairy wastes preferably should be treated with municipal wastes in a combination treatment plant. Where this is not practical, dairy wastes can be treated by land irrigation, lagooning, trickling filters, or modifications of the activated sludge process. Costs of treatment are dependent upon the local situation.

#### PUBLICATIONS OF INTEREST

**Editorial Note:** Listed below are books, pamphlets and reprints on a variety of subjects considered to be of interest. Requests for material should be addressed to the source indicated. Note cost of books and certain items.

USDA Handbook on Insecticides. Directions and precautions for safe agricultural use of more than 100 insecticides are updated and summarized. No. AH-313. Supt. of Doc., Govt. Printing Office, Wash., D. C. 20402. \$1.25.

Trichinosis: How it affects you, how it affects your hogs, what you can do about it. Office of Information, USDA, Wash., D. C. 20250.

The Bacteriological, Chemical and Physical Requirements for Commercial Egg Cleaning. Market Res. Dept. No. 740.

Office of Information, USDA, Wash., D. C. 20250.

Procedures Governing the Cooperative State-PHS Program for Certification of Interstate Milk Shippers. PHS Bull. No. 1046. Supt. of Doc., Govt. Printing Office, Wash., D. C. 20402.

Review of Baking Industry Sanitation Standards. H. P. Milleville and Paul Gelber. Food Processing and Marketing. 27, No. 2 P. 73, 1966.

Sanitation Standards for Baking Equipment, 23 units. Baking Industry Sanitation Standards Comm. 521 Fifth Ave., New York, N. Y. 10017. 25c.

Volume-Weight Conversion Factors for Milk. Marketing Res. Dept. No. 701. Consumer Mktg. Serv., Dairy Div., USDA. Wash., D. C.



# ASSOCIATION AFFAIRS

## A LETTER FROM STEVE WOLFF

August 22, 1966

Mr. H. L. Thomasson,  
Executive Secretary  
IAMFES  
Shelbyville, Indiana

Dear Red:

During the presentation of Honors and Awards at the Annual Banquet, I was asked to receive the Honorary Life Membership Plaque in the International Association of Milk, Food and Environmental Sanitarians on behalf of Doctor Milton R. Fisher, and to formally present it to him upon my return to St. Louis.

It is my pleasure to report that the Executive Committee's request was complied with on Thursday evening, 18 August 1966.

I can only report that Milt was literally overcome with surprise and joy. He is indeed most grateful and appreciative of the honor bestowed upon him, and has asked that I specifically extend to the Executive Committee, and the entire Membership at large, his sincere thanks and best wishes to all.

With kindest personal regards, I am

Cordially,  
Stephen J. Wolff  
Pevely Dairy Company  
Saint Louis 4, Mo.

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## PARIS BOLES EXPRESSES THANKS

The recipient of the 1966 Sanitarian's Distinguished Service Award, Mr. Paris B. Boles, Senior Sanitarian, Wayne County Health Department, Monticello, Kentucky, expresses his appreciation of the honor in the following letter to "Red" Thomasson, IAMFES Executive Secretary:

"It would be impossible for me to try and put in words my sincere thanks to you and the Association for the wonderful honor bestowed upon me at the Fifty-third Annual Meeting in Minneapolis.

"I do want to thank you and every member of our Association, the men from industry who donated the money, and last but not least, the judges. To all of you, thanks."

## COMMITTEE CHAIRMEN REPORTS FEATURE INDIANA SANITARIANS ANNUAL MEETING

A novel idea for the submission of committee reports was utilized at the 16th Annual Meeting of the Indiana Association of Sanitarians at Indianapolis October 4-6, 1966. The chairmen of the eleven standing committees were assembled at the speakers table from which point each gave his report covering the highlights of his committee's accomplishments of the past year and his plans and recommendations for future activities. The presentations, made a part of the formal program in contrast to the usual reporting from the floor at a business meeting, were received with much more interest and attention by the entire audience.

The full program provided a broad coverage of interesting topics ranging from housing and general sanitation to food services and food processing, milk sanitation, proposed state laws and codes and the basis for such regulations and the financing of local health departments. A representative of the Public Health Service discussed microbiological hazards related to synthetic fillings for pies and pastries. A member of the State University Department of Dietetics utilized visual aids in presenting a program for the design and layout of a sanitary and efficient food service.

