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THE EFFECT OF VARIOUS PIPELINE MILKING CONDITIONS ON THE ACID DEGREE AND FLAVOR SCORE OF MILK

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(Received for publication January 12, 1957)

Statistical analyses of acid degree values (Thomas et al.) and rancid flavor scores of pipeline milk subjected to various riser heights and pumping treatments showed that significantly higher acid degree values and poorer flavor scores were associated with risers and with continuous pumping as compared with no risers and intermittent pumping treatments. Milk exhibiting acid degree values of 1.5 or less were consistently judged to be free from rancid flavor.

Patricia MacLeod was graduated from the University of Saskatchewan in 1928, received the M.S. degree in bacteriology from the University of New Hampshire in 1939, and the Ph.D. degree in bacteriology at the University of Connecticut in 1956. She has been an Instructor in the Dairy Manufacturing Section of the Department of Animal Industries, University of Connecticut since 1947.

That a large number of cows produce milk containing lipolytic enzymes is now an accepted fact; however, it is believed that these are inactive in a great many instances (*1*) unless the milk is subjected to various treatments such as homogenization (*7*), changes in temperature (*3*), agitation (*4*), and certain conditions prevailing in some pipeline milkers and farm tanks (*2*).

According to the studies of Kelley and Dunkley (*2*) "some of the more troublesome conditions causing induced rancidity are admission of air to the milk line, low milk flow-rate, elevation of warm milk under vacuum with air bubbling through it, inclusion of a filter and numerous fittings in the vacuum-section of the milk line, and continuous operation of a starved centrifugal pump." They also found risers within the pipeline milker to be one of the components that especially promoted the development of rancidity.

The present paper reports the results of a study undertaken at the University of Connecticut in order to establish: (*a*) whether intermittent or continuous pumping of milk contributed to the tendency of the milk to become rancid, (*b*) whether varying heights of risers imposed on the pipeline increased the development of hydrolytic rancidity, and (*c*) whether the milk subjected to the above treatments became progressively rancid when held under refrigeration (36° to 38° F.) for 24, 48, and 72 hours.

Experimental Procedure

The milk from morning and evening milking of 12 consecutive days beginning with the evening milking of January 20, 1956, and continuing through the morning milking of February 2, 1956, was subjected to six different riser heights and two different pumping treatments.

To effect the various riser levels, a pipeline of approximately 120 feet was installed in the University dairy barn. The pipeline installation was so arranged that risers could be added or removed as desired. Risers of 48 inches, 60 inches. 72 inches, 84 inches, and 96 inches were installed. Because of limited ceiling height these elevations could not be obtained by using single vertical risers. They were accomplished by adding a vertical pipe rise of 24 inches followed by vertical drops of 48 inches, 60 inches, 72 inches, 84 inches, and 96 inches which in turn were followed by vertical rises of 24 inches, 36 inches, 48 inches, 60 inches, and 72 inches to establish normal pipeline level prior to connecting with a milk receiver.

The milk was pumped by means of a diaphram pump from the receiver into a portable bulk farm tank. The pump could be operated either continuously or

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could be controlled by an electronic liquid level control which maintained a constant head of milk on the pump.

The air intake for the pipeline was regulated by a standard controller and the vacuum in the line was maintained at 12½ inches.

During the experimental period all 20 cows involved in the experiment were fed the same ration which consisted of grass silage, grain and alfalfa hay. Four milking units were used and the time required for milking was about 35 minutes.

The various riser treatments (0 inches, 48 inches, 60 inches, 72 inches, 84 inches, and 96 inches were randomly assigned by days during the experimental period, the milk from two morning and two evening milkings being subjected to each of the six riser treatments. The experiment was so arranged that each of the above sets of evening and morning milks were exposed to continuous and intermittent pumping treatments. The evening milk of one day was pumped by the intermittent set up, and the following morning's milk was subjected to continuous pumping. In the second set of evening and morning milks the pump treatments were reversed.

Drip samples of milk were taken at three places in the pipeline: (*a*) before riser, (*b*) between the riser and the pump, and (*c*) after the riser and the pump, just before going into the bulk tank. The samples were immediately cooled to 45° F. and then stored under refrigeration at 36° to 38° F. for 24, 48, and 72 hours. At the end of each storage period the samples were laboratory pasteurized at 160° F. for 10 minutes, given code numbers, and sent to the DeLaval laboratory at Poughkeepsie, New York, for acid degree determinations made by the method described by Thomas et al. (*6*). At the same time coded samples were presented in random order to a panel of three judges who scored them for rancid flavor. Each judge scored the milk on the following basis: 0 = no rancid flavor, 1 = slightly rancid, and 2 = definitely rancid.

The acid degree data were subjected to statistical analyses; however, because of the preponderance of zero values, the flavor score values (total for three judges) were transformed into the square root of the total score plus 0.5 before being statistically analyzed (*5*).

RESULTS AND DISCUSSION

The analysis of variance of the acid degree values

TABLE 1 — AVERAGE ACID DEGREE VALUES AND TOTAL FLAVOR SCORE (3 JUDGES FOR 2 SAMPLES) OF MILK TREATED BY INTERMITTENT AND CONTINUOUS PUMPING, VARIOUS LEVELS OF RISERS AND HELD FOR 1, 2, AND 3 DAYS AT 36°TO 38° F.

Pumping	Riser level in inches	1 day: Average acid degrees 2 samples	1 day: Total flavor score for 2 samples	2 days: Average acid degrees 2 samples	2 days: Total flavor score 2 samples	3 days: Average acid degrees 2 samples	3 days: Total flavor score 2 samples
	0	1.33	0	1.50	0	1.71	2
	48	1.70	1	2.05	5	2.21	3
Intermittent	60	1.84	2	2.02	0	2.07	2
	72	1.96	4	2.10	5	2.40	7
	84	1.96	4	2.09	6	2.34	5
	96	1.92	2	2.32	3	2.02	5
Overall average		1.78	2.2	2.01	3.2	2.12	4.0
	0	1.47	0	1.59	0	1.62	0
	48	2.28	2	2.56	7	2.99	8
Constant	60	2.08	2	2.22	4	2.39	6
	72	2.10	2	2.42	7	2.60	11
	84	2.36	4	2.65	5	2.90	8
	96	2.00	4	2.13	7	2.04	6
Overall average		2.05	2.3	2.26	5.0	2.42	6.7

TABLE 2 — NUMBER OF SAMPLES FALLING INTO CERTAIN RANGES OF ACID DEGREE AND FLAVOR SCORE VALUES.

Acid degree values	Total flavor score							Total number samples	Average total flavor score per sample
	0	1	2	3	4	5	6		
.96-1.50	59	3	—	1	—	—	—	63	0.095
1.51-2.00	26	28	11	3	2	—	—	70	0.96
2.01-2.50	5	14	14	17	7	2	1	60	2.29
Above 2.50	3	—	4	2	7	2	5	23	3.60

and the flavor scores included variability between types of pumping, among riser levels, and among days held in storage. The analyses indicated that samples of milk subjected to the continuous pump treatment showed significantly higher acid degree values and poorer flavor scores than the intermittently pumped samples. In this study the samples subjected to *any* riser treatment showed significantly higher acid degree values and flavor scores than those subjected to no risers ($p = <0.001$), but no statistical difference was noted within the acid degree or flavor scores among the samples subjected to the various riser treatments (48 inches, 60 inches, 72 inches, 84 inches, and 96 inches). The acid degrees and the flavor scores increased in a linear pattern during the storage periods of 24, 48, and 72 hours. The average acid degree values for each two samples subjected to similar pumping treatment and riser height are given in Table 1, along with the total flavor score for the two correspondingly treated milk samples. Actually these flavor scores are the total score made up of 6 judgements (3 judges each scoring the 2 samples).

Since milk is often held two days on the farm and one day in the plant, the results of the tests performed on the samples which had been held for 72 hours at refrigeration temperature are of particular interest. It is evident from the results shown in Table 1 that at the end of the 3-day storage period the 48 inch riser treatemnt had as great an effect on the acid degree value and flavor score as did the higher riser treatments. It is also evident that the continuous pumping treatment increased the tendency of the milk to become rancid to a greater degree than did the intermittent pumping system.

The overall average of the acid degree values for all pump and riser -treated samples (held for 24, 48, and 72 hours at 36° to 38° F.) was $2.11 \pm 0.4.283$, while the corresponding average of transformed flavor scores was 1.45 ± 0.4298. The average acid degree value for all the continuously pumped samples was 2.24, and for those treated with the intermittent pump it was 1.97, and the corresponding total transformed flavor scores were 1.58 and 1.33, respectively.

The samples subjected to riser treatment, not exposed to intermittent or continuous pumping, but held for 24, 48, and 72 hours at 36° to 38° F., had an average acid degree of 1.99, and the corresponding samples taken before the riser treatments, had an average value of 1.42.

The number of samples falling into various ranges of acid degree values with their actual corresponding flavor scores (total of three judges) are given in Table 2.

There appeared to be a general relationship between the magnitude of the acid degree values and the total flavor scores of the samples. In the great majority of cases when the acid degree value of a sample was less than 1.50, the sample was judged by each member of the panel as having no rancid flavor.

When the acid degree value of a sample was within the range of 1.51 – 2.00, as shown in Table 2, the average total score was approximately 1. This might suggest that, on the average, one of the three judges considered the milk to be slightly rancid, while the other two members did not. Actually, 37 per cent of the samples were judged to have no rancid flavor by each of the three judges, while in an additional 40 per cent of the samples, one of the three judges considered the samples slightly rancid.

When the acid degrees were above 2.00 but below 2.50, the average flavor score per sample was 2.29. This would indicate that on the average two of the judges considered the samples slightly rancid, whereas the other did not, or alternatively, one judge considered the samples definitely rancid, whereas the other two members did not. Actually 8.3 per cent of the samples were considered free from rancid flavor, and in 23.3 per cent of the cases with total score of 1, one judge considered the samples slightly rancid while the other two detected no rancid flavor. Thirteen of the 14 samples (92.87 per cent) with total scores of 2, were considered slightly rancid by two judges and free from rancid flavor by the third. Of the 17 samples with flavor scores of 3, 6 (35.27 per cent) were considered slightly rancid by each of the three judges while 11 (64.7 per cent) were considered free from rancid flavor by one of the three panel members, definitely rancid by another, and slightly rancid by the third.

