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Journal of

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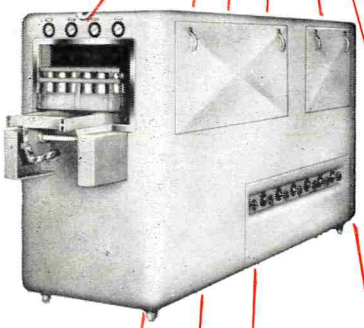

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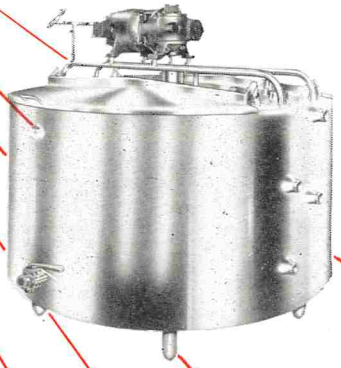

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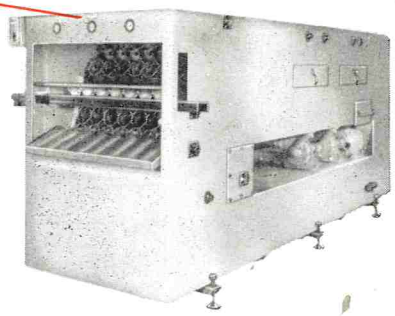

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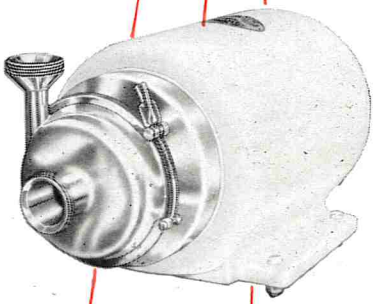

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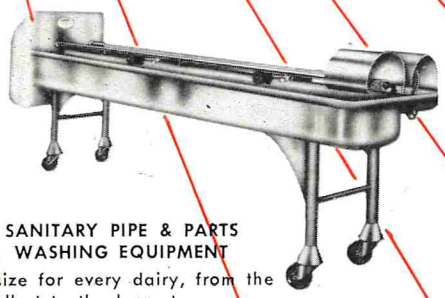

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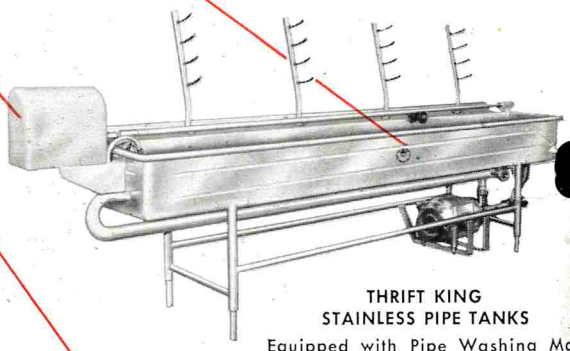

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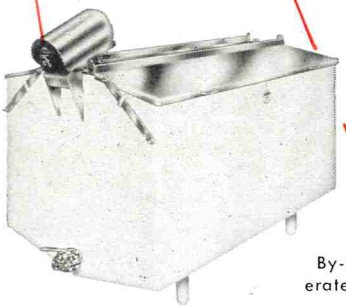

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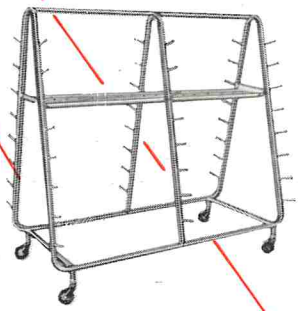

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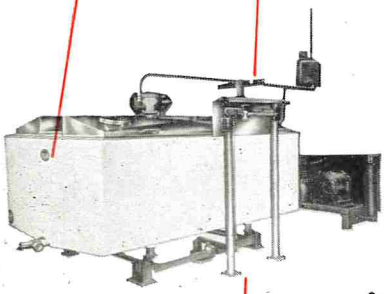

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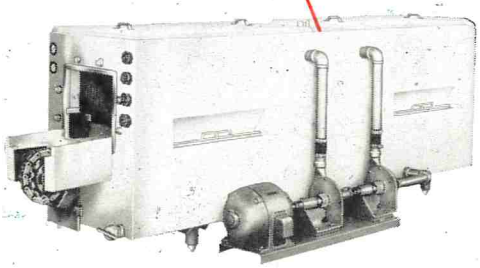

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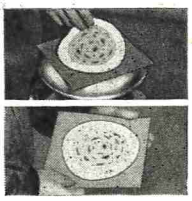

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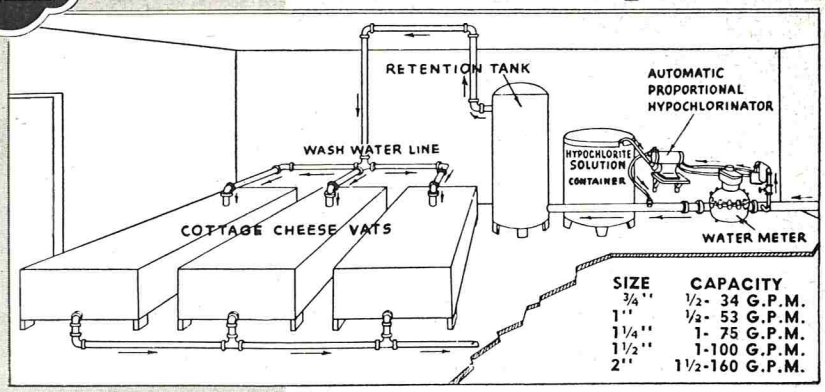

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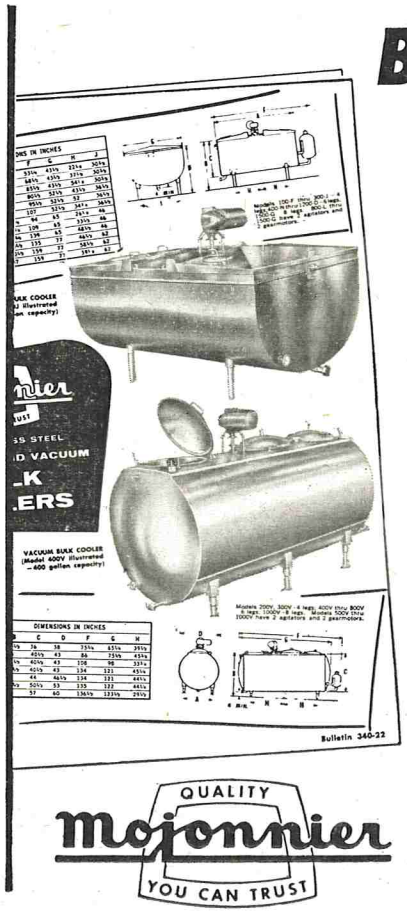

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THERMAL RESISTANCE OF FOOD POISONING ORGANISMS IN POULTRY STUFFING[1]

R. C. Webster and W. B. Esselen

Department of Food Technology,
University of Massachusetts,
Amherst

(Received for Publication February 4, 1956)

Thermal death times of food poisoning types of organisms as represented by Salmonella enteritidis, Micrococcus pyogenes **var.** aureus, **and** Streptococcus faecalis **in poultry stufing were investigated. The thermal destruction characteristics of these organisms are described in terms of z and F140 values.** Streptococcus faecalis **was considerably more heat resistant than the other two organisms studies. The data obtained indicate that roasting procedures for stuffed poultry, based on the attainment of a center stuffing temperature of 165°F., should be adequate to destroy such organisms if present in the stuffing.**

Roast poultry and poultry stuffing have been frequently implicated in food poisoning outbreaks. In view of the role of poultry in such food poisoning outbreaks, the present investigation was conducted to obtain data on the thermal death time characteristics of certain food poisoning bacteria in poultry stuffing.

Studies on roasting times and temperatures required to kill food poisoning organisms added to the stuffing of turkeys have been reported by Castellani *et al.* (2). They concluded that a temperature of 165°F. reached in the center of the stuffing during the roasting period appears sufficient to kill streptococci, staphylococci, and salmonellae and to allow a modest margin of safety. It was also observed that an active bacterial multiplication occurs during the earlier phases of the roasting process. This period of microbial growth was longer in the larger birds where the rate of heat penetration into the stuffing is slower.

In the present investigation the thermal destruction characteristics of one strain each of staphylococci, streptococci and salmonella were determined in poultry stuffing in thermal death time tubes at several temperatures in the range of 125° to 150°F.

Poultry Stuffing:

Samples of stuffing were removed from frozen stuffed turkeys packed by four different commercial plants engaged in the preparation of this product. The ingredients of these poultry stuffings included bread, water, celery, shortening, onions, and in some cases, seasonings and giblets. A typical analysis of such poultry stuffing as given by Esselen and Levine (3) is as follows:

Constituent	*Per Cent*
Moisture	44.9
Protein (N x 6.25)	7.6
Fat (ether extract)	18.4
Extract matter (carbohydrate)	26.2
Ash	2.5

Preparation of Poultry Stuffing Substrate:

To facilitate handling during thermal death time tests the poultry stuffing was diluted with distilled water and sterilized. One part by weight of stuffing to four parts distilled water were mixed in a Waring Blender for five minutes. Fifty-ml. portions of the diluted stuffing in 125-ml. Erlenmeyer flasks plugged with cotton and containing 15 glass beads were sterilized in an autoclave for 15 minutes at 15 pounds steam pressure. The pH values of the poultry stuffing substrate ranged from 5.9 to 6.1.