Other highlights included a combined paper and "chalk talk" by a State Board of Health bureau director on the philosophy of laws and regulations. The presentation proved to be most impressive and thought-provoking.

New officers for the coming year are: Karl K. Jones, President; J. W. Nix, President-Elect; J. E. Goodpasture, 1st Vice-President; Joseph McIntosh, 2nd Vice-President; J. R. Collins, Treasurer; and J. D. Boruff, Secretary. The retiring President is L. C. Lukemeyer. John M. Schlegel also retires as Secretary after having served the Association for a number of years.

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## KANSAS SANITARIANS ANNUAL MEETING

The 37th Annual Conference of the Kansas Association of Public Health Sanitarians was held at Manhattan on October 26-28, 1966. Approximately 100 members and guests enjoyed an interesting program.

Featured at the meeting was a presentation of films and slides employed by representatives of three county health departments in furthering their pro-



grams of education and enforcement of ordinances and regulations. Advantages in using this material as well as photographs of actual conditions was discussed by each of the sanitarians.

An industry member of the State Food Service and Lodging Board told how a restaurant owner would prefer to be inspected and emphasized the value of intelligent, well-coordinated inspections. There were two discussions on salmonella problems of concern in food processing and handling. Experiences in controlling the sale of hot and cold foods for immediate consumption from mobile units were related in another paper.

Other topics covered in the three-day program included nursing home standards relating to plumbing and heating systems, new methods of water analysis, counter freezer controls and bird infestation in urban areas.

At the annual awards banquet Citations of Merit for long and valuable service in the interest of milk and food sanitation in the state were presented to two members. Mr. D. V. Van Sickle has spent some 20 years as a field man for a creamery and since 1942 was an employ of the State Board of Agriculture. Mr. Guy Duncan, since the early 1930s, has been engaged in procurement and field work for a large dairy organization in the state. Both gentlemen are retired. No Sanitarian of the Year Award was given this year.

#### INDUSTRY AND REGULATORY AGENCY COORDINATION STRESSED AT WASHINGTON ASSOCIATION MEETING

At the Washington Milk Sanitarians Association annual meeting on September 13, 1966, Syd Suckling, President, reviewed the progress of the Association and its accomplishments. Pointing out that the Association was organized to achieve improvement in quality of dairy products, he stated that to have maximum success the endeavor needed the support of all interested people. He particularly stressed the importance of cooperation of dairy industry people and equipment suppliers in the activities of the Association.

Dr. F. W. Crews, Chairman of the Laboratory Methods Committee, reviewed the activities and recommendations of his Committee. Ray Carson, Chairman of the Farm Methods Committee, reported on the meeting of the Committee last June and the accomplishments of subcommittees. Ben Luce, Association Secretary, gave an interesting review of the annual meeting of the International Association at Minneapolis.



New Officers and Speaker at Washington meeting (left to right): Roy Olson, A. W. Sturm, Ben Luce and Adolph Rygg.

The featured speaker at the Washington Association's annual meeting was Adolph Rygg, Northwest Sales Manager for Foremost Dairies, Inc. His topic was "Dairying in Russia" and his very interesting and informative talk was based on his observations while on a tour following the World Dairy Congress last summer.

The following officers were elected for the coming year: President, Roy Olson; President Elect, A. W. Sturm; Secretary-Treasurer, Ben Luce; and Auditors, Carroll Bagley and Harold Larson.

#### DIPLOMATE RECOGNITION AVAILABLE TO SANITARIANS

An Academy to give special recognition to professional sanitarians who have and are demonstrating a high degree of ability, competence and leadership has been created and is known as the American Intersociety Academy for Certification of Sanitarians, Incorporated. The Academy was formally launched when it was legally incorporated in March, 1966.

The establishment of the Academy is an outgrowth of several years of planning by a group of professional sanitarians representing the National Association of Sanitarians, the International Association of Milk, Food and Environmental Sanitarians, and the American Public Health Association.

