MAY, 1964
Vol. 27 P. 125-160 No. 5

Journal of

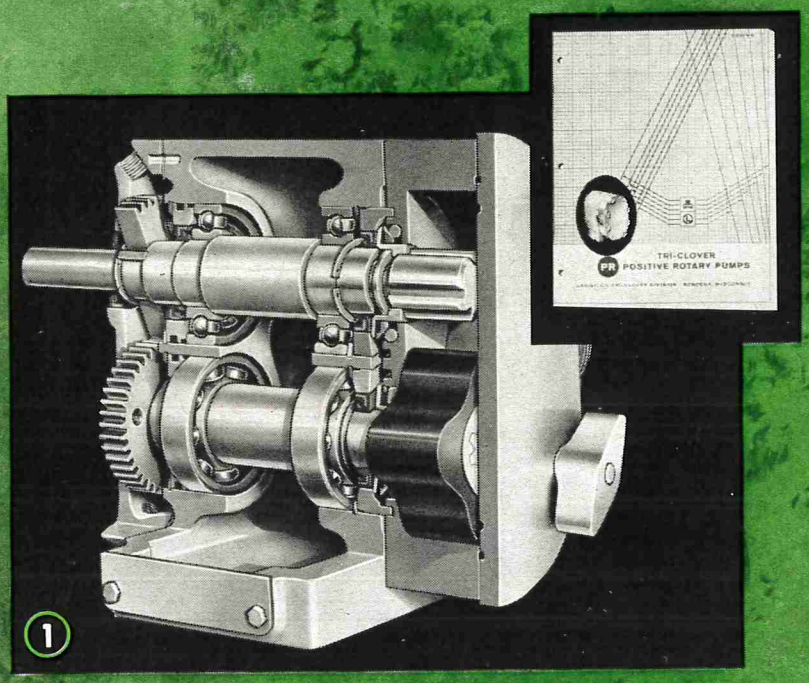
MILK and FOOD TECHNOLOGY

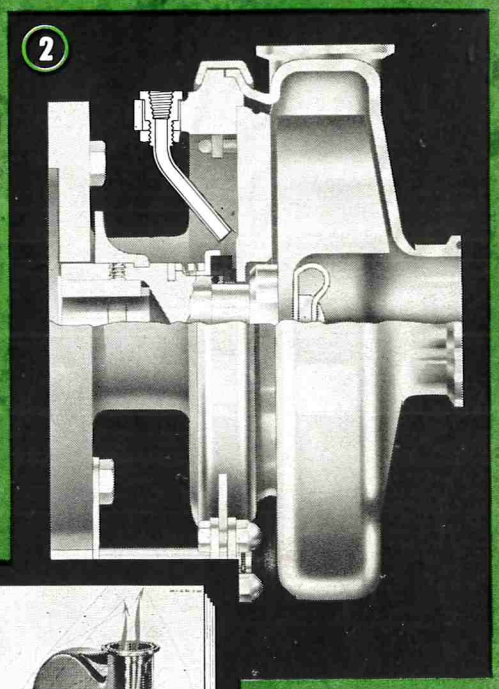
51st ANNUAL MEETING
AUGUST 18, 19, 20, 21, 1964
Portland Hilton Hotel — Portland, Oregon

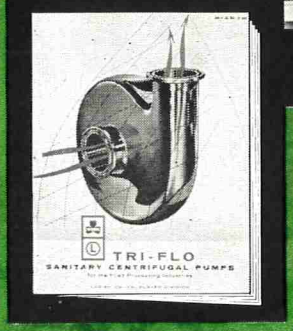
Official Publication

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

New from Tri-Clover:







TWO WAYS TO SIMPLIFY YOUR PUMP SELECTION PROBLEMS

There's a whole new generation of Tri-Clover Pumps—designed specifically to overcome the multiplicity of sources and limitations in application which so often needlessly complicate your pump selection process:

1. *Static Sanitary O-Ring Seal* and separate gear and bearing housing minimize wear, provide top operating efficiency and the highest obtainable sanitary standards—with **PR**, the new positive rotary pump that was designed with you in mind. Catalog PR-62 provides 30 pages of useful dimension, specification and application data.

2. *Adaptability* to the widest possible range of mounting and usage requirement is the bench mark of **TRI-FLO**—Tri-Clover's new centrifugal processing pump. Exhaustive detail is provided in a new comprehensive 40 page catalog—TF 263.

More and more processing people are learning that they can save needless and costly duplication of time, effort and inventory by relying on Tri-Clover—the Pump People—for assistance with pumping and liquid flow control requirements.

SPECIFICATIONS: PR Positive Rotary Pump

MOUNTING: Standard | Tanker | W/Relief Cover | Side Mounted

MODELS:	PR3	PR10	PR25	PR60	PR125	PR300
CAPACITY: (gpm @ 20 psi)	3.3	12	28	60	120	300
DISPLACEMENT: (gal. per 100 RPM)	0.5	2.1	8.0	17.5	30.0	63.0

SPECIFICATIONS: TRI-FLO Centrifugal Processing Pump

SERIES: C-Close Coupled | S-Shrouded Motor | SP-Base Mounted | US-Unshrouded Motor

MODELS:	114	216	218	328	5410
HEAD (in ft.) CAPACITY gpm	to 73 to 160	to 173 to 270	to 318 to 280	to 320 to 650	to 286 to 1100

P-264

See your Tri-Clover distributor or write for literature. **LADISH CO.**

TRI-CLOVER DIVISION
Kenosha, Wisconsin

INDEX TO ADVERTISERS

The Journal of Milk and Food Technology is issued monthly beginning with the January number. Each volume comprises 12 numbers. Published by the International Association of Milk, Food and Environmental Sanitarians, Inc. with executive offices of the Association, Blue Ridge Rd., P. O. Box 437, Shelbyville, Ind.

Entered as second class matter at the Post Office at Shelbyville, Ind., March 1952, under the Act on March 3, 1879.

EDITORIAL OFFICES: J. C. Olson, Jr., Associate Editor, Dept. Dairy Industries, University of Minn., St. Paul, Minn.; H. L. Thomasson, Managing Editor, P. O. Box 437, Shelbyville, Ind.

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to J. C. Olson, Jr., Associate Editor, Dept. Dairy Industries, University of Minn., St. Paul, Minn.

"Instruction to Contributors" can be obtained from the editor for the use of contributors of papers.

Journal of

MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION
Official Publication
International Association of Milk, Food and Environmental Sanitarians, Inc.
REG. U. S. PAT. OFF.

Volume 27 May, 1964 Number 5

Contents

Business Matters: Correspondence regarding business matters, advertising, subscriptions, orders for single copies, etc., should be addressed to H. L. Thomasson (address above).

Subscription Rates: One volume per year, Individual non-members, Governmental and Commercial Organization subscription.

1 yr.	$8.00
Public and Educational Institution Libraries, 1 yr.	$6.00
Single Copies	$1.00

Orders for Reprints: All orders for reprints should be sent to the executive office of the Association, P. O. Box 437, Shelbyville, Ind.

Membership Dues: Membership in the International Association of Milk, Food and Environmental Sanitarians, Inc., is $7.00 per year, which includes annual subscription to the **Journal of Milk and Food Technology.** All Correspondence regarding membership, remittances for dues, failure to receive copies of the **Journal,** changes in address, and other such matters should be addressed to the Executive Secretary of the Association, H. L. Thomasson, Box 437, Shelbyville, Indiana.

A METHOD FOR EVALUATING THE DESTRUCTION OF AIR-BORNE BACTERIOPHAGES[1, 2]

E. L. Sing, P. R. Elliker and W. E. Sandine

Department of Microbiology, Oregon State University, Corvallis

(Received for publication November 21, 1963)

Summary

A method was developed for testing the effectiveness of germicidal aerosols against air-borne bacteriophages by incorporating the use of an Andersen air sampler containing gelatin plates containing a suitable germicide inactivator. A special chamber 29.25 ft^3 in volume was used in which the activity of different aerosols was compared. Standard dosages of bacteriophage particles were sprayed under controlled conditions into the chamber. Immediately following the infection, the experimental germicide was fogged into the chamber. Concentrations and quantities were carefully controlled in order to provide an accurate evaluation of the virucidal effects. Recoverable phages were diluted from liquefied gelatin plates and numbers determined by the plaque count technique.

A number of preliminary experiments was conducted to establish a standard procedure. In these experiments the most significant information concerning applications and sampling was derived from the phage fall-out data curve for the test chamber.

The procedure described under controlled conditions gave consistently satisfactory results which could be repeated.

Air-borne infection of dairy cultures and products with lactic streptococcus bacteriophages is sufficiently serious to justify studies on sanitation methods and techniques to evaluate the effectiveness of various virucidal agents applied as aerosols. A number of different types of germicides are presently employed for control of bacteriophages in aqueous solution; however, little information is known regarding the virucidal activities of these compounds when they are applied as aerosols. Some of the more widely used sanitizers for phage control have been hypochlorites, quaternary ammonium compounds (QAC), iodophors and more recently phosphoric acid wetting agent (PAWA) and tri- and dichloroisocyanuric acid.

Since choice of specific types of germicides is an important consideration in determining the most effective agent for phage control, it was considered desirable to develop a technique to compare the virucidal activity of representative germicides in air. The development and adoption of a standard procedure will be discussed in this paper and the comparative results of virucidal activity of various aerosolized agents will be discussed in the following paper. The developed method incorporated the use of an Andersen Air Sampler containing gelatin plates with a suitable inactivator for collecting suspended phage particles.

Experimental

In order to evaluate various aerosols a confined area was needed. This was provided by selecting a chamber lined with transite. This chamber had a volume of 29.25 ft^3, could be vented adequately, contained an observation window 2.5 x 5 ft and was so constructed that all manipulations inside could be made through rubber glove ports.

A nebulizer (Fisher catalog no. 5-719-5) was used to infect the chamber with a given amount of bacteriophage. This type of sprayer was chosen because it was constructed entirely of glass, could readily be cleaned and sterilized, and produced an ultrafine mist. The germicide sprayer was a simple air pressure type sprayer which operates by means of an air flow directed horizontally across the orifice of a vertical feed tube dipping into the germicide solution. It was constructed using a 125-ml Erlenmeyer flask fitted with a no. 5 rubber stopper. The size of the droplets could be controlled by the size of the orifice of the supply tube. The orifice size was approximately 0.75 mm in diameter.

An air sampler developed by Andersen *(2)* was incorporated in this study for collecting and enumerating viable air-borne phage particles. The instrument consists of a series of six sieve type samplers through which the sample of air is drawn. The device is pressure sealed with gaskets and three adjustable spring fasteners. Each stage contains a plate perforated with 400 holes resting above an exposed petri dish of culture medium. Air is drawn through the device at the rate of one cubic foot per minute (cfm) and a jet of air from each of these holes plays on the surface of the medium. The size of the holes is constant for each stage but decreases in each succeeding lower stage. Consequently the air velocity increases in each succeeding stage so that the larger particles are impacted on the medium surfaces from the larger openings in the first stages and the smaller particles, depending on their size and inertia, are impacted on the last stages in the lower part of the sampler.

The collection medium used in the Andersen sampler was 5% gelatin containing an appropriate inactivator. For inactivation of iodine and chlorine compounds, 144 mg of sodium thiosulfate per 100 ml

---

[1]Technical Paper No. 1747, Oregon Agricultural Experiment Station.

[2]This work was supported in part by a grant from Klenzade Products, Incorporated.

of 5% gelatin was used. QAC was inactivated by addition of 6.66 g of asolectin, 46.8 ml of Tween-80 and 80 ml of M/4 phosphate buffer per liter of 5% gelatin adjusted to pH 7.2. A 5% gelatin in M/50 phosphate buffer solution at pH 7.2 was used to inactivate PAWA. All collection media were sterilized and stored in sterile bottles prior to use.

The organisms used in the host-phage system were *Streptococcus cremoris* strain 144F, and *Streptococcus diacetilactis strain* 18-16. These organisms were activated from lyophilized stocks maintained in the Department of Microbiology at Oregon State University, and they were propagated by daily transfer in 10% sterile nonfat milk. Corresponding strains of bacteriophages were used. These were maintained as filtrates in whey having a titer of 10^{10} plaque-forming units (pfu)/ml. The whey, prepared from infected milk cultures, was assayed for pfu/ml by the overlay method of Adams *(1)* using semi-solid lactic agar *(4)* seeded with about 10^7 host cells. In preparing the phage for trials the filtrate was standardized to a concentration of 5 x 10^8 phage/ml with sterile whey.

In evaluating the effectiveness of any germicide either in aqueous solution or applied as an aerosol, certain fixed constants must prevail in order to measure accurately the gross effects. Many of these factors such as application of phage and germicide, type of collecting substances and appropriate collection times had to be established by trial and error. However, once established, these factors had to remain constant throughout the trials made on different germicides. The comparative results were then used as an index of their effectiveness.

The establishment of an optimum time and interval for taking the air sample was determined from a phage fallout curve (Figure 1) within the test chamber. The percentage of the number of phage particles that had fallen out in the chamber was determined from the curve. From these data a period of 5 min was selected as the air sample collection time. This period would commence immediately after the application of the experimental germicide or control solution. This was considered an appropriate period because at least 92 to 93% of the phage particles would be air-borne during the first 5 minutes after application of experimental germicide or control solution and would facilitate the removal of a representative sample of air containing viable phages.

In order to further standardize the procedure, a nontoxic collection medium having high phage retention capacity and suitable handling qualities was sought. Earlier trials using a liquid collection medium proved unsatisfactory. Dahlgren et al. *(3)* working with a split sampler used 6% to 12% gelatin as collecting medium for *Escherichia coli* phage. Based

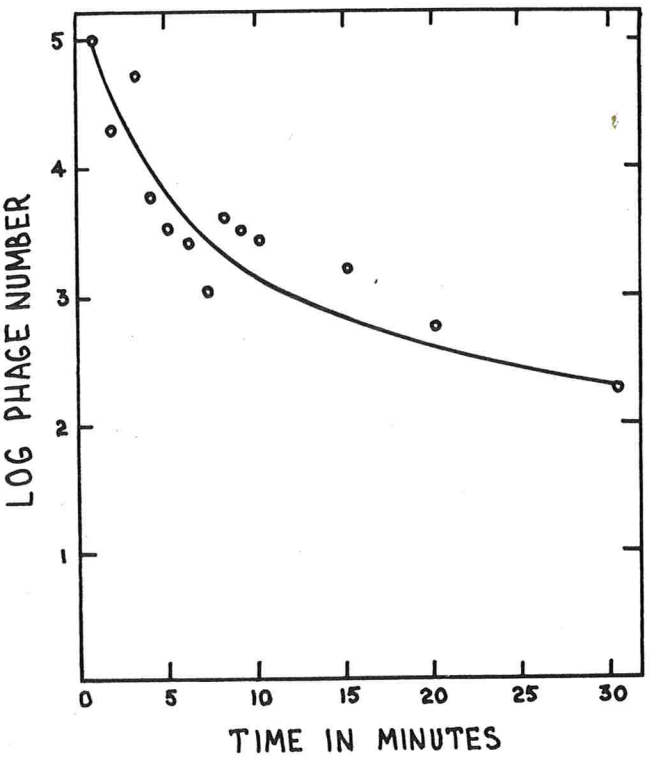


Fig. 1. Fallout curve for nebulized phages in the test chamber over a 30-minute period.

on their studies, it was felt that gelatin could be incorporated as a collecting medium in the Andersen sampler. After numerous trials using different percentages of gelatin, 5% gelatin was found to be most suitable for three reasons. First, it required less heat to remelt after being solidified; second, it was semisolid at room temperature and easier to handle than less concentrated solutions; third, it possessed a higher phage retention capacity.

Dispersion by nebulizing an organic suspension of the infection mixture was found to be the most suitable procedure for application of phage into the test chamber. An electric vibrator sprayer was tried without success. Difficulties were encountered in the selection of a diluent that would maintain the titer of the phage filtrate during the application of the infection mixture. Dilution in distilled water and 0.5% tryptone solution resulted in reduction of titer up to 86.5%. Trials using sterile whey suspensions of phage were found to be successful. Plaque counts run before and after similar 15-min holding periods in whey showed no reduction in titer. Based on these results, sterile whey was selected as the phage diluent. The practice of running a plaque count of the infection mixture before and after application was also adopted as a routine procedure.

Determination of the level of application of germicide was similar to that of phage application. Trials were made using different volumes, times and pres-

the phage fallout time in the chamber, the shortest possible time interval for application of germicidal aerosol was felt to be desirable. By interchanging supply tubes of the sprayer and increasing the pressure, it was possible to apply germicide in a minimum period of time after phage application. The procedure developed consisted of spraying 40 g of germicide at a constant pressure over a period of 45 sec.

PROCEDURE ADOPTED

The method employed for evaluating the effectiveness of germicidal aerosols on air-borne phage was standardized after several modifications that involved variation of level of infection of test chamber, method of spraying test agents and germicides, type of collection medium and periods of sampling. Following considerable experimentation discussed previously, the adopted method was as follows:

The collection plates from the Andersen sampler were poured with 10 ml of 5% gelatin containing an inactivator and placed at refrigeration temperature (2 C) to solidify the gelatin. The phage infection mixture was standardized in the sprayer with sterile whey to a volume of 50 ml with a titer of 5×10^8 pfu/ml. Just prior to the trial, respective germicide solutions at desired concentrations were weighed into 125-ml erlenmeyer flasks (the germicide spray reservoir) to provide 80 g total net weight of germicide. Both the infection and germicide sprayers were weighed before and after each trial to insure constant application into the test chamber.

The Andersen sampler was loaded with 6 petri plates, each containing previously cooled, solidified 5% gelatin, and placed in the test chamber. The chamber containing the Andersen sampler, the infection sprayer and the germicide sprayer was sealed off. The chamber then was infected with the standardized whey suspension of phage for a period of 4 min. Immediately following the infection, the experimental germicide was sprayed for a period of 45 sec. The chamber was now completely saturated with vapor. Following the application of the germicide, the vacuum hose was attached to the sampler and suction applied at the rate of 1 cfm for a period of 5 min. The air flow was regulated by a flow meter. The chamber then was opened and the plates removed from the sampler. Each plate was covered with a sterile lid. These gelatin collection plates were melted, aliquots were removed and appropriate dilutions made.