Mr. Robert C. Webster received the B.S. degree in food technology at the University of Massachusetts in June 1952. After serving in the United States Navy for two years he returned to the University of Massachusetts for graduate study. He received the M.S. degree in food technology in June 1955. He is presently employed as a food technologist in the Research Division of the Continental Can Company, Chicago, Illinois.

[1]Contribution No. 1035 University of Massachusetts, College of Agriculture Experiment Station, Amherst, Mass.

TABLE 1 — THERMAL DESTRUCTION OF *Salmonella enteritidis*, *Micrococcus pyogenes* VAR. *aureus*, AND *Streptococcus faecalis* IN POULTRY STUFFING

125°F.		130°F.		135°F.		140°F.		145°F.		150°F.	
Time (min.)	Organisms per ml.	Time (min.)	Organisms per ml.	Time (min.)	Organisms per ml.	Time (min.)	Organisms per ml.	Time (min.)	Organisms per ml.	Time (min.)	Organisms per ml.
					Salmonella enteritidis						
....	.....	0	26,500	0	42,500	0	39,000	0	45,500	..	.....
....	.....	5	6,950	2	14,250	1	12,450	1	10,400	..	.....
....	.....	10	2,425	4	7,675	2	5,250	2	2,900	..	.....
....	.....	15	1,212	6	1,742	3	1,840	3	955	..	.....
....	.....	20	670	8	400	4	1,025	4	290	..	.....
....	.....	25	115	10	232	0	360	5	125	..	.....
....	.....	....	.....	....	.....	6	205	....	.....	..	.....
					Micrococcus pyogenes var. *aureus*						
0	106,500	0	124,000	0	120,500	0	143,000	....	.....	..	.....
10	65,750	5	20,170	3	24,400	2	19,750	....	.....	..	.....
20	21,900	10	7,100	6	9,625	4	1,490	....	.....	..	.....
30	9,900	15	2,830	9	2,050	6	350	....	.....	..	.....
40	7,675	20	730	12	252	8	42	....	.....	..	.....
50	3,975	25	172	15	120	....	.....	....	.....	..	.....
60	1,335	....	.....	....	.....	....	.....	....	.....	..	.....
					Streptococcus faecalis						
....	.....	0	22,500	0	65,000	0	52,000	0	55,500	0	46,000
....	.....	5	18,450	5	46,250	4	27,250	2	30,500	1	22,175
....	.....	10	15,350	10	43,000	8	16,525	4	8,500	2	9,975
....	.....	15	13,250	15	33,750	12	6,950	6	3,550	3	5,125
....	.....	20	10,825	20	28,000	16	1,280	8	1,850	4	3,350
....	.....	25	9,550	25	22,825	20	680	10	650	5	1,740
....	.....	30	8,550	30	18,750	24	180	12	210	6	862
				35	15,575	28	80	14	90	7	419
				40	11,375	32	35	....	.....	8	172
				45	7,850	....	.....	....	.....	9	62
				50	3,040	....	.....	....	.....	..	.....
				55	1,332	....	.....	....	.....	..	.....

Organisms:

A strain of *Salmonella enteritidis* (from the Department of Bacteriology, University of Massachusetts) and *Micrococcus pyogenes* var. *aureus* 9664 and *Streptococcus faecalis* 7080 (from American Type Culture Collection) were used as test organisms. The former was grown on nutrient agar (Difco) slants at 98.6°F., and the latter two organisms were cultured on tryptose agar (Difco) at 98.6°F. Inocula of these organisms were prepared from 24-hour agar slant cultures. Two slants each were washed with two five-ml. portions of sterile physiological saline. The cell suspensions were diluted to the desired approximate cell concentrations on a basis of turbidity readings. The suspensions were diluted so that 1 to 2 ml., when added to 50 ml. of sterile poultry stuffing substrate, gave a cell concentration of 50,000 to 100,000 per ml. The substrate was then shaken 200 times to distribute the inoculum. The inoculated substrates were held under refrigeration until filled into thermal death time tubes.

Thermal Destruction Rate Tests:

Two ml. portions of the inoculated poultry stuffing substrate were filled into sterile thermal death time tubes (Pyrex glass tubes 7 mm. inside diameter and 150 mm. in length) by means of a sterile pipette. The tubes were then flamed and sealed with sterile cotton plugs. They were kept in an ice water bath prior to being heated. The tubes were heated in an electrically heated constant temperature water bath controlled to within ± 0.5°F. by means of a thermoregulator. For heating, the tubes were placed in copper racks that accommodated six tubes each. A wire handle was attached to the rack allowing immersion to within one inch of the top of the tube. Two tubes of substrate were heated for each time and temperature interval per run. A minimum of five time intervals was used at each temperature, and a minimum of four temperatures (in the range of 125° to 150°F.) was used in the determination of thermal destruction rate characteristics. The heating times were corrected for a pre-

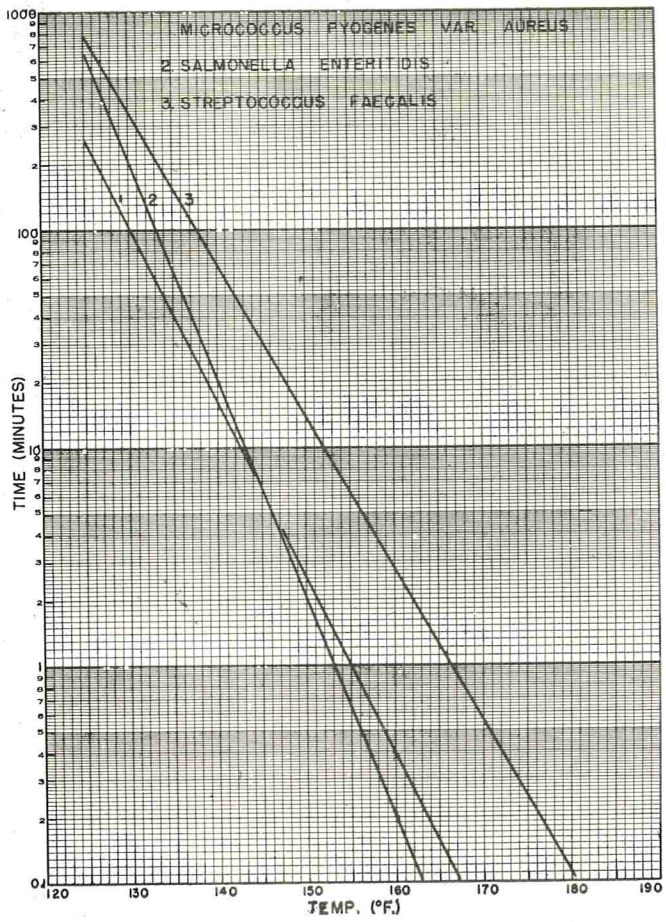

FIGURE 1: Thermal death times curves of *Micrococcus pyogenes* var. *aureus*, *Salmonella enteritidis*, and *Streptococcus faecalis* in poultry stuffing.

viously determined heating lag correction factor of 1.4 minutes. The thermal death time tubes were immersed in the water bath for specified times after which they were removed and immediately placed in ice water to cool. The contents of the tubes were then diluted and plated out in appropriate media to determine the number of surviving organisms.

Subculturing Heated Poultry Stuffing:

One ml. portions of heated substrates were transferred to sterile dilution bottles containing distilled water. Decimal dilutions were made and plated in duplicate on the following media:

Salmonella enteritidis on trypticase soy agar[2]

Micrococcus pyogenes var. *aureus* on tryptose phosphate agar (Difco)

Streptococcus faecalis on trypticase soy agar

The plates were incubated at 98.6°F. for 48 hours and counted. The initial number of organisms in the inoculated stuffing prior to heating in the thermal death time tubes was determined by plating unheated controls.

Definition of Terms:

The observed thermal resistance characteristics of the organisms studied are described according to the concepts of Ball (1) and Stumbo (5), and are designated by the following terms:

F_{140} = A symbol that represents the number of minutes required at 140°F., assuming instantaneous heating and cooling, to reduce the number of microorganisms of a given species, present in a given quantity of substrate, to a given level.

z = The slope of the thermal death time curve expressed as the number of degrees Fahrenheit on the temperature scale traversed by the curve in passing through one logarithmic cycle on the time scale.

D = The time in minutes at a given temperature required to reduce the original bacterial population by 90%, assuming instantaneous heating and cooling.