The initial Board of Directors for the Academy is as follows: H. S. Adams, Indianapolis, Ind., Chairman; Dr. A. Harry Bliss, Berkeley, Calif., Vice Chairman; Darold W. Taylor, Alexandria, Va., Secretary; B. Russell Franklin, Philadelphia, Pa., Treasurer; Emill T. Chanlett, Chapel Hill, N. C.; E. E. Diddams, Springfield, Ill.; Larry J. Gordon, Albuquerque, N. M.;



William C. Miller, Jr., Bethesda, Md.; A. Faegin Parrish, Decatur, Ga.; Verne C. Reiersen, Portland, Ore.; and Edwin L. Ruppert, Dallas, Tex.

The Board of Directors of the Academy is now in a position to begin functioning and to receive, review and act upon applications. Persons found eligible for certification will become Diplomates of the Academy and have voice in its operation.

The objectives, purposes and functions of the Academy are set forth in the articles of incorporation and are as follows:

1. To improve the practice, elevate the standards and advance the professional functions and ethical standards of practice of the professional sanitarian in the various fields of environmental health.
2. To grant and issue to qualified sanitarians certificates indicating special knowledge, competence and proficiency in various fields of environmental health. The fields in which certificates may be granted by the Corporation are Environmental Sanitation (General), Milk and Food Sanitation, Vector and Solid Waste Control, Radiological Health, Air Pollution Control, Industrial Hygiene, Institutional Sanitation, Water Supply and Waste Disposal, Housing Hygiene, Environmental Health Administration and such other defined comprehensive fields as may be determined by two-thirds vote of the Board of Directors.
3. To receive and act upon applications for such certifi-

cates of special knowledge in environmental health for sanitarians to establish, maintain and from time to time, alter and amend standards and qualifications for the granting or issuance of, and the retention of such certificates; to determine by examination, investigation or otherwise, the fitness of applicants for, and the holders of, such certificates; to prepare, provide and conduct examinations, or to contract for same, for the purpose of, or in connection with, a determination of fitness, and to determine the results of any such examinations; to arrange for and conduct investigations as may be deemed necessary or desirable for, or in connection with, carrying out any of the above acts and to collect and receive from each such applicant or examinee, such fees for application, examination, investigation and determination of fitness as may, from time to time be prescribed by the Board of Directors or the bylaws of the Corporation.

In making this announcement, the Directors felt that its main purpose at this time, should be to alert and acquaint sanitarians throughout the country with the fact that the Academy is now an operating entity and is in position to receive and act upon applications. A brochure giving more precise detail on qualifications, examinations, fees and instructions for making application has been prepared, and is available.

Further details including an application form may be obtained by writing Darold W. Taylor, Secretary-AIACS, 2101 Wakefield St., Alexandria, Va. 22308.

### WISCONSIN DAIRY INDUSTRY TOUR OF EQUIPMENT MANUFACTURING PLANT



Representatives of the Wisconsin dairy industry, fieldmen and regulatory officials enjoyed an interesting and educational tour of the manufacturing plant of the Dairy Equipment Company in Madison, Wisconsin, on October 4, 1966. The company manufactures and distributes a comprehensive line of

equipment for the dairy industry.

After the tour the group was addressed by L. O. Britson, Vice President, and Mike Hales and Jack Quee, division supervisors, on the scope of operations of the company and in-plant manufacturing facilities.



## NEWS AND EVENTS

### AAAS MEETS IN WASHINGTON, D.C.

The American Association for the Advancement of Science will hold its 133rd Annual Meeting at Washington, D. C., December 26-31, 1966. Some 10,000 scientists, doctors, engineers, education and science students are expected to attend the five-day meeting, the general theme of which is "How Man has Changed His Planet."

AAAS, an affiliation of 296 societies with more than 105,000 individual members, is by far the largest and most influential scientific organization in the world. Organized in 1848, its sections cover all the principal fields of science ranging from Mathematics, Physics, Chemistry, Astronomy, Geology and Geography to Engineering, Medical and Social Science, Agricultural and Industrial Science and Education. The four-fold aim of AAAS is to further the work of scientists, to facilitate cooperation among scientists, to make science more effective in promoting human welfare, and to increase public understanding of science.