The plaque count method *(1)* was used to assay for the remaining phages. Plates were incubated upright for 12 to 14 hr at 30 C and plaques were counted on each collection stage of the sampler; these were summated and reported as total number of phages collected per trial. Figure 2 illustrates a schematic diagram showing position of equipment employed in the procedure. The magnitude of recovery using the above procedure with phage strains 144F and 18-16 in the absence of any aerosol germicide was in excess of 10^6 pfu/ml.

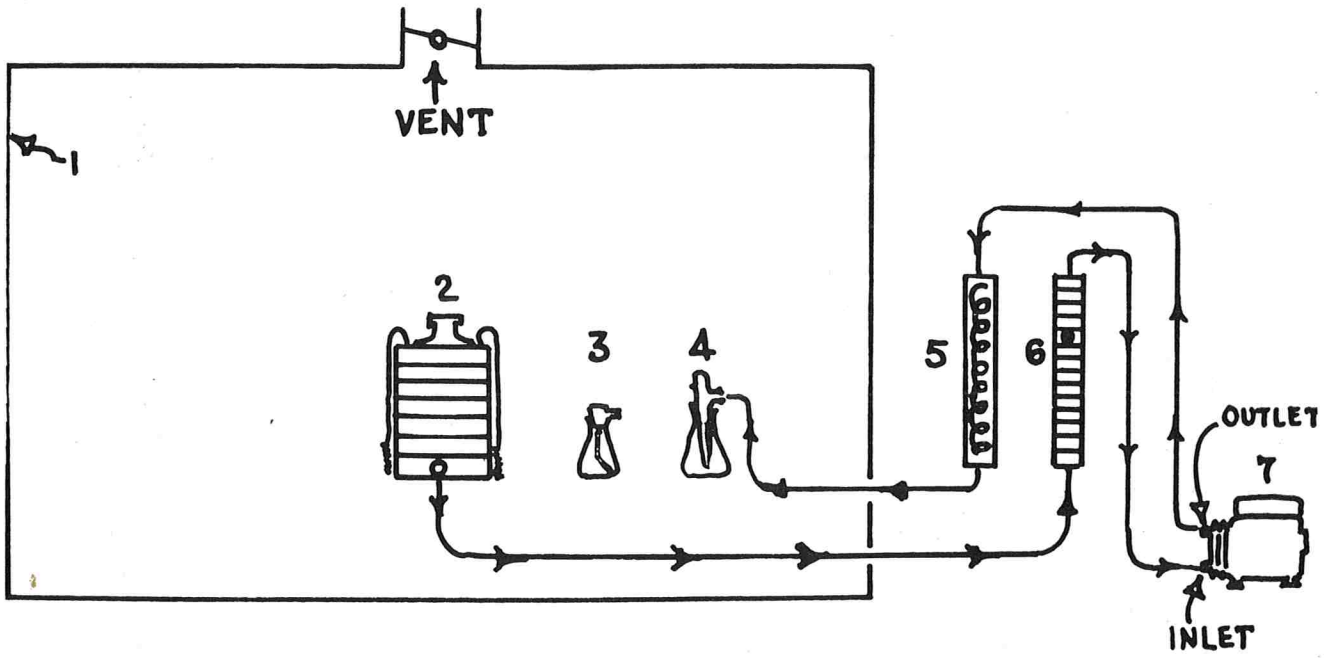


Fig. 2. Schematic diagram showing of equipment employed in determining theeff iciency of germicidal aerosols against air-borne bacteriophage: (1) test chamber, (2) Anderson sampler, (3) germicide sprayer, (4) phage infection nebulizer, (5) air filter, (6) flow meter, and (7) vacuum pump.

DISCUSSION

The procedures described in this study simulated conditions that could be applicable to circumstances where air-borne phages were being controlled by germicidal aerosols. By saturation of the enclosed test chamber with both phage particles and germicide conditions were most appropriate for testing the resistance of phages and the effectiveness of the germicidal aerosol.

The use of the Andersen sampler afforded several distinct advantages. First, it insured that a representative sample of air was taken; second, the phage particles collected could be trapped in a viable state and could be measured quantitatively; third, it was engineered with simplicity of design and operation.

The use of gelatin with an appropriate inactivator was found to be particularly successful in this study. Incorporation of a specific inactivator in the collection medium was found to be absolutely essential. It eliminated the possibility that phages contained in the droplets could be killed after they were collected in the plates, thus assuring that the actual destruction of phage occurred in the air. Gelatin was also found to be unique in that collection could be made on a solid medium and liquid aliquots removed after sampling.

Liquid impingers proved less satisfactory than the Andersen sampler on the basis of degree of recovery of phage, loss of liquid by evaporation and excessive frothing. These observations were supported by results of Moulton et al. *(5)*.

The use of whey as a diluent offered a protective value to the bacterial viruses. This was perhaps due to coating of particles with organic matter. The high pressures exerted upon phages during whey separation which produces a mist of virulent particles also suggests that whey may offer protection to the phages. This protection would create conditions favoring the survival of phages for long periods in nature.

The preliminary experiments in establishing a standard method of comparing various aerosols were generally developed by trial and error. However, a great deal of information regarding standardization of methods was derived from the fall-out curve of the chamber. Optimum times for sampling and the sampling time interval were derived from the data obtained from the curve.

Under controlled conditions the procedure described has given consistently satisfactory results which could be repeated. With certain modifications of this method we were also able to compare the effects of aerosols on the destruction of phages residing on various building and equipment surfaces. This will be discussed in a companion paper. A more practical application could also be derived from this study. This would be the monitoring of air-borne phages in a dairy plant. This could be used as an index for control and scheduling of cultured products manufacture.

REFERENCES

1. Adams, N. H. *Bacteriophages*. 1st. ed., New York: Interscience Publishers, Inc. 1959.

2. Andersen, Ariel A. New sampler for the collection, sizing and enumeration of viable airborne particles. J. of Bacteriol. 76:471-484. 1958.

3. Dahlgren, Charles M., Herbert M. Decker and J. Bruce Harstad. A slit sampler for collecting T-3 bacteriophage and Venezuelan equine encephalomyelitis virus. Appl. Microbiol. 9:103-107. 1961.

4. Elliker, P. R., A. W. Anderson and G. Hanneson. An agar culture medium for lactic streptococci and lactobacilli. J. of Dairy Sci. 39:1611-1612. 1956.

5. Moulton, S., T. T. Puck and H. M. Lemon. An apparatus for determination of the bacterial content of air. Sci. 97: 51-52. 1943.

COMPARATIVE DESTRUCTION OF AIR-BORNE LACTIC BACTERIOPHAGES BY VARIOUS GERMICIDES APPLIED AS AEROSOLS[1, 2]

E. L. Sing, P. R. Elliker and W. E. Sandine

Department of Microbiology, Oregon State University, Corvallis

(Received for publication November 21, 1963)

Summary

The chlorine-releasing compounds were highly effective in destroying air-borne lactic streptococcus bacteriophages 144F and 18-16. At a concentration of .048 ppm available chlorine in the chamber, which was attained with 1000 ppm available chlorine in the solution applied, the inactivation was 99.999% or better. Of the various germicides tested, the quaternary ammonium compound and phosphoric acid wetting agent were found to be least effective as virucidal aerosols. Incorporation of chelating agents (EDTA) with quaternary ammonium compounds, to enhance their virucidal activity, was unsuccessful. The effectiveness of iodophor applied as an aerosol, was progressively greater with increasing concentration; however, undesirable side effects such as a heavy brown residue on all surfaces contacted and undesirable odors were noted.

The study of corrosive effects by germicides on various metals indicated that of the chlorine-containing compounds, dichloroisocyanuric acid was least corrosive. Phosphoric acid wetting agents were the least corrosive of all compounds tested.

Results of this study suggested that the chlorine-containing compounds, when applied as an aerosol at sufficiently high concentration, should provide the most effective agents for sanitizing procedures for the control of bacteriophages in the air and on building and equipment surfaces. The results further indicated that a concentration of .048 ppm available chlorine or more in the air provided most effective phage destruction under experimental conditions. This concentration was provided by the equivalent of 1 to 1.5 liters of 1000 ppm applied as an aerosol per 1000 ft³ of space.

Present state of knowledge would indicate that dichloroisocyanuric acid should be an effective and practical compound for control of bacteriophage in dairy plants. In addition to being highly virucidal, dichloroisocyanuric acid also has a low rate of corrosion.

A comparison was made of the destruction of lactic streptococcus phages 144F and 18-16 by various germicides applied as aerosols using the procedure described in a previous paper *(5)*. Some fundamental factors affecting the virucidal activities of the aerosols were also studied.

Dichloroisocyanuric acid (DCCA) and other chlorine-containing compounds were studied extensively; however, quaternary ammonium compound (QAC) iodophor, and the new phosphoric acid wetting agents also were compared.

To provide conditions favoring phage survival, USDA water of 500 ppm hardness was used to dilute the experimental germicide; a germicide resistant strain of phage 144F *(8)* was used in most trials.

Also phages were suspended in sterile whey and necessary dilutions made in sterile whey to promote phage survival.

Since corrosiveness of germicides is an important consideration in selecting the best sanitizer, observations also included a comparison of the corrosiveness of the aerosolized germicides under consideration.

Experimental

Number of phages collected under controlled conditions.

It was necessary to have a reference standard or control value in each of the germicide evaluations. This was determined by several trials using sterile 500-ppm hardness USDA water instead of germicide and altering the amounts and titers of the infection spray in an attempt to collect the maximum number of phage particles. The levels which gave the greatest number of phages collected were used as the reference for comparison in all ensuing trials with germicide.

The influence of titers and amounts of the phage suspension sprayed on total recoverable phages is illustrated in Table 1. Increase of both levels resulted in corresponding increases in total phage collected; however, no substantial increases in phage collection were noted after a concentration of 5 x 10^8 plaque forming units (pfu)/ml was attained despite increases in the amounts sprayed.

Effect of dichloroisocyanuric acid (DCCA) aerosols on S. cremoris 144F phage.

DCCA compounds are organic chlorine-containing compounds which yield hypochlorous acid as the active agent. These compounds were of particular interest in this study because they are less corrosive than conventional hypochlorites. Table 2 illustrates the effects of various concentrations of the DCCA aerosol on the destruction of S. *cremoris* 144F phage. At the relatively low concentration levels of 25 to 100 ppm, a high virucidal activity was observed. With higher concentrations, proportionate increases in destruction were not noted; at 1000 ppm a level

---

[1]Technical paper No. 1745 Oregon Agricultural Eperiment Station.

[2]This work was supported in part by a grant from Klenzade Products, Incorporated.

TABLE 1. EFFECT OF TITER AND VOLUME OF SPRAYED PHAGE SUSPENSION ON TOTAL RECOVERABLE PHAGES USING ANDERSEN SAMPLER[a]

Phage in spray solution	Volume sprayed	Gelatin in collection medium	Total phage collection
(*per ml*)	(*g*)	(%)	(*per ml*)
2.10×10^7	7.9	5	1.02×10^5
2.25×10^7	8.4	5	1.31×10^5
3.50×10^8	7.0	5	1.20×10^6
3.15×10^8	16.2	5	6.01×10^6
5.00×10^8	16.4	5	6.00×10^6
5.70×10^8	5.7	6	1.74×10^6
6.30×10^8	5.9	8	2.35×10^6
9.00×10^8	9.2	6	4.56×10^6

[a]Collection time, 5 min at 1 cfm.

of inactivation of 99.999% was realized. Evidence of phage survival was noted even at 5000 ppm.

Effect of hypochlorite aerosols on S. cremoris 144F phage.

The hypochlorites have been shown to be very effective against lactic streptococcus bacteriophages both in aqueous solution and applied as aerosols. They are included in this study to compare their virucidal activity with other germicides under a given set of conditions and to determine the optimum concentrations necessary for control of air-borne phage.

A series of trials using different concentrations of germicide was made incorporating the same test method described previously *(5)*. The results obtained with sodium and calcium hypochlorites are tabulated in Table 3. The results at the 500 ppm level were similar for both hypochlorites. Complete inactivation of the phage was obtained using 2000 ppm of either sodium and calcium hypochlorite solutions as aerosols.

Effect of chlorine-containing aerosols on S. diacetilactis 18-16 phage.

Virucidal trials were also conducted on *Streptococcus diacetilactis* phage 18-16 using DCCA and sodium hypochlorite. The results are tabulated in Table 4. It was noted that a sharp decrease in the number of recoverable phage particles occurred at 500 ppm of DCCA and sodium hypochlorite; however, increasing concentrations did not provide complete inactivation until the 2000 ppm level with DCCA and 1000 ppm level with sodium hypochlorite were attained.

Effect of Phosphoric Acid Wetting Agent (PAWA) aerosols on S. cremoris 144F phage.

As mentioned earlier, PAWA is a relatively new sanitizer which consists chiefly of orthophosphoric acid and anionic surface active agents. The effectiveness of PAWA as a virucide in aqueous solution was reported by Hays and Elliker *(2)*. Their results suggested that at the recommended level of 200 ppm, PAWA should provide an effective agent when applied directly as a solution for destruction of bacteriophages on dairy equipment. It was of interest in this study to compare effectiveness of PAWA as a germicidal aerosol with other germicides. The results obtained at different concentration levels with two brands of PAWA are given in Table 5. Both products showed a relatively low degree of virucidal activity at all concentration levels.

Effect of iodophor and QAC aerosols on S. cremoris 144F phage.

The widespread use of iodophors and QAC as sanitizers in the dairy industry prompted the inclusion of these products in the study. To date there have been no published data regarding the effectiveness of iodophor as a germicidal aerosol against lactic streptococcus phage. Watkins and co-workers *(8)* reported that iodophor and QAC compounds have slower virucidal activities than chlorine in aqueous solutions and that higher concentrations and longer exposure times were needed to inactivate the phage. It was of interest in this study to determine whether the same properties existed when these compounds were applied as aerosols.

As shown in Table 6, moderate levels of virucidal activity were indicated at all concentrations of iodophors. The effectiveness of iodophors was progressively greater with increasing concentrations. A concentration of .097 ppm available iodine in the test chamber, attained with 2000 ppm available iodine in the solution applied, resulted in a 99.990% inactivation of *S. cremoris* 144F phage.

The quaternary ammonium compounds were found to be ineffective. Despite 94.625% inactivation at 500 ppm level there was little or no inactivation at 1000 ppm and 2000 ppm. Recently Watkins and Elliker *(9)* reported that Versene (EDTA), a chelating agent, when incorporated with QAC enhanced its virucidal properties. However, when EDTA was incorporated at levels of 200 ppm into a 2000 ppm solution of QAC, applied as an aerosol, the inactivation was no greater than QAC without EDTA (Table 6).

Effect of DCCA against S. cremoris 144F phage in aqueous solution.

In an attempt to establish the virucidal activity of DCCA in aqueous solution an experiment was conducted using the modified procedure of Weber and Black *(10)*. Results demonstrated that complete destruction of 2×10^8 *S. cremoris* 144F phages per ml was effected in a 15-sec exposure period using either 12.5 or 25 ppm DCCA.

TABLE 2. EFFECT OF DCCA AEROSOL ON S. *cremoris* 144F PHAGE

DCCA in spray solution[a]	DCCA in air of chamber	pH DCCA solution	Total phage collected in air sample[b]	Phage inactivation
(ppm)	*(ppm)*		*per 5 ft³*	*(%)*
0	0.000	8.8	6.01×10^{6}	0.000
25	0.0012	9.1	4.40×10^{3}	99.927
100	0.0048	9.4	4.80×10^{2}	99.992
500	0.024	9.9	2.30×10^{2}	99.996
700	0.034	9.4	2.80×10^{2}	99.995
1000	0.048	9.5	7.00×10^{1}	99.999
2000	0.097	9.2	1.00×10^{1}	99.999
5000	0.0240	9.2	3.00×10^{1}	99.999

[a]Average volume of germicide sprayed per 29.25 ft³ was 40 g diluted with USDA water of 500 ppm hardness.

[b]Average volume of phage suspension sprayed per 29.25 ft³ was 16.8 g with titer of 5×10^{8} per ml.

TABLE 3. EFFECT OF HYPOCHLORITE AEROSOLS ON S. *cremoris* 144F PHAGE

Germicide	Germicide in spray solution[a]	Germicide in air of chamber	pH germicide solution	Total phage collected in air sample[b]	Phage inactivation
	(ppm)	*(ppm)*		*(per 5 ft³)*	*(%)*
Control[c]	0	0.000	8.8	6.01×10^{6}	0.000
NaOCl	500	0.024	9.0	1.40×10^{2}	99.998
	1000	0.048	9.5	8.00×10^{1}	99.999
	2000	0.097	9.3	0	100.000
CaOCl	500	0.024	8.8	1.00×10^{2}	99.999
	1000	0.048	9.6	1.00×10^{2}	99.999
	2000	0.097	10.5	0	100.000

[a]Average volume of germicide sprayed per 29.25 ft³ was 40 g diluted with USDA water of 500 ppm hardness.

[b]Average volume of phage suspension sprayed per 29.25 ft³ was 16.8 g with titer of 5×10^{8} per ml.

[c]USDA test water of 500 ppm hardness.

TABLE 4. EFFECT OF DCCA AND NaOCl AEROSOLS ON S. *diacetilactis* 18-16 PHAGE

Germicide	Germicide in spray solution[a]	Germicide in air of chamber	pH germicide solution	Total phage collected in air sample[b]	Phage inactivation
	(ppm)	*(ppm)*		*(per 5 ft³)*	*(%)*
Control[c]	0	0.000	8.8	3.00×10^{6}	0.000
DCCA	500	0.024	9.7	4.70×10^{2}	99.984
	1000	0.048	9.5	7.00×10^{1}	99.998
	2000	0.097	9.6	4.00×10^{1}	99.999
NaOCl	500	0.024	9.2	1.00×10^{2}	99.997
	1000	0.048	9.0	0	100.000

[a]Average volume of germicide sprayed per 29.25 ft³ was 40 g diluted with USDA water of 500 ppm hardness.