When the acid values were above 2.50, 13 per cent of the 23 samples within the class were considered to have no rancid flavor. In three of the four samples having a flavor score of 2, two of the judges considered the samples slightly rancid while the third believed them to be free of rancid flavor. All of the seven samples having a total flavor score of 4, were considered slightly rancid by two judges and definitely rancid by a third member of the panel.

The above results indicate the wisdom of having a judging panel rather than an individual judge testing for rancidity in dairy products, because of the difficulty of detecting the defect when the product has only a slight rancid flavor and of individual taste "threshold differences". Judgments of the members of a panel should always be made independently and whenever possible reference standards should be provided, if the organoleptic tests are to be meaningful.

CONCLUSIONS

1. Samples of pipeline milk subjected to continuous pumping treatment showed significantly higher acid degree values and poorer flavor scores than the intermittently pumped samples under the conditions of the experiment.

2. The average acid degree value for all samples treated with continuous pumping was 2.24, and for those treated with the intermittent pump was 1.97. The averages of the total transformed ($\sqrt{\text{total} + 0.5}$) flavor score of three judges for the corresponding samples were 1.58 and 1.33.

3. Samples subjected to any riser treatment used in this experiment showed significantly higher acid degree values and poorer flavor scores than those subjected to no risers ($p=<0.001$). No statistical difference was noted either, in the acid degrees or the flavor scores of the samples subjected to various riser treatments of 48 inches, 60 inches, 72 inches, 84 inches, 96 inches.

4. The average acid degree value of all samples taken after the 0 inches, 24 inches, 48 inches, 60 inches, 72 inches, 84 inches, 96 inches, riser treatments was 1.99, and that for the corresponding samples taken before riser treatment was 1.42.

5. The acid degrees and flavor scores of the milk samples increased in a linear pattern during 1, 2, and 3-day ice box storage periods.

6. There seemed to be a general relationship between the magnitude of the acid degree values and the total flavor scores of the samples. The results of this study indicate that if a sample of milk has an acid degree value of 1.5 or less, in all probability it will be free from rancid flavor. When the acid degree value falls within the range of 1.51 to 2.00, the milk may or may not be acceptable for use, but in all cases it should be processed quickly and blended if possible. Milk with an acid degree greater than 2.00 should be rejected.

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COMMITTEES OF THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, Inc., For 1957

An organization such as the International Association of Milk and Food Sanitarians, Inc., which meets only once a year and whose membership is widespread, must do a great share of work through the medium of committees.

The work done by the various committees of the International continues to be one of the most important contributions to the progress and vigor of the Association. All members are encouraged to suggest topics and projects for consideration of the various committees. From personal observation or through the suggestion of others, there may be problems which require research or inquiry. In this connection, all members are encouraged to communicate with chairmen of appropriate committees to give them suggestions for study.

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Objectives

To study new laboratory procedures and bacteriological problems of current interest to milk and food control authorities, to evaluate both published and unpublished data, and to present conclusions which will be helpful to the sanitarian in the conduct of his work.

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COMMITTEE ON BAKING INDUSTRY EQUIPMENT

Objectives

The objectives of this Committee are to provide consultative assistance to the Baking Industry Sanitation Standards Committee in the development of standards for items in the Baking Industry.

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COMMITTEE ON COMMUNICABLE DISEASE AFFECTING MAN

Objectives

To study problems related to those diseases communicable to man through the consumption of foods, including milk, and milk products, meat, poultry, and shellfish, and to recommend specific measures that can be taken by the sanitarian to control such diseases.

Members

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COMMITTEE ON DAIRY FARM METHODS

OBJECTIVES

To study dairy farm methods and procedures, to determine the sanitary problems involved, and to make recommendations for the solution of such sanitary problems, and for the improvement of dairy farm methods which have a relationship to the sanitary quality of milk.

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OBJECTIVES

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OBJECTIVES

To participate with other health organizations and industries in the formulation of sanitary standards for food equipment. Specifically, the functions of this committee include; (a) cooperation with other health agencies and industry, under the auspices of the National Sanitation Foundation, in the joint development of NSF Standards for Food Service Equipment; (b) when directed by the Executive Board, to cooperate with other health groups and industry in the development of sanitary standards for food equipment; (c) to present to the membership at the annual meeting those standards which the Committee recommends be endorsed or approved by the Association.

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OBJECTIVES

To study conditions and practices within the frozen food industry, to determine the sanitary problems involved which might contribute to a public health hazard, and to make recommendations for the solution of such problems

MEMBERS

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COMMITTEE ON MEMBERSHIP

OBJECTIVES

To make every effort to increase the membership of the organization by bringing to the attention of all qualified persons the advantages of belonging to the International Association of Milk and Food Sanitarians, Inc., and to interest state milk and food sanitarians' organizations in the advantages of affiliation with the International Association of Milk and Food Sanitarians, Inc.

MEMBERS

Mr. Harold Wainess, *Co-Chairman,* H. Wainess & Associates, 238 N. LaSalle Street, Chicago, Illinois.

H. L. Thomasson, *Co-Chairman,* Executive Secretary, IAMFS, Journal of Milk and Food Technology, P. O. Box 437, Shelbyville, Indiana.

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Otis E. Skiles, 303 Haworth Drive, Knoxville, Tennessee.

L. O. Tucker, State Department of Health, Smith Tower, Seattle 4, Washington.

Charles Walten, Pueblo County-City Health Department, Pueblo, Colorado.

COMMITTEE ON ORDINANCES AND REGULATIONS PERTAINING TO MILK AND DAIRY PRODUCTS

Objectives

To review and study the provision of sanitary ordinances and regulations pertaining to milk, milk products, and frozen desserts, to evaluate data on research findings relative to the sanitary and public health significance of the specific requirements of ordinances and regulations, and to prepare for submission to the members of the Association recommendations for changes in existing ordinances and regulations.

Members

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E. Small, Head, Dairy Division, Standards Section, Standardization and Program Development Branch, United States Department of Agriculture, Agricultural Marketing Service, Washington 25, D. C.

Stephen J. Wolff, Pevely Dairy Company, 1001 South Grand Boulevard, Saint Louis 4, Mo.

COMMITTEE ON RECOGNITION AND AWARDS

Objectives

This Committee is charged with the responsibility of implementing those objectives of the Association concerned with, (a) recognition of individual milk and food sanitarians whose achievements have contributed greatly to the public health and welfare of their communities, and (b) recognition of those members of the Association who have through distinguished service contributed greatly to the professional advancement growth and reputation of the International Association of Milk and Food Sanitarians, Inc.

The Committee receives and reviews nominations for the annual Sanitarian's Award and has full responsibility for the selection of the recipient. The Committee also receives and reviews recommendations on candidates for the annual Citation Awards, and counsels with the Executive Board relative to the selection of the recipients. It is also responsible for handling all matters pertaining to the presentation of awards, publicity and other related items.

Members

Professor Ivan M. Parkin, *Chairman,* Department of Dairy Industry, Pennsylvania State University, University Park, Pennsylvania.

(For Two Year Term)

Professor H. S. Adams, Indiana University School of Medicine, Department of Public Health, 1100 West Michigan Street, Indianapolis, Indiana.

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William Hickey, City Health Department, Salt Lake City, Utah.

John H. McCutcheon, Bureau of Food and Drugs, Division of Health, Jefferson City, Mo.

COMMITTEE ON RESOLUTIONS

Objectives

To present for consideration at the annual meeting matters on Association policy and matters wherin the Association can make known its official position with respect to proposals affecting, (a) the work of professional sanitarians, and (b) the health of the people of the nation.

MEMBERS

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Dr. Fred Babel, Dairy Department, Purdue University, West Lafayette, Indiana.

Mrs. F. C. Dugan, Director, Division of Food and Drug Control, Kentucky State Health Department, Louisville, Kentucky.

Mr. T. E. Sullivan, Director, Bureau of Food and Drugs, Indiana State Board of Health, 1300 West Michigan Street, Indianapolis, Indiana.

COMMITTEE ON SANITARY PROCEDURES

OBJECTIVES

To participate jointly with the Sanitary Standards Subcommittee of the Dairy Industry Committee and the Milk and Food Branch of the U. S. Public Health Service in the formulation of 3A Sanitary Standards for Dairy Equipment. Specifically, the functions of this Committee are: (a) to receive, consider, and comment on proposed sanitation standards for daidy equipment submitted by the Sanitary Standards Subcommittee; (b) to bring to the attention of the Sanitary Standards Subcommittee items of dairy industry equipment and methods for which formulation of sanitary standards appear desirable; and (c) to cooperate with the Dairy Industry Committee, the U. S. Pubic Health Service, and health officials in attaining universal acceptance of the sanitary standards upon which mutual agreement has been reached.

MEMBERS

C. A. Abele, *Chairman*, 2617 Hartzell Street, Evanston, Illinois.

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Mr. Harry Bremer, Department of Agriculture, Montpelier, Vermont.

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Mr. David Cleveland, Director, Dairy and Food Division, City Health Department, Oklahoma City, Oklahoma.

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COMMITTEE ON RESEARCH NEEDS AND APPLICATIONS

OBJECTIVES

The objectives of this committee are: (a) to serve the field sanitarian as a clearing house for new ideas and practices which would enable a more efficient discharge of their duties; (b) to coordinate its activities with those of a similar committee of the American Public Health Association (Engineering and Sanitation Section); (c) to ascertain the needs of the membership for specific information on given problems and to find the best method of disseminating information obtained by the Committee.

MEMBERS

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Mr. H. J. Barnum, Chief, Milk Sanitation Services, City & County of Denver, Denver 4, Colorado.