Some 1500 scientific reports will be given during the five-day meeting. Subjects include: The Changing Man; Dynamics of Industrial and Economic Systems; U. S. Policy on Food and the World's Future; Weather Modification; Problems of Securing Constructive Legislation; Political Aspects of the Population Explosion; Pest Control, Public Policy, and Human Welfare; and Migration to the Arid Lands of the U. S.

In addition to the scientific reports there will be the annual Exposition of Science and Industry made up of displays from industry and science organizations. A Science Theatre will provide for showing a choice selection of foreign and domestic science films.

Detailed information on the meeting is available from the office of AAAS, 1515 Massachusetts Ave. N.W., Washington, D. C. 20005.

### NRA SCHEDULES MANPOWER AND SKILL NEEDS CONFERENCE

One of the most significant Industry meetings in history, the NRA Food Service Industry Manpower and Education Conference, will be held in Chicago Feb. 23 and 24, 1966, according to an announcement by President Watson B. Rulon of the National Restaurant Association. Mr. Rulon said, "It is the purpose of the NRA in this first conference to launch a continuing dialogue between industry, operators, government officials, and professional educators on

'the human factor' in the nation's fourth largest industry.

"The basic objective of this entire Conference," he pointed out, "is to identify clearly the actual manpower and skill needs of the industry both now and in the future, so that the full resources of our industry, of government, and of education can work together more effectively in meeting those manpower and skill needs. Over the next several years, we hope to achieve heightened enthusiasm; clearer definitions of quantitative and qualitative manpower needs; identification and recognition of outstanding training programs in the schools; encouragement of greater research and experimentation in vocational planning and programming, and better industry on-the-job training."

The NRA President said that additional goals of the Conference are to analyze manpower trends and conditions in the industry, and to encourage a strengthened, broadened interest in education, training and manpower development among supervisory and management personnel. The Conference will be conducted for executive secretaries and officers of state and local restaurant associations, educators, government officials, state vocational training officers, and personnel and training directors of food service organizations, restaurants, institutions, hotels and motels.

Attention in the Conference will focus on planning, organizing, and activating every type of human resource development program that can be made available for the industry. Courses and other activities in colleges, vocational schools, high schools, and activities within the industry through on-the-job training will be emphasized. The Conference will also give recognition to vocational guidance, personnel recruitment, and other related manpower development activities.

Following the Thursday morning opening sessions, there will be task force panels assigned to work on such problems as recruiting the new labor force, the role of industry in its relationships with government and education, the kind of technical help needed to create curricula guides, and the possible application of new teaching techniques for training purposes. A report from each task force panel will be given on Friday afternoon to the main group. Proceedings of the two day symposium will be edited into a publication to serve as a guide in planning all types of educational and training programs for the growing industry, Mr. Rulon stated.

The Conference will be conducted under the auspices of the new NRA Food Service Educational



Institute. Persons interested in attending the Conference should contact the Industry Manpower Conference, c/o NRA Food Service Educational Institute, National Restaurant Association, 1530 North Lake Shore Drive, Chicago, Ill. 60610.

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### UNIVERSITY OF MARYLAND ANNOUNCES SHORT COURSES AND CONFERENCES

The 1966-67 schedule of short courses and conferences on dairy technology has been completed by the Department of Dairy Science, University of Maryland. All meetings will be held at the University at College Park.

The schedule is as follows: 22nd Annual Dairy Technology Conference, November 2, 1966; Ice Cream Short Course, January 23 through February 1, 1967; Ice Cream Conference, February 2, 1967; and Cottage Cheese and Cultured Milk Products Symposium, March 8, 1967.

More specific information on the meetings may be obtained from Professor W. S. Arbuckle, Department of Dairy Science, University of Maryland, College Park.

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### PHS BOOKLET ON SINGLE SERVICE MILK CONTAINERS AND CLOSURES

In the form of a Guide for Sanitation Standards the Public Health Service, Milk and Food Branch has issued a new publication entitled "Fabrication of Single Service Containers and Closures for Milk and Milk Products."