RESULTS AND DISCUSSION

The results of the thermal destruction rate tests with *Salmonella enteritidis*, *Micrococcus pyogenes* var. *aureus*, and *Streptococcus faecalis* in poultry stuffing are summarized in Table 1. The data obtained are grouped together inasmuch as little or no difference in thermal destruction rates for the three test organisms in the four different kinds of commercial poultry stuffing studied was observed. These data were plotted on semilogarithmic paper to obtain thermal destruction rate curves and their corresponding D values time for 90 per cent destruction) at the different temperatures used. The curves so obtained followed a straight line in most cases. In order to obtain thermal death time curves the D values for different temperatures were plotted against time on semilogarithmic paper. The slope or z value of the thermal death time curves could then be obtained. The thermal death time characteristics of the test organisms are expressed in terms of F_{140}, F_{150}, F_{160}, F_{165} and z values as shown in Table 2. The F_{140} value refers to the destruction time at 140°F. The F values were taken as the time required to

TABLE 2 — THERMAL DEATH TIME CHARACTERISTICS OF *Salmonella enteritidis*, *Micrococcus Pyogenes* VAR. *aureus*, AND *Streptococcus Faecalis* IN POULTRY STUFFING.

Organism	z	F140	F150	F160	F165
Salmonella cnteritidis	10.1	19.25	1.95	0.20	.....
Micrococcus pyogenes var. *aureus*	12.3	15.4	2.45	0.38	0.15
Streptococcus faecalis	14.2	67.2	13.5	2.68	1.20

[2]Tryptiscase soy broth (Baltimore Biological Laboratories) plus 1.5% agar.

achieve 99.99999% destruction or seven times D (time for 90% destruction at a given temperature). Corresponding F_{165} values (time for 99.99999% destruction of organisms at 165°F.) are also shown in Table 2 in view of the observations of Castellani *et al.* (2) that a temperature of 165°F. reached in the center of the stuffing during the roasting period appears sufficient to kill streptococci, staphylococci, and salmonellae and to allow a modest margin of safety. Thermal death time curves for these three organisms in poultry stuffing are presented in Figure 1.

The thermal destruction rates of the three organisms studied indicated a logarithmic order of death. The only notable deviations from straight line destruction rate curves were found with *Streptococcus faecalis* at the lower temperatures. The z values obtained were slightly higher than the value of 9 as given by Gross and Vinton (4)and others, for nonsporeforming bacteria. *Streptococcus faecalis* exhibited a considerably higher degree of heat resistance than the Micrococcus and Salmonella.

The recommendations of Castellani *et al.* (2) that a temperature of 165°F. be reached in the center of the stuffing of poultry during the roasting period would appear to be adequate to destroy food poisoning organisms of the heat resistance observed in the present investigation even if they were present in large numbers.

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SOME OBSERVATIONS ON THE EFFECT OF SEVERAL ORGANIC AND INORGANIC ACIDS IN INHIBITING THE HEAT PRECIPITATION OF CALCIUM HARDNESS SALTS FROM WATER[1]

D. A. Evans and G. H. Watrous, Jr.
Department of Dairy Science,
The Pennsylvania State University,
University Park

(Received for publication February 15, 1956)

A study of acidification of hard water with various organic and inorganic acids to prevent water hardness from precipitating due to heating indicates that a reaction of pH 5 will, in general, essentially prevent such precipitation under the conditions of this investigation. While all of the acids investigated were quite satisfactory, it would appear that gluconic acid would be most satisfactory to employ, inasmuch as it is highly efficient in preventing waterstone deposits, and also at use concentration it appears to have no corrosive effect on 18-8 type 302 stainless steel.

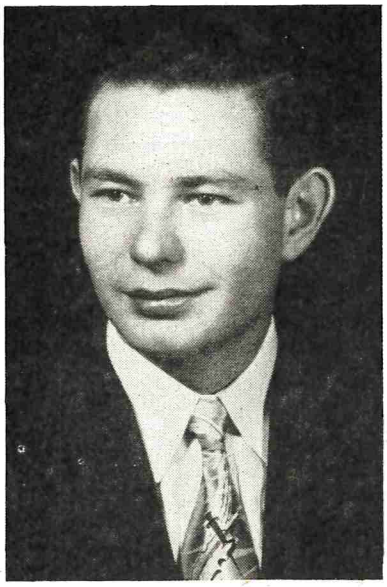
The problem of waterstone deposits when hot water sanitation of dairy equipment is required or practiced is both costly and troublesome. These deposits, for the most part, result when the temporary water hardness salts of calcium and magnesium bicarbonate are converted by heating to insoluble salts of calcium and magnesium which precipitate from solution, forming a typical greyish white film on the surfaces of equipment.

The proper control of waterstone films is of significance from an economical and sanitation standpoint since it is recognized that such films enhance the formation of milkstone deposits, and often are correlated with thermoduric problems.

Of the methods utilized for controlling waterstone films, the most effective is water softening. While several processes are available for water softening, insofar as this investigation is concerned attention was directed to acidification of water as a means of preventing waterstone formations.

The use of acids to prevent heat precipitation of temporary water hardness long has been recognized to be effective. Klenzade Products Inc. (2) state that a reaction of pH 5.0 to 5.4 in the final rinse section of milk can washers is effective in preventing waterstone deposition. Baylis (1), in working on a problem concerned with corrosion in water mains, concluded there was an inverse relationship between the solubility of calcium and magnesium water hardness salts and pH, in that as pH was decreased the solubility of these salts was increased. Longlier (3), devised a formula for calculating the pH at which the solubility of the hardness concentration of any water would be in equilibrium with the water. A pH value below the calculated value would indicate complete solubility of the hardness while a pH value above the calculated value would indicate a partial solubility and a tendency for waterstone deposition.

While the use of acids to inhibit the heat precipitation of temporary water hardness is recognized as being possible, specific data is lacking on the critical levels of various organic and inorganic acids needed to prevent heat precipitation from waters of varying degrees of hardness, heated to temperatures usual in dairy plant sanitizing procedures. The purpose of this investigation, therefore, was to determine the effectiveness and critical levels of various organic and inorganic acids necessary to prevent the heat precipitation of temporary hardness from waters of varying degrees of hardness, and to determine what corrosive effects, if any, the various acids at use concentration might have on type 302, 18-8 stainless steel.



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[1]Authorized for publication as paper No. 2038 in the Journal Series of the Pennsylvania Agricultural Experiment Station.

PROCEDURE

The investigation was divided into two separate studies. The first part had as its purpose observations of the effect of acidifying water with various acids in inhibiting the heat precipitation of calcium hardness salts. The second study was concerned with the corrosive effects of the acids investigated.

Since various temperatures are employed when hot water sterilization is used, and since the temperatures used might reasonably be expected to be a factor in the formation of waterstone, the data to be presented represent the effect of holding water of varying hardness levels at 180°F. for 10 minutes as well as at 165°F. for 10 minutes. The acids used for acidification included hydrochloric, phosphoric, acetic, hydroxyacetic, gluconic and levulinic.

TABLE 1 — PERCENTAGE OF ORIGINAL CALCIUM REMAINING IN WATER SOLUTIONS SUBSEQUENT TO ACIDIFICATION AND HEATING TO 180°F. AND HOLDING FOR 10 MINUTES

	Unacidified				pH 6				pH 5				pH 4				pH 3			
Grains/gal. hardness —	20	15	10	5	20	15	10	5	20	15	10	5	20	15	10	5	20	15	10	5
Acid Used																				
	43.7	62.0	77.0	89.0																
Hydrochloric	......	......	......	......	74.8	76.1	91.7	96.1	88 2	88.2	98.8	98.8	89.0	88.4	94.1	98.8	88.2	90.0	95.1	98.8
Phosphoric	......	......	......	......	74.8	78.2	98.8	93.1	88.8.	89.0	98.5	97.7	90.0	89.3	95.5	98.6	89.0	88.6	95.0	98.8
Acetic	......	......	......	......	60.0	70.3	92.3	84.6	74.8.	71.9	93.4	94.4	72.3	72.3	92.0	94.2	74.6	71.4	91.7	94.2
Hydroxyacetic	......	......	......	......	75.6	84.4	95.0	91.9	90.6	91.3	98.4	99.0	90.0	91.2	98.0	99.0	90.8	93.6	98.0	99.0
Gluconic	......	......	......	......	82.6	83.1	99.0	95.4	93.3	93.6	98.9	98.7	93.3	93.3	98.8	98.8	93.6	94.2	98.9	99.0
Levulinic	......	......	......	......	81.9	82.5	98.7	99.0	93.8	94.0	99.0	98.8	93.6	94.3	99.0	99.0	94.0	94.3	99.0	99.0

TABLE 2 — PERCENTAGE OF ORIGINAL CALCIUM REMAINING IN WATER SOLUTIONS SUBSEQUENT TO ACIDIFICATION AND HEATING TO 165°F. AND HOLDING FOR 10 MINUTES

	Unacidified				pH 6				pH 5				pH 4				pH 3			
Grains/gal. hardness —	20	15	10	5	20	15	10	5	20	15	10	5	20	15	10	5	20	15	10	5
Acid Used																				
	44.6	65.0	78.8	90.5																
Hydrochloric	......	......	......	......	75.6	87.2	88.2	97.1	90.0	93.5	99.0	98.8	90.0	93.5	98.8	98.8	90.4	93.5	98.6	98.8
Phosphoric	......	......	......	......	76.2	86.0	93.4	94.1	90.6	96.9	98.0	98.7	91.3	96.9	98.8	98.8	92.0	96.9	98.8	98.8
Acetic	......	......	......	......	78.1	88.8	85.0	85.6	75.1	91.3	98.0	98.0	72.3	90.6	98.0	98.2	69.8	90.7	98.0	98.2
Hydroxyacetic	......	......	......	......	80.9	91.8	93.0	92.0	92.5	98.8	99.0	99.0	93.1	99.0	98.8	99.0	92.0	99.0	99.0	99.0
Gluconic	......	......	......	......	87.0	97.8	98.6	98.2	95.1	99.0	98.8	99.0	95.1	99.0	98.4	99.0	96.0	99.0	98.8	99.0
Levulinic	......	......	......	......	87.0	96.7	98.5	98.4	95.0	98.8	99.0	98.8	95.0	98.6	99.0	99.0	95.2	98.8	99.0	98.8