[b]Average volume of phage suspension sprayed per 29.25 ft³ was 16.8 g with titer of 5×10^{8} per ml.

[c]USDA test water of 500 ppm hardness.

TABLE 5. EFFECT OF PAWA AEROSOL ON *S. cremoris* 144F PHAGE

Germicide	Germicide in spray solution[a]	Germicide in air of chamber	pH germicide solution	Total phage collected in air sample[b]	Phage inactivation
	(ppm)	*(ppm)*		*(per 5 ft³)*	*(%)*
Control[c]	0	0.000	8.8	6.01×10^6	0.000
PAWA-1	500	0.024	1.85	8.17×10^5	86.410
	1000	0.048	1.65	5.41×10^5	90.998
	2000	0.097	1.50	4.46×10^5	92.579
PAWA-2	500	0.024	2.1	3.41×10^6	43.261
	1000	0.048	1.75	1.59×10^6	73.544
	2000	0.097	1.65	1.28×10^6	78.702

[a]Average volume of germicide sprayed per 29.25 ft³ was 40 g diluted with USDA water of 500 ppm hardness.

[b]Average volume of phage suspension sprayed per 29.25 ft³ was 16.8 g with titer of 5×10^8 per ml.

[c]USDA test water of 500 ppm hardness.

TABLE 6. EFFECT OF IODOPHOR AND QAC AEROSOLS ON *S. cremoris* 144F PHAGE

Germicide	Germicide in spray solution[a]	Germicide in air of chamber	pH germicide solution	Total phage collected in air sample[b]	Phage inactivation
	(ppm)	*(ppm)*		*(per 5 ft³)*	*(%)*
Control[c]	0	0.000	8.8	6.01×10^6	0.000
Iodophor	500	0.024	2.1	1.54×10^4	99.744
	1000	0.048	1.7	2.28×10^3	99.962
	2000	0.097	1.35	5.80×10^2	99.990
QAC	500	0.024	7.0	3.23×10^5	94.625
	2000	0.097	8.3	4.64×10^6	22.795
	2000[d]	0.097	7.5	4.64×10^6	22.795

[a]Average volume of germicide sprayed per 29.25 ft³ was 40 g diluted with USDA water of 500 ppm hardness.

[b]Average volume of phage suspension sprayed per 29.25 ft³ was 16.8 g with titer of 5×10^8 per ml.

[c]USDA test water of 500 ppm hardness.

[d]Incorporated with 200 ppm EDTA.

TABLE 7 COMPARATIVE CORROSIVENESS[a] OF VARIOUS GERMICIDES ON STAINLESS STEEL, GALVANIZED STEEL, COPPER AND ALUMINUM

	Stainless steel	Galvanized steel	Copper	Aluminum
Most corrosive	XY-12	XY-12	Iodophor	Iodophor
	DCCA	DCCA	XY-12	PAWA-2
Moderately corrosive	Iodophor	Iodophor	PAWA-2	QAC
	PAWA-2	QAC	DCCA	XY-12
Least corrosive	QAC	PAWA-2	QAC	DCCA

[a]Corrosiveness based on loss in weight of metal strips immersed in 25 ppm, 50 ppm, 100 ppm, and 500 ppm of germicide.

Corrosive nature of germicides.

Table 7 illustrates comparative data for each germicide listed in order of corrosiveness to every metal represented. The data suggest that DCCA is the least corrosive of the chlorine-containing compounds. PAWA and QAC were the least corrosive of all compounds tested. Hypochlorites were particularly corrosive to ferrous metals; only moderately corrosive to copper and aluminum.

DISCUSSION

Results indicate that DCCA chlorine-releasing compound was effective in destroying phages 144F and 18-16. With a concentration of .048 ppm available chlorine in the test chamber, which was attained with 1000 ppm available chlorine in the solution applied, the inactivation was 99.999% or better. The hypochlorites gave similar results, being very effective on both phage strains 144F and 18-16. Previous recommendations for adequate control of phage in dairy plants using sodium hypochlorite compounds was a concentration of .014 ppm available chlorine in the air of the test chamber. This concentration was attained with 4 ml of 9 to 12% available chlorine solution per 1000 ft^3 *(11)*. The present studies suggest most effective destruction with application of a high level of chlorine.

In aqueous solution DCCA compared favorably with hypochlorites in inactivation of phage 144F. Fortney *(1)* indicated that trichloroisocyanuric acid, a closely related compound to DCCA containing one additional chlorine group, was completely effective in aqueous solution against S. *cremoris* phage strain W at 10 ppm for 15 sec.

The range of phage inactivation using PAWA was 50 to 90%. These results were rather surprising because in aqueous solution PAWA was found to be highly virucidal. It is possible that the contact of agent to be destroyed is facilitated more readily in application of an aqueous solution than when the compound is in the form of an aerosol. As an aerosol, the PAWA type of compound was relatively ineffective against phage.

The effectiveness of iodophor was progressively greater with increasing concentrations; however, the unsightly brown residue deposited, undesirable odor, and perhaps the cost of this product at the higher concentrations needed probably would not allow its practical use as an aerosol.

The QAC was found to be ineffective. The combination of EDTA and QAC also was found to be ineffective. The same factors may play a role here as were discussed for the acid-wetting agents. In Table 8, which summarizes the comparative inactivation of 144F phage by different germicidal aerosols at 2000 ppm, QAC and PAWA appear the least active; NaOCl and DCCA were the most active, and iodophor was moderately active.

In considering mode of action of germicidal aerosols, reference must be made to two schools of thought. Pulvertaft and Walker *(4)* on the one hand believe that direct contact of the germicidal aerosol droplets with the agent to be destroyed is the method of lethal action. Masterman *(3)*, on the other hand, believes that lethal action is the result of collision of the agent to be destroyed with molecules of gas or vapor of the volatilized droplets of germicide. In this study the manner of application of germicide and the nature of the germicide itself seems to favor the direct contact of germicidal aerosol droplet theory. The germicides used in this study all were in water solution and had relatively low vapor pressure. In addition, they were applied as a droplet aerosol rather than volatilized. Furthermore, Twort et al. *(7)* and Pulvertaft and Walker *(4)*, indicate that a satisfactory germicidal aerosol must have a low vapor pressure and be soluble in water; those having high vapor pressures must be compensated by rapidity of action.

The mode of action of germicides should be the same regardless of means of application (aerosols or in aqueous solution). This, however, should not be interpreted as meaning that a substance active in solution would also be active in the aerosol form. Sykes *(6)* points out that the physical behavior of germicides is as important as the germicidal action. Several aspects of this study have indicated this to be true. For instance, concentrations of aerosols necessary for complete phage inactivation were extremely high compared to concentrations needed in aqueous solution. Also, surface active compounds such as QAC and PAWA were found to be ineffective as aerosols yet they have virucidal activity in aqueous solutions. The inability of these compounds to be effective agents can be attributed to different physical environments under which they must exert their activity.

TABLE 8. COMPARATIVE INACTIVATION OF 144F PHAGE BY 2000 PPM GERMICIDAL AEROSOLS

Type germicide	Total phage collected in air sample (*No./5 ft³*)	Phage inactivation (%)
NaOCl	0.00	100.000
DCCA	1.00×10^{1}	99.999
Iodophor	5.80×10^{2}	99.990
PAWA	4.46×10^{5}	92.579
QAC	4.64×10^{6}	22.795

REFERENCES

1. Fortney, Kenneth F. The germicidal properties of trichlorocyanuric acid. Master's thesis. Corvallis, Oregon, Oregon State University, 1958.

2. Hays, Helen A. and P. R. Elliker. Virucidal activity of a new phosphoric acid wetting agent sanitizer against bacteriophage of *Streptococcus cremoris*. J. of Milk and Food Technol., 22:109-111. 1959.

3. Masterman, A. T. Air purification by hypochlorous acid gas. J. Hygiene, 41:44-64. 1941.

4. Pulvertaft, R. J. V. and J. M. Walker. The control of air-borne bacteria and fungus spores by means of aerosols. J. Hygiene, 39:696-704. 1939.

5. Sing, E. L., P. R. Elliker and W. E. Sandine. A method for evaluating the destruction of air-borne bacteriophages. J. Milk and Food Technol. 27:125-128. 1964.

6. Sykes, G. Disinfection and Sterilization. 396 p. Princeton, Van Nostrand. 1958.

7. Twort, C. C., A. H. Baker, S. R. Finn and E. O. Powell. The disinfection of closed atmospheres with germicidal aerosols. J. Hygiene, 40:253-342. 1940.

.8 Watkins, Sprague, Helen A. Hays and P. R. Elliker. Virucidal activity of hypochlorites, quaternary ammonium compounds, and iodophors against bacteriophage of *Streptococcus cremoris*. J. of Milk and Food Technol., 20:84-87. 1957.

9. Watkins, Sprague and P. R. Elliker. Effects of chelating agents on destruction of *Streptococcus cremoris* bacteriophage by quaternary ammonium compounds. J. of Milk and Food Technol., 32:360-362. 1960.

10. Weber, G. A. and L. A. Black. Laboratory procedure for evaluating practical performance of quaternary ammonium and other germicides proposed for sanitizing food utensils. Am. J. of Public Health, 38:1406-1417. 1948.

11. Wolf, J. L., A. A. Nichols and P. J. Ineson. Mists containing hypochlorite as germicides in the destruction of air-borne bacteriophage attacking lactic streptococci. J. of Dairy Research, 14:291-315. 1946.

POTENTIAL MICROBIAL CONTAMINANTS FROM DAIRY EQUIPMENT WITH AUTOMATED CIRCULATION CLEANING[1]

R. B. Maxcy

Department of Dairy Science, University of Nebraska, Lincoln

(Received for publication November 26, 1963)

Summary

Dairy equipment with automated circulation cleaning was studied to determine the extent and nature of the microorganisms contributing contamination to the products being processed. When automated dairy equipment was cleaned within the standards of acceptable levels of sanitation, the microorganisms remaining for growth and subsequent contamination of milk were relatively few but represented a heterogeneous lot. Micrococci and Gram positive sporeforming rods were most numerous and were found throughout the plant. Other Gram positive rods were quite common in the equipment handling pasteurized products. Gram negative rods account for only a small percentage of the numbers of organisms associated with the contamination of equipment.

The common criteria for evaluating dairy plant sanitation have been visible cleanliness and/or the total numbers of microorganisms on the equipment and in the finished products. Certain specific groups of microorganisms have received limited emphasis. Some emphasis has been placed on the coliform organisms, which have been taken as indicators of general post-pasteurization contamination. The psychrophilic group has been associated with poor shelf life under refrigerated conditions. The source of the various microorganisms is commonly left to generalization based on knowledge of the habitat of common microorganisms associated with dairy products.

Considerable work has been done on the psychrophilic organisms in raw milk and their fate during pasteurization and subsequent storage *(3, 4, 5, 6, 9)*. The definition of psychrophilic organisms is dependent on the worker reporting *(2)*. The common practice for reporting coliform organisms is to give results based on enumerations of those growing on violet red bile agar. A number of tests for coliform organisms have been suggested *(8)*.

To maintain a low count in pasteurized products, some emphasis has been placed on the thermoduric organisms. The traditional definition has been survival at 143 F for 30 minutes. For a truly meaningful definition in commercial practice the time-temperature combination for each processing operation should be given. As Trout *(11)* has pointed out from a recent survey, there is a pronounced and wide variation in pasteurization treatments and the treatments are well above the legal minima. Increasing heat treatments should alter the flora remaining as contamination for growth between cleaning operations.

It is generally recognized that milk handling equipment can be a major contributor to the total contamination of dairy products. The extent of the contamination varies greatly depending on the nature of the equipment and the methods of handling the products. More important, however, each variation in the equipment and methods of handling the products provides a new environment for microorganisms and a potentially new flora of contamination. Thomas et al. *(10)* have done considerable work on the microflora of raw milk as influenced by farm dairy equipment and methods. The results of their work indicate the significance of the qualitative aspect of contamination and the sensitivity of the microflora to alterations in equipment and methods.

The processing operation of a dairy plant might be expected to contribute materially to the qualitative and quantitative significance of the microflora of dairy products. High pasteurization temperatures, severe cleaning operations, automated equipment, and wet storage create an environment far removed from the traditional dairy utensils (terminology commonly used to describe the habitat of microorganisms). Modern dairy plants might be expected to harbor an unknown flora, about which some added knowledge should contribute to better quality control and public health programs.

Methods

The work reported here involved a dairy plant with a welded line system with remote controlled valves and time sequence programmers for controlling the cleaning operations. Only Grade A milk from bulk pick up operations was handled by this plant. Monthly samples of the entire line of commercial products were taken from the cooler for standard plate and coliform counts as a routine evaluation of the bacterial quality.

Representative inspection stations were selected throughout the plant. With one exception the inspection stations were available without special construction at conventional cleaned-in-place (CIP) joints and at locations adjacent to centrifugal pumps. A special port was built into the holding tube of the pasteurizer. There were four inspection stations which were chosen to represent the equipment

[1]Published with the approval of the Director as paper no. 1454, Journal Series, Nebraska Agricultural Experiment Station, Lincoln.

handling raw milk, one station in the pasteurizer holding tube, and four stations which were chosen to represent the equipment handling pasteurized milk. Each station was chosen to include a weld in the approximately eight square inches to be swabbed. There were also two stations handling pasteurized milk where hand cleaning was used.

Another approach to assessing the sanitary condition was to make plate counts on the first market milk product through the filling operations.

The swabs and plates were made in general according to Standard Methods for the Examination of Dairy Products *(1)* with the incubation of the plates at 35 C. The coliform counts were made using violet red bile agar plates *(1)*. When making the swabs, 20 ml of rinse in each vial was used. From the rinse 10 ml was divided into approximately equal quantities for three plates. After appropriate incubation the plates were counted. The center colony of each of the three plates that were made for each inspection of each station or each first product through was picked and transferred to litmus milk, with the cells clinging to the loop being streaked on standard plate count agar with added sterile skim milk. In these two media the cultures were grown at 32 C for further study. The following tests were routinely made:

1. Reaction produced in litmus milk.
2. Nature of surface growth.
3. Gram stain.
4. Proteolysis on milk agar.
5. Catalase production.
6. Gas formation in brilliant green lactose bile broth.
7. Spore formation (resistance to 80 C for 10 min in litmus milk).
8. Coagulase production in brain heart infusion medium as judged by Difco coagulase plasma.

Where doubt continued as to the appropriate group for the isolates, further tests such as temperature of growth, growth rate, stimulation by yeast extract, etc. were used.

Visual examinations, swabs, and product tests were made at approximately monthly intervals for a period of one year to include the anticipated seasonal variations. The planned variations included swabs before sanitization and after sanitization. In addition, a system was used whereby the lines were flooded with 1 ppm of chlorine after cleaning and it was allowed to remain overnight until the lines were ready for routine sanitization and use.

TABLE 1. BACTERIAL COUNTS ON COMMERCIAL DAIRY PRODUCTS FROM EQUIPMENT WITH AUTOMATED CIRCULATION CLEANING

	Standard plate counts	
Range of counts	Number of samples	Percentage
3,000 or fewer	117	89
From 3,000 to 30,000	14	11
Over 30,000	1	1
	Coliform counts	
	Number of samples	Percentage
Fewer than 1	117	89
From 1 through 10	11	8
More than 10	4	3

TABLE 2. BACTERIAL COUNTS ON THE SWABS FOR EVALUATING THE CLEANING PROCESS OF AUTOMATED EQUIPMENT

	Total counts	
Range of counts per 40 in.^{2}	Number of samples	Percentage
100 or fewer	53	53
From 100 to 500	24	24
500 or more	23	23
	Coliform counts	
Occurrence of coliform organisms	Number of samples	Percentage
Negative	97	96
Positive	4	4

RESULTS

The degree of sanitation

The kinds of microorganisms in a dairy plant no doubt depend on the degree of sanitation that prevails. Thus, plate counts and coliform counts on the finished products and on the swabs were obtained. The results on the finished products are given in the first part of Table 1, which shows that 89% of the samples had a standard plate count of 3,000 or less, and 11% of the samples had more than 3,000 but less than 30,000. Only 1% of the samples had 30,000 or more. The results on the coliform counts are given in the second part of Table 1. There were 89% with less than 1 per ml, while 8% showed positive results but with fewer than 10 per ml. There were 3% with more than 10 per ml.

The results of the evaluation of the cleanliness by the swab method are given in Table 2. The counts are expressed in terms of number per 40 in.^{2} of area swabbed. The upper part of Table 2 presents the results of total counts. There were 53% of the counts that showed 100 or fewer colonies from the 40 in^2. In the category of 100-500 colonies there were 24%, and for those exceeding the recommended standard of 500 or more there were 23%. The results on the coliform counts are given in the second part of Table 2. Of the total of 101 swabs, 96% gave negative results for 5 ml of 20-ml swab samples and 4% showed 1 or more. Only half of the coliforms counted were able to produce gas in brilliant green lactose bile broth.

TABLE 3. CHARACTERIZATION OF MICROORGANISMS FROM AUTOMATED DAIRY EQUIPMENT

Criteria	Group
Gram positive cocci Occurring in clusters Surface growth Catalase positive Coagulase positive (Some isolates) Slow growth in litmus milk	1. Micrococci (The family *Micrococcaceae*, etc.)
Gram positive cocci Occurring in paris and chains Acid production in litmus milk Poor surface growth Catalase negative	2. Streptococci (The tribe *Streptococceae*, etc.)
Gram positive rods Surface growth Catalase positive Spore formation	3. *Bacillus* sp.
Gram positive rods Catalase positive or negative Surface growth, often poor Non spore forming	4. Other Gram positive rods (The genera *Lactobacillus, Microbacterium, Corynebacterium, etc.*)
Gram negative rods Surface growth Proteolytic on milk agar No gas formation in brilliant green lactose bile broth	5. Gram negative rods (Proteolytic)
Gram negative rods Surface growth generally not pigmented Non proteolytic on milk agar No gas formation in brilliant green lactose bile broth	6. Gram negative rods (Non proteolytic)
Gram negative rods Growth on violet red bile agar Gas production in brilliant green lactose bile broth	7. Gram negative rods (Coliform indicators)

The plate counts on the first market milk products through the filling operation showed an average of 930 for 17 trials.