Paper single service containers and closures manufactured under industry-applied controls in sanitary condition and free from toxic materials have been in use in the dairy industry for many years. Container suppliers in recent years, however, have introduced many new materials, equipment and design concepts. This new Guide for Sanitation Standards undertakes to evaluate basic manufacturing and handling techniques and establish sanitation criteria which will assure that single service containers and closures will continue to be safe and in compliance with the Grade "A" Pasteurized Milk Ordinance — 1965 recommendations of USPHS.

The requirements of the standards apply to all blank fabricators, closure manufacturers, plastic laminators and similar plants and also to the installation and maintenance of equipment used in compounding materials for the fabrication, production, handling and storage of the containers and closures. Sanitation standards for the physical condition of the fabricating

plants are established and provision is made for sampling and bacterial examination of the finished product.

Copies of this PHS Bulletin No. 1465 are available at 15 cents each from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

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### ICE CREAM SHORT COURSE AT PENN STATE

The annual Ice Cream Short Course of The Pennsylvania State University will be held January 9 to 20, 1967. Included in the instruction will be: Industry trends, composition of milk, testing for fat and acidity, composition of ice cream, ingredients, processing the mix, acidity standardization, freezing the mix, hardening ice cream, refrigeration, ice cream flavors, stabilizers and emulsifiers, sherbets, ices, ice milk, defects, judging ice cream, bacteriology, ice cream mix concentrates, cleaning dairy equipment, soft ice cream, and fancy ice cream.

Approximately 12 hours will be devoted to comprehensive coverage of the principles involved in calculating ice cream mixes. Fourteen hours of laboratory practice will be given in the testing, processing, and freezing of ice cream mix. More than 30 different ice cream formulas will be used in evaluating the effects of variations in fat, serum solids, sweetener, stabilizer, emulsifier, and flavoring on the texture, body, and flavor of frozen desserts.

Further information can be secured from the Director of Short Courses, Room 208 Armsby Building, The Pennsylvania State University, University Park 16802.

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### SOUTH DAKOTA STATE TEAM WINS DAIRY PRODUCTS JUDGING

The three-man judging team from South Dakota State University claimed top honors in the 32nd Collegiate Students International Contest in Judging Dairy Products at the 1966 Dairy and Food Exposition at Atlantic City. The contest is sponsored jointly by the Dairy and Food Industries Supply Association and the American Dairy Science Association.

The winners received the All Products Bowl, a \$2,500 fellowship, the Cottage Cheese Cup, four plaques for second and third place standings in the product category contests and several top individual awards to team members. Second ranking team in All Products judging hailed from the University of Minnesota and the team was awarded a \$2,350 fellowship and a plaque.



The All Products judging rates over-all ability to test milk, ice cream, cottage cheese, butter and cheddar cheese. In addition, awards in the form of cups are made to the top team in the five product categories and outstanding individuals also receive watches and other prizes.

The Milk Cup for milk judging was won by the University of Minnesota team. Since Minnesota had won the cup twice before, it was retired. The Ice Cream Cup was awarded to the University of Tennessee team and the Butter cup went to the team from Ohio State University. The team from the University of Connecticut took home the Cheddar Cheese Cup.

The Contest is an annual event which invites colleges and universities throughout the United States and Canada to enter student teams to compete in judging five dairy products according to appearance, odor, touch and taste. Students' ratings are then compared against the standards set by professional judges.

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### "MILK IN THREE DIMENSIONS"

A new film entitled "Milk in Three Dimensions" has been released by the International Paper Company. It is in color with sound, 16 mm, with running time of 28 minutes.

The theme of the picture and the basis for its title are the three great quality control programs that are involved in the production of a finished package of milk. The three programs are the familiar quality control effort devoted to producing and processing milk, the lesser known but equally exacting quality control program involved in producing single service milk cartons and the joint quality control program involving both the milk plant operator and the carton manufacturer when the first two programs merge at the filler.

There are no commercials in the picture. It is an objective effort to improve milk packaging on the theory that a better understanding of the quality that is built into both milk and the milk container will produce a better packaging operation and thus a better package of milk.

The film is available without charge on a loan basis. Further information on the film and its availability may be obtained by writing the International Paper Co., Product Promotion & Publicity Dept. 220 E. 42nd St., New York, N. Y. 10017.