TABLE 3 — MILLIGRAMS PER GRAM GAIN OR LOSS IN WEIGHT FOR EACH STRIP OF TYPE 302, 18-8 STAINLESS STEEL AFTER IMMERSION FOR 24 OR 48 HOURS

	pH 6		pH 5		pH 4		pH 3	
Hours Immersion	24	48	24	48	24	48	24	48
Acid								
Hydrochloric	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.13
Phosphoric	0.00	0.00	0.00	0.00	0.00	+0.01	+0.031	+0.093
Acetic	0.00	0.00	0.00	0.00	0.00	0.00	−0.064	0.00
Hydroxyacetic	0.00	0.00	0.00	0.00	0.00	0.00	−0.085	0.00
Gluconic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Levulinic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The water used in this study was naturally hard water, having 20 grains per gallon calcium hardness as determined by the Hagan modification of the Schwartzenbach hardness titration method (4).

Stock waters were prepared containing concentrations of 5, 10 and 15 grains per gallon natural calcium hardness by dilution of the original hard water with distilled water. In each trial separate 250-ml. samples of water at each hardness level were adjusted to reactions, at 25°C., of pH 3, 4, 5 and 6 with each of the six acids. After acidification the water samples were heated to 180°F. in one series, and to 165°F. in another series and held for 10 minutes. Following heating, each sample was immediately filtered through a cintered glass gooch crucible to remove any heat precipitated hardness salts.

Immediately after filtration, 100 ml. aliquots of the filtrates were neutralized with 10 per cent ammonium hydroxide, and 10 ml. of a 10 per cent oxalic acid solution added to precipitate the calcium in solution as the oxalate. After settling for five hours the solutions were filtered through previously dried and weighed cintered glass gooch crucibles. The retained precipitate and crucibles were then dried in a 100°C. vacuum oven for 30 minutes. After cooling, the weight of calcium oxalate was obtained. From the weight of calcium oxalate obtained, the weight of calcium remaining in the acidified, heated water samples was determined. This was considered to be the weight of non-heat precipitated calcium. Based on the original amount of calcium present in the various samples, the percentage of calcium which did not precipitate because of acidification, was determined.

In assessing the corrosive effects of the various acids, strips of type 302, 18-8 stainless steel measuring one half by two inches were suspended from glass rods into 100-ml. beakers containing 90 ml. of acidified distilled water solutions. The acidified test solutions were prepared by adjusting samples of distilled water at room temperature to reactions of pH 3, 4, 5, and 6 with each of the six acids investigated. Prior to immersion each strip was thoroughly washed, rinsed, dried in a 100° C. vacuum oven for 30 minutes and, after cooling, the weight of each strip was determined.

Following immersion of the strips in each test solution, the solutions were heated to 180° F. in a water bath and held for periods of 24 and 48 hours. At the end of these intervals strips were removed, rewashed, dried as before and reweighed. The loss or gain in weight of each strip, if any, was obtained and results were expressed as the milligrams per gram gain or loss in weight.

RESULTS AND DISCUSSION

Table 1 shows the relative effect of each of the six acids in inhibiting the heat precipitation of calcium hardness from water heated to 180° F. and held for 10 minutes. The data represent the percentage or original calcium remaining in solution subsequent to acidification and heating.

The data show several interesting facts. The unacidified or normal hard water reacted to heating as might be expected in that the precipitation of calcium hardness due to heating is roughly proportional to the original water hardness. In general, the trend appears to show that acidification with each of the acids to pH 6 or pH 5 prevented heat precipitation of the water hardness to a degree dependent on the hardness of the water, the waters of lower hardness levels showing less heat precipitation than progressively harder water samples. While samples acidified to pH 5 indicate less heat precipitation of the hardness than was true at pH 6, reducing the reaction below pH 5 with any of the acids had little, if any, additional value in this respect.

Of the six acids employed, gluconic and levulinic appear, in general, to be more effective than hydrochloric, phosphoric, acetic or hydroxyacetic acids in inhibiting calcium precipitation at all concentrations of calcium hardness studied. It will be observed, however, that the effectiveness of each acid increased somewhat as the concentration of hardness was reduced.

Table 2 shows the relative effect of each of the six acids in inhibiting the heat precipitation of calcium hardness from water heated to 165° F. and held for 10 minutes. The data indicate the same general

trends as were observed in Table 1; namely, the precipitation of calcium hardness due to heating is roughly proportional to the original water hardness and degree of acidification. Reducing the reaction below pH 5 again had no added advantage and again gluconic and levulinic acids were more effective than the other acids, especially in water of less than 15 grains hardness, where for all practical purposes precipitation was essentially prevented.

In comparing Table 1 with Table 2 it will be observed that the higher temperature induced more precipitation of the calcium hardness, as might be expected.

Table 3 presents the gain or loss in weight in milligrams per gram for each strip of stainless steel after immersion in the acidified test solutions for 24 or 48 hours at 180° F. The data indicate the several acids used were not measurably corrosive to the steel studied at a reaction as low as pH 4, under the conditions of this trial. At pH 3 at the end of either 24 or 48 hours some evidence of corrosion became apparent. The most corrosive acid in this respect appeared to be hydrochloric. The two most effective acids from the standpoint of sequestering efficiency did not show any measurable corrosive effects on the stainless steel used at any of the acid concentration levels studied.

Discussion

The sequestration of calcium water hardness by acidification of the water is postulated on the decomposition of calcium bicarbonate by the particular acid used through the following reaction:

$$[Ca\ (HCO_3)_2]n + [2HY]n \rightarrow [CaY_2]n + [2H_2O]n + [2CO_2]n$$

This reaction in effect appears to be nothing more than a neutralization reaction between a weak base and a stronger acid resulting in the formation of a heat soluble salt of calcium. If, as thought, neutralization is the major factor, pH as such, is of less consideration than the total acid hydrogen available for neutralization. Since pH is a measure of hydrogen ion concentration and not total hydrogen, the quantity of a particular acid to achieve a given pH would be dependent on its ionization at any given temperature. In this respect, more of either gluconic or levulinic acid was required to adjust the reaction to pH 5 than was true with the more highly ionized acids. It is possible, therefore, that the apparent advantage of gluconic or levulinic acid over the other acids might be due to the fact that neutralization was not only achieved, but also on heating additional hydrogen was available to maintain an acidic solution in which the calcium salts formed would be relatively soluble.

Coupled with this are many other factors, including the total calcium hardness, the time-temperature relationships to which the samples were heated, the boiling points of the acids used, and the solubility of the calcium salts formed.

The results of the corrosion study are significant in that the acids investigated were found to be relatively non-corrosive to type 302, 18-8 stainless steel at the concentrations needed to inhibit waterstone deposition. However, it is felt that gluconic acid would be the most practical to use inasmuch as it is readily available, inexpensive to use at the concentrations required, and very active in inhibiting heat precipitation of calcium water hardness. Furthermore, it does not cause measurable corrosion, and of practical significance, it is safe for employees to use.

Summary

The results of this investigation show that with water not exceeding 20 grains per gallon calcium hardness, acidifying to a reaction of pH 5 with gluconic or levulinic acid essentially will prevent waterstone deposition. However, pH, as such, does not appear to be the major factor for determining the critical level of acid required; rather, it appears that the total acid hydrogen available is more important in this respect.

The acids studied were found to cause negligible corrosion of type 302, 18-8 stainless steel at levels necessary for sequestration. However, it is felt that acidifying water to inhibit waterstone deposition should be used with caution if equipment is fabricated from less resistant metals, inasmuch as corrosion resistance of other metals or alloys was not studied.

The practical value of this investigation is that in those areas where hot water sanitation is used, a method of controlling waterstone deposits is available with savings of time and money resulting, as well as possibly less difficulty due to thermoduric organisms thriving in the alkaline mixture which accumulates on dairy equipment.

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A CASE HISTORY OF A GRADE A MILK PRODUCER WHO WAS UNABLE TO MEET STATE REQUIREMENTS OF FREEZING POINT AND PERCENT SOLIDS NOT FAT

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Lactose is an important component of milk in that it affects both the freezing point and per cent S. N. F. of milk. Milk high in lactose invariably insures a low freezing point and a high lactometer reading. The per cent lactose in milk may be influenced by the ration fed to the cows.