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3-A SANITARY STANDARDS FOR MILK AND MILK PRODUCTS EVAPORATORS AND VACUUM PANS

MARCH 1, 1957

Formulated by

International Association of Milk and Food Sanitarians

U. S. Public Health Service

The Dairy Industry Committee

It is the purpose of the IAMFS, USPHS and DIC, in connection with the development of 3-A Sanitary Standards Program, to allow and encourage full freedom for inventive genius or new developments. Milk Evaporator specifications which are developed and which so differ in design, material, construction or otherwise so as not to conform with the following standards, but which in the opinion of the manufacturer or fabricator are equivalent to or better, may be submitted at any time for the consideration of IAMFS, USPHS, and DIC.

Milk and Milk Products Evaporators and Vacuum Pans conforming to 3-A Sanitary Standards comply with the following in design, material, and construction.

A-SCOPE

This standard covers the sanitary aspects of milk and milk products evaporators and vacuum pans, including single and multiple effect units, automatic water level controls and safeguards. This standard does not cover vacuum pasteurizers and deaerators.

B - DEFINITIONS

(1) *Product*: Shall mean the milk or milk product which is processed in this equipment.

(2) *Evaporators and Vacuum Pans*: Shall mean equipment in which products may be concentrated in vacuo. Product heating surfaces and vapor condensing units are considered to be essential auxiliary equipment and are, therefore, included.

(3) *Product Contact Surface*: Shall mean all surfaces that are exposed to the product, or from which liquid may drain, drop, or be drawn into the product.

(4) *Non-Product Contact Surface*: Shall mean all other surfaces.

C - MATERIAL

(1) All metallic product contact surfaces shall be of 18-8 stainless steel with a carbon content of not more than O.12%, nickel alloy, or equally corrosion-resistant metal that is non-toxic. Non-metallic materials may be used for transparency and sealing, in positions where their use is required, except that:

(a) Sight and light glasses shall be of clear glass.

(b) Multi-use gaskets shall be made of a resilient rubber or rubber-like material that is non-toxic, relatively non-absorbent, and having a smooth surface. Single service gaskets may be used.

(c) Non-metallic parts having product contact surfaces shall be made of non-toxic, relatively fat-resistant, relatively non-absorbent, relatively insoluble material, and shall not impart a flavor to the product. Non-metallic materials shall be smooth, and shall be of such composition as to retain their surface and conformation characteristics and withstand penetration and corrosive action of the product, and of cleaning and bactericidal agents encountered in normal uses and cleaning operations.

(2) All parts having external surfaces shall be of corrosion-resistant material or shall be rendered corrosion-resistant. If painted, the paint shall be applied to a prepared surface, and shall be durable.

D - FABRICATION

(1) All product contact surfaces shall be at least as smooth as a No. 4 mill finish on stainless steel sheets or 120 grit finish properly applied. All joints shall be smooth and flush. All permanent joints in metallic product surfaces shall be fused, welded or brazed with durable, corrosion-resistant, non-toxic material.

(2) All appurtenances having product contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.

(3) All parts having product contact surfaces shall be easily accessible and readilv cleanable, either in an assembled position or when removed. An exception is made for the coils of a vaccum pan which are specifically covered in paragraph D(6). Removable parts shall be readily demountable.

(4) All internal angles of 135° or less on product contact surfaces shall have minimum radii of ¼″, except that minimum radii for fillets of welds in product contact surfaces may be ⅛″ where the thickness of one or both parts joined is less than 3/16″.

(5) The minimum inside diameter of product heat exchange tubing used shall be that of nominal 1″ O.D., 16 U. S. standard gauge tubing.

(6) The minimum space between coils shall be 2½″, the minimum space between coils and vacuum pan walls shall be 3″, and the minimum space between coil banks shall be 3½″.

(7) *Openings*:

(a) Product inlet and outlet connections shall conform to 3-A Sanitary Standards For Fittings Used On Milk And Milk Products Equipment And Used On Sanitary Lines Conducting Milk And Milk Products.

(b) Sight and light glass ports shall be designed so that the interior surfaces drain inwardly and the exterior flare pitched so that liquids cannot accumulate The glasses shall be readily removable for cleaning.

(c) Thermometer connections shall conform with 3-A Sanitary Standards For Thermometer Fittings And Connections Used On Milk And Milk Products Equipment and Supplement No. 1 thereof.

(d) Manhole cover assembly shall be of such construction as to permit the cover to swing outside away from the opening. The minimum inside diameter of the man hole opening shall be 16″.

(e) Openings for vaccum breaker and sampling valve shall be in product contact surface.

(8) Gaskets for manhole cover, and sight and light openings shall be considered non-metallic parts having product contact surfaces. They shall be removable. No gasket groove or gasket-retaining groove shall have a depth greater than its width and shall not be more than ½″ deep nor less than ¼″ wide. The minimum radius of any internal angle in a gasket groove or gasket-retaining groove shall be not less than ⅛″. In grooved gaskets, the length of the shorter leg shall not exceed twice the width of the groove. All gasket grooves and gasket-retaining grooves shall be readily cleanable.

(9) There shall be no threads used on product contact surfaces.

(10) All vapor lines beyond the product contact surface shall drain away from the product contact surface. A pitch of at least ⅜″ per foot to the first vertical drop shall be provided.

E - ACCESSORIES

(1) An automatic condenser water level control for preventing water from entering the product shall be provided by one of the following means:

(a) A barometric leg.

(b) A surface condenser, in which the vapor and the condensing water are separated by metal walls and do not come into contact with each other.

(c) A safety shut-off valve, located in the water feed line to the condenser, automatically actuated by a control which will shut off the inflowing water when the water level rises above a predetermined point in the condenser. This valve may be actuated by water, air, or electricity, and shall be so designed that failure of the primary motivating power will automatically stop the flow of water.

(2) Vacuum gauge connection(s) shall be placed in the vapor line beyond the product contact surface.

(3) Vacuum breaking and sampling valves shall conform with 3-A Sanitary Standards For Fittings Used On Milk And Milk Products And Used On Sanitary Lines Conducting Milk And Milk Products.

(Effective date August 1, 1958)

BACTERIOLOGICAL CONDITION OF WATER SUPPLIES IN DAIRY PLANTS[1]

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Samples of water supplies used in 14 butter and 12 cottage plants were examined for total, coliform, lipolytic, proteolytic and psychrophilic bacterial populations. Most of the water samples were free from coliform bacteria but contained psychrophylic, proteolytic and lipolytic organisms indicating that the coliform test alone does not afford sufficient information about the microbiological condition of water supplies intended for dairy plant use. Water samples taken at or near the source where the water entered the plant usually contained fewer bacteria than samples taken at the churn door or cheese vat, suggesting contamination of the water lines within the individual plants.

The bacteriological condition of the water supply is extremely important in dairy plant operations. Contaminated water is particularly detrimental because water comes in direct contact with plant equipment and some dairy products, such as butter, cottage cheese and sherbets. Also water frequently is used in reconstituting condensed or powdered milk which may not be repasteurized. The type of organisms present, due to the nature of the fermentation they may cause, in dairy products are much more important than total numbers.

Several workers have reported on the hazards incurred when contaminated waters are used in dairy plants. Corley *et al.* (*4*) and Greene and Jezeski (*7*) found that many creamery water supplies contained organisms causing spoilage in butter. Long and Hammer (*11*) isolated *Pseudomonas putrefaciens*, an organism causing putrefactive spoilage in butter, from creamery water samples secured from various states. Several reports (*8*), (*12*), (*13*) have mentioned water as a source of spoilage organisms in cottage cheese.

The method for examination of drinking water supplies recommended by the United States Public Health Service (U.S.P.H.S.) (*2*) and as routinely performed by most Health Departments consists of an enumeration of coliform bacteria and perhaps an occasional total count. This information may be sufficient for public health purposes, but is inadequate for the dairy processor who requires a more complete bacteriological analysis which will reveal the presence of psychrophilic, lipolytic and proteolytic organisms detrimental to the keeping quality of dairy products.

EXPERIMENTAL PROCEDURE

Water samples were obtained from 14 butter and 12 cottage cheese plants and were examined in accord with Standard Methods (*1*) recommendations. In all plants, water samples were obtained at the point where the water was entering the cheese vat or the churn. When physically possible, and practical from the sanitation standpoint, samples were also taken at or near the point where the water entered the dairy plant. The latter samples were secured in 4 of the cheese and 12 of the butter plants. Some plants used municipal water supplies, others obtained water from private wells, and a few secured water from both private and municipal sources.

Total, psychrophilic and coliform bacterial counts were performed according to Standard Methods (*1*). Lipolytic organisms were determined by the method of Long and Hammer (*10*). Proteolytic bacteria were determined on a medium containing 0.2 per cent peptone, 0.3 per cent beef extract, 1.5 per cent agar, and 3 per cent sterile skim milk added at the time the plates were poured.

RESULTS AND DISCUSSION

The individual and logarithmic averages of the total, psychrophilic, proteolytic, lipolytic and coliform bacterial counts on samples of water taken from each of the butter and cheese plants are shown in Tables 1 and 2, respectively.

In the 12 butter and 4 cheese plants where it was possible to secure water samples at two points, the counts on the water samples taken at or near the source where the water entered the plant usually were substantially lower than counts on samples taken at the churn door or cheese vat. The extent of these differences may be observed by comparing the two counts

[1]Michigan Agricultural Experiment Station Journal Number 2012.