Visual examinations of the equipment indicated it to be well cleaned.

Qualitative aspects of the contamination

During the process of evaluating the degree of sanitation, isolates of the microorganisms from the swabs and from the plating of the first product processed were obtained. These isolates (as can be seen in Table 3) were categorized into groups as to their potential functional significance. Isolates possessing those characteristics appearing in the upper left hand corner of Table 3 were placed into the group micrococci. The occurrence of micrococci indicated an environment potentially capable of supporting the growth of staphylococci. The presence of staphylococci within this group was indicated by the finding that 5% of the isolates were coagulase positive.

The streptococci included those organisms that are so universally considered a normal part of the flora of dairy equipment.

The bacillus group included only the aerobic sporeforming organisms.

The group of Gram positive nonsporeforming rods was broad. No significant repetition of occurrence of definite types within this group was apparent. The morphology and physiology of this group was indeed varied. It was interesting to note that only a single isolate fit readily into a classification of *Microbacterium lacticum*, as representative of a heat resistant nonsporeforming organism.

The Gram negative rods were divided into three groups to emphasize those producing proteolysis, the coliform indicators, and other Gram negative rods.

Frequency of occurrence of various categories of organisms

From the standard plate counts on the swabs 193 isolates were obtained. The frequency of occurrence of the various categories of the isolates from the raw milk equipment and the pasteurized milk equipment is shown in Table 4. It is apparent that the frequency of occurrence of the micrococci is high. This group accounts for over half the total isolates from the raw milk handling area. There was a lower frequency from the automated equipment in the pasteurized area and on hand washed equipment handling pasteurized products. Throughout the operation the micrococci accounted for almost half of the organisms isolated from the swabs.

The second most numerous group was the bacilli accounting for approximately one-fourth of the total.

TABLE 4. DISTRIBUTION OF CATEGORIES OF MICROORGANISMS FROM SWABS AND PRODUCTS PROCESSED IN AN AUTOMATED CIP SYSTEM

	Number of isolates				
		Pasteurized product equipment			
Category	Raw milk equipment	CIP	Hand washed	First packages	Percent of total
Micrococci	55	27	6	12	44.2
Bacilli	8	29	10	13	26.5
Other Gram positive rods	10	12	5	4	13.7
Streptococci	16	3	1	1	9.3
Gram negative rods (Proteolytic)	4	0	1	1	2.7
Gram negative rods (Non proteolytic)	3	2	0	1	2.7
Gram negative rods (Coliform indicators)	—	—	—	1	.4
Miscellaneous	—	—	1	—	.4
Total	96	73	24	33	99.9

These were least frequent on the raw side, more frequent on the hand washed equipment, and most frequent on the pasteurized side with the automated CIP equipment.

The Gram positive nonsporeforming rods occurred commonly throughout the operation but more frequently on the pasteurized side.

The streptococci made up approximately one-tenth of the total and occurred more commonly on the raw milk side. Three isolates, however, were obtained from the pasteurized side. There were no known possibilities for cross contamination, and the time-temperature combination of the cleaning solution would have been expected to destroy any streptococci.

The Gram negative organisms were relatively uncommon with more of them occurring on the raw side. Only two isolates, neither being proteolytic, were obtained from the pasteurized side.

There was no apparent difference in the kinds of organisms obtained by swabbing before sanitization and swabbing after sanitization.

From the plate counts on the 17 packages representing the first product processed after cleaning and sanitization, 32 isolates were obtained. As can be seen on the right hand side of Table 4, the predominant organisms were sporeforming rods and micrococci. Each of the groups was represented. The distribution as a whole was much the same as the swabs from the pasteurized side.

The last column in Table 4 presents the percentage of the total isolates from the swabs and from the first product processed.

Cleaning solution contamination

From a general observation it might be assumed that the cleaning solution was removing most of the microorganisms yet leaving a selected few. Plate counts on the solutions from different cleaning operations showed 9 to be sterile, six to have an average count of 4 colonies per ml, and one solution to have in excess of 3,000 per ml. The one high count solution was grossly contaminated, which was apparently a fault of the automated system. Within these results were zero plate counts on an alkaline cleaning solution that had been used for cleaning raw milk equipment and pasteurized milk equipment throughout a period of 24 hours. The essential sterility of a correctly programmed and applied cleaning solution is in agreement with the results found earlier by Maxcy and Shahani (7).

DISCUSSION AND CONCLUSIONS

The organisms isolated during the work reported here were from a plant with a good level of sanitation. Furthermore, the results when compared to results of sanitation evaluation in other plants indicate the plant harbored approximately the same general extent of contamination. The general type of residual organisms might therefore be expected to be the common flora of dairy plants. Further investigation along this line with other plants should prove most interesting.

The heterogeneity of the contamination existing in automated CIP equipment indicates there is neither a single source of contamination nor is the problem a single entity. Yet, contamination with a few predominating organisms was apparent during month observations. The organisms remaining generally appear as those capable of surviving an unfavorable environment. This is in contrast to the type of contamination that would appear from a small amount of whole milk undergoing natural fermentation, where a large population of lactic streptococci and the Escherichia-Aerobacter group would be expected.

The occurrence of a high proportion of micrococci was somewhat surprising. The micrococci were found both on the raw side and on the pasteurized side. It was indeed striking to see the similarity in the overall contamination in the equipment used for handling raw milk and the equipment handling pasteurized milk, in spite of the fact there were no common items for potential cross contamination. With the high heat treatment used in pasteurization one might have expected a higher percentage of sporeforming microorganisms from the equipment in-

volving pasteurized milk both in the swabs and in the first milk through the equipment. The frequent occurrence of micrococci might logically be taken as an omen of potential hazards of food poisoning if negligent handling of the products should follow.

ACKNOWLEDGMENT

The generous cooperation of the Omaha-Douglas County Health Department and the Roberts Dairy Company is gratefully acknowledged.

REFERENCES

1. American Public Health Association. Standard Methods for the Examination of Dairy Products. 11th ed. Am. Public Health Assoc., Inc. New York, N. Y. 1960.

2. Baumann, D. P. and Reinbold, G. W. Enumeration of Psychrophilic Microorganisms. J. Milk and Food Technol., 26:81. 1963.

3. Kaufmann, O. W. and Andrews, R. H. The Destruction Rate of Psychrophilic Bacteria in Skimmilk. J. Dairy Sci., 37:317. 1954.

4. Lawton, W. C. and Nelson, F. E. The Effect of Storage Temperatures on the Growth of Psychrophilic Organisms in Sterile and Laboratory Pasteurized Skimmilk. J. Dairy Sci., 37:1164. 1954.

5. Macaulay, D. M., Hawirko, R. Z., and James, N. Effect of Pasteurization on Survival of Certain Psychrophilic Bacteria. Appl. Microbiol., 11:90. 1963.

6. Marth, E. H. and Frazier, W. C. Bacteriology of Milk Held at Farm Bulk Cooling Tank Temperatures. III. Psychrophiles Found and Their Growth. J. Milk and Food Technol., 20:93. 1957.

7. Maxcy, R. B. and Shahani, K. M. Cleaning and Sanitization of Welded Line Systems for Handling Milk. J. Milk and Food Technol., 24:122. 1961.

8. Mundt, J. O. and Rai, B. N. Rapid Detection of Faecal Coliform Bacteria in the Food Processing Plant. J. Milk and Food Technol., 26:46. 1963.

9. Schultze, W. D. and Olson, J. C. Jr. Studies on Psychrophilic Bacteria. I. Distribution in Stored Commercial Dairy Products. J. Dairy Sci., 43:346. 1960.

10. Thomas, S. B., Jones, Mena, Hobson, Phyllis M., Williams, G., and Druce, R. G. Microflora of Raw Milk and Farm Dairy Equipment. Dairy Ind., 28:212. 1963.

11. Trout, G. M. Official Acceptance of Homogenized Milk in the United States. J. Dairy Sci., 46:342. 1963.

SANITARY STUDIES ON MALTED MILK SHAKES[1]

V. D. FOLTZ[2] AND ROSS MICKELSEN[3]

Kansas Agricultural Experiment Station, Manhattan

(Received for publication November 27, 1963)

SUMMARY

One hundred samples of vanilla flavored malted milk shakes were analyzed for the incidence of staphylococci and coliform organisms. Eighty-one samples contained coliform organisms and ten samples contained coagulase positive phage typable strains of staphylococci. A discussion of bacterial sanitary standards for products such as "malts" and "shakes" is presented.

Several types of dairy products have been examined by the authors in recent years to determine the presence of potentially pathogenic staphylococci *(2, 4, 5)*. The findings indicate that post pasteurization contamination may play an important role in introducing staphylococci into some dairy products. Attempts have been made to correlate the presence of coliform organisms and staphylococci, since the coliform test is often used as an index of post-pasteurization contamination.

Coliform organisms can grow in ice cream mix at temperatures as low as 4.4 C over prolonged holding periods *(3)*. Present day practices of centralized ice cream-ice milk mix processing followed by distribution over distances of several hundred miles to soft-serve stores could permit considerable growth of organisms of the coliform group. Thus, the significance of coliform organisms in soft-serve frozen dairy products, as far as post-pasteurization contamination is concerned, would seem to be the presence or absence of the organism, and not its total numbers. However, the soft-serve industry might well consider the number of coliform organisms along with total plate count as an index of mix quality.

EXPERIMENTAL PROCEDURE

One hundred samples of vanilla flavored malted milk shakes were collected from malt shops, soft-serve drive-ins, and drug store soda fountains located within 150 miles of Manhattan, Kansas. Samples, purchased as an ordinary consumer might purchase them, were immediately transferred to sterile sample jars and refrigerated with dry ice until returned to the laboratory. Analysis of samples was begun within 12 hours of collection.

Isolation, enrichment and identification of staphylococci were carried out as previously described *(2)*. Bacteriophage typing was done at the Regional

[1]Contribution No. 406, Department of Bacteriology, and Contribution No. 323, Department of Dairy Science, Kansas Agricultural Experiment Station, Manhattan; supported in part by research grant E-3157 from the National Institutes of Health and the Public Health Service.

[2]Department of Bacteriology; [3]Department of Dairy Science.

Bacteriophage Typing Center, Kansas State Board of Health Laboratories, Topeka.

Coliform counts were made on Violet Red Bile Agar (Difco). Confirmation of isolates was done using the methyl red reaction, production of acetyl methyl carbinol (Voges-Proskauer reaction) and utilization of citrate (Koser citrate). Additionally, lactose fermentation, Gram's stain and morphological characteristics were utilized as confirmatory criteria.

RESULTS

Qualitative data from examining samples of malted milk shakes for coliform organisms are presented in Table 1. Table 2 contains similar data, quantitative in nature.

TABLE 1. QUALITATIVE DATA OBSERVATIONS ON COLIFORM ORGANISMS IN MALTED MILK SHAKES

	Number of samples	
Coliform free		19
Containing coliform		81
Containing *Escherichia coli* only	14	
Containing *Aerobacter aerogenes* only	42	
Containing both *Escherichia coli* and *Aerobacter aerogenes*	25	
TOTAL		100

TABLE 2. QUANTITATIVE DATA OBSERVATIONS ON COLIFORM ORGANISMS IN MALTED MILK SHAKES

	Number of samples	Counts per ml[a]
Containing *Escherichia coli* only	14	4100
Containing *Aerobacter aerogenes* only	42	1640
Containing *Escherichia coli* and *Aerobacter aerogenes*	25	849
Coliform positive	81	1820
Coliform negative	19	—
Average for 100 samples		1470

[a]Mean arithmetic average.

Table 3 presents the range of coliform counts in the samples examined.

Ten samples contained coagulase positive phage typable strains of staphylococci. The distribution of coliform organisms in the ten samples is presented in Table 4.

The chi square test showed the relationship between coliform organisms and S. *aureus* in malted milk shakes to be nonsignificant. Thus, the presence or absence of coliform organisms is not necessarily a good index as to whether staphylococci will be present.

The bacteriophage pattern for the ten samples containing coagulase positive staphylococci is presented in Table 5. Thirteen separate phage patterns were noted among the ten samples that contained coagulase positive staphylococci.

TABLE 3. RANGE OF COLIFORM COUNTS IN 100 SAMPLES OF MALTED MILK SHAKES

Number of samples	Number of coliform present
19	None
20	1 to 10
5	11 to 20
4	21 to 50
7	51 to 100
8	101 to 200
6	201 to 300[a]
3	301 to 400
4	401 to 500
8	501 to 1000
2	1001 to 2000
10	2001 to 5000
1	5001 to 10,000
1	10,001 to 20,000
2	20,000

[a]When new standards are proposed, they usually are set at a point so two-thirds of the operators qualify. Using the data reported here and such standards would permit 300 per ml.

TABLE 4. RELATIONSHIP BETWEEN THE PRESENCE OR ABSENCE OF COLIFORM ORGANISMS AND *Staphylococcus aureus* IN MALTED MILK SHAKES

	Number of samples	Samples containing *Staphylococcus aureus*
Free of coliform	19	3
Escherichia coli only	14	1
Aerobacter aerogenes only	42	3
Both *Escherichia coli* and *Aerobacter aerogenes*	25	3
TOTAL	100	10

TABLE 5. PHAGE PATTERNS OF *Staphylococcus aureus* CULTURES

Pattern	Malt sample (No.)
3A	10
6, 43E, 47, 53, 83A, 81	16
6, 42E, 45, 83A	16
3B, 3C, 71	18
42D	25
80, 81	32
80, 81	35
29, 52, 79, 80	58
6, 7, 42E, 47, 54, 75, 42D	82
79, 80, 3C, 6, 7, 42E, 47, 54, 75, 83A, 81	82
6, 42E, 47, 77, 81	82
6, 42E, 75, 77, 42D	82
29, 81	89
29, 7, 81	90
13 Phage patterns	10 samples

DISCUSSION

Standard plate counts were not made. Past experience indicates that many samples with high standard plate counts would have been found. In-

terest was directed toward the two groups of bacteria reported.

In the process of pure culture isolation procedures, many yeasts were noted in several samples. Counts were not tabulated but the yeasts are a significant index of general sanitary practices.

Most states have total plate and coliform count standards for ice cream and related products. However, specific standards for products such as "malts" and "shakes" are not included in most cases so attention to quality of those consumable products is not mandatory. Regulatory agencies often direct their attention to the quality of the mix components of malted milk shakes, on the apparent assumption that high quality mix ingredients assure high sanitary quality of the mixes. Data reported here indicate that sanitary practices break down somewhere between pasteurization of the mix and sale of the malted milk products. If data from this limited study represents the general sanitary quality of malted milk shakes throughout the country, then standards for these products should be established. Where should the standard be set with regard to coliform and staphylococci? Table 6 illustrates the percentage of samples, based on this study, that would comply with various arbitrarily assigned coliform counts.

The bacterial standards for ice cream and related products in many states specify 10 or fewer coliform organisms per ml. Some states allow up to 20 coliform organisms per ml. Pennsylvania regulations permit a coliform count not exceeding one in two of five samples and not exceeding 10 in the other three *(1)*. Some states have no bacterial standards for ice cream and related products.

Table 7 presents the percentage breakdown of malt samples that meet indicated arbitrarily-assigned standards for both coliform organisms and staphylococci.

TABLE 6. PERCENTAGE OF MALT SAMPLES MEETING INDICATED ARBITRARILY ASSIGNED COLIFORM TOLERANCES

Number of coliforms tolerated/ml	Percentage meeting requirement
None	19
10	39
100	45
300	69
1,000	84
10,000	97
20,000	100

TABLE 7. PERCENTAGE OF MALT SAMPLES MEETING INDICATED ARBITRARILY ASSIGNED STANDARDS FOR COLIFORM ORGANISMS AND STAPHYLOCOCCI

Requirements - organism/ml	Percentage meeting requirement
Coliform free	19
Staphylococcus free	90
Coliform free and staphylococcus free	16
10 or fewer coliform	39
10 or fewer coliform-no staphylococci	36

If data reported here are representative, they answer affirmatively the question: Are bacterial standards for malted milk shakes necessary?

REFERENCES

1. Anonymous. *Digest of State Laws Affecting Ice Cream and Related Products.* International Association of Ice Cream Manufacturers, Washington, D. C. 1962.

2. Foltz, V. D., Mickelsen, R., Martin, W. H., and Hunter, C. A. The Incidence of Potentially Pathogenic Staphylococci in Dairy Products at the Cansumer Level. I. Fluid Milk and Fluid Milk By-Products. J. Milk and Food Technol. 23: 230. 1960.

3. Foster, E. M., Nelson, F. E., Speek, M. L., Doetsch, R. N., and Olson, J. C. Jr. *Dairy Microbiology.* Prentice-Hall, Inc. Englewood Cliffs. 1957.

4. Mickelsen, R., Foltz, V. D., Martin, W. H., and Hunter, C. A. The Incidence of Potentially Pathogenic Staphylococci in Dairy Products at the Consumer Level. II. Cheese. J. Milk and Food Technol. 24:342. 1961.

5. Mickelsen, R., Foltz, V. D., Martin, W. H., and Hunter, C. A. Staphylococci in Cottage Cheese. J. Milk and Food Technology. 26:74. 1963.