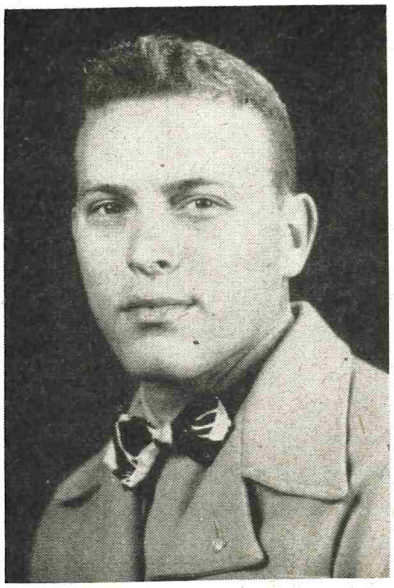
During the course of a study dealing with factors affecting the freezing point of milk it was learned that a Grade A milk producer (producer "H") in West Texas was having difficulty in meeting the legal state requirements as to freezing point and percent solids-not-fat (S.N.F. of 8%) in his milk.

The herd of producer "H" consisted mainly of grade cows which were crosses between the Jersey and Holstein breeds. The cows were slightly thin in flesh but were thrifty and in good health when first visited on February 20, 1955.

Approximately 80 percent of the animals had been in milk 8 months or longer. Average daily production per cow was 25 lb. of 3.5 per cent fat milk. A week prior to the first visit the herd had been changed abruptly from a ration of sorghum silage *ad lib*, limited alfalfa hay, and a 16 percent protein concentrate to a new ration consisting of 8 lb. of alfalfa hay, 8 lb. of alfalfa meal, 4 lb. of cottonseed meal and 8 lb. of the former concentrate, with no silage. This ration was rather high in protein and low in digestible carbohydrate content (1). No mineral supplement was provided.

Within five days after the change in ration the mixed herd milk was found to have a freezing point of -0.535° C., and a calculated S.N.F. content of 7.8 per cent, which was 0.2 percent below Texas Grade A milk requirements. The producer lost his permit on suspicion of delivering watered milk.

Two days later individual milk samples were collected from each of the 31 cows in quart glass milk bottles. The bottles had been rinsed previously with low conductivity glass-distilled water and allowed to dry. The samples were packed in ice and transported to the College laboratory for analysis of freezing point, percent lactose and conductivity in a manner described elsewhere (2). Table 1 shows the data obtained.



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None of the milk samples had a freezing point as low as -0.550°C. and only 12 of the 31 samples had freezing points below the tolerance level of -.5335°C. A large portion of the milks were low in lactose. Conductivity values varied inversely to the percent lactose. This relationship had been observed previously (2).

In order to improve the composition of the herd milk, producer "H" modified the feed ration on February 21. The new ration consisted of 16 lb. alfalfa hay, 6 lb. of 16 percent protein concentrate, 4 lb. dried citrus pulp, 3 lb. molasses and free choice of bone meal and common salt. On the second visit on March 6 the freezing point of the mixed herd milk was found to have decreased to -0.540° C. and the calculated

TABLE 1 — DATA OBTAINED DURING THE FIRST VISIT TO PRODUCER "H" ON 2-20-55; MILK SAMPLES ARRANGED IN ORDER OF ASCENDING FREEZING POINT.

Cow number	Freezing point 0°C.	Per cent lactose	Conductivity at 37°C. mhos./cm. 10-4
1[a]	—.549	4.60	60.6
2[b]	—.544	4.85	57.2
3[c]	—.541	4.80	60.6
4	—.538	4.60	57.2
5	—.537	4.80	60.6
6	—.537	4.70	57.8
7[d]	—.537	4.10	70.6
8	—.536	4.60	62.8
9	—.536	4.35	64.4
10	—.535	4.10	67.8
11	—.534	4.20	63.6
12	—.534	4.15	65.0
13	—.533	4.40	60.0
14	—.532	4.50	60.6
15	—.532	4.10	65.0
16	—.532	4.10	65.0
17[e]	—.531	4.85	53.0
18	—.531	4.45	61.4
19	—.530	4.75	62.0
20	—.528	4.45	62.8
21	—.527	4.00	69.6
22	—.526	4.45	60.0
23	—.526	4.30	66.0
24	—.523	4.75	60.6
25	—.523	4.65	57.2
26	—.523	4.25	66.0
27	—.522	4.00	62.0
28	—.521	4.50	56.4
29	—.521	4.45	60.0
30	—.518	4.25	62.8
31	—.517	4.45	62.0
Average	—.531	4.44	62.3

[a]Guernsey cow producing 8 lb./day
[b]Jersey cow producing 10 lb./day
[c]Purebred Holstein, fresh, producing 80 lb./day
[d]Clinical mastitis in two quarters
[e]Jersey cow in 13th month of lactation

S.N.F. content to have increased to 8.2 percent. At the same time the production of the herd had increased by an average of 5 lb. per cow per day.

During the second visit milk samples of individual cows were screened by the lactometer test, and the five milk samples showing the lowest readings were saved and taken to the College laboratory for further analysis.

A week later on March 13 a third visit was made. The cows had been grazing for five days on a very young oat pasture. Alfalfa hay and concentrates were fed as at the second visit, but were eaten sparingly. Molasses had been omitted from the ration to lessen scouring. The young oat pasture made up approximately 80 percent of the total feed intake.

An analysis of the mixed herd milk showed a freezing point of -0.534° C. and a calculated S.N.F. content of 8.0 percent. Individual samples of milk were collected from the same five cows selected during the second visit. Results of analysis on milk samples from these five cows obtained during the three visits are shown in Table 2.

The change in feeding ration after the first visit had brought about an improvement in freezing point of herd milk, as well as in percent lactose and conductivity of the individual cows examined. However, at the third visit the situation of the five selected cows was worse than on the first visit, although the herd at large showed a more favorable freezing point and percent S.N.F. than at the first visit.

While getting milk samples from herd "H" it was thought desirable to examine several more herds producing Grade A milk under prevailing drouth conditions within the same county. The collaboration of producers "D", "S" and "W" was obtained. The three herds were composed mainly of crosses between Holstein and Jersey breeds. The cows were in fair to good condition, producing milk under average management practices.

Herd "D" was producing an average of 25 lb. of milk per cow per day and on March 13 had a mixed herd milk containing 7.8 percent S.N.F. The ration of this herd had been changed recently by replacing the sorghum silage, fed *ad lib,* and limited alfalfa hay to alfalfa hay only. Feeding of a 16 percent protein concentrate and of mineral concentrates remained unchanged. While gradually changing from liberal silage to liberal hay the calculated percent S.N.F. in the milk, as observed by the milk plant, had shown an erratic but definite decline.

Herd "S" was fed only a limited amount of 20 percent protein concentrate besides grazing a rather poor, young oat pasture with no mineral supplement. This herd averaged 18 lb. of milk per cow per day. The mixed herd milk at the time of the visit contained 8.3 percent S.N.F. by calculation.

Herd "W" received sudan hay, *ad lib,* and a 16 percent protein concentrate with added minerals fed at the rate of 4 lb. per gallon of milk produced. The average milk production per cow was 22 lb. per day, and the calculated S.N.F. content of the mixed herd milk was 8.5 percent.

Individual samples of milk were collected from 110 animals comprising the three herds. The samples were screened by means of the lactometer and Babcock fat tests. The seven samples from each herd with the lowest calculated S.N.F. content were taken to the College laboratory for further examinations. The results obtained are shown in Table 3.

The average freezing points of the seven cows from herd "D" and "S" were similar and higher than that of herd "W". The cows from herd "W" had the high-

TABLE 2 — FREEZING POINTS, PER CENT LACTOSE AND CONDUCTIVITY VALUES OF MILK SAMPLES COLLECTED FROM FIVE COWS ON THREE VISITS TO PRODUCER "H".

Cow.	Freezing point in °C.			Per cent lactose			Cond. at 37°C., mhos./cm.10-4		
no.	2-20	3-6	3-13	2-20	3-6	3-13	2-20	3-6	3-13
11	—.534	—.535	—.525	4.20	4.30	3.80	63.6	65.7	66.8
12	—.534	—.536	—.530	4.15	4.20	3.90	65.0	67.8	61.2
16	—.532	—.531	—.530	4.10	4.30	3.70	65.0	67.8	65.2
21	—.527	—.529	—.526	4.0	4.35	3.95	69.6	66.4	63.6
23	—.526	—.541	—.536	4.30	4.50	4.00	66.0	67.8	63.6
Ave.[a]	—.531	—.534	—.529	4.15	4.33	3.87	65.7	67.1	64.1

[a]Average herd freezing point: 2-20: —.531°C.; 3-6: —.540°C.; 3-13: —.534°C.
Average herd S.N.F.: 2-20: 7.8%; 3-6: 8.2%; 3-13: 8.0%

TABLE 3 — A COMPARISON OF FREEZING POINTS, PER CENT LACTOSE AND CONDUCTIVITY OF MILK IN HERDS "D", "S" AND "W" SUBSISTING ON DIFFERENT RATIONS.