TABLE 1 — BACTERIOLOGICAL CONDITION OF BUTTER PLANT WATER SUPPLIES

		Bacterial counts				
Plant	Source[a]	Total	Psychrophilic	Proteolytic	Lipolytic	Coliform
A	a	4	<1	3	<1	<1
	b	22	54	6	2	<1
B	a	62	2	<1	2	<1
	b	680	290	220	260	<1
C	a	1400	4	<1	<1	<1
	b	>3000	110	120	74	<1
D	a	46	40	20	26	<1
	b	1300	210	43	34	<1
E	a	7	6	1	<1	<1
	b	3100	330	130	280	3
F	a	7	<1	4	<1	<1
	b	350	210	110	160	<1
H	a	1	<1	<1	<1	<1
	b	>3000	970	500	210	6
I	a	21	38	10	9	<1
	b	1900	>3000	240	>300	<1
J	a	21	2	<1	<1	<1
	b	170	4	<1	4	<1
K	a	26	2	<1	<1	<1
	b	6	13	9	7	<1
M	a	<1	1	<1	<1	<1
	b	<1	3	2	<1	<1
N	a	170	5	10	8	<1
	b	49	6	9	6	<1
G	b	>3000	>3000	1200	1400	<1
L	b	2500	>3000	240	300	<1
Log. average counts of 26 samples		89	25	13	12	<1
Log. average counts of 12 samples at source		19	4	3	2	<1
Log. average counts of 12 samples at churn		23	80	33	31	<1

[a]a = Water at or near source

b = Water running into churn

in each of the pairs of samples from individual plants and also by comparing the logarithmic averages of the samples taken from each of the two locations (Tables 1 and 2). It is noteworthy that none of the 16 "source" samples showed coliform bacteria and only 4 of the 26 samples taken at the churn or vat contained coliform organisms in 1 ml.; whereas psychrophiles were found in 13 of the 16 "source" samples and in 15 of the 16 samples taken at the churn or vat.

These data show the importance of water as a source of organisms which may cause spoilage in dairy products and emphasize the ineffectiveness of the coliform determination in serving as an index of desirability for water for dairy plant use.

The substantial increase in objectionable organisms in the water passing through the plant (Tables 1 and 2) indicates contamination in most of the pipe line systems. Many of the psychrophilic organisms causing lipolsis and proteolysis of dairy products are not fastidious in nutrient requirements and may thrive in cold water lines. These organisms are often present in large numbers around dairy plants and may invade water systems through the ends of open pipe lines such as those commonly found near cheese vats or churn doors. This source of contamination could be minimized by terminating these water lines with a section of sanitary pipe and cap which could be readily disconnected and sanitized.

Chlorination of water systems is commonly recommended to control water-borne spoilage organisms. Elliker (*6*) has suggested the addition of 5 to 10 parts per million (p.p.m.) of chlorine to the plant water supply. The effectiveness of chlorination is partially dependent upon the pH of the water. The pH of the 14 water samples secured from butter plants ranged from 7.35 to 8.10. Collins (*3*) reported on the relationship between pH and the ability of chlorine to destroy several common spoilage organisms and showed that 3 to 5 p.p.m. of chlorine was effective in water at pH 6.0. A combination of chlorination and acidification of water with a harmless acid is effective in destroying water-borne spoilage organisms but care should be exercised to avoid reducing the pH of the water below 5.0. If the pH is too low there may be a danger of corroding pipe lines and imparting metallic flavors. Chlorine should be added at a point where maximum possible contact time will be permitted. It is useless to inject chlorine into a water line immediately before the water comes in contact with a dairy product because the exposure time may not be adequate; furthermore, the organic matter may inactivate the chlorine if the concentration is not great enough. Davis and Babel (*5*) reported that 100 p.p.m. of chlorine added to water immediately before the water was used to wash cottage cheese, was ineffective in controlling selected organisms of the genera *Achromobacter, Aerobacter, Alcaligenes, Proteus* and *Pseudomonas.*

Pasteurization has been used as a means of render-

TABLE 2 — BACTERIOLOGICAL CONDITION OF COTTAGE CHEESE PLANT WATER SUPPLIES

		Bacterial counts				
Plant	Source[a]	Total	Psychrophilic	Proteolytic	Lipolytic	Coliform
G	a	8	23	3	7	<1
G	b	10	9	<1	2	4
R	a	22	30	10	10	<1
R	b	800	980	10	10	<1
V	a	30	39	26	30	<1
V	b	1600	840	600	1040	<1
DD	a	63	23	<1	30	<1
DD	b	2	3	<1	>1	<1
A	b	110	90	120	10	<1
C	b	360	480	82	7	<1
E	b	10	9	10	2	>1
T	b	<1	<1	<1	<1	<1
Y	b	184	110	31	19	<1
AA	b	9	12	6	<1	4
EE	b	46	40	2	<1	<1
FF	b	4400	6000	1500	1800	<1
Log. average counts of 16 samples		49	50	13	10	<1
Log. average counts of 4 samples at source		24	28	6	16	<1
Log. average counts of 4 samples at vat		71	68	10	13	<1

[a]a = Water at or near source

b = Water running into cheese vat

ing contaminated water supplies suitable for use. Seiberling (*14*) has recommended a procedure which was reported to be superior to chemical sanitizers in one plant.

There is a question as to what should be an acceptable bacteriological standard for dairy plant water supplies. In 1943 Corley (*4*) recommended that water supplies used in butter plants should: (a) meet U.S. P.H.S. drinking water standards; (b) contain a maximum total count of 50 organisms per ml; and (c) contain a maximum of 5 proteolytic and/or lipolytic organisms per ml.

Harper (9) has endorsed these standards with the modification that the total count be limited to 20 organisms per ml.

These recommendations seem reasonable, however only 4 of the 26 samples examined in the work reported herein (Tables 1 and 2) met these standards. The data emphasize the need for focusing attention to the bacteriological condition of water supplies utilized in each individual dairy plant and the necessity for applying remedial procedures to contaminated waters.

SUMMARY

Most of the water samples obtained from 14 butter and 12 cottage cheese plants were free from coliform bacteria but contained psychrophilic, proteolytic and lipolytic organisms. Water samples taken at or near the source where the water entered the plant usually contained fewer bacteria than samples taken at the churn door or cheese vat, suggesting contamination of the water lines within the individual plants.

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DATING OF PASTEURIZED MILK AS A PUBLIC HEALTH MEASURE[1]

By Harold B. Robinson

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Dating of pasteurized milk, either by itself or accompanied by a limitation on the length of time it may be sold, is a provision in the regulations of some States and municipalities. In general, this provision appears most often in the regulations of those jurisdictions which were among the first to institute milk sanitation activities. Polikoff (7) stated that incorporation of dating requirements for pasteurized milk originated before World War I. Of 13 cities studied by him, six had adopted this requirement between 1912 and 1917. In this connection, the Milk Ordinance and Code recommended by the Public Health Service (6), while never containing a dating requirement as such, did in early editions, establish 60 hours for the sale of milk after pasteurization. However, this limit was removed in 1934 at the recommendation of the Public Health Service Milk Sanitation Advisory Board and has not appeared in any edition since that date.

The public health significance of dating pasteurized milk and of limiting the time for its sale can best be assessed by considering the status of technical knowledge during the first decade of the century when milk sanitation requirements were evolving, and relating it to the new information that has become available and the changes that have occurred in the production, processing, and marketing of milk.

Milk sanitation – the practice of applying sanitary measures to safeguard the consuming public from milk-borne disease – owes its origin to epidemiological studies during the last half of the 19th Century. In 1857, Dr. Michael Taylor (8) of Penrith, England, described an outbreak of typhoid fever which occurred in that community, and which appeared to be related to the consumption of milk from a small dairy. In 1867, he made a similar observation regarding an outbreak of scarlet fever. By 1881, milk had been the suspected vehicle in several recorded outbreaks in England, and a compilation of 69 milk-borne epidemics was cited by Mr. Ernest Hart (8) before the International Medical Congress in that year. During this same period, the rapidly developing science of bacteriology contributed knowledge on the etiology of communicable diseases which further confirmed the role that milk could play in their spread. By the end of the century, a considerable body of knowledge had been brought together regarding the ability of certain pathogenic microorganisms to gain access to milk, survive in it, and produce disease in humans.

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Epidemiological information on the role of contaminated milk in the spread of specific diseases was and is the fundamental basis for milk sanitation activities. However, it was not necessarily the sole consideration in the formulation of milk sanitation regulations. During the latter part of the 19th Century, there evolved a legal structure of control over the dairy industry which had for its purpose regulating the composition

[1]Presented before the 10th Annual Meeting of the Dairy Products Improvement Institute, Inc., held at the Statler Hotel, New York, February 14, 1957.

of milk. As stated by Prucha (*1*), "The prevailing idea appeared to be that changing the natural chemical composition of milk made the milk unwholesome." These laws were at times also concerned with addition of coloring materials, thickening materials, and preservatives, which might be used surreptitiously to enhance the saleability of inferior milk. Both the content and philosophy of these laws appear to have been carried over in the development of regulations to protect the public from milk-borne disease.

It had also been established that spoilage of milk was caused by the growth of bacteria, and by 1900, pasteurization was being employed in a number of the larger cities to extend keeping quality of milk. Although also advocated as a public health measure to reduce the disease risk, many officials viewed pasteurization as a questionable practice. Hammer (*5*) stated, "In the past, milk inspectors have sometimes maintained that the employment of pasteurization to improve keeping quality of milk is an unfair practice, and that the only legitimate use is to destroy disease-producing organisms." In other words, they would have preferred a process which destroyed pathogenic organisms but did not extend keeping quality of the product.

Pasteurization also met with opposition for other reasons. Many authorities feeling that nutritional values were impaired, regarded pasteurization as an expedient to be empoyed only until such time as techniques could be developed for the production of a raw milk free from disease hazards. Others were reluctant to accept the commercial pasteurization processes as being adequate to destroy all pathogenic microorganisms. There was also a belief that the heat treatment of milk by pasteurization killed benign acid-producing types and left a predominance of proteolytic types which might, in the course of their growth, produce toxins.

The last two of the above objections, together with the likelihood of pasteurized milk becoming contaminated during subsequent operations, very probably influenced the decisions that led to the incorporation of dating and time limitations for the sale of pasteurized milk, in milk regulations. It could be postulated that actions leading to prompt distribution and consumption of pasteurized milk would minimize growth of the organisms present and, hence, reduce the risk

If these were the reasons, new knowledge and technological improvements in all phases of milk production, processing, and marketing, will have made them much less important. First, there has been continued improvement in the design and construction of pasteurization equipment since the process was first introduced. The Endicott studies (*2*) in 1925 showed that much equipment then available was not designed to provide prescribed conditions of time and temperature throughout the entire body of milk being pasteurized. Short-circuiting of flow between inlets and outlets of continuous-flow pasteurizers, leaking valves, dead ends, foam, and splash, were found to provide conditions whereby pathogens could survive even though the time and temperature controls appeared to indicate a satisfactory operation. The study further demonstrated that these equipment defects were correctable, and when such corrections were made, processing at 143° F. for 30 minutes would destroy all pathogenic microorganisms then considered to be significant.