COMMUNICATIONS IN THE FOOD AND DAIRY FIELD[1]

D. L. GIBSON
Dept. of Dairy Science,
University of Saskatchewan, Saskatoon, Canada

The importance of communications may be comprehended by the fact that nearly every major organization has a full complement of staff to handle the subject and every college and University throughout North America offers undergraduate course work and many institutions teach graduate courses in the communication arts. It was rather surprising how the College of Agriculture at the University of Saskatchewan began teaching in this field. A questionnaire sent to the graduates from the College asked several pertinent questions on how course content could be improved to meet the needs in their particular area. Under the additional remarks column nearly 70 percent of the replies stated that although the material was correctly presented and vast quantities of information was absorbed, no attempt had been made to tell or show the student how to disseminate or communicate this vast wealth of knowledge to others. To surmount this oversight all freshmen must take a compulsory course designed to improve their communication technique.

Communications media are a phenomena of the twentieth century. However, their roots are to be found in the origin of language itself. Man learned to communicate, before he became civilized and the art of communication therefore predates civilization. When we speak of communications the whole gamut must be considered — press, radio, television, newsreels, movies, telegraph, telephone, cinemascope, house organs, scientific and popular magazines, other advertising media, public platform, discussion groups; even the "hucksters" are included.

When one mentions communications they really mean public relations since it inevitably involves communication with the people who comprise the various publics. However, it is a paradox that, as the number of communication media has increased and as the media themselves have vastly improved, communication has become more difficult. Since the means of communication exist, it must be the use of those means that is at fault.

Because of the breadth of the subject, it is necessary to limit this discussion to the communication of ideas by means of words.

There are four questions which will help to make clear the general problem of communication of ideas. If we apply them to specific cases in everyday life we shall find that we can make our thoughts known clearly so as to persuade people to see events and ideas from our point of view.

1. What is it we wish to communicate (We must have it clear in our own minds).
2. To whom (It is childish to try to score a bull's eye by aiming in the general direction of the target).
3. What is the best medium of communications (writing, speaking, photographs, charts, movies, T.V., radio, etc.).
4. What will best carry our message to the audience. (In the food and dairy field it is probably direct communication).

If anyone doubts the difficulty in communication of ideas by words, try to teach your son without active demonstration how to knot his tie. Or to bring it closer to home let me demonstrate a technique learned from an old friend of many of us, namely Dr. W. H. Haskell of Wisconsin. He was discussing cleaning and wanted to impress the group with the fact of "Don't tell them, show them". He set the scene by stating the audience would consider him an aborigine who had never seen a suit coat and the audience were to tell him how to put on the coat. The results were hilarious but it proved the point that, often you must work with the person and not just talk. As a matter of fact we should all entertain a new concept of Public Relations, which is; "Nine-tenths doing and one-tenth talking". Too many talk public relations and do nothing about it.

Successful public relations are essentially the results of a complicated interplay of virtues and principles. One of the cardinal principles in dealing with people is to show enthusiasm. Walter P. Chrysler, when asked to give the secret of success, listed various qualities such as capacity, energy, etc., but added that the real secret was enthusiasm. Right here is the big reason why thousands of people hit their high water mark at the age of thirty-five and recede — they can "do their work with their eyes shut" and that is the way they do it. They either never had or have lost the driving force of enthusiasm. Actually, the majority of people only use about 10 percent of their mental capacity because it has not been enthusiastically promoted. If we promote our ideas in the field, plant or laboratory in an enthusiastic way it will be possible to increase the mental capacity of all around us and as a result product improvement, in which we are all interested, will follow.

---

[1]Presented at the 50th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc., October 22-25, 1963, Toronto Canada.

When in New York a few years ago I was fortunate in studying under one of the foremost public relations men in the country. In discussing the phase of how to communicate, he presented four cards with a letter on each card ICCM and said "If you wish to get your message across you must be Interesting, Clear, Convincing and the subject material Memorable.

In looking at the word COMMUNICATIONS we note these letters are present and in addition there are several other attributes that one should possess such as being orderly, methodical, upright, nonpartisan, intelligent, active, tactful, objective, nonconformist and last but not least sincere.

I C C M

CLEAR	CONVINCING
Orderly	Active
MEMORABLE	Tactful
Methodical	INTERESTING
Upright	Objective
Nonpartisan	Nonconformist
Intelligent	Sincere

Those who are students of "semantics" may wish to use other symbols (words) but anyone who deals in dissemination of statements to the public would do well to understand the science of semantics in the communication process, for words loosely used can be open to many and varied interpretations or misinterpretations. The great General Von Moltke at the outbreak of the Franco-Prussian War said to his officers, "Remember gentlemen, any order that can be misunderstood will be misunderstood". Further Anatole France remarked that there are three requisites in all good communications. The first is clarity, the second is clarity and the third is — clarity. Words either written or spoken are no use except to convey ideas. In this fast moving age of science and technology we have seen our language grow and add its quota of new words and phrases peculiar to our time. In 1846 the English dictionary contained only 47,000 words, today it includes almost half a million, an increase of 12 new words a day. Milton knew 10,000 words, Shakespeare knew 15,000; the Bible only contains 5000 different words. In other words if we wish to be understood, keep our language simple.

It is quite possible that Albert Szent-Gyorgyi was prompted to write his article on "The Development of Mind and Science are not in Balance" due to the complexity of semantics. After all, whatever man does, he must first do in his mind. The machinery of the mind is the brain, and any machine can only do what it is made to do. Consequently, if we want to understand ourselves and others, we must understand what sort of machine our brain is. Primarily, the brain is an organ of survival. It was designed by nature to search for food, shelter, clothing, to gain advantage — before addressing itself in the pursuit of truth. Hence most human brains are unable to distinguish between truth and advantage, and accept as truth that which is only advantage. Simultaneously, we produce thoughts and arguments which justify our feelings and dealings; for instance the majority of politicians today are devoting their brain power less to the next generation than to the next election!

An understanding of how the brain works is a must for all in the public relations field because it gives us the necessary background in the strategy of working with people. To illustrate this, we may use the example of one of my former students. For twelve years he was employed by a Department of Public Health in the dairy field. Two years ago he joined a large dairy organization in charge of quality control (both farm and finished product). At his first briefing the manager handed him a copy of Dale Carnegie's "How to Win Friends and Influence People." His wife laughed at him for reading it but not long after he confessed to me that it was the most important book in his library. He wished he had started using it fourteen years ago, because now he was making real progress with his producers, — they no longer let the dog off the leash or out the back door when they saw his car coming up the lane! The principles outlined in the book, when practiced sincerely, often make the difference between success and failure. Further, if King George III of England had not been so pig-headed on that fateful day of December 16, 1773 (Boston Tea Party) we Canadians might still have for a colony that great country south of the 49th parallel! I often wonder when we are in a position to wield a big stick if we forget our public relations.

Ralph Waldo Emerson wrote, "Nature never rhymes her children nor makes two men alike." Thus to be effective in our Public Relations we must admit two truths: (*a*) We are all different, and (*b*) We are all acting and reacting in different environments. When we realize these truths, we are inclined to begin understanding people and to study them.

We all realize that nothing is pure white or pure black. Many of us who have certain prejudices must accustom ourselves to thinking in degrees of black and white, goodness and badness, poisonous and wholesome. K. S. Keys in his book "How to Develop Your Thinking Ability" refers to a chemical called phenyl-thiocarbimide, the tolerance chemical. One out of five finds it tasteless, 65 percent find it bitter, 5 percent call it sour, 2 percent insist that it is sweet and 5 percent are sure it is salty. Others call it something else. There is no one answer on which people can agree. Knowing this, we realize the

futility of argument concerning the taste of the chemical, and we shall not be prejudiced against friends whose opinions differ from ours. The Royal Bank of Canada, our major financial institution, felt so strongly about the subject of prejudice that they devoted an entire monthly newsletter to the subject.

Frequently one finds that prejudice creeps into highly specialized personnel and it sometimes reduces their ability to contribute as much as they are capable of doing. Rather than be highly specialized let's be more generalized and practical. For example Dr. Frantz of our city told me of the strange case of a young man who had a ringing in his ears and his eyes were bugging out. When sent to a specialist and thoroughly examined it was concluded he had a rare tropical disease and was given a maximum of six months to live. Thus he decided to spend some money on a complete new outfit. Finally he got down to shirts and said to the clerk, "Give me half a dozen size 14 shirts." The clerk looked, then measured him and said "If you wear a size 14 it will make your ears ring and your eyes bug out! Buy a 15." Sometimes a little practical background helps.

Despite the resources of our language for clarity, distinctive expression and minute differentiation of meanings, there are people who write and speak in an obstruse, involved, pompous and thoroughly tiresome manner. Simple things are made complex and complex things are made well-nigh incomprehensible. It is actually the disease "logorrhea" or in plain everyday language "Jargon". The big problem today is that we are bombarded with jargon which is supposed to be a form of communication when it really isn't at all, and in fact is well on the way to destroying communication. Those who are interested in practicing gobbledegook must follow three principles: (*a*) Avoid active verbs, (*b*) Use plenty of words where a few will suffice and pad, and (*c*) Be careful to use fuzzy words and phrases.

For instance if you look up a Lexicon of Gobbledegook you find: "Implement" means – what you do to carry out a decision, policy or program when you are doing nothing. "Finalize" means – signifying formal adoption of a decision policy or program, with silent agreement to give it a quiet burial.

Consequently you will never catch the jargoneer giving an active order with an active verb like "go to work" rather it is "it is imperative that action of a positive nature be implemented at the earliest date."

In other words when we want to get things across "Keep it simple." Don't give a fourteen point method to follow in any program or the producer-processor or party you are talking to will be lost. Even if you show him as well as tell him he will likely get lost in the maze of directions.

Quite frequently I read the music critics column and yearn for the good old days, when one could understand the review; however, was pleased to note not long ago of one of the briefest musical criticisms on record. It was "An ameteur string quartet played Brahms here last evening. Brahms lost." Simple, plain, and straightforward.

When we are dealing with people, let us think of the word "communications" and all that it stands for in our own particular area. The International Association of Milk and Food Sanitarians might well develop the public relations concept of the Pennsylvania Railroad which is to have every employee of the railroad make a friend for himself and the company each day. If this concept was practiced throughout this Association on controversial matters, to the public outside the Association, there is little doubt that opposition to improvements we desire in the food and dairy field would be eliminated.

While practicing this concept remember "Don't treat the public like you would your relations."

ENVIRONMENTAL HEALTH FACTORS IN NURSING HOMES[1]

FRANKLIN H. FISKE

Allegheny County Health Department,
Pittsburgh, Pennsylvania

Nursing homes fill an important need in the community of today. With an increased demand for homes for our aging population, public health workers have become involved with the control of those factors in the nursing home that have an effect on the health of the occupants. Many of the public health factors have a direct relationship to the environment of the home. It will be my purpose to discuss the environmental health factors and show how the sanitarian can contribute to the control of these items in the nursing home.

ORIENTATION TO THE NURSING HOME

During the past few years a great deal of attention has been given to the problem of providing adequate care for the chronically ill and the aging citizens of our communities. The nursing home has been identified as the principal means of providing this type of care.

The need for nursing homes has greatly increased during the past decade. The "Nursing Homes and Related Facilities Fact Book" *(1)* reports that "the number of elderly in the United States is increasing at the rate of more than 1000 a day." In 1962, persons aged 65 and older totaled more than 17 million, 8.8% of the total United States population.

In addition to the rapid increase in number of elderly people, there is also a gradual increase in the life span, particularly in the female population. Other factors include a change in family pattern with fewer three generation families residing in the same household; assured income from retirement plans; and an ever-present desire to avoid being dependent upon family members. All have contributed to the demand for additional nursing home facilities.

During this same period a great deal of interest has been shown by official and voluntary health and welfare agencies in particular and the public in general concerning the well-being of patients in nursing homes. This concern has resulted in the development of control programs by State and local agencies. National groups have also contributed by proposing standards and establishing guide lines for nursing home requirements.

TYPES OF NURSING HOMES

There are several types of institutions which come under the general classification of nursing homes. There are also numerous definitions being used to describe the types of nursing homes. As set forth in the publication "The Condition of American Nursing Homes" *(2)* four categories of nursing homes are now generally accepted.

1. Skilled Nursing Home, which provides skilled nursing care as its primary and predominant function. It is a facility equipped for the accommodation of individuals who are not in need of hospital care but who are in need of nursing care and related medical service.
2. Personal Care Home
   a. With skilled nursing care, providing such care only as an adjunct to its primarily domiciliary or personal care function, or
   b. Without skilled nursing care, providing personal services such as required by older persons. The persons in these homes usually are not bed patients and do not need skilled nursing care but do need assistance with essential activities of living in a protected environment.
3. Sheltered Homes or Residential Facility, which provide a minimum of services, such as meals and limited room custodial service. These are boarding homes for aged persons who need a minimum of help and can manage their own care and affairs.
4. Combination Facility, which provides services in two or more of the categories listed above and therefore cannot be classified exclusively as a particular type of facility.

In spite of the confusion created by the various definitions of nursing homes and related institutions, the basic health factors are generally the same. A sanitarian capable of providing consultation to a skilled nursing home can just as well provide a similar service to the other types of institutions. So for the purpose of convenience in this discussion, the term "nursing home" is used as an inclusive term for all institutions of this type.

HOUSING HYGIENE

Nursing homes have a dual responsibility in terms of providing their clientele a home with a certain amount of protection as well as nursing and medical care. The relationship between health and housing

[1]Presented at the 50th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, October 22-25, 1963, at Toronto, Canada.

has been presented by the Committee on the Hygiene of Housing of the American Public Health Association. The Committee submitted the "Basic Principles of Healthful Housing" *(3)* as:

1. Fundamental physiological needs.
2. Fundamental psychological needs.
3. Protection against contagion.
4. Protection against accidents.

It was stated in the recently published "Nursing Homes — Environmental Health Factors" *(4)* that "these basic concepts are applicable to a greater degree in the nursing home than they are to domestic housing usually considered in public health programs." Knowledge of housing problems and related health matters is required in the nursing home control program.

ENVIRONMENTAL HEALTH FACTORS

The demands on the sanitarian in reviewing the requirements of an existing or future nursing home are extensive. Environmental health factors such as site location, water supply, sewage and waste disposal, food sanitation, laundry operation, safety and accident prevention are all important aspects of the nursing home. Matters within the knowledge of the trained sanitarian include:

1. *Site Location.* A nursing home should be located convenient to transportation but away from objectionable surroundings. The building should be placed so as to avoid flooding and yards should be graded to permit use by the occupants of the home.

2. *Water Supply.* Nursing homes should be provided with a safe and adequate supply of water under pressure. When possible an approved community system should be utilized because of the known quality and quantity of this type of supply. When it becomes necessary to depend upon an individual supply, acceptable standards for location and installation of the system *(5)*, for the chemical and biological quality and for an adequate quantity under pressure must be followed. Routine testing of the individual systems should be required by the control agency.

3. *Sewage Disposal.* A municipal sewerage system is desirable for the disposal of liquid wastes because the volume is too great for satisfactory operation of septic tanks and soil absorption methods of sewage disposal. If a private system is necessary, careful attention should be given to make certain adequate design and construction standards are observed *(6)*.

4. *Solid Waste Disposal.* Proper collection, storage and disposal of all solid wastes (garbage and other refuse) of a nursing home is essential to maintain a sanitary environment. Careful attention to this item will help prevent the attraction and propagation of insects and rodents, avoid the development of offensive odors and reduce the possibility of transmission of infection to employees and patients *(7, 8)*.

5. *Food Sanitation.* Studies of the food needs of older people show that nutrition may be the most important single factor affecting health *(9)*. Good sanitation practices in the kitchen and serving area are also imperative to the health of the patients. Such basic requirements as adequate refrigeration, proper dishwashing, safe food storage, preparation and serving practices are essential. Sanitarians should apply and refer to food sanitation requirements in guides such as food service manuals *(10, 11)* and equipment standards *(12)*.

6. *Laundry.* The collection, sorting and washing of soiled and the storage and distribution of clean articles is an important factor in preventing the spread of infection. Sanitarians should be able to evaluate and advise on laundry handling and laundering methods *(13)*.

7. *Housing.* The requirements of the physical plant are stipulated in most regulatory standards for nursing homes. In addition Building, Zoning, Fire, Safety, Plumbing and similar structural requirements have special sections applicable to institutions. The sanitarian acquainted with this multiplicity can be helpful in guiding an operator through the maze of regulatory provisions. Manuals as the "Nursing Home Standards Guide" *(14)* and similar publications are useful in planning and evaluating a nursing home. The sanitarian should give special attention to safety and accident prevention aspects in homes for the elderly.

8. *Other Factors.* Heating, ventilation, lighting, screening, convenience and adequacy of toilet facilities, and housekeeping problems are some of the other environmental health factors.

TRAINING NEEDS

As indicated in the above list of environmental health factors, extensive knowledge is required to become an effective participant in a nursing home control program. A trained and experienced sanitarian has the background for this type of assignment. However to develop competence in this somewhat specialized field of environmental health, authorities have recommended advanced training for personnel selected for this activity. An example of a training program for sanitarians has been documented in the "Papers presented at the Hospital and Nursing Home Sanitation Seminar for Local Health Department Sanitarians" held in March, 1962, by the Michigan Department of Health *(15)*.

As indicated in the selected reference list attached to this paper, there is an extensive amount of study

material available for the sanitarian. The U. S. Public Health Service has been helpful by assembling detailed resource material in such publications as "Nursing Homes — Environmental Health Factors" *(4)* and "Nursing Homes and Related Facilities Fact Book" *(1)*.

INSPECTION AND CONSULTATION

The sanitarian should be sufficiently well equipped not only to carry out a comprehensive inspection of a nursing home but should also be able to provide consultation on nursing home problems. Guiding rather than forcing people to comply with necessary and desirable provisions for the well-being of people is the philosophy of most health departments. A consultant must be equipped with knowledge of the requirements and also the reason for and practical solution to the fulfillment of the regulations.