Cow	Freezing point in °C.			Per cent lactose			Cond. at 37°C., mhos./cm.10-4		
no.	"D"	"S"	"W"	"D"	"S"	"W"	"D"	"S"	"W"
1	—.542	—.539	—.553	4.30	4.60	4.75	72.8	66.8	56.6
2	—.535	—.539	—.553	4.30	4.35	4.75	65.2	60.6	58.4
3	—.535	—.534	—.551	4.20	4.50	4.70	70.8	58.4	62.3
4	—.534	—.532	—.548	4.25	4.60	4.70	65.2	59.2	58.4
5	—.527	—.529	—.548	4.60	4.30	4.70	58.8	63.6	59.8
6	—.527	—.528	—.548	4.50	4.55	4:70	62.0	60.6	62.0
7	—.524	—.523	—.547	4.35	4.80	4.70	62.8	54.0	58.4
Ave.	—.532	—.532	—.550	4.35	4.53	4.71	65.4	60.5	59.5

est percent lactose of the three herds, and showed the least variation in percent lactose from cow to cow. Animals in herd "D" and "S" differed greatly among themselves in percent lactose, with herd "S" having the higher percent lactose average of the two. Again, lowest lactose values were associated with highest conductivity values.

A month prior to the cases just described an experiment had been conducted at the College to study the effect of type of ration on the composition and freezing point of milk. Although the experiment involved only two cows, the data are presented for consideration.

Two Holstein cows, both four years old and in good physical condition with no previous record of mastitis, were selected for this study. Both cows were in the third month of lactation and produced about 35 lb. of milk per day. Prior to the onset of the experiment the cows were fed the regular herd ration consisting of 12 lb. of 16 percent protein concentrate, 10 lb. alfalfa hay and sorghum silage *ad lib.* Cow 177 was changed over to a high carbohydrate (54% digestible nitrogen-free extract), medium protein (14% digestible) ration which was fed *ad lib.* The ration of cow 199 was changed over four feedings to a low carbohydrate (44% digestible nitrogen-free extract), high protein (20% digestible) ration. The animals remained on the same ration for 12 days after which time the rations were reversed and the feeding continued for another 12 days. Samples of each cow's evening milk were taken daily throughout the feeding trial and examined for freezing point, percent lactose and conductivity. Table 4 shows the data obtained on freezing point and on percent lactose.

The data in Table 4 show that cow 199 while on the high carbohydrate ration had only one milk sample with a freezing point above -0.550° C. However, when fed the low carbohydrate ration, eight milk samples showed freezing points above -0.550° C. The results with cow 177 were similar in trend. Both cows showed averages of higher freezing points and lower percent lactose while on the low carbohydrate ration. Conductivity values, although not shown, varied inversely with the percent lactose in milk.

DISCUSSION

A perusal of the data shown in tables 1, 2 and 3 presents evidence of variation of freezing point, percent lactose and conductivity in milk from animal to animal within the same herd, and from herd to herd within the same area. It appears justifiable to attribute some of these variations to the type of ration fed (3).

Herds receiving rations containing low percentages of digestible carbohydrates and high percentages of protein and managed normally otherwise, produced milk with higher freezing points, lower percent lactose and higher conductivity than was the case when they received rations containing higher levels of digestible carbohydrates.

TABLE 4 — RESULTS OF A REVERSAL TRIAL INVOLVING TWO ANIMALS FED HIGH OR LOW CARBOHYDRATE RATIONS AND THE EFFECT UPON FREEZING POINT AND PER CENT LACTOSE IN MILK.

Day of trial	Cow 199		Cow 177	
	F.P. °C.	Per cent lactose	F.P. °C.	Per cent lactose
	High carbohydrate		Low carbohydrate	
1	–.548	4.85	–.541	4.65
2	–.550	4.85	–.550	4.70
3	–.554	4.80	–.553	4.75
4	–.554	4.90	–.555	4.90
5	–.558	5.00	–.555	4.80
6	–.558	5.00	–.543	4.60
7	–.556	4.95	–.527	4.40
8	–.556	4.90	–.545	4.60
9	–.550	4.85	–.541	4.45
10	–.552	4.85	–.540	4.50
11	–.557	4.80	–.546	4.60
12	–.554	4.80	–.552	4.60
Ave.	–.554	4.90	–.546	4.65
	Low carbohydrate		High carbohydrate	
1	–.546	4.75	–.555	4.80
2	–.552	4.85	–.545	4.75
3	–.546	4.85	–.547	4.75
4	–.558	5.00	–.552	4.85
5	–.548	4.80	–.547	4.85
6	–.552	4.75	–.543	4.90
7	–.551	4.75	–.547	4.80
8	–.545	4.70	–.547	4.80
9	–.545	4.80	–.549	4.80
10	–.544	4.85	–.548	4.65
11	–.547	4.85	–.554	4.75
12	–.548	4.85	–.547	4.75
Ave.	–.549	4.80	–.548	4.80

An examination as to the nutritive ration of the four individual producers' rations fed to the herd showed in some instances considerable deviation from the recommended standard of 1:7 to 1:9 (1). Herd "W" which was fed a ration with a calculated nutritive ration of 1:8 produced excellent results as regards the freezing point and percent lactose of milk.

SUMMARY

A case history is presented in which a producer was unable to meet state requirements for Grade A on account of composition of milk.

A modification in the feeding ration resulted in improvements in composition of milk.

Additional cases are reported showing different feeding rations and composition of milk obtained.

The data obtained indicates rather strongly that an abundance of digestible carbohydrates in the ration as well as a proper nutritive ratio are beneficial in decreasing freezing point of milk and in increasing the percent lactose.

ACKNOWLEDGEMENTS

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TESTING THE PERFORMANCE OF MILK LABORATORIES BY MEANS OF LIQUID SPLIT-SAMPLES[1]

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In recent years state laboratory agencies have shown greater interest in the accuracy of results of laboratories performing official quality tests of milk. Visits to laboratories for purposes of evaluation may be supplemented by use of split-samples shipped from the central laboratory twice each year. The details of a method for shipping liquid split-samples are described.

Liquid split-samples may be examined by procedures such as standard plate count, coliform plate count and the phosphatase test. A thermal sensitive organism proved to be useful in detecting laboratories using excessive incubation temperatures.

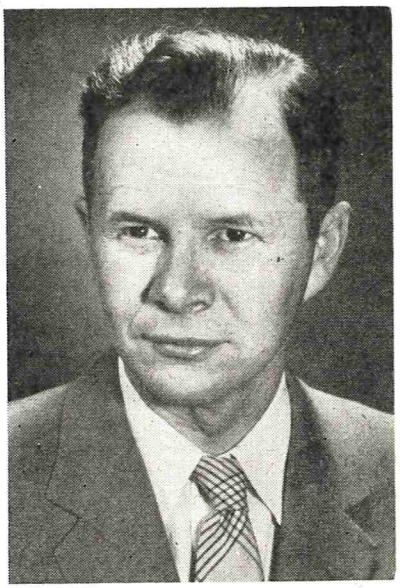
A nationwide survey of milk laboratories (2) commencing in September 1941 revealed a lack of uniformity of procedures used in making plate counts of milk. The Surgeon General of the Public Health Service in 1946 (4) and later the National Conference on Interstate Milk Shipments recommended state approval of milk laboratories performing official bacteriological tests of milk entering interstate commerce. It was recommended that at least annual visits be made to these laboratories for the purpose of evaluating techniques, equipment and quarters. An additional requirement was that approved laboratories check closely on split-samples at least twice each year.

Representative portions of samples must be received by the participating laboratories if the results are to be valid for comparison. All samples should be subjected to approximately the same conditions from the time they leave the control laboratory until they are examined by the participating laboratories.

Beck and Adams (2) have reported on a method of quick freezing of split-samples for shipment to laboratories. A comparison of the results of the control laboratory with the results of three participating laboratories indicated that a variation within 20 per cent would be obtained in 90 per cent of the samples tested. These were sterile skim milk samples to which known organisms were added before freezing.

The Maryland State Department of Health (3) also has described the use of frozen skim milk samples in their milk laboratory evaluations.

[1]Presented before a Joint Session of the Coordinating Committee on Laboratory Methods and the Laboratory Section of the American Public Health Association at the Eighty-third annual meeting in Kansas City, Mo., November 17, 1955.



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Methods

In Wisconsin where normally reliable overnight parcel post service is available from the Control Laboratory in Madison, the shipment of liquid split-samples has been found to be a satisfactory procedure. The outfit for shipping the samples consists of the following materials:

(a) Corrugated shipping carton measuring 11½″ x 6″ x 6″.

(b) Insulating material consisting of two layers of corrugated cardboard liners and two insulated "Jiffy" bags measuring 8½″ x 14¼″.

(c) Two cans containing ice, the smaller can (size No. 1) is for the purpose of refrigeration only and is sealed. The larger can (size No. 2½) is sealed after it receives the samples. This can contains approximately 550 grams of ice frozen from water chlorinated to 1 ppm.

(d.) Five sterile screw-capped vials of 7 ml. capa-

city. Three wide rubber bands are placed around these vials to help prevent breakage.

Special care is taken in cleaning the sample vials and caps to eliminate all traces of phenol, which would interfere with the phosphatase test procedure. Identification numbers are inscribed on the vials with a steel scriber.

Preliminaries such as labeling and stamping shipping cartons, affixing "Rush" and "Special Delivery" or "Special Handling" stickers, setting up sample distribution sheets etc., are prepared prior to the day of shipment. On the day of shipment mailing schedules are checked and the dispensing is timed so as to have no delay between packaging and shipping. The original milk samples from which divisions are made are thoroughly mixed and transferred aseptically to the sterile vials by means of an aspirator bottle. This type bottle can be rotated gently to keep the sample thoroughly mixed and the spout at the bottom is convenient for pouring. Both top and spout are covered with aluminum foil.