The above findings, together with other equipment studies by the Office of Milk Investigations of the Public Health Service (*4*), were used in the development of design criteria for vat-type pasteurizers and provided the basis for developing similar standards for high-temperature, short-time equipment. It is interesting to note that the adequacy of these criteria has been recently confirmed in studies on the thermal destruction of *Coxiella burnetii,* the causative agent of Q fever. Both laboratory and plant level studies showed pasteurization at 143° F. for 30 minutes to permit some survival when large numbers of this organism were present, but processing at 145° F. for 30 minutes to be adequate for its destruction in milk (*3*). (This information, together with the finding that pasteurization at 161° F. for 15 seconds, was also adequate, for the destruction of *C. burnetii,* has been transmitted to all State milk sanitation authorities and to the dairy industry.)

The second major change is in the sanitary practices involved in the production, processing, and distribution of milk. Better facilities and, more important, a better understanding of the sanitation factors involved in milk quality by dairy farmers and processors, has resulted in a higher quality product. Improvements in processing equipment have not been limited to pasteurizers; they have also provided greater protection against contamination of the pasteurized product and better cleanability. Dipped milk, with its attendant contamination, is a thing of the past, and hazards once attributable to poorly cleaned containers, have been minimized by mechanized cleaning operations and single-service containers. These improvements, coupled with proper cleaning, bactericidal treatment, and operating procedures, have significantly reduced opportunities for pasteurized milk to be contaminated with harmful microorganisms.

Although each of the above changes reduces the significance of age as a factor in the safety of pasteurized milk, the change most directly involved is, perhaps, refrigeration. Time and temperature are related factors in bacterial growth. By itself, the significance of time cannot be assessed. Accordingly, early concepts as to the length of time pasteurized milk might be safely sold were, of necessity, conditioned by the storage temperatures then in use. The great strides that have been made in providing mechanical refrigeration on the farm, in the processing plant, and in the home, have resulted in prevailing storage temperatures for milk today, that could not have been anticipated when early regulations were adopted.

The temperature at which pasteurized milk is held would have a definite bearing on the need for limiting the period during which pasteurized milk might be sold, if the limitation was predicated on a belief that the flora which normally survive pasteurization would produce toxic substances. Whether or not it is true that these organisms can produce toxins—and there is little evidence to show that this has ever occurred under practical conditions—the lower storage temperatures that now prevail would certainly substantially extend a period of safety predicated on the storage conditions of 40 years ago. In this connection, the finding that some strains of staphylococci can produce a toxin that will withstand pasteurization even though the causative organism is destroyed, suggests a better explanation for the hazard once associated with old pasteurized milk. Several outbreaks of gastroenteritis have been reported in which the evidence pointed to a toxin of bacterial origin, and which appeared to have been produced in the milk prior to, not after, pasteurization.

The dating of milk has one other facet that merits consideration—that is the matter of consumer reaction. At present, this is believed to be the leading force in the retention of dating requirements. Freshness has always been recognized as a desirable attribute of milk and certainly, no one can contend that age makes milk better. The consumer associates off-flavors and other undesirable characteristics with old milk, and regards dating as a means of assuring a fresh product. However, freshness, in terms of age, relates to the time of production—not pasteurization. As cities have grown larger, it has been necessary to go farther and farther afield to obtain adequate supplies of milk. There are now in existence situations where milk is picked up in a bulk transport tank from a farm and transported over a thousand miles to the pasteurization plant. In fact, the problems associated with the inspection of such distant sources became so acute a few years back, that the Conference of State and Territorial Health Officers requested the Public Health Service to assist in the development of an interstate milk shipper certification plan. You may recall that this plan was discussed at your 5th Annual Meeting on January 17, 1952 *(9)*. Since that time, the program has progressed and there are now over 500 shippers whose supplies are routinely rated by State milk sanitation rating officers, and these ratings included in quarterly lists that are used by many State and local health officers to determine the acceptability of milk they receive from other areas. The fact that milk may now be transported hundreds of miles without loss of the properties associated with freshness, is a practical manifestation of the vast improvement that has taken place in sanitation and refrigeration of milk supplies.

These improvements in sanitation and refrigeration have permitted economies in the milk industry through the use of every-other-day pick-up of milk on farms and a 5-day week for plant operations. Such improvements also provide a pasteurized product having better keeping quality, but the practice of dating the pasteurized milk tends to negate the economic advantage of a more stable product. Despite the fact that the regulations may permit sale over a longer period, most consumers will refuse to accept milk which does not bear the date of the day of purchase. Because of this, stores retailing dated milk often order minimum quantities on the regular delivery for fear of leftovers involving losses, and then order special deliveries if demands are greater than were anticipated. Such extra deliveries tend to increase the price of milk. On the other hand, when demand is less than was anticipated, returns to the milk plant are involved. Such returns must be dumped and the milk diverted into other channels, with resulting loss of the closure and, in the case of single-service containers, the container itself.

In addition to the economic aspect, dating of pasteurized milk has at times led to situations presenting public health hazards. In some instances, due to the limited time pasteurization plants are permitted to make deliveries after pasteurization, they are required to make store deliveries several hours before the stores open in the morning. The milk is set in the front doorway without protection from the heat, dogs, cats, birds, and street grime, until the store is opened and the milk put in refrigerated display cases at the leisure of the storekeeper. Where glass bottles without tamper-proof closures are involved, a very serious objection has been observed in the temptation to surreptitiously change bottle caps by hand in stores and on delivery trucks. Hand-capping under any condition may contaminate milk and must be considered a serious public health hazard.

These disadvantages are believed to be more significant than any advantage that may now be claimed for the dating of pasteurized milk, and were, in all probability, among the considerations that led the Public Health Service Milk Sanitation Advisory Board, in 1934, to conclude that requirements limiting the time of sale of pasteurized products was not of sufficient significance to merit recommending them on a nationwide basis.

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The concerns the names of which are listed below have been granted authorization to affix the 3-A Symbol to the models of equipment listed, by the 3-A Sanitary Standards Symbol Administrative Council. The Council emphasizes that this is not to be considered a complete roster of concerns which offer equipment conforming to pertinent 3-A Sanitary Standards.

HOLDING AND/OR COOLING TANKS

AUTHORIZATION NUMBER — *CONCERN* — *ADDRESS*

Dairy Equipment Company
4 — Madison, Wisconsin
Model Nos. DKS 100, 150, 200, 250, 300, 400, 500, 600, and 700. MK 100, 150, and 250.

Solar Permanent Company
6 — Tomahawk, Wisconsin
Model Nos. 1-1000, 2-1000, 3-1000, 4-1000, 5-1000, and 18-1000.

Stainless, Inc.
8 — Van Nuys, California
Model Nos. R (True rectangular), U (U-bottom) and O (Cylindrical).

Girton Manufacturing Company
10 — Millville, Pennsylvania
Models: DeLuxe and Scotsman, various capacities.

Creamery Package Mfg. Co.
11 — Chicago, Illinois
Model Nos. C-100, CFA-180, CFO-250, CFA-250, CFO-375, CFA-375, R-300, RF-375, CFO-500, RF-500, R-400, R-500, R-600, R-800, and R-1000.

Paul Mueller Company
12 — Springfield, Missouri

Models: "L" 150 to 1500 gal; "S" 150 to 300 gal.

Cherry-Burrell Corporation

13 Little Falls, New York

Models: Kold-Vat FTC, FTC-1, and K.

Zero Sales Corporation

16 Washington, Missouri

Model No. T-20.

Whirlpool Seeger Mfg. Co.

18 St. Paul, Minnesota

Model Nos. MC-150PX, MC-200PX, MC-300PX, MC-400PX, MC-500PX, MC-600PX, and MC-700PX.

Brown Equipment Company

19 Coalville, Utah

Models: Dairy King B150, B200, B250, B300, B350, B400, B500, B600, B700, B800, B900, B1000, B1500, and B2000.

Groen Manufacturing Co.

22 Chicago, Illinois

Models: RW, RW2, and RW3: 100, 150, 205 and 275 gal. W and WL: 300, 400, 500, and 600 gal. TW: 300, 400, 500, and 600 gal.

Wilson Refrigeration, Inc.

24 Smyrna, Delaware

Models: WB 100, 150, 200, 250, 300, 375, 500, 600, and 700.

Cherry-Burrell Corporation

33 Cedar Rapids, Iowa

Model Nos. FTM-120-EOD, FTM-120-D, FTM-185-EOD, FTM-185-D, FTM-285-EOD, FTM-285-D, FTM-285-EOD, and FTM-285 -D.

Craft Manufacturing Co.

36 Chicago, Illinois

Models: CM 135, 190, 265, 330, 400, 440, 600, and 800.

Mojonnier Bros. Co.

41 Chicago, Illinois

Models: 100-, 150-, and 200-F; 250- and 300-J; 400-N; 500-, 600-, and 800-L; 1000- and 1200 -D; 1500-G, 200-, 300-, 400-, 500-,600-, and 800-V.

Van-Vetter, Inc.

42 Seattle, Washington

Models: VVS-115 to 1000. VVSS-115 to 300.

Miller Metal Products

48 Wichita, Kansas

Models: "R" and "S"

De Lavel Separator Co.

49 Poughkeepsie, N. Y.

Model Nos. Da-180, 250, and 375; D-250 and 375; DR-375; R-300, 400, 500, 600, 800, and 1000.

Emil Steinhorst & Sons., Inc.

50 Utica, New York

Models: L-15, 20, 30, 40, 50, 60, 80, and 100; LS-15, 20, 30, and 40; WS-2, 3, and 4.