As you may have suspected from the scope of the public health factors related to nursing homes, other professional staff are also involved with the control program. In some jurisdictions, nursing personnel conduct the inspectional service in the institutional field and only call upon the sanitarian or engineer when necessary. The trend, however, is to utilize the "team approach" with nurses and sanitarians serving as the principal team members and medical and engineering personnel available for consultation. This team arrangement provides the capabilities required to resolve the most complex health problem.

Training programs, as mentioned above, are essential to develop a broad perspective for the inspection and consultant staff working as a team in a nursing home control program.

SUMMARY

Nursing homes fill an important need in the care of the elderly in our communities. The public health factors related to nursing homes have been presented and discussed. The extent of those factors involving the environment have been shown in order to establish the scope of the field. The relationship between the types of problems and the normal activities of a trained and experienced sanitarian have been mentioned. In order to qualify for such an assignment it is proposed that the sanitarian have a background of basic sanitation knowledge in water supply, waste disposal, food sanitation and housing hygiene.

In order to deal effectively with the problems of nursing homes by evaluation and consultation, extensive training of staff is indicated. Because of the scope of a control program it is recommended that the sanitarian can fill an important position on the team, along with nursing, medical and engineering personnel. The sanitarian should be able to deal effectively with the environmental health factors of nursing homes.

REFERENCES

1. Nursing Homes and Related Facilities Fact Book. Public Health Service Publication #930-F-4. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., February, 1963.

2. The Condition of American Nursing Homes. Subcommittee on Problems of the Aged and Aging of the Committee on Labor and Public Welfare. U. S. Senate, Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1960.

3. Basic Principles of Healthful Housing, published by the Committee on the Hygiene of Housing, American Public Health Association, 1790 Broadway, New York 19, N. Y., 1939.

4. Nursing Homes — Environmental Health Factors, A Syllabus. Public Health Service Publication No. 1009. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., March 1963.

5. Individual Water Supply Systems. U. S. Dept. of Health, Education and Welfare. Public Health Service Publication #24. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1962.

6. Manual of Septic Tank Practice. U. S. Dept. of Health, Education and Welfare. Public Health Service Publication No. 526. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1957.

7. Hospital Solid Wastes and Their Handling. A Committee Report. Committee on Hospital Facilities, Engineering and Sanitation Section. American Public Health Association, American Journal of Public Health, Vol. 46, March, 1956.

8. General Standards of Construction and Equipment, Long Term Care Facilities. U. S. Dept. of Health, Education and Welfare, Public Health Service Publication No. 930-A-3. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1962.

9. Standards of Care for Older People in Institutions, Section I — for Homes for the Aged and Nursing Homes, The National Committee on the Aging of the National Social Welfare Assembly, 1953.

10. Food Service Manual. American Hospital Association and American Dietetic Association. American Hospital Association, 840 North Lake Shore Drive, Chicago 11, Illinois, 1954.

11. Food Service Sanitation Manual. U. S. Dept. of Health, Education and Welfare. Public Health Service Publication #934. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1962.

12. Food Service Equipment, Standard #2 and Spray-type Dishwashing Machine, Standard #3. National Sanitation Foundation, Ann Arbor, Michigan, 1956.

13. Hospital Environmental Sanitation Handbook. Klenzade Products, Inc., Beloit, Wis., 1958.

14. Nursing Home Standards Guide. U. S. Dept. of Health, Education and Welfare. Public Health Service Publication No. 827. Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C., 1961.

15. Papers Presented at the Hospital and Nursing Home Sanitation Seminar for Local Health Department Sanitarians. Michigan Department of Health, Lansing 4, Michigan, March, 1962.

NATIONAL LABELING COMMITTEE ACTIVITIES TO-DATE.[1]

JOHN F. SPEER, *Executive Assistant*
International Association of Ice Cream Manufacturers
Washington, D. C.

At the last two annual meetings of the Dairy Products Improvement Institute reports were presented on the activities of the National Labeling Committee. This continuing interest on the part of DPII, as well as its active support both in personnel and financing this voluntary industry-regulatory Committee is greatly appreciated by all of us here in this room I am sure.

The early work of Dr. Dahlberg in formalizing the NLC, the activities of Harold Barnum as its first Secretary and the continued counsel of Livingston Jennings, DPII's official representative on the Committee, all have contributed greatly to this project.

Since its formal beginning in April of 1962, the National Labeling Committee has made progress towards its basic objective, that of drafting and promoting the voluntary adoption and implementation of uniform definitions, standards, and required labeling information for dairy products. It was evident from the outset that the attention of the Committee would primarily be directed to fresh milk products although some of its proposals would also apply to the frozen desserts industry. This emphasis on the fluid milk industry was largely due to the fact that nearly all other dairy products had been federally standardized, and definitions, standards of identity and labeling provisions were in existence.

While the concept of a voluntary organization -- comprised of both industry and regulatory people -- working towards uniformity in labeling is not unique -- it had never been attempted at the national level until the formation of the National Labeling Committee.

All of us in this room have witnessed the accomplishments of similar cooperative work between regulatory and industry personnel at the state and local level and are aware how effectual an effort of this kind can be -- not only to the two groups, but also to the ultimate consumer.

During the preceding year the National Labeling Committee has made steady progress. Any new voluntary committee working on problems as complex and deeply rooted as those surrounding dairy labeling cannot be expected to leave its launching pad, gain instant momentum and successfully land in the bulls-eye down range. The Committee believes, however, that due to changes made in its basic structure, procurement of a new Executive Secretary and the awareness of the presence of this committee by regulatory officials throughout the country, 1964 will mark a new emergence for the NLC as an established, competent and widely represented group of persons interested in uniform labeling and definitions for dairy products.

Let us briefly look at the activities of the National Labeling Committee and its accomplishments in 1963.

NCL PROPOSAL #1 — UNIFORM PACKAGE IDENTIFICATION FOR FRESH MILK PRODUCTS AND FROZEN DESSERTS

After surveying industry and regulatory officials throughout the country and analyzing a large number of comments, the Committee finalized its first proposal. Proposal No. 1 is a uniform coding system for identifying fluid milk products and frozen desserts manufactured under private label or at a multi-branch plant where the address on the container or carton is not necessarily the address of the actual plant where the package is filled. Prior to this uniform coding system in some areas it was necessary for a plant whose products were shipped into several states to carry many plant identification codes — thus assuring the manufacturer that all products in inventory were acceptable to all jurisdictions where they might be eventually sold.

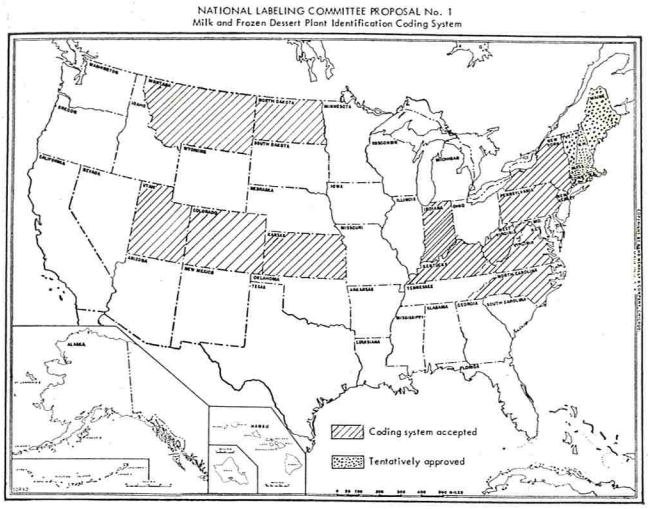
In order to eliminate the need for several codes on the same carton, each of the 50 states has been assigned a suggested two-digit number. This numbering system was first divided by IBM and is used by several federal agencies. Each state than assigns a number to follow the state number to each fluid milk and frozen dessert plant which operates more than one processing operation.

Through the adoption of this proposal it is possible for a regulatory official to quickly and clearly identify the plant where a product was filled and additionally allows industry flexibility in both carton and finished product inventory.

If a state at the request of a city or other jurisdiction wishes to set aside a series of numbers, e.g. 101-199 or 201-299, etc., to identify processing plants under a specific jurisdiction, this can easily be accomplished.

The genesis for this uniform identification proposal was the Northeast Labeling Committee — a regional

[1]Presented at Seventeenth Annual Meeting Dairy Products Improvement Institute, Inc., Hotel Governor Clinton, New York, N. Y., February 11, 1964.



regulatory-industry committee and it was their Chairman, Dick Parry, who first introduced this concept to the NLC. I thought you would be interested in knowing these states which have adopted this proposal during the past 12 months or which are currently in the process. They are: Colorado, Indiana, Kansas, Kentucky, Montana, New York, North Carolina, North Dakota, Pennsylvania, Utah, Virginia and West Virginia.

In addition to the above states several others are now studying Proposal No. 1 and it is my understanding that later this month industry and regulatory officials in the New England States will meet and possibly implement this coding system.

The National Conference on Interstate Milk Shipments at its meeting last April approved a resolution that in its Sanitation Compliance Ratings publication, assigned state numbers would follow the name of the plant listed in the directory and additionally the publication would contain a full explanation of the proposal.

Procedural Changes in the Committee

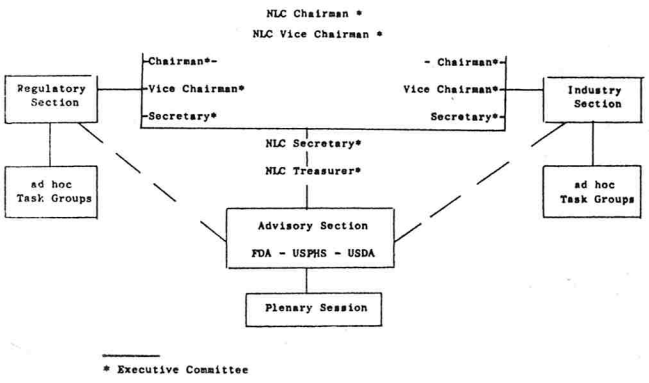
In an undertaking such as the National Labeling Committee, it is evident that a sufficient number of persons must be engaged in the formulation of such programs to assure adoption of its proposals. This participation should not be in numbers only, but those involved must be skilled in production techniques, merchandising and food law as well as the regulatory aspects. While there are 17 official representatives on the Committee, representing regulatory and industry associations, as well as federal advisors from the Food and Drug Administration, Public Health Service and the U. S. Department of Agriculture, the Committee felt that increased membership was vital to the continued success of the program. Patterned after the 3-A Sanitary Standards, whose membership is similar in many ways to the NLC with both industry and state and federal officials represented — the Committee has altered its procedural guidelines.

Under the revised procedures three sections have been provided for — Regulatory, Indutsry and Advisory. In the drafting of a definition, standard or labeling proposal, each section would meet separately. Only in Plenary Sessions, after each section has approved a proposal would the entire membership meet together. Under both the Regulatory and Industry Sections a number of ad hoc task groups would be formed; their job being to formulate an initial draft. For example, if the Executive Committee of the NLC wished to undertake a uniform standard for low fat milk, as it has done recently,

Table I

PROCEDURAL GUIDELINES

NATIONAL LABELING COMMITTEE

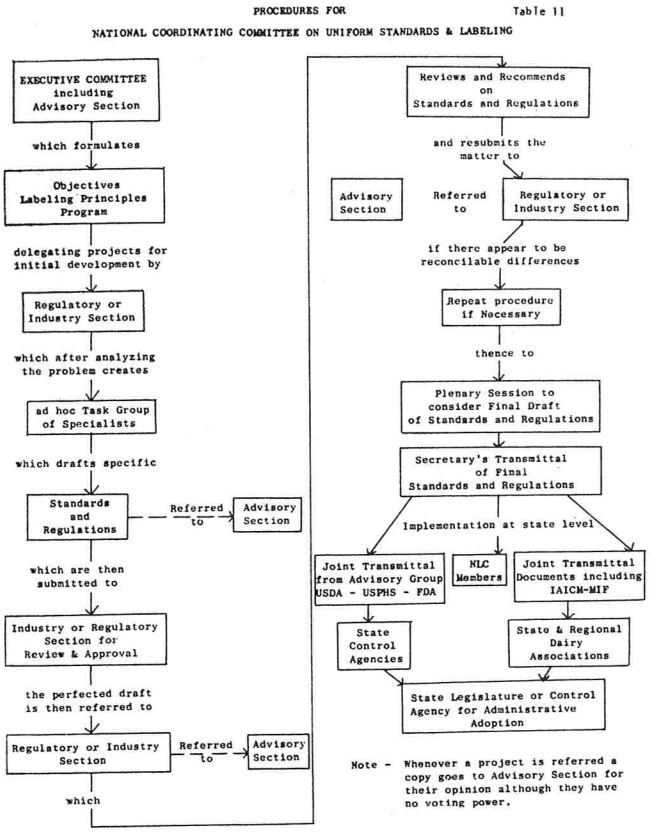


* Executive Committee

it would instruct the Industry Section to form an ad hoc task group comprising all segments and skills in the dairy industry to formulate such a proposal. Once this proposal is completed it is then transmitted to the Industry Section for approval. When the Industry group has completed its initial deliberations the proposal in first draft form is then forwarded through the Executive Secretary's Office to both the Regulatory and Advisory Sections. These two Sections then review the draft and alter it in any way they feel necessary. The draft is then sent back to the Industry Section. This exchange between the three Sections continues until it has received approval from each.

When meeting in Plenary Session, the Regulatory and Industry Sections each cast a single vote. In addition to the two sections voting, each official representative on the NLC may also cast a vote on the proposal. While this may seem at first glance a cumbersome procedure to follow, its success and effectiveness have been proven in the 3-A Sanitary Standards program.

It is believed that through the use of ad hoc task groups the procedures have been greatly strengthen-



ed. Regulatory and industry persons knowledgeable on a specific product would be asked to serve on a Task Group until the proposal has been approved by the Committee. By adopting this procedure, it is possible to greatly increase participation in the National Labeling Committee and further, it allows the undertaking of several projects at one time.

Initiation of new projects to be undertaken by the Committee can be recommended by anyone on the three sections. The Executive Committee, comprised of the officers of the National Labeling Committee, as well as the Chairman, Vice Chairman and Secretary of each section, approves the undertaking of any project and assigns to a section the drafting of the initial proposal.

Selection of a New Executive Secretary

With the resignation of Harold Barnum, as Secretary of DPII and the National Labeling Committee, to return to his responsibilities with the Denver Health Department, the Committee was faced with the task of finding a qualified person to replace Barney. Due to the closing of DPII's headquarters in Ithaca, it was also necessary to find an office for the NLC which could handle correspondence, reproduce drafts and maintain the mailing list.

A Selection Committee was formed and applicants for the position interviewed. At a meeting held last month, the NLC selected H. L. Thomasson as Executive Secretary. "Red" Thomasson, I am sure, is known to many of you in his capacity as Secretary of the International Association of Milk, Food and Environmental Sanitarians. We believe his past experience with the industry and his understanding of its workings make him an excellent successor to Barney. "Red" will continue in his capacity as Secretary of IAMFES and the office of the National Labeling Committee is now in Shelbyville, Indiana.

Up to now, I have, in a cursory fashion, outlined the Committee's activities and accomplishments during '63.

Let us look at its program for 1964.

At the January meeting the following projects were reported by the Committee:

1. An Industry Task Group has been working on uniform standards and labeling for low fat milk, non-fat milk and sour cream. The initial draft for these three standards is expected shortly and once it is reported out it will be submitted to the three Sections as previously outlined. The urgent need for uniform labeling in low fat milk containing less than 3.25% milk fat is known to all of us. Some states have been meeting together in an effort to come to some agreement on this problem and it is hoped that the NLC proposal will be completed this year and subsequently adopted by the several states.

2. The Committee will be reviewing the product names and definitions which are contained in the preliminary draft of the revised USPHS Milk Ordinance and Code and their comments submitted to USPHS.

3. The third project now before the National Labeling Committee is the submission by a Regulatory Task Group of a list of questions and problems regarding the location of labeling information on cartons and packages of fluid milk product. In short, what is a principal panel on a milk carton, cottage cheese container, etc. The question of what constitutes principal panel and its location on a package, for all foods, drugs, cosmetics, paint, chemicals and similar products is now being studied in earnest by the National Conference on Weights and Measures, and it behooves us to answer this question, as it pertains to fluid milk products, at the earliest possible time. Task Group Chairmen have been named to these projects and personnel to serve on the groups are now being selected.

In summary I would like to say the National Labeling Committee and its activities are becoming better understood by regulatory and industry personnel throughout the country. Under the new procedural guidelines participation and interest in the Committee should increase greatly. And through the selection of a new Executive Secretary and the acquiring of an office, the labors of this Committee should bear fruit in 1964.

NEWS AND EVENTS

Klenzade Seminar guests at general session.

KLENZADE PRODUCTS HOLDS 25th EDUCATIONAL SEMINAR

The Ahwahnee Hotel, Yosemite National Park, California was the site of the 25th Educational Seminar held by Klenzade Products, Inc., April 6, 7.

A more beautiful setting could hardly be imagined and the excellent program participated in by some three hundred west coast representatives of industry, health and agriculture department personnel was equally outstanding.

Panel discussion topics were: The Chemistry of Cleaning, Sanitation Microbiology, Cultured Products Manufacture, Modern Milk Production Practices, Processing Plant Sanitation, Automatic Cleaning Systems, Maintaining an Objective Plant Sanitation Program, all of which were capably conducted by panels of outstanding experts in their respective subjects.

Evening consultant sessions were held with the areas of discussions as follows: Chemical and Bacteriological Aspects of Cleaning, Consultants, A. J. Morris, Chairman, V. W. Greene, W. G. Jennings, S. B. Crecelius; Modern Plant Layout, Consultants, E. S. Doyle, Chairman, R. H. Kampfer, L. D. Searing, A. W. Hayes; Special Plant Cleaning and Maintenance Problems, Consultants, M. E. Held, Chairman, P. G. Dolan, L. J. Christensen, C. J. Rogers; Sanitation in Cultured Products Manufactures; Consultants, P. R. Elliker, Chairman, M. E. Powell, J. M. Duncan, W. K. Moseley; Milk Production Practices and Procedures, R. F. Rentelmann, Chairman, H. B. Toone, Lawrence Bouma, R. L. Severson, Carl Lorenz; Recirculation, Spray and Automatic Cleaning Systems, D. A. Seiberling, Chairman, J. E. Ward, John Virgil, H. S. Christiansen.