### FIELDMEN'S AND PLANT SANITATION CONFERENCES AT PURDUE

Two one-day meetings for dairymen were held at Purdue University. The Dairy Fieldmen's Conference was held on November 15 and the Dairy Plant Sanitation Conference on November 16, 1966. The conferences are sponsored annually in cooperation with the Indiana Dairy Products Association.

The Dairy Fieldmen's Conference included, papers on Alternate Methods of Accounting for the Major Components in Milk by L. C. Christensen, Mayflower Farms, Portland, Ore; Planning the Ideal Production Facility by W. M. Dillon, Purdue University; Economic Importance of Dairying in Multi-Enterprise Farming by F. M. Sims, University of Illinois; An Outlook For and Review Of Dairy Production in Indiana by E. E. Carson, Purdue University; Modern Farm Equipment Cleaning Practices by LaVerne Tiffany, Diversey Corp, Chicago, and a panel discussion on Getting the Most Out of What You Have, led by Purdue's Dairy Extension group.

The Dairy Plant Sanitation Conference featured discussions on Water Treatment Practices by J. Fred Wilkes, W. R. Grace Co., Chicago; Limitations We Must Face in Waste Disposal by Samuel L. Moore, Indiana State Board of Health; Housekeeping—Its Role in Plant Sanitation by B. J. Liska, Purdue University; The Relationship Between Sanitation Practices and Shelf Life of Products by W. K. Moseley, Moseley Laboratories, Indianapolis; Setting Up a Plant Sanitation Control Program by L. C. Christensen, Mayflower Farms, Portland, Ore. and Culture Handling—Sanitation Relationships by F. J. Babel, Purdue University.

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### NATIONAL MASTITIS COUNCIL HEADQUARTERS MOVED

The office of the National Mastitis Council, formerly at Hinsdale, Illinois, has been moved to Washington, D. C. The new address is 910 Seventeenth St. N.W.

The occasion for the move was the transfer of the headquarters of John C. Flake, Secretary to the Council, when the Evaporated Milk Association, with whom Dr. Flake has been employed for a number of years, relocated its office from Chicago to Washington. Inasmuch as Dr. Flake was available to continue as Secretary, the Board of Directors of the Council approved transfer of its office to Washington.



## DYE BINDING TEST FOR MILK PROTEIN

The dye binding test for milk protein devised by Dr. Doyle C. Udy, Boulder, Colorado, has been submitted to the Association of Official Analytical Chemists for possible adoption as an official, first action test. This is the first method for milk protein submitted that does not utilize the laborious Kjeldahl procedure. The method was tested extensively by several Western Milk Market Administrators. They circulated 39 samples to seven laboratories and compared results. Variations in test results on the same sample were less with the dye binding method than with the Kjeldahl method.

The test is based on the ability of a dye, Acid Orange 12, to complex with proteins in acid solution. The complex can be filtered out, so that the amount of dye remaining can be used as an inverse measure of the protein content of the sample. A small amount of milk is mixed with an acid solution of the dye, the complex filtered out, and the excess dye remaining is measured in a spectrophotometer. The only special equipment required is the spectrophotometer and a short path cuvette. A set-up costs several hundred dollars, but can be used for years. The test is very rapid, requiring only a few minutes per sample.

Possible uses for the new test are in breed improvement programs, for protein or solids accounting in dairy plants, and perhaps even as a basis for payment. The A.O.A.C. action should be known this fall. Similar procedures have been developed for use with other high protein foods, and may be submitted to the A.O.A.C. in the future.

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## STATE LEGISLATIVE ACTION FOR PROTECTION OF WATER RESOURCES

The Commerce Clearing House News Bureau of Chicago, Illinois, has released an interesting summary of current legislation in the various states for the protection of water resources and prevention of water pollution. Almost half the states so far this year have enacted new laws ranging from protection of spawning fish in Alaska to tax breaks for treatment facilities in Wisconsin.