Each shipment includes five vials placed on top of the ice in the No. 2½ can. The can is then sealed. The package is assembled by placing the No. 1 can inside the double "Jiffy" bags in the carton and inverting the No. 2½ can containing samples on top of it. This places the samples between the ice in the sample can and the ice in the No. 1 can. The "Jiffy" bags are folded over, the top layers of corrugated cardboard added and the packages are sealed with paper tape. A few days before the samples are shipped a letter is sent to each of the participating laboratories notifying them of the shipping date. Generally, laboratories are requested to test the milk samples for standard plate count, coliform plate count and phosphatase test. However, laboratories that have not been approved for all three of the above procedures are required to make only the tests for which they are approved or for which they are requesting approval.

TABLE 1 — RESULTS BY PARTICIPATING LABORATORIES ON LOW COUNT HOMOGENIZED MILK SAMPLES

Standard Plate Count per ml. at 35°C.[a]

Lab. No.	Sample II		Sample IV	Lab. No.	Sample VII
Control Lab	<3000	Control Lab.	<3000	Control Lab.	<3000
1	<3000	1	<3000	2	2200
2	1100	5	<3000	3	3300
3	<3000	6	<3000	4	<3000
7	<3000	7	<3000	5	<3000
8	<3000	8	<3000	6	<3000
9	<3000[b]	9	<3000[b]	10	<3000
10	<3000	13	<3000[b]	11	<3000
11	<3000	14	<3000	12	4100
15	<3000[b]	15	<3000[b]	13	<3000[b]
16	<3000[b]	16	<3000[b]	14	<3000
17	<3000	17	<3000	18	<3000
18	3900	21	<3000[b]	19	<3000
19	<3000	22	<3000[b]	20	<3000
23	<3000	23	<3000	21	<3000[b]
24	<3000	26	<3000	22	3000[b]
25	<3000	27	<3000	24	<3000
28	3400[b]	28	3900[b]	25	<3000
29	<3000[b]	29	4000[b]	26	3000
30	<3000[b]	30	<3000[b]	27	<3000
31	830	35	<3000[b]	31	1700
32	<3000	36	<3000	32	<3000
36	<3000	37	<3000[b]	33	<3000
37	<3000[b]	38	<3000	34	3200
38	<3000	41	<3000[b]	35	<3000[b]
39	1500[b]	42	<3000	39	2100[b]
42	<3000	43	<3000	40	<3000
43	<3000	44	<3000	41	<3000[b]
44	<3000				
Mean	<3000		<3000		<3000

[a] Laboratories 26 and 30 incubated plates at 32°C.

[b] Samples plated in A.M. all others plated in P.M.

TABLE 2 — RESULTS BY PARTICIPATING LABORTORIES ON HOMOGENIZED MILK SAMPLES ARTIFICALLY CONTAMINATED WITH LACTIC STREPTOCOCCUS CULTURE

	Standard Plate Count per ml. at 35°C.[a]				
Lab. No.	Sample III	Lab. No.	Sample VI	Lab. No.	Sample VIII
Control Lab.	5,800	Control Lab.	16,000	Control Lab.	46,000
1	4,800	3	15,000	2	57,000
2	7,100	4	14,000	3	66,000
6	6,100	5	14,000	4	89,000
7	6,200	6	13,000	5	52,000
8	6,100	7	14,000	9	53,000[b]
9	6,100[b]	11	13,000	10	45,000
10	5,900	12	13,000	11	69,000
14	6,900	13	15,000[b]	12	50,000
15	5,000[b]	14	13,000	13	71,000[b]
16	6,200[b]	15	12,000	17	62,000
17	5,900	19	17,000	18	66,000
18	3,200	20	16,000	19	70,000
22	7,200[b]	21	14,000[b]	20	81,000
23	6,900	22	12,000[b]	21	66,000[b]
24	8,100	25	16,000	24	70,000
27	9,000	26	16,000	25	57,000
28	9,100[b]	27	13,000	26	58,000
29	7,000[b]	28	15,000[b]	30	51,000[b]
30	7,900[b]	32	13,000	31	55,000
31	5,200	33	12,000	32	64,000
35	5,200[b]	34	15,000	33	59,000
36	6,200	35	13,000[b]	34	67,000
37	6,800[b]	39	16,000[b]	38	47,000
38	170,000[c]	40	12.000	39	73,000[b]
41	6,600[b]	41	14,000[b]	40	51,000
42	50,000[c]	42	15,000	44	65,000
43	6,000				
44	6,300				
Mean	6,400		14,000		61,000
Coefficient of variation	19%		10%		18%

[a] Laboratories 26 and 30 incubated plates at 32°C.
[b] Samples plated in A.M. all others plated in P.M.
[c] These counts were dropped in calculating coefficient of variation.

Packages shipped from Madison in the afternoon, normally reach any of the laboratories in the morning or early afternoon of the following day. Temperatures upon arrival have been consistantly 40°F. or below as indicated by the temperature of the ice water in the sample can. However, shipments have been avoided in summer months so as not to overtax the refrigeration capacity.

The samples of the first shipments were prepared by selecting stored and fresh homogenized market milk of various standard plate counts. Some of these samples were prepared by blending high count milk with low count milk in an attempt to produce samples with the desired range of bacterial populations.

During the past two and one half years forty-two samples have been divided into 850 split-samples. The standard plate count reports on the majority of the samples subdivided in this manner showed a coefficient of variation of 25 per cent or less. However, some of the stored samples showed as high as 70 per cent variability. Samples showing wide variation in results contained predominating bacteria that were sensitive to small elevations of temperature over 35°C. It became apparent later that homogenized milk samples containing an added pure culture of a facultative psychrophile could be used advantageously to detect laboratories operating their incubators in excess of 35.5°C. The culture used for this purpose was a gram negative rod isolated from a bottle of market milk that had been refrigerated for 7 - 10 days. This culture formed readily visible colonies at 35.5°C. However, at 36°C the number of visible colonies found on Plate Count Agar (Difco) incubated for forty-eight hours were greatly reduced.

Other samples of this shipment included low count homogenized milk and samples of low count homogenzied milk artificially contaminated with a culture of a streptococcus isolated from pasteurized milk. This culture readily formed visible colonies equally well at 37°C and 32°C.

RESULTS AND DISCUSSION

Eight samples were prepared on each shipping date for subdividing into split-samples; however, portions of only five samples were shipped to any one laboratory. The sample vials were identified by code number.

The results of forty-four laboratories and the control laboratory are presented in Tables 1 through 4. Thirty-one laboratories plated the samples in the morning and thirteen in the afternoon of the day following shipment. This did not appear to affect the counts significantly.

The results on the low count samples II, IV and VII are presented in Table 1. These results were quite uniformly reported as less than 3000 per ml.

Samples III, VI and VIII were artificially contaminated with a streptococcus culture that formed easily visible colonies over a rather wide temperature range. As shown in Table 2 the results were in reasonably close agreement on these samples. The results on sample VI were particularly uniform as indicated by the coefficient of variation of 10 per cent.

Table 3 shows the results of samples I and V which were artificially contaminated with the culture of a gram negative rod sensitive to small elevations of incubator temperature. The results on these samples showed great variations.

A follow-up visit to one of the laboratories that reported low counts on sample I revealed the following: A custom-made forced circulation incubator was

TABLE 3 — RESULTS BY PARTICIPATING LABORATORIES ON HOMOGENIZED MILK SAMPLES ARTIFICIALLY CONTAMINATED WITH A GRAM NEGATIVE ROD CULTURE WHICH WAS SENSITIVE TO INCUBATION TEMPERATURES OVER 35.5°C.

	Standard Plate Count per ml. at 35°C.[a]		
Lab. No.	Sample I	Lab. No.	Sample V
Control Lab.	170,000	Control Lab.	93,000
1	150,000	1	62,000
2	<3000	4	93,000
3	160,000	5	93,000
4	200,000	6	60,000
8	160,000	7	73,000
9	140,000[b]	8	100,000
10	170,000	12	62,000
11	210,000	13	120,000[b]
12	120,000	14	71,000
16	220,000[b]	15	45,000[b]
17	170,000	16	110,000[b]
18	160,000	20	<3000
19	<3000	21	<3000[b]
20	<3000	22	100,000[b]
23	140,000	23	90,000
24	170,000	26	83,000
25	<3000	27	<3000
29	21,000[b]	28	83,000[b]
30	210,000[b]	29	88,000[b]
31	150,000	33	60,000
32	260,000	34	86,000
33	65,000	35	57,000[b]
37	185,000	36	95,000
38	7,000	37	70,000[b]
39	160,000[b]	40	<3000
40	5,200	41	95,000[b]
43	140,000	42	40,000
44	140,000	43	<3000
Mean	130,000		68,000
Coefficient of variation	59%		51%

[a] Laboratories 26 and 30 incubated plates at 32°C.
[b] Samples plated in A.M. all others plated in P.M.