The Seminar closed with a dinner on Tuesday evening, April 7, with Lewis Dodson, Amarillo, Texas, acting as Toastmaster and C. T. Townsend, President-Elect of The Institute of Food Technology as guest speaker.

ANNUAL MEETING WASHINGTON MILK SANITARIANS ASSOCIATION

Washington Milk Sanitarians Association Executive Board elected at the annual meeting. From left to right: Ben Luce, Secretary-Treasurer, Olympia; C. O. Johnson, President, Bellingham; Howard Copenhaver, Past President, Moses Lake; Fred Fohn, Chairman, Southeastern Washington Section, Yakima; Kenneth Kassube, Chairman, Northwestern Section, Bellingham; L. A. Weddle, Chairman, Northeastern Section, Spokane; Syd Suckling, President-Elect, Seattle; and Fred Nyland, Chairman, Southwestern Section, Centralia.

The annual meeting of the Washington Milk Sanitarians Association was held on March 24, at Washington State University, Pullman, in conjunction with the 32nd Institute of Dairying.

Topics discussed of particular interest to sanitarians included "What Do We Mean By Milk Quality" and "How Do We Insure Clean Equipment?" by Dr. C. K. Johns; "Millipore and Direct Microscopic Count Technique for Determining Bacteriological Quality of Milk" by Dr. Lloyd O. Luedecke; "Revisions in the USPHS Milk Ordinance and Code" by Milton E. Held; and a Mastitis Control Program symposium with Dr. T. L. Forster, Dr. G. R. Spencer, Dr. John Barnhart, Cameron S. Adams, and Roy T. Olson.

President Howard Copenhaver presided over the Washington Milk Sanitarians Association business meeting at which surprise and disappointment were expressed by bacteriologists, supervisory personnel, and industry that the Direct Microscopic Count method was not included as an official method in the new proposed Milk Ordinance and Code.

Dr. F. W. Crews, Director of the State Department of Agriculture laboratory and Chairman of the Washington Milk Sanitarians Association Laboratory Committee, and who is in charge of the certification program of industry laboratories in the state, stated that by experience, correlation was actually greater with DMC than on standard plate count when determinations were made by trained, experienced personnel. Agencies not routinely using the DMC method obviously do not realize its importance and how much more information it actually gives concerning milk quality. Dr. Crews and other members of the Association stated that it would be ridiculous to eliminate DMC especially since the plate method tells us so little about milk quality on bulk tank milk, and leucocyte counts are so necessary to mastitis control programs. Dr. Hibbs, Owner of the Hibbs Commercial Laboratories at Boise, Idaho, and Dr. Luedecke, Washington State University bacteriologist, and other bacteriologists present at the meeting, agreed that this would definitely be a backward step and a disservice to consumers, regulatory agencies, and the dairy industry alike.

Committee reports were given and the following officers elected: President, C. O. Johnson, Bellingham; President-Elect, Syd Suckling, Seattle; Secretary-Treasurer, Ben Luce, Olympia; Auditors, Clayton Gustafson, Vancouver and Robert Freimund, Seattle.

Dr. C. K. Johns spoke on the subject "What is Milk Quality" at the Milk Sanitarians dinner meeting in the evening.

MICHIGAN ASSOCIATION OF SANITARIANS ANNUAL MEETING MARCH 17, 18

The Michigan Association of Sanitarians Annual Meeting held at the Kellog Center, East Lansing, Michigan, March 17, 18 was attended by a record crowd. The program was excellent and sessions were well attended.

Sam Stephenson received the Sanitarian of the Year Award. Ralph Florio reported on the activities of the Committee on Affiliation with IAMFES and introduced "Red" Thomasson, Executive Secretary of IAMFES. The following officers were elected: President, Frank P e a b o d y; President-Elect, Sam Stephenson; Secretary, Owen Birchman; Treasurer, Armin Roth; Past President, Roger Lewis; Directors: Bruce Reynolds, Norman Papsdorf, Kenneth Cotter, Edward Dubiel, David McMullen.

UNIVERSITY OF MISSOURI OFFERS COURSE IN ENVIRONMENTAL SANITATION

The University of Missouri is offering an eight-week course of field practice in Environmental Sanitation from June 15 to August 7, 1964. Emphasis will be placed upon practical experience under the supervision of experts in the respective fields covered, viz., food and milk, water and sewerage, swimming pools and plumbing, vector control, housing and community development, and laboratory controls.

3-A COMMITTEES ADOPT NEW STANDARD, PRESENT PLAQUE AT FLORIDA SESSIONS

The 3-A Sanitary Standards Committees adopted as final a new 3-A Sanitary Standard for Dry Milk Sifters at their regular meeting held May 5-7 at The Americana Hotel, Bal Harbour, Florida.

The Committees also approved a series of amendments to nine published 3-A Standards, providing a cross reference to the 3-A Plastics Standard.

Tom A. Burress was honored at the sessions as the second recipient of the 3-A bronze plaque for distinguished services to the 3-A Sanitary Standards program. The first recipient, honored at the group's October meeting last year, was Dr. E. H. Parfitt. Mr. Burress, recently retired from The Heil Co., is a veteran of many years in the 3-A Committees.

Ninety delegates, representing regulatory sanitarians, U. S. Public Health Service, equipment fabricators and dairy processors, were on hand for the three-day meeting.

Tentative standards for welded pipelines, dry milk sifters, and dry milk fillers were considered, as well as proposed amendments to the 3-A Fittings Standard, the 3-A Pump Standard, and the 3-A Accepted Practices for Air Under Pressure. Stainless steel, nickel alloy and surface cleanability were subjects of comprehensive committee reports.

The groups' next session will take place March 30-April 1, 1965, in Kansas City, Mo.

3-A Sanitary Standards for dairy equipment are the result of cooperation among three groups: (1) dairy processors, the users of dairy equipment; (2) dairy industrial suppliers and equippers, the manufacturers and sellers of dairy equipment; and (3) public health officials and sanitarians, the regulatory officials under whose jurisdiction the equipment is installed and used.

The 3-A program, which is supported by every national dairy trade association, is an entirely voluntary undertaking which has resulted in standards being issued for 23 items of dairy industrial supplies or equipment.

Generally speaking, 3-A standards are acceptable in public health jurisdictions in nearly every town, city, or state in the United States. The 3-A Sanitary Standards are cited in the recommended Milk Ordinance and Code of the U. S. Public Health Service.

BOOK REVIEW

Danish Dairying, Einar Petersen. Translated by G. H. Wilster and published by the Technical Dairy Publishing House, Copenhagen, Denmark, 1963.

This publication of 153 pages of text on dairying in Denmark is well written and adequately illustrated. It discusses the geography and climate of Denmark, its agriculture, the cooperative movement, and especially the educational and research programs in agriculture and the dairy industry. The material on dairy cattle describes the breeds, presents production statistics and information on recording societies, feeding and diseases. Emphasis is placed upon dairy plant construction, technology, equipment, organization, and operation. The manufacture of butter, cheese, ice cream, condensed and dry milk is explained in detail with special attention paid to the fluid milk industry. Additional information is provided on the government control of dairy foods, quality control, promotion, dairy organization and world trade in Danish dairy products. This book of reference should be in the library of anyone concerned with the dairy industry.

—H. Macy

SOUTH CAROLINA ASSOCIATION MEETING JUNE 11, 13

The South Carolina Association of Sanitarians will hold its annual meeting in conjunction with the South Carolina Public Health Association on June 11-13, 1964 at the Ocean Forest Hotel, Myrtle Beach, South Carolina.

The Sanitarian's sectional meeting will be held on Friday, June 12th, A.M. and the business session in the P.M. Speakers at the Sanitarian's sectional meeting will be:

W. E. Garner, P.E., in charge of U. S. Department of Agriculture, Southeastern Cotton Ginning Laboratory, Clemson University, Clemson, S. C. His topic will be "Air Pollution In Cotton Ginning".

Harold P. Kramer, P. E., Director, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. His topic will be "New Ideas In Urban And Rural Sanitation."

We extend to members of the International an invitation to visit with us.

E. Marion Causey, Jr.
Secretary-Treasurer

CONFERENCE OF FIELDMEN AND SANITARIANS AT THE UNIVERSITY OF KENTUCKY

"We should all be proud of the achievements of our dairy farmers . . . Efficiency on the farm has brought about the greatest increase in production per man of any segment of our population," stated Glenn Lake, president of the National Milk Producers Federation at a recent Conference of Fieldmen and Sanitarians at the University of Kentucky.

In his address to a luncheon gathering, Mr. Lake went on to discuss some of the problems facing dairy farmers as a result of changing times. He concluded that all segments of the industry must work together, being guided but not tied to the past. "Past experiencies should be a guide post — but not a hitching post," he told the group.

The meeting of Fieldmen and Sanitarians was sponsored by the Department of Dairy Science, University of Kentucky and the Kentucky Association of Milk and Food Sanitarians. Each group was responsible for planning the program for one day of the two day sessions.

Speakers from other Universities on the program, Dr. J. L. Albright, Department of Animal Science, Purdue University and Professor J. M. Jensen, Department of Food Science, University of Michigan. Dr. Albright was a key speaker on a mastitis problem discussion while Professor Jensen discussed various aspects of sanitation.

Other speakers and their affiliations were: Vernon Berry, Swift & Co., Lebanon, Ky., J. D. Bowers, Borden Co., Columbus, Ohio; Wallace Campbell, State Department of Agriculture, Frankfort, Ky.; R. L. Connor, Kyana Milk Producers Association, Louisville, Ky.; Dudley Connor, Kentucky Department of Health, Frankfort, Ky.; R. L. Cooper, Calloway County, Murray, Ky.; Al Didier, Dean Milk Co., Louisville, Ky.; Dawson Eckler, Kraft Foods Co.; Taylorsville, Ky.; W. D. Long, Chappell's Products, Campbellsville, Ky.; Earl Netherland, Carnation Milk Co., Campbellsville, Ky.; H. V. Marshall, Borden Co., Hopkinsville, Ky.; Harold McCurry, Southern Belle Dairy, Somerset, Ky.; Kenneth Mennen, Armour Creameries, Springfield, Ky.; Ed Napier, Sealtest, Louisville, Ky.; Steve Sandlen, Kentucky Department of Health, Frankfort, Ky., and members of the staff of the University of Kentucky.

NATIONAL RESTAURANT ASSOCIATION HOLDS CONFERENCE WITH PUBLIC HEALTH ORGANIZATIONS

Taking part in a meeting convened by the NRA in Chicago of some of the nation's leading public health organizations are (clockwise): Ward Duel, representing the National Association of Sanitarians; Thomas Gable of the National Sanitation Foundation; Dr. Edward Press of the Association of State and Territorial Health Officers; William Clements, Chairman of the NRA's Public Health and Safety Committee; M. B. Crabil of the Conference of Municipal Public Health Engineers; J. M. Jarrett of the Conference of State Sanitary Engineers; Edwin Ruppert of the U. S. Public Health Service; Donald Greenaway, NRA Executive Vice President; H. L. Thomasson of the International Association of Milk, Food and Environmental Sanitarians; Walter F. Snyder of the National Sanitation Foundation; Dr. Douglas H. Fryer of the Association of State and Territorial Directors of Local Health Services; Hardy Watson of the National Society of Professional Sanitarians; John H. Fritz of the U. S. Public Health Service; Cyril L. Kegler, Chairman Emeritus of NRA's Public Health and Safety Committee; NRA President J. W. Putsch, and Vernon Cordell, NRA Staff Director of Public Health and Safety. The conferees discussed methods to establish more effective lines of communication between the food service industry and public health and sanitarian organizations, including the pooling of knowledge, both technical and operational, to provide better and more uniform guidance for food protection programs.

ORANGE COUNTY, CALIF., HEALTH DEPARTMENT WINS AWARDS FOR SANITATION, FOOD SERVICE PROGRAMS

The Health Department of Orange County, Calif., was named May 6 to receive both of two major awards in a nationwide competition for having developed outstanding programs in environmental health and in food and drink sanitation.

Since the Samuel J. Crumbine Awards were established in 1955, no other health department has won in both categories in any one year. The 1964 Competition was open to more than 1,200 local health units throughout the United States.

"Vigorous measures taken by the Orange County Health Department to deal with a complex of problems arising from a more than three-fold increase in population over the past 10 years were a key factor in the jury's decision," according to Howard E. Hough, secretary of the Public Health Committee of the Paper Cup and Container Institute, sponsors of the Crumbine Awards.

The awards are made annually in memory of Dr. Samuel J. Crumbine, Kansas state health officer, whose theories and practices are heavily drawn upon by modern health departments. Dr. Crumbine, who died in 1954 at the age of 91, was a vigorous foe of the "common" drinking cup and sought to educate the public on the value of paper cups in preventing the spread of disease.

"Leading public health officials and educators on the awards jury for 1964, took due note of the fact that Orange County faced an enormous challenge in developing uniform health and sanitation services for no less than 23 cities, plus unincorporated areas, each with its own problems, needs and characteristics," Mr. Hough said.

"The Department has analyzed its existing problems carefully and organized to meet them. It has made more than the usual use of other community resources and has involved them in its programs. It has shown excellent leadership in steering the community toward whatever measures might be needed to solve individual problems," he added. Orange County, south of Metropolitan Los Angeles, has had to cope with a population growth from 216,224 in 1950, to an estimated 1,000,000 in 1963; a shift from an agricultural to industrial economy; and a highly mobile population including many aged and retired persons who "create both medical and social problems."

The Department's presentation for the awards underscored these accomplishments:

- Radiological Health—The future radiation problem was assessed in 1963, and a program is now well under way with the hiring of a health physicist and appointment of a radiological health technician.
- Hospital Infections Control—Department sanitarians play a significant role in this "team effort." They present training programs for hospital personnel, and consult on environmental sanitation matters.
- Accident Prevention—An epidemiological survey of glass door accidents was made, and the Department currently is trying to have an ordinance adopted requiring safety glass in new and replacement doors and panels.
- Fly Control—Fly control research project, employing two entomologists, is believed to be "unique among local health departments." Work over the past 5 years with a county-wide fly control advisory committee illustrates community participation in solution of a mutual problem.
- Land Development—The Department reviews all proposed subdivisions for water supply and sewage disposal. The program is "a prime example of preventive public health," developed out of a definite community need through the efforts of many groups.

Among other activities, the Department reviews all new proposed sewage treatment systems and discharges, has surveillance over oceanside sports areas, sets standards for construction of food handling establishments, and conducts a food handler training program.

The Crumbine environmental health award for 1963 was won by Lake County, Ill., in Chicago's northern suburbs, and the award for food and drink

sanitation went to Hamilton County (Cincinnati), Ohio.

Judges for the 1964 awards were Harold S. Adams, University of Indiana; Winona Bannister, Society of Public Health Educators; George H. Eagle, Ohio Department of Health; Ralph T. Fisher, New Jersey Department of Health; Dr. Harald M. Graning, United States Public Health Service; Morton S. Hilbert, University of Michigan.

'ALL PROCESSES GO' IS THEME OF DAIRY AND FOOD INDUSTRIAL EXPOSITION OCTOBER 4-9, 1964

"All Processes Go!" will be the theme of the Dairy and Food Industrial Exposition to be held October 4-9, 1964, at Chicago's McCormick Place, with more than 300 exhibitors.

John J. Weldon, Bessire & Co., Inc., chairman of the Exposition Attendance Promotion Committee, announced the show's theme at the annual meeting of the sponsoring organization, Dairy and Food Industries Supply Association.

"The phrase describing this year's Exposition couldn't be more apt than 'All Processes Go!' " Mr. Weldon said, "Not only will this show be of more interest to food processors than ever before, but Exposition plans are coming along A-ok!"

Speaking at the April 2 business session of the supplier-equipper organization's 45th annual meeting in Scottsdale, Ariz., Mr. Weldon went on to reveal promotional plans for the autumn Exposition in Chicago, which embraces other-than-dairy food industries for the first time this year.

At the same morning session, Emil Howe, Ladish Co., Tri-Clover Division, chairman of the Exposition Credentials Committee, announced publication of the associations newly revised Credentials Booklet, a handbook of rules for admission to the giant biennial show.

Generally speaking, the Exposition, an industrial show, is open only to those with a direct vocational interest in the displays. With admission by badge only, fees are charged only to those suppliers and equippers not exhibiting in the show. Processor customers, educators, scientific and technological personnel, government officials, etc., are admitted without charge.

Exhibits will include nearly every item of equipment and supplies or service required by dairy and food processors. Featured will be processing equipment, evaporators, pasteurizers, homogenizers, freezers, tanks, conveyors, etc.; cleansers, sanitizers and refrigerants; containers and packaging equipment; trucks, bodies, over-the-road transport and transportation equipment; ingredients, emulsifiers, stabilizers, sweeteners, vanilla, chocolate, and other flavorings; point-of-sale refrigeration equipment, display cabinets, dispensers and vending machines; publications, advertising programs, architectural services, financial aids, accounting systems, and other specialized services.

PUBLIC HEALTH SERVICE TRAINING COURSE

The Public Health Service will conduct a 3-day training course, Milk Pasteurization Controls and Tests, September 9-11, 1964, at the Robert A. Taft Sanitary Engineering Center in Cincinnati, for sanitarians engaged in milk sanitation programs. Instruction covers the principles of pasteurization control operation and includes laboratory practice in the procedures for effective pasteurization. The course is conducted by personnel of the Division of Environmental Engineering and Food Protection.

For more complete information concerning the course, see the new *Bulletin of Courses* which is available on request. Applications or requests for information should be sent to the Director, Training Program, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio 45226, or to an appropriate PHS Regional Office. No tuition or registration fee is required.