C. E. Howard Corporation

51 South Gate, California

Models. "H," "K," "HS," and "KS."

Harverly Equipment Div. – John Wood Co.

55 Syracuse, New York

Models: HB-100, 150, 200, 250, 300, 400, 500, 600, 700, and 1000.

Houston Fearless Div. – Color Corp. of America (Formerly McHale Mfg. Co.)

56 Los Angeles, California

Models: Pioneer No. 840 and Forty-Niner No. 840.

The Pfaudler Company

57 Rochester, New York

Models: DS-15, 18, 20, 25, 180, and 250.

Schweitzer's

58 Pipestone, Minnesota

Models: BC, SW, and SH.

Jamesway Sani-Kool Corporation

61 Fort Atkinson, Wisconsin

Models: FK 160, 210, 300, 400, 1600, and 2100; FK16EOD, FK21EOD, and FK500EOD; SK150, 200, 250, and 300.

Stainless Steel Automotive Milk Transportation Tanks For Bulk Delivery And/Or Farm Pick-Up Service – 0501

Atlas Metal Products, Inc.

64 Hartford, Conn.

Model Nos. FPSS, FPFS, FPT and MTT.

Dairy Equipment Company

66 Madison, Wisc.

Capacities of 700, 800, 900, 1000, 1200, 1500, 1700, 1800, 1900, 2000, 2200, 2300, 2400, 2500, 3000, 3500, 4000, 4500 and 5000 gallons.

PAPERS PRESENTED AT AFFILIATE ASSOCIATION MEETINGS

Editorial Note: The following listing of subjects presented at meetings of Affiliate Associations is provided as a service to the Association membership. Anyone who desires information on any subject is encouraged to write to the Secretary of the Afifliate Association concerned for the address of the speaker. Information desired then may be requested from the speaker (a copy of the paper may be available for the asking).

CONNECTICUT ASSOCIATION OF DAIRY AND FOOD SANITARIANS, INC.

(Thirty-second Annual Meeting, January 16, 1957)

Mr. H. Clifford Goslee, *Sec.*, 256 Palm St., Hartford, Conn.

Bacteriological Laboratory Controls. Richard Eglinton.

Butterfat Testing Regulations. Curtis W. Chafee.

Current Topics in Agriculture. Joseph N. Gill.

Food Sanitation. Louis A. King.
Current Topics in Food and Drugs. Attilio R. Frassinelli.
Feedy Flavors Are Expensive. Professor James C. White.

RHODE ISLAND ASSOCIATION OF DAIRY AND FOOD SANITARIANS
(Annual Meeting, February 20, 1957)

Dr. Richard M. Parry, *Sec.*, 158 Greenwich Ave., Warwick, R. I.
Bulk Tank Operations. A panel discussion.. Moderator, Dr. James W. Cobble
Installation and Maintenance of Farm Tanks. Arthur Frink
Tank Truck Operations. Clayton Kibbe
Quality Control of Milk. Carl Johnson
Communicable Disease in Venezuela. Professor Warren Stoner

ASSOCIATED ILLINOIS MILK SANITARIANS
(Fall Conference, December 10, 1956)

Mr. P. E. Riley, *Sec.*, Dept of Public Health, 1800 W. Filmore St., Chicago, Ill.
Bulk Tank Truck Problems and a Look to the Future. Gilbert A. Imse
Automation and CIP Cleaning in Milk Pasteurization Plants and Receiving Stations. John E. Yonts
The Fieldman and The Farmer. Ralph Johnson
Environmental Sanitation in the Juvenile Deliquency Program. Edward P. Hopper
Control Factors in the Manufacture of Cottage Cheese. Dr. Fred J. Babel
Constructive Suggestions for Milk Plant and Dairy Farm Inspections. Harold Wainess

ASSOCIATED ILLINOIS MILK SANITARIANS
(Annual Spring Conference, June 3, 1957)

Mr. P. E. Riley, *Sec.*, Dept. of Public Health, 1800 W. Filmore St., Chicago, Ill.
Milk Flavors, Good and Bad. Dr. Ernest O. Herreid
Typical Causes of Food Borne Outbreaks. Dr. T. J. King
Rodent Control and Insect Control. Emmett Chompion
Making a Dairy Farm Inspection Where C. I. P. Pipelines are used. James A. Meany
Problems Involved in the Development of Suitable Plastics for the Dairy and Food Industry. Dr. D. F. Sidall
Mastitis and Public Health. Dr. C. A. Brandly

WISCONSIN DAIRY PLANT FIELDMAN'S CONFERENCE
(February 7-8, 1957)

H. C. Jackson, University of Wisconsin, Madison 6, Wisconsin.
How Our Changing Agriculture Affects the Fieldman. Walter Ebling
New Research for New Farm Problems. Noble Clark
Making Fieldwork More Effective. Frank Birch
What the Fieldman Should Know about the Mastitis Problem in 1957. Joseph Simon
The Urgency of Meeting Quality Requirments in 1957. H. J. Weavers
Milk Flavors and Their Control. Myron P. Dean
Practical Feeding Schedules to Control Feed Flavors. George M. Werner
Intake Inspection. William Mair
What Research Tells Us about Meters for Measuring Milk from Bulk Tanks. S. Witzel
Practical Experiences in Milk Measurements. Norman Kirschbaum
What Research Tells Us about the Performances of Bulk Tanks. Calvin Cramer
What about 3A Standards for Farm Milk Handling Equipment? C. K. Luchterhand
Making Reciprocal Inspection Work. Karl Mohr
Getting People to Understand. Richard E. Sullivan

PROFESSOR A. C. RAGSDALE RECEIVES HONORARY DOCTOR DEGREE

Culver-Stockton College awarded Prof. A. C. Ragsdale, chairman of the University of Missouri dairy department at Columbia, an honorary doctor of science degree at its annual commencement here this morning. President Fred Helsabeck conferred the honor.

The degree was granted Prof. Ragsdale in recognition of his professional scientific achievements and for his outstanding leadership among the laymen of the Disciples of Christ.

Prof. Ragsdale has been chairman of the Missouri dairy department since April 1, 1919. During his tenure as chairman, the department has developed an international reputation for scientific research and graduate training that annually attracts large numbers of graduate students from throughout the United States and many foreign countries.

He has served as president of the American Dairy Science Association, is a member of many scientific and professional societies, has served the Missouri and national dairy industries in many ways, and is listed in "Who's Who in America."

Prof. Ragsdale has been active in church work. He is an elder, chairman of the division of finance and stewardship, treasurer, and trustee of the First Christian Church in Columbia. He has served as state and national president of the Christian Men's Fellowship and is a member of the National Layman's Advisory Commission of the Christian Church – Disciples of Christ.

A native of Aurora, Prof. Ragsdale received his undergraduate degree from the University of Missouri and his master's degree from the University of Wisconsin.

Prior to his appointment as chairman of the dairy department in 1919, he had been on the staffs of the New Jersey and West Virginia Colleges of Agriculture and had served as extension dairy specialist for the Missouri College of Agriculture.

WILLIAM V. HICKEY ACCEPTS NEW POSITION

William Vincent Hickey, former director of the Division of Foods and Sanitary Engineering of the Salt Lake City (Utah) Board of Health, has been appointed Field Sanitarian by the Paper Cup and Container Institute, Homer N. Calver, Secretary of the Institute's Public Health Committee, announced today.

Mr. Hickey, who has been active in national public health organizations for the past 16 years, is second vice president of the International Association of Milk and Food Sanitarians and president of the Dairy Technology Society of Utah.

Mr. Hickey has served on the Joint Committee of the National Sanitation Foundation and is a member of the American Public Health Association.

After attending the University of Utah, Mr. Hickey joined the Utah State Health Department in 1941. He has held the Salt Lake City position since 1944. Born in 1907 in Washington, D. C., Mr. Hickey is married and has three children. He will make his home in New York City.

Mr. Hickey replaces Samuel D. Macready, of Pensacola, Fla., who retired May 1.

DONALD H. WILLIAMS APPOINTED TECHNICAL DIRECTOR OF DAIRY INDUSTRIES SUPPLY ASSOCIATION

The appointment of Donald H. Williams as Technical Director of Dairy Industries Supply Association, effective June first, has been made known in a news announcement from the Washington, D.C., headquarters of the national trade association of dairy industrial suppliers and equippers.

He succeeds Dr. John L. Barnhart, announcement of whose resignation to return to dairy collegiate educational work recently was made.

A native of Washington, D.C., Mr. Williams comes to DISA from International Association of Ice Cream Manufacturers, with which he has held a technical and consulting post for the past six years. During much of this period he has been very active in work of the 3-A Sanitary Standards for Dairy Equipment committees, a program in which he will now become a key staff figure.

Don H. Williams was graduated as a dairy technologist from the University of Maryland in 1938. He served in the U.S. Marine Corps for five years, emerging a Lieutenant-Colonel at the end of World War II. He currently holds this rank in the U.S. Marine Corps Reserve. Thereafter until 1951 he worked successively for the General Ice Cream Corporation in Portland, Me., and for the Dairy Products Research Laboratories of U.S. Department of Agriculture in Washington, D.C.

He is married and the father of two young daughters.

A first announcement of his new appointment was made by Roberts Everett, DISA Executive Vice-President, during semi-annual sessions of the 3-A Sanitary Standards committees at Bethesda, Md. on May 13, to representatives of dairy processors, sanitarians and equipment manufacturers, who also commended Dr. Barnhart for his services to the Committees' work.

3-A SANITARY STANDARDS COMMITTEES HOLD SEMI-ANNUAL MEET; GIVE OK TO STANDARD FOR CARTON FILLERS

A regular semi-annual meeting of the 3-A Sanitary Standards Committees was held May 13-16 at the Kenwood Country Club, Bethesda, Md., and more than 100 design engineers, sanitarians, Public Health Service officials, technologists and executives from all parts of the United States participated in the discussions.