Five states took action to establish or revise state agencies concerned with water resources and pollution prevention. Colorado has established a new Water Pollution Control Commission; Delaware has set up a Water and Air Resources Commission; Kentucky has created a Water Resource Authority and revamped its Water Pollution Control Commission; Mississippi has formed a state Air and Water Pollution Control Commission; and Rhode Island has established a permanent seven-man legislative committee to consult with local authorities on water problems.

Every state as well as the District of Columbia, Guam, Puerto Rico and the Virgin Islands has at least one agency dealing with problems of water resources, control, and pollution.

## STATE AID

Five states joined the battle against water pollution by providing tax exemptions, approving state grants, or strengthening state guarantees for local water control bond issues, said the CCH summary.

For example, Rhode Island has exempted from state taxation all real and tangible personal property acquired to abate or control water pollution in the state, and Georgia has granted a sales tax exemption for sewage control projects. That state has also approved state grants for pollution control projects regardless of whether the project is also receiving federal assistance.

Massachusetts has authorized its Department of Natural Resources to spend \$150 million for financial aid to cities and towns in the fight against water pollution. New Hampshire has boosted to a total of \$35 million its guarantee on bonds issued by municipalities for the construction of sewage and waste treatment plants.

Among major provisions of a new Wisconsin water law are: up to \$6 million in interest-free loans will be made to municipalities for installation of sewage treatment works; tax incentives are provided corporations and individuals allowing them to write off expenses of treatment facilities; and money now available for pollution treatment at the state level is now doubled.

## WATER COMPACTS

Three states have already completed legislative action on the multistate water compact front, the CCH summary related. These actions are in addition to numerous existing compacts. Kansas ratified the proposed Arkansas River Basin compact with Oklahoma. Maryland has asked New York and Pennsylvania to refrain from unilateral decisions diverting water from the Susquehanna River Basin pending creation of the Tri-State Compact to manage these water resources. Also, New York has approved formation of a compact between itself and Vermont to develop the Lake Champlain Basin.

And, now awaiting the President's signature is a bill which would allow New Jersey and New York to proceed with preservation and restoration of Hudson River Valley waters through the framework of a Hudson River Basin compact.

## MISCELLANEOUS LAWS

Alaska now requires all contractors to notify the state Fish and Game Commission of any construction project which could cause damage by pollution to the migration ground of fish coming from the sea to spawn in state waters.

Hawaii has authorized a study of the merits of planting trees to ease the annual drought problems facing the state's agricultural industry. Mississippi has labeled a misdemeanor the cutting of logs in excess of six inches in diameter which are placed in a running stream so as to impede the water flow, according to the CCH summary.

Other states completing legislative action on the water law front so far this year include California, Louisiana, Michigan, New Jersey, Pennsylvania, South Carolina, South Dakota, Vermont and Virginia. Their laws generally consist of rules and regulations covering cesspools, sewage districts, water storage facilities, flood control districts, industrial wastes abatement, watershed preservation, and qualifications for federal aid.



Federal activity on the water law scene also continues. Now pending in Congress are major amendments to the Federal Water Pollution Control Act which would, among other things, sharply boost funds for sewage treatment works construction across the nation, the CCH summary said.

### NEW IDEAS FEATURED AT 1966 DAIRY AND FOOD SHOW

An ingenious "snifter" that detects and rejects contaminated plastic bottles before filling; a 50-foot high model of a vertical spray dryer capable of processing 1,500 lbs. of product every hour; a completely new approach to the bag-in box home dispenser; a revolutionary cleaning process that removes oxide-like stains from stainless steel and keeps them from reappearing—these were a few of the multiplicity of new products, new processes, and new applications on display at the Dairy and Food Industrial Exposition in Atlantic City Oct. 23-28, 1966. This was the second Exposition devoted to both the dairy and food industries, and the inter-relationship and reciprocal applications which dictated the change in the Show's scope two years ago were increasingly obvious this year.

The trend toward the use of plastic containers was one of the Exposition's dominant features. For example, a complete system was shown for the use of returnable plastic gallon milk bottles. A device is built into such systems which detects volatile organic contaminants and destroys the offending bottle without slowing down the filling process.

Also on display were refinements in equipment for automatic, in-plant blow-molding of polyethylene plastic milk containers. The completely automatic system starts with the feeding of a polyethylene pellet and continues through trimming, silk-screen decorating, filling, capping and labeling half-gallon containers.