ATKINS PROPOSES INTER-AMERICAN HIGHWAY SANITATION AUTHORITY[1]

Sanitary engineers of the middle Americas have been presented with a proposal to improve sanitation standards along the three thousand-mile-Inter-American Highway, linking the U. S., Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica, and Panama. In a speech presented at the IV Sanitary Engineering Seminar for Central America and Panama at Panama City, Panama, on December 3, 1963, the Chief Engineer, C. H. Atkins, set forth this blueprint for action:

"For some years now the various Central American governments have had under consideration and intercountry compact or authority for maintaining and operating the Inter-American Highway. Such an authority would establish and maintain minimum standards for the condition of the Highway in all the member countries.

"At this time, I would like to propose similar intercountry cooperation for handling all sanitation and environmental health matters along the Highway. Safe water supplies, sanitary means of excreta and refuse disposal, vector control, and good sanitation in restaurants and motels are, of course, essentials. These necessities for environmental health re-

quire adequate facilities and services. The sanitary maintenance of way stations, such as automative service stations and recreational areas, also is an important aspect of this program. An Inter-American Highway Sanitation Authority, among other things, would set overall sanitation standards for tourist facilities, secure their implementation, and certify those establishments meeting such standards.

"As I visualize it, such an Authority could operate under the policies of a Governing Board comprised of representatives from the various member countries. The Pan American Health Organization could provide technical assistance in close collaboration with the Authority and member countries. It would be expected, however, that each country would provide staff and other resources insofar as available to implement and maintain the public health program along its respective segment of the Highway. It would seem appropriate for the member countries to contribute funds on an equitable formula basis for the support of the Authority. In its early stages, however, the Authority might also obtain financial support from other sources.

The objectives of good environmental health facilities and services along this Highway would be twofold: (1) to immediately serve the travellers and enhance trade and (2) to demonstrate environmental health planning and sanitary engineering techniques worthy of emulation throughout each participating country.

[1]Reprinted from The Engineering Newsletter, U. S. Dept. of Health, Education and Welfare, Vol. 2, No. 1, 1964.

SYMPOSIUM ON FOOD AND CIVILIZATION MAY 15-17, UNIVERSITY OF CALIFORNIA

Social scientists, food science experts, and members of the health professions throughout the nation will meet for a symposium on "Food and Civilization" May 15-17 at the University of California, San Francisco Medical Center.

The program is presented by University of California, Davis, and Continuing Education in Health Sciences, University Extension, to examine new research in nutritional science, and to explore the social implications of food resource problems.

"The necessity for planning and restraint, for a careful evaluation of human needs and planetary resources is most apparent and most urgent," states Seymour M. Farber, Dean of Educational Services and Director of Continuing Education in Health Sciences. "Civilization requires that man be, not merely fed, but adequately fed. If civilization should fail to meet this challenge, all of its other achievements will be in vain."

The symposium staff will be faculty members of universities throughout the United States and guest faculty George L. Mehren, U. S. Assistant Secretary of Agriculture, author Mary K. F. Fisher; *Time* editor-in-chief, Henry Luce; Philip M. Wagner, *Baltimore Sun* editor, and William Vogt, Secretary, The Conservation Foundation, New York. A group of San Francisco restaurateurs will also serve as resource staff in ethnic and cultural food patterns.

The symposium will be presented as a two-part program. The first session on Friday, May 15 is planned for members of the health science professions and will be devoted to medical and technical aspects of nutrition and to recent research in the field. The second half of the program, May 16-17, will be open to the public and will explore social issues arising from food supply problems and population growth.

Further information and enrollment forms are available from Continuing Education in Health Sciences, U. C. Medical Center, San Francisco 22, Calif.

ABRAHAM W. FUCHS SAN. ENG. DIR., USPHS, RETIRED[1]

When Abraham Fuchs retired on March 1, 1956, he had completed a rich 40 years of duty with the Public Health Service. Many of his friends and associates will remember him primarily for his work in the milk and food sanitation field; he was chief of the Milk and Food Branch from 1940-1952. However, his experience extended broadly beyond the milk and food field. He also saw duty in a local sewerage commission, in water pollution control, in malaria control activities, and in foreign assignments.

One of his former associates was heard to remark

that "Abe always attacked the problems of the day with a minimum of muss and fuss." In dealing with his subordinates, even under difficult circumstances, he maintained a calm and kindly manner.

Mr. Fuchs was born on February 2, 1892, in New York City, and attended public schools there. Subsequently, he attended Cornell University, attaining the C. E. degree in Civil Engineering in 1913. He was aided in college by two scholarships, in one of which he placed highest competitively in New York County. As a young man, he was an active participant and leader in boys' literary, social, and athletic activities.

He was a junior engineer with the Baltimore Sewerage Commission from 1913-1916 and served short periods with the Lehigh Valley Railroad Bridge Department and the State Barge Canal (New York) before entering the Public Health Service in 1916. His PHS experience from 1916-1927 was primarily in the malaria control field, taking him to such States as Tennessee, Mississippi, North Carolina, and Florida. However, during this period he also participated in field studies of trade wastes in Cincinnati, Ohio, and in studies of health practices of the 100 largest cities in the U. S., with headquarters in Baltimore, Md.

From 1927-1952, Mr. Fuchs served principally in the milk and food sanitation field, having assignments in Mississippi, Connecticut, New York, and Washington, D. C. He was commissioned in the Regular Corps in 1930 with the Full grade rank. From 1933-1940 he was assistant chief, Office of Milk Investigations. His service in the milk and food sanitation field spanned the period in U. S. history when greatest strides were made in the development and extension of milk pasteurization. The shift from raw milk to pasteurized milk has been one of the major positive health developments of this century in the United States. Technically, his interest in milk sanitation focused on sanitary design and adequacy of pasteurization equipment. He developed basic design criteria for leak-protector valves on vat pasteurizers as well as for milk regenerators.

Following his assignment as chief of the Milk and Food Branch, he served as chief of Health and Sanitation Division to Israel and as senior public health consultant to Jamaica, British West Indies. Since retirement he has continued to be active as a consulant on food sanitation to the World Health Organization and to the Public Health Service.

Mr. Fuchs has been a nationally prominent figure in his field for many years, his name appearing in two editions of *Who's Who in American Jewry*, *Who's Who in the East*, and other similar publications. He has authored or co-authored over 60 technical papers and edited several official PHS publications.

With his wife, Hanna, he resides at 4545 Connecticut Avenue, Washington 8, D. C. He spends considerable time with his two grandchildren and enjoys keeping in touch with his friends and former associates.

[1]Reprinted from The Engineering Newsletter U. S. Dept. Health, Education and Welfare, Vol. 2, No. 1, 1964.

U. S. DAIRY PRODUCTS A HIT SHOW IN THE 42ND MILAN FAIR APRIL 12-25, 1964

The Milan Fair, one of Italy's major commercial events in the business world, included U. S. dairy products this year. Last year's show attracted hundreds of exhibitors from 82 countries and was attended by more than 4,200,000 visitors from 130 different countries.

Dairy Society International, Foreign Agricultural Service and Bresler International Enterprises, Inc., are cooperating to manufacture and sell U. S. recombined dairy products and instantized dairy products.

Representing Dairy Society International and the U. S. dairy industry will be Mr. F. Patrick Heffernan, Jr., Operations Manager for the Genesee Valley Cooperative, Inc., Rochester, New York. Mr. Heffernan was raised on dairy farms in New York, Pennsylvania and Vermont. He is a graduate of Cornell University with a B.S. in Dairy Industry.

Representing Bresler International Enterprises will be Harry O. Bresler Secretary-Treasurer of the Bresler Ice Cream Company and Richard Van Cleave, Executive Vice-President of the same firm. Robert F. Lenick, a Bresler Plant Production Specialist, will supervise equipment installations and production during the fair.

Mr. Heffernan will be responsible for sampling and selling U. S. dairy products to the estimated 4.5 million visitors. Delicious ice cream sundaes, milk shakes, recombined whole milk and flavored milk drinks as well as instant nonfat dry milk and instant chocolate mix will be demonstrated and market tested under actual sales conditions. Mr. Heffernan will also answer questions regarding availability and pricing procedures of U. S. dairy products. It is expected that many importers and brokers will visit the dairy booth where they can sample and examine the most common U. S. dairy products, including butter and cheese. In addition to the demonstration and sales of dairy products, a display will emphasize the aspects of production, merchandising, and the easy adaptability of dairy products to international trade.

Cooperating U. S. companies with products on dis-

play are: Alpha Aromatics, Inc., American Food Laboratories, Inc., Carnation Company, Crystal Dairies, Dairy Maid Products, Germantown Manufacturing Company, M. E. Franks, Inc., Pet Milk Company, Sanna Dairies, and Weldon Farm Products.

A complete Bresler Franchise plant designed to process and attractively retail dairy products will be set up on the exhibit floor. This plant will recombine High Temperature Continuous (HTC) pasteurize, homogenize, and attractively package some 50 gallons or more of milk and flavored milk products an hour or an equal volume of ice cream mix. All equipment is of the latest design and provides for the highest standards with modern production efficiency.

The major components of the plant in Milan are a recombining funnel system, HTC pasteurizing system, an homogenizer, plate cooler, fluid packing machine, a walk-in dairy case, ice cream freezer, ice cream holding box, industrial ice builder and hot water heater, a case and bottle washer, a milk dispenser and a bulk milk tank.

Mr. Bresler and Mr. Van Cleave will explain their "turn-key" plant and discuss its availability on a franchise basis to interested parties visiting the fair. Potential buyers are expected to come from Spain, North Africa, Greece, Italy, and many other countries in Europe and South America.

A relatively small but complete recombining operation of this kind can be widely applied in many countries and offers a marketing opportunity for commercial sales of nonfat dry milk and anhydrous milk fat.

The 1964 Milan fair represents the first major trade fair participation by Dairy Society International and Foreign Agricultural Service in Italy, and constitutes the 39th such operation where Dairy Society International has featured dairy products.

THE BOTULISM PUZZLE[1]

The year 1963 has become notable in public health circles as that marked by the first epidemic of botulism in over 30 years, caused by commercially processed food products. The canned tuna and smoked whitefish episodes have received wide publicity in all channels of popular communication. However, health officials and food technologists alike have been puzzled by the lack of an explanation for these outbreaks which is fully consistent with all the known facts.

The serious consequences of food poisoning by botulinus toxin and the public apprehension created by these outbreaks led to a symposium sponsored by the Division of Environmental Engineering and Food Protection of the U. S. Public Health Service held in Cincinnati in January. An array of outstanding experts in the field reviewed the status of current knowledge related to the epidemiology, the causative organism, the clinical manifestations and treatment, and the prevention of botulism.

In brief, the deliberations of the symposium revealed large and significant gaps in current scientific knowledge bearing on the problem, the closing of which should be a matter of serious concern to all if further recurrences of similar episodes are to be prevented. While the adoption of more stringent regulations by public health agencies at all levels has been initiated, it is far from clear that these are based on adequate knowledge or that even if fully enforced, they can totally preclude all possibility of future trouble.

The *Clostridia* are omnipresent in man's environment and the member of the species *botulinum* are no exception to this rule. Being strict anaerobes, however, they pose a threat to foods only when viable survivors persist under conditions where oxygen is absent (as in hermetically sealed containers) and where favorable pH and temperatures prevail. Non-acid foods have been traditionally regarded as most susceptible. Under favorable conditions, the organism grows and produces its toxin, which recent biochemical investigations reveal to be one of the most potent poisons known. As little as 0.25 microgram (one four-millionth of a gram) of the pure substance may be a lethal dose for man.

Because of the difficulties of differential diagnosis (the majority of medical practitioners have never seen an authentic case of botulism) and the lack of positive therapeutic measures, the mortality rate from the disease is high (40-50 percent). The efficacy of even the specific antisera is questionable especially when the patient is not seen until after the neurological symptoms have become dominant.

In the entire United States, there is currently only one licensed manufacturer of botulinus antiserums and that one presently produces only two of the five

(possibly six) specific types which have so far been identified. Type E, which was responsible for the most recent epidemics, is not one of the two being produced.

The practical non-existence of botulism from the consumption of commercially canned foods is a credit to the canning industry. To what extent recent innovations in food processing, packaging, and distribution pose a new threat to public health from this disease is not known. Prudence dictates that the handling of susceptible foods by new methods be approached with extreme caution until further intensive research has substantiated their safety.

[1]Reprinted from Food and Drug Research January 1964, No. 37.

FOOD COMMISSIONERS OF THREE NORTH AMERICAN COUNTRIES TO ADDRESS FOOD UPDATE SEMINAR

Talks by Food Commissioners of the United States, Canada and Mexico will be a feature of International Day at "Foods On The Move," the next in the series of Food Update seminars sponsored by the Food Law Institute, Inc., which will be held June 15-19 at the St. Moritz Hotel, New York. Representing their governments will be John L. Harvey, U. S. Deputy Commissioner of Food and Drugs, L. I. Pugsley, Associate Director, Food and Drug Directorate, Canadian Department of National Health, and Dr. Rafael I. Frisbie, Director of Food and Drug Control, Mexican Ministry of Health.

Other International Day speakers will devote their talks to the growing international movement of foods and to satisfying the increasing demands for quality and convenience in serving the modern world traveler. The food law session will place special emphasis on recent developments in international food legislation and standards.

The upcoming seminar will also examine some basic new developments in food processing such as drying and preservation, but the bulk of the sessions will be devoted to the title theme: Foods On The Move. Airline, railway and roadside food service experts will discuss with food manufacturers their present and future requirements and examine trends in these important fields.

Speakers and the full program will be announced shortly. Those planning to attend should contact Dr. Edward A. Nebesky, Food Law Institute, Inc., 205 East 42nd Street, New York, New York — 10017, 212 MU 6-2220. The school has reserved a number of rooms at the St. Moritz Hotel, but due to the anticipated shortage of accommodations during the World's Fair, it is suggested that plans be made as early as possible.

CHCIAGO HOUSING BUREAU NOW HANDLING ROOM REQUESTS FOR WEEK OF DAIRY AND FOOD SHOW

Room reservations are now being accepted in Chicago for the week of the Dairy and Food Industrial Exposition, October 4-9, 1964 — a week which will also see the staging of conventions by numerous dairy and food industry associations there.

Because of the large numbers of persons who will attend the exposition and concurrent conventions, all hotels are pooling their rooms in a central housing bureau to which one should write for reservations. The address is Chicago Convention Bureau, 332 South Michigan Avenue, Chicago, Ill. 60604.

Why food processors spell clean with a "K"

"K" is the eleventh letter in the alphabet . . . but for modern cleaning and sanitizing in food processing plants it tells the whole story from A to Z. When you add the "K" from Klenzade you add a new concept in completely controlled sanitation programs. The Klenzade Complete Plant Quality Program makes food processing simpler, quicker and safer and includes all necessary detergents, sanitizers and application equipment. From **Vega-Kleen** to **Klenz-Mate,** there's a Klenzade product formulated to efficiently solve each and every one of your sanitation problems.

A Klenzade technical representative will be happy to help you improve your products. Write today. We'll reply promptly.

For Completeness, Quality and Cost-Cutting, it's **KLENZADE PRODUCTS,** Dept. 00, Beloit, Wisconsin.

KLENZADE

A Dairy Scientist Speaks Out about Milk . . . and the Dairy Industry!

But we think we would be wrong if we did not make available to you some of the things that Dr. Gibson told a group of Surge Dealers when he talked to them.

"In the advertising field . . . it is essential that we appeal to the teenagers—especially the girls who are the mothers of tomorrow. Surveys show that "Poor" to "Very Poor" diet classification is present in 70% of teenage girls and women under 30".

"They are just not interested in strong bones and teeth. *They are more interested in their figures, when . . . what we have been trying to sell them is health.* Let's WAKE UP and tell them

(1) that as far back as Cleopatra, the Egyptians knew that protein tightened up sagging facial tissues. So . . . they bathed in milk. They worried more about wrinkles than about health.

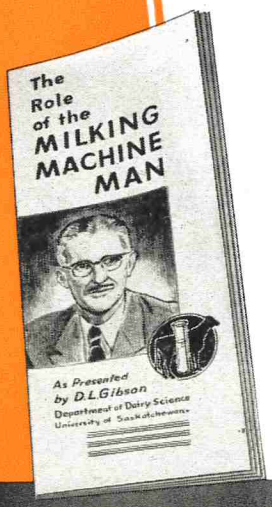
(2) today the expensive face creams contain pure milk protein.

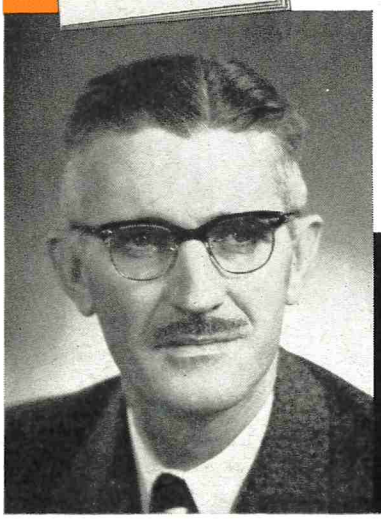
(3) that the job of producing beautifully textured skin . . . and . . . lovelier, prettier, naturally shining hair . . . can be aided by milk *inside* the body as well as outside.

(4) that the dairy industry has tailor-made products for low calorie diets.

"It is high time we in the dairy industry embarked on an aggressive mission to acquaint producer, processor, salesman and consumer alike that . . . pound for pound . . . *the protein in dairy products is one of the cheapest and highest qualities that can be obtained in any food.*

For many years we have pleaded poverty. Let's become aggressive".





The above is part of a talk given by Dr. D. L. Gibson, Head of the Department of Dairy Science, University of Saskatchewan, on January 21, 1964, before Surge Milking Systems Equipment Dealers and Canadian dairy industry officials at Toronto. It is presented here as a public service to the entire dairy industry. Copies of Dr. Gibson's speech are available in booklet form and may be obtained by writing to:

BABSON BROS. CO.
2843 W. 19th St., CHICAGO, ILL. 60623

SURGE