Two standards reached final, or almost final, approval at the meeting. These were the 3-A Sanitary Standard for Fillers and Sealers of Single Service Containers for Milk and Fluid Milk Products, which received signatures of officials representing participating groups in the program; and the 3-A Sanitary Standards for Milk and Milk Products Evaporators and Vacuum Pans, which received signatures designating approval from all groups except the U.S. Public Health Service, representatives of which wished to check a newly-typed copy of the standard before affixing official approval.

The approved standards now will be published in The Journal of Milk and Food Technology, official publication of International Association of Milk and Food Sanitarians, following which reprints of the standards will be available.

In addition to the approved standards, on the agenda for the sessions were further revisions, or considerations, of existing or tentative 3-A Sanitary Standards for the following items of dairy industrial equipment and supply:

Separators, standardizers and clarifiers for milk and fluid milk products; non-coil type stainless steel batch pasteurizers; coin operated bulk fluid milk and fluid milk products venders; rubber and rubber-like materials used as product contact surfaces in dairy equipment; and farm holding and/or cooling tanks.

In addition, one entirely new tentative 3-A Sanitary Standard—this on accepted methods and equipment for supplying air under pressure for processing milk and milk products—came before the participants for the first time.

The 3-A Sanitary Standards Committees are composed of representatives from the Committee on Sanitary Procedure of International Association of Milk and Food Sanitarians; U.S. Public Health Service; the Sanitary Standards Subcommittee of Dairy Industry Committee, representing users of dairy equipment; and the Technical Committee of Dairy Industries Supply Association, representing manufacturers of supplies and equipment.

Traditionally, the meeting is presided over by the Chairman of the SSS-DIC, but this year, for the first time in more than a decade, Dr. E. H. Parfitt, Chairman, was unable to attend because of the press of other duties. In his absence, four men presided at various sessions. These were F. E. Uetz, The Borden Co., Pioneer Ice Cream Div.; A. E. Nessler, Kraft Foods Co.; William A. Dean, Bowman Dairy Company; and M. H. Brightman, Executive Secretary of the Dairy Industry Committee.

LEONARD H. MALE

Leonard H. Male, 60, Assistant Regional Engineer in the Kansas City Regional office, died suddenly of a heart attack at his home on April 30.

Mr. Male was a sanitary enginneer for more than 30 years, and served in a variety of positions both in and out of the Federal service ever since his graduation in 1924 from the University of Kansas with a B.S. in civil and sanitary engineering. In the following nine years he served for varying periods as sanitary engineer in private industry and as the State Sanitary Engineer for Utah.

Mr. Male joined the Public Health Service in 1933 and was stationed in the District of Columbia, Atlanta, New Orleans, Chicago, and Cleveland, as well as Kansas City, his special field being milk and food sanitation. In 1942 he was commissioned in the Reserve Corps and in 1947 was appointed to the Regular Corps as Senior Sanitary Engineer.

Among the organizations of which he was a member were the American Public Health Association, International Association of Milk and Food Sanitarians, and the Commissioned Officers Association.

He is survived by his widow, two sons, and two daughters.

TWO CALIFORNIA HEALTH DEPARTMENTS RECEIVE NATIONAL AWARDS

Two California health departments took top honors in the national competition for the Dr. Samuel J. Crumbine Awards, given in memory of the pioneer Kansas state public health officer. The awards, sponsored by the Public Health Committee of the Paper Cup and Container Institute and the only ones made to local health departments throughout the nation, were presented to the San Jose City and San Diego County Departments of Public Health at the annual meeting of the Western Branch of the American Public Health Association in Long Beach, California, on May 30.

Nearly 1,150 local health departments were eligible to submit entries based on their work in 1956.

First place for "outstanding achievement in the development of a program of eating and drinking sanitation" was awarded to the San Jose unit.

Top honors for "outstanding achievement in the development of a comprehensive program of environmental sanitation" went to the San Diego Department. Under the rules of the contest, the jury in making this award gave special consideration to newly developed activities of a pioneering nature which supplemented a well-rounded municipal program.

Dr. Dwight M. Bissell, Commissioner of the San Jose Department, and Dr. J. B. Askew, Health Officer of the San Diego Department, received the plaques for their departments as well as a personal medallion.

Medallions were also awarded to Thomas F. McGowan, Director of Sanitation and Elvin O. Hodgert, Senior Sanitarian of the San Jose Department; and to William B. Walshe, Chief, Division of Sanitation of the San Diego unit.

San Jose's winning program drew special attention because of its effort to give the food handler new status in his own eyes and at the same time give the restaurants observing correct sanitation procedures added prestige in the eyes of the buying public. The awards jury believed that these forms of positive motivation for those directly responsible for correct procedures, enhanced the effectiveness of the food handler courses. The department's follow-up procedures were also unusually thorough.

By cooperating with restaurant owners and the workers' union, the department has obtained high voluntary enrollments in the courses, which cover (1) personal hygiene, (2) disease transmission, (3) correct dishwashing methods, and (4) food protection. Maximum teaching enthusiasm has been generated by frequently rotating the instructors. Instructors stress the importance of the handler's work and give him practical advice on how to improve his performance to increase his income as well as demonstrate the everyday fundamentals of good sanitation. The result is that the sanitarian-teachers assume new stature as advisors. Successful trainees return to work with a distinguishing button to indicate their participation in the training program.

The San Diego County department was cited by the jury for carrying out an unusually well-rounded program over a large territory and continuing its pioneering activities.

Typical of the diversity of the department's many projects were:

1. Pioneer work in developing standards of construction and operation for mobile vehicles vending foods to industrial workers so that this new kind of food service, through the cooperative effort of industry and other public groups, was made as safe as that in any public restaurant.
2. Establishment of fact-finding studies to determine air pollution in the county in general and in areas within the county, every sanitarian making twice-daily reports on conditions within his district.
3. Successful solution of county-wide difficulties with septic tanks through study of the problem and passage of an ordinance requiring health department tests and approval of installations.
4. Development of measures to handle such nuisances as mosquitoes and dissemination of necessary information to the public about the measures through newspapers, radio and television.
5. Maintenance of a vigorous communications program to keep the public posted on changing sanitation problems and developments.

Like other departments facing today's chronic shortage of public health workers, San Diego could not, in the opinion of the jury, have sustained such an ambitious program without a high degree of teamwork within the department and with community groups, whenever they could be enlisted to augment the department's efforts.

OPENING OF NEXT YEAR'S CONTEST

The Public Health Committee of the Paper Cup and Container Institute has announced the opening of the 1958 Fourth Annual Samuel J. Crumbine Award Competition for programs conducted in 1957. Requirements are the same as in previous years, and no department that has won an award may compete for the same award again. Previous winners may, however, for the award which they have not won.

Entry blanks may be obtained from Crumbine Awards Jury, Room 1025, 250 Park Avenue, New York 17, New York.

All entries must be completed by March 1, 1958.

U.S. DAIRY EXHIBIT
JAPAN INTERNATIONAL TRADE FAIR

Distribution of samples of U. S. nonfat dry milk, a display of American dairy products, and a school lunch booth portraying the value of milk to school children, were the major attractions of the United States dairy exhibit at the Japan International Trade Fair.

The fair was held in Tokyo, May 5-19, 1957.

The exhibit was sponsored cooperatively by the Foreign Agricultural Service of the U. S. Department of Agriculture; Dairy Society, International; and the Japan Dairy Products Association.

Miss Shari Lewis, 1957 American Dairy Princess, from Daykin, Nebraska, made personal appearances at the dairy exhibit and handed out samples of American nonfat dry milk.

Commercial brand-name packages of American dairy products were displayed on shelves along the booth walls. Samples of U. S. cheese were displayed in glass-front refrigerators in the booth.

The colorful, animated school lunch exhibit attracted the Japanese "small fry" in droves. Cut-out heads and artists' figures of happy Japanese school children

American and Japanese beauties sponsored by two farm commodities vital to world trade meet. A. James Martin, Foreign Agricultural Service Pavilion Director. Left is Shari Lewis, 1957 American Dairy Princess; right is Japan's Miss Cotton of 1957,, Yogo Yago.

L. H. Burgwald, Foreign Agricultural Service Dairy Marketing Specialist, displays American-made dairy products at the U. S. Pavilion. To his left are Arthur Rollefson, U. S. Assistant Agricultural Attache in Japan; and T. Yoneda, Japan Dairy Products Association. Right, is Allen I. Konno, consultant for Japan's dairy industry; and one of the dairy booth attendants.

bobbled back and forth to give movement to the exhibit. In the center panel, through use of lights, milk was poured into a glass from a huge bottle. The booth background was an artist's impression of school children playing, and enjoying sports.

The dairy exhibit, like the others in the U. S. pavilion, was brough to Japan to acquaint more Japanese people with the high quality of U. S. farm products that are available for export.

At the present time, Japan is not a big importer of American dairy products, except for nonfat dry milk which is brought in only for use in the school lunch program.

L. H. Burgwald, Foreign Agricultural Services Dairy Marketing Specialist, who is spending several months in Japan on a mission to sell cheese and assist in a school lunch project, said, "Japan does not permit the import of cheddar cheese from dollar areas except with special license and allocation of exchange. This is a real road block to shipping U.S. cheese to Japan. However, with the cooperation of the American Embassy and Japanese dairy companies, who import some cheddar cheese for blending with domestic cheese to produce processed cheese, we hope to get this restriction removed and eventually build a market for some U. S. cheese."

Mr. Termohlen, U. S. Agricultural Attache in Japan, praised the value of an American move like sending Shari Lewis, the 1957 American Dairy Princess, to the Trade Fair, even though no immediate or promising action is anticipated on larger sales of U. S. dairy products in Japan.

"She won the hearts of the Japanese people while

Miss Shari Lewis, 1957 American Dairy Princess, distributes samples of U. S. nonfat dried milk at the Trade Fair. Helping her is Gertrude Drinker, Dairy Nutritionist, for the Foreign Agricultural Service, USDA. Miss Lewis, from Daykin, Nebraska, is representing the U. S. Department of Agriculture and the U. S. dairy industry in Japan during the Fair. This is non-fat dried milk dissolves readily in water and makes a nutritious drink.

she was here and symbolized the quality, wholesomeness, and purity of American dairy products, and the beauty and dignity of American women. She cooperated splendidly with Japanese and American dairy people during the Trade Fair, and in her role of Ambassadress of good will from the American dairy industry, she contributed greatly to good Japan-American relations.