Advances in plastic design, handling and use are not limited to containers for fluid products. One multi-purpose machine forms, fills, seals and packages a wide variety of products. It is possible with such equipment operated by only one man to change quickly from one package and product to another and to provide strong brand identification.

Materials and machinery to fabricate a tremendous variety of plastic tubs, cartons, bottles, and other containers were exhibited in profusion. Exhibitors made much of the advantages of "table-readiness", durability, and merchandising appeal of these food containers.

Home milk dispensers, a development of recent years, have also been improved. On exhibit were six, eight, and ten quart capacity single-trip milk containers utilizing a 2-ply plastic bag with a dispensing spout. This plastic bag is inside of a moisture-repellent paper bag with a self-handle. This in turn, goes into a plastic keeper which the housewife retains in her refrigerator. The paper-and-plastic bag is disposable and the handle makes it easy for the housewife to carry.

Another process receiving a lot of attention in these days of world food shortage is sterilization which makes possible the long-distance, non-refrigerated shipment of perishables such as milk. On display were many items of new equipment featuring complete food sterilizing systems. These systems involve returning food from sterilization temperatures to a cooled state in a few seconds, thus eliminating former heat induced flavor problems which limited consumer acceptance.

Other equipment, offering refinements of processing meth-

ods, included pressure controllers for use in food operations requiring constant product pressure; flow-diversion valves to control the direction of product flow during pasteurization; and coolers to cool hot cream directly from a continuously operating hot separator for cooling and storage.

In cheese processing equipment on display it was obvious that attention had been given to devising means for processing more product at one time. There were units capable of handling up to 35,000 or 40,000 lbs of milk per batch. This is automated equipment including finishing vats which unload automatically into a conveyor which takes cheese to hoops, molds or large containers.

For the first time at the Exposition a warm milk separator was exhibited with clean-in-place capability. Also introduced were clarifiers of warm or cold milk permitting processing of up to 38,000 lbs. per day without shutdown for cleaning.

Some impressive new departures in washing equipment were on view at the Exposition. One such unit is a completely enclosed system of tunnel washing of containers used for commercially sterile products such as orange juice, syrups, etc. There was also equipment for rinsing single service glass bottles of the type used for wine which can accommodate a variety of sizes. Other innovations in the category of washing equipment included units for fragile laboratory glass implements, utilizing a jet spray technique, and machines for washing laboratory animal cages, also adaptable for use in washing cheese hoops, meat pans etc. A new mammoth washer cleans railroad food tank cars. Another new machine is an automatic washer for bulk milk coolers.

A new device in refrigerated trucks maintains temperatures by the use of liquified gases. When a certain temperature is passed, CO<sub>2</sub> is sprayed throughout the interior lowering the temperature to the desired level.

In summary, innovations and refinements were on display in abundance at the Dairy and Food Exposition. In virtually every category of machinery, supplies, materials, processes and applications there were items that were either completely new or which demonstrated a fresh approach to dairy and food processing, packaging, handling, sanitizing and distributing.

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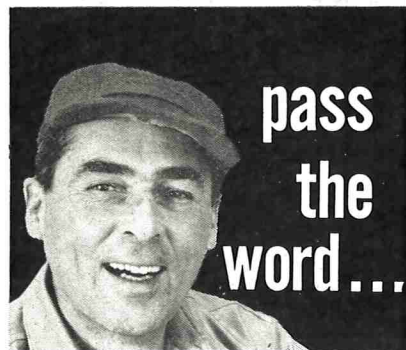
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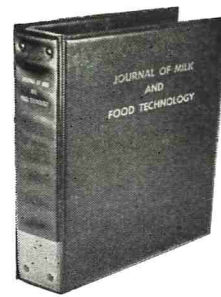
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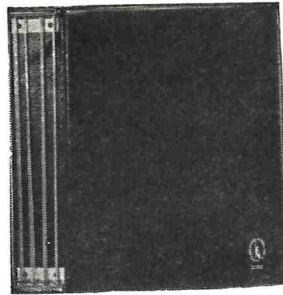
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