Her many appearances at the Trade Fair dairy booth helped to call attention to the availability of fine American dairy animals and the contribution American nonfat dry milk is making to the school lunch program here, and the ultimate health improvement of Japan's children," Mr. Termohlen said.

PIPELINE CHATTER

May 20, 1957

Mr. H. L. Thomasson, Managing Editor
Journal of Milk and Food Technology
Box 437
Shelbyville, Indiana
U. S. A.

Dear Mr. Thomasson:

I am enclosing a check in the amount of $15.00 for five additional memberships. Miss Pauline Layne has just sent me a note stating that our Florida membership to date now totals 111.

This is a real experience for me here in Costa Rica. During these first three weeks I have been studying the low-fat problem here. This is caused by lack of roughage in the ration as our Florida study revealed. It appears that this condition prevails for several months of the year. During the rainy season, that has just started, very succulent grass and concentrates are about all the cows receive. Before it starts grass is very short.

Great strides have been made in the production and care of milk during the past 5 years. The Cooperativa has outgrown its new plant in this time and is enlarging. Some of the other plants are also doing this. At present only about one-third of the milk is pasteurized. Some home deliveries are still by the can and dipper method.

Most of the fluid milk production is in the highlands near San Jose. Well established herds of Guernseys and Jerseys consist of very good cows. The usual number in a herd is about 30.

Very little helado (ice cream) is manufactured, but several frozen products, including some on sticks, are being made. The Cooperativa, here in San Jose also produces non-fat dry milk in a very modern plant that was built about two years ago.

I made one trip to an area down near Panama and will make one this week up toward Nicaragua on the Pacific side. Both are potential cheese producing areas.

On the trip to the south we went over mountains up to 10,000 feet. This is a nice scenic drive on the Inter-American highway that is an all weather road and is now being paved. Work also is in progress to push it to the Panama border.

The people of Costa Rica are very congenial and helpful in my work. It is a treat to be here.

Sincerely,
W. A. Krienke, Sec. Treas.
Florida Association Milk &
Food Sanitarians

ROBERT E. HENSLEY RECEIVES $1000 RESEARCH AWARD

Robert E. Hensley, Hartville, a University of Missouri senior specializing in dairy manufactures, was recently awarded a $1,000 research fellowship by the Southern Association of Ice Cream Manufacturers, according to John H. Longwell, dean of the University's College of Agriculture.

The fellowship is given to the senior with the highest scholastic ranking in all colleges and universities located in the 16 southern states represented by the Association. However, the winner must be specializing in dairy manufactures, Longwell said.

Hensley has an outstanding scholastic record at the University. His grade average is 3.72 with 4.0 being perfect. He will enroll in the University's Graduate School during the coming school year and will continue in dairy manufactures under the direction of W. H. E.Reid, professor of dairy husbandry.

In addition to receiving the $1,000 cash award, Hensley will be the guest of the Southern Association of Ice Cream Manufacturers at its 1957 convention. The convention will be held late in the year in Florida.

This is the sixth year the research fellowship has been offered and Hensley is the third University of Missouri student to win the award.

PAUL K. GIRTON NAMED NADEM HEAD, GORDON A. HOURAN VICE-PRESIDENT, AT 11TH ANNUAL MEETING OF GROUP

Paul K. Girton, Girton Manufacturing Co., was elected President of the Board of Directors of National Association of Dairy Equipment Manufacturers, as NADEM brought to a close its Eleventh Annual Meeting, April 28 to May 2nd, at the Hollywood Beach Hotel, Hollywood, Florida. Gordon A. Houran, The DeLaval Separator Company was elected Vice-President.

Mr. Girton succeeds D. H. Burrell, III retiring President of NADEM and Vice-President of Cherry-Burrell Corporation who presided during all sessions.

At the Annual Business Meeting on Wednesday, May 1st, Mr. Noland of Mojonnier Brothers Company, Chicago, Illinois and Mr. James Brazee of Creamery Package Manufacturing Company, Chicago, were elected as members of the Board of Directors. Other members of the Board of Directors are Emil Howe, Waukesha Foundry Company, Waukesha, Wisconsin and Geo. Huffman of the Ex-Cell-O Corporation, Detroit, Michigan.

H. J. KERR APPOINTED DIRECTOR OF BRANCH OPERATIONS FOR CREAMERY PACKAGE

Harold J. Kerr has been advanced to Director of Branch Operations of The Creamery Package Mfg. Company, Chicago, manufacturers of food processing and refrigeration machinery, it was announced by J. L. Brazee, vice-president of the firm.

Mr. Kerr joined Creamery Package in 1930 following graduation from Michigan State University with a degree in Engineering. He served as sales engineer, Director of War Projects, Chicago Branch Manager and at the time of his promotion was Director of Machinery Sales.

Mr. Keer is married, has a daughter, and resides in Elmwood Park, Illinois.

QUARTERLY MEETING DEL-MAR-VA MILK AND FOOD SANITARIANS ASSOCIATION

Second quarterly meeting of the Del-Mar-Va Milk and Food Sanitarians Association was held at the Wagon Wheel in Smyrna, Deleware, Wednesday, June 5, 1957.

The meeting was attended by 31 persons from the states of Deleware, Maryland, Virginia and Pennsylvania.

Guest speaker, Mr. Ivan Parkin, Pennsylvania Dairy Extension Department.

Slides of Mr. Parkin's recent tour of Columbia, South America were shown.

Installation and C. I. P. of pipe lines was discussed along with slides of model installations.

100TH ANNIVERSARY OF CONDENSED MILK CELEBRATED AT TORRINGTON, CONN.

On May 23, 1957, the dairy interests in Connecticut cooperated in a "Dairy Centennial" marking the site in Burrville State Park where Gail Borden first condensed milk commercially by the "vacuum method". Theodore S. Gold, Assistant to the Secretary of Agriculture was toastmaster at a Dairy Breakfast, and Mr. Bryan Blaelock of Texas was the principai speaker.

A parade, a milking contest, and the unveiling of a bronze plaque on the site of the first milk condensory were the highlights of the centennial program."

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MILK SANITARIAN

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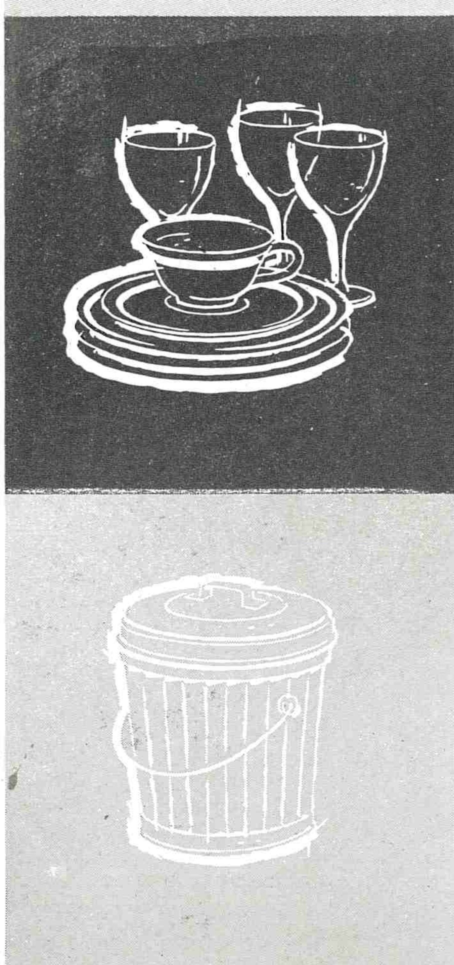

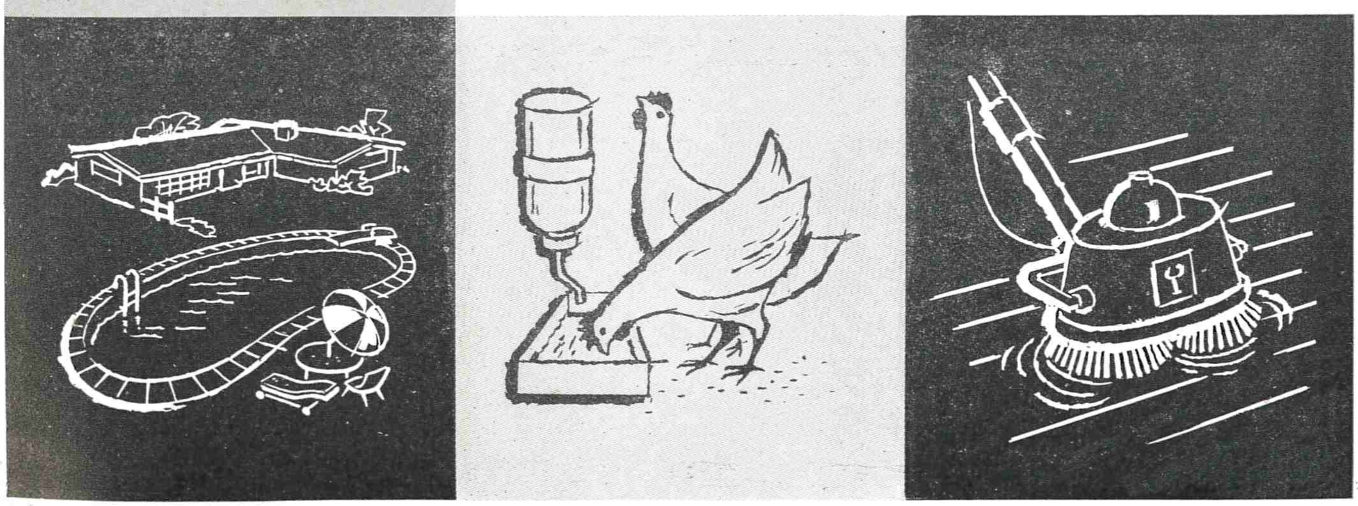

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