TABLE 4 — COLIFORM COUNTS AT 35°C. OBTAINED BY PARTICIPATING LABORATORIES FOR ONE SERIES OF SPLIT-SAMPLES

	SAMPLES							
Lab. No.	I	II	III	IV	V	VI	VII	VIII
Control Lab.	<1	1	<1	35	<1	<1	23	<1
1	<1	1	<1	44	<1			
2	3	<1	<1				30	<1
3	<1	2				<1	24	1
4	<1				<1	<1	28	<1
5				28	<1	<1	13	<1
6			1	37	<1	<1	20	
7		4	<1	49	<1	<1		
8	<1	3	<1	46	<1			
9[a]	<1	<1	<1	48				<1
10	<1	3	<1				21	<1
11	<1	2				<1	25	<1
12	<1				<1	<1	20	1
13[a]				34	<1	<1	23	<1
14			<1	43	<1	<1	19	
15[a]		2	<1	38	<1	<1		
16[a]	<1	2	<1	27	<1			
17	<1	2	<1	38				<1
18	<1	2	<1				22	<1
19	<1	2				<1	18	<1
20	<1				<1	<1	18	<1
21[a]				31	<1	<1	16	<1
22[a]			<1	40	<1	<1	24	
23	<1	2	<1	14	<1			
24	<1	2	<1				14	1
26				26	<1	<1	25	<1
27			<1	37	<1	<1	23	
30[a]	<1	1	<1	45				<1
31	<1	<1	<1				25	<1
32	<1	3				<1	18	<1
33	<1				<1	<1	17	<1
34				29	<1	<1	20	1
35[a]			<1	42	<1	<1	23	
36		2	<1	39	<1	<1		
38	<1	<1	<1	37				<1
39[a]		2				<1	23	<1
40	<1				<1	<1	25	<1
42		1	<1	30	<1	<1		
Mean	<1	1.7	<1	36	<1	<1	21	<1

Note: A suspension of *Escherichia coli* was added to samples IV and VII.

[a] Samples plated in P.M. all others in A.M.

[b] Laboratory No. 26 used 32°C. incubation temperature.

being used. It was equipped with a recording thermometer, as well as accurate thermometers properly submerged in small tightly stoppered vials containing water. The thermometers were located in the front part of each of the four shelves used. All of the above thermometer readings indicated that the incubator temperature had not exceeded 35.5°C. However, further investigation revealed that the split-sample plates had been incubated in the rear part of the bottom shelf. A thermometer placed in this area read 37°C. The thermometer located on the front part of the same shelf read 34°C.

Temperature variations within the incubator were revealed in most laboratories that reported low counts on samples I and V. One significant result of the split-sample procedure is an increased interest in incubators that will maintain uniform temperatures.

Table 4 shows the results of the thirty-seven laboratories making the coliform determinations. The agreement between laboratories was excellent in the samples having low coliform densities. The high count samples IV and VII exhibited coefficients of variation of 23 per cent and 19 per cent, respectively. These latter two samples were artificially contaminated with a pure culture of *Escherchia coli*.

Phosphatase tests were run by thirty-five of the forty-four laboratories participating. Two of the samples (II and VII) contained 0.12 per cent added raw milk and were accordingly positive for the phosphatase test. All thirty-five of the laboratories reported these two samples correctly as "improperly pasteurized". The remaining six samples were negative for phosphatase as determined by the control laboratory. Four of the laboratories reported false positive results on one or more of these samples. The modified Scharer Field Test was used by all except two of the laboratories.

SUMMARY AND CONCLUSIONS

1. A method for shipping refrigerated liquid milk samples is described.

2. The results on split-samples containing high percentages of facultative psychrophiles show great variations. Slight elevations in incubator temperature over 35.5°C. is the most probable cause of poor agreement on these samples. On the other hand coefficients of variation of less than 20 per cent were obtained in the samples containing the mesophillic streptococcus.

3. The agreement of the coliform plate counts seemed reasonably close on most of the samples.

4. All laboratories participating in phosphatase evaluation were able to detect 0.12 per cent raw milk added to homogenized milk. However, four of the laboratories reported false positive results on the samples determined to be negative by the control laboratory.

5. The split-sample procedure appears to be an effective way of testing the performance of milk laboratories. This tool is made more effective by using pure cultures of thermal sensitive bacteria to detect excessive incubation temperatures.

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NEWS AND EVENTS

DETERMINATION OF SEDIMENT IN MILK IN FARM TANKS AND/OR PLANT STORAGE TANKS AND TANK TRUCKS

N. E. WATSON, DEPARTMENT OF HEALTH, LOS ANGELES, CALIF.

Editorial Note: Due to the interest in adapting sediment testing procedures for use in the bulk tank pick-up operation the following is an account of a method used with success in California. Readers who may desire further information on the application of this method may write directly to the author.

The advent of the bulk milk tank on the dairy farm has presented many problems, among which is the control of sediment. Since the milk is picked up in large tank trucks into which the milk is pumped from the farm tanks and there mixed with the milk from several farms, the problem arises as to how to determine which farm is sending in milk containing any large amount of sediment (2).

The procedure described here is based on studies which have shown that the sediment recovered from a one-gallon sample of mixed milk is equivalent to the sediment recovered from a one-pint sample taken off-the-bottom of a ten-gallon can of the same milk which has been settled for one hour. The test consists of using a one-pint sample of mixed milk and concentrating the sediment from this sample on one-eighth the area of a stardard 1.25-inch sediment pad (4).

The merits of this test have been proven by private research conducted by the author over a period of several years and later by the University of Wisconsin, Madison, Wisconsin, Department of Dairy and Food Industries (4). Their report is extensive and conclusive and recommended by the author to anyone who is interested in the research statistics. The objective of this paper will be described the practical application of this method.

Periodic testing of milk in each farm tank for sediment is an important duty of the control official. It is desirable that tests be made at intervals of not more than one month, concentrating the work, however, where previous tests have indicated the existence of the worst conditions.

It is not considered good sanitary practice for milk control officials or plant field men to go from farm to farm with a sediment tester as this method could lead to much doubt as to the freedom from contamination. Also, due to difficulties encountered in testing cold

milk several hours old, this practice constitutes a waste of time as results are not dependable.

Standard one-pint milk bottles with plain paper caps are satisfactory sample bottles. Care should be taken to rinse the top of the bottle with running water before it is opened at the laboratory; or, if the sample to be used is to be used for the lactometer test, bottle tops may be protected with re-usable hoods or bowl covers of polyethelyne plastic. Small paper cups also may be inverted over bottle tops for protection.

Samples for routine control work may be taken from the farm tanks under sanitary conditions and may be taken by the same procedure as official samples for Babcock tests (milk in the tank should be mixed by mechanical agitation for at least five minutes). Samples may be taken by the tank truck driver if such driver is also a licensed weigher and sampler. The amount of sample should be one pint by volumne taken by a clean sample dipper and placed in clean bottles. These should be protected from dust and dirt, and transported in such manner that they will arrive at the laboratory in good condition. No preservative should be added except liquid formaldehyde in cases where samples cannot be kept cool in transportation. If formaldehyde is used, two or three drops should be sufficient to keep samples from souring until deposited at the laboratory.

The sediment tester should have the filtering head restricted to a filtering area of 0.44″ (forty-four hundredths of one inch). The manufacturer of the tester can supply this special head. Milk may be warmed to a maximum of 105°F for easier testing.

Tests may be made with a laboratory vacuum tester or pressure tester or with tester for off-the-bottom tests. If test is off-the-bottom, container shall be of ample size and not more than three inches across the bottom and test shall be taken immediately after pouring from pint, sample bottle. Also, tester shall be air-swept by raising tester and drawing in air, then forcibly ejecting air and small amount of milk remaining in the tester. This will prevent floating the sediment off of the cotton disc when filtering head is removed.

The sediment standard recommended is as described in "Standard Methods" for milk in cans unless local or state laws provide for a different standard to meet local conditions (3).

For ease of comparison the sediment standard should have a round hole of one-half inch diameter through the center of standard, and standard superimposed over the modified sediment disc.

Reports of tests and follow-up procedure shall be the same as described in "Standard Methods" for producers who ship milk in cans (3).

The whole secret of obtaining satisfactory results is having all the equipment in order and the milk warm. (75°F to 100°F is the most satisfactory temperature range.)

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3. Standard methods for the examination of dairy products. 10th Ed. Am. Public Health Association.
4. Calbert, H. E. and Liska, B. J. — A study of mixed milk sample methods of sediment testing using off-the-bottom standards and equipment, for possible use with farm bulk milk holding tanks. J. Milk and Food Technol., 17:82. 1954.

UNIVERSITY OF KENTUCKY DAIRY SCIENCE CLUB HONORS JOHN MOSER

John Moser, Louisville, was named Honor Guest at the Annual Honors Day Banquet of the University of Kentucky Dairy Science Club Friday, April 27. His picture will be hung in the Thomas Poe Cooper Dairy Products Building

Mr. Moser is the second in his family to be so honored. Just 30 years ago, in 1926, his father Adolph Moser was awarded this, Kentucky's highest dairy award.

Marshall Carpenter, manager of the Kentucky Artificial Breeding Association, Louisville, made the introductory address. He pointed out that Mr. Moser was one of the most progressive dairy men in the state; that he was instrumental in the founding of K.A.B.A.; that he was one of the founders of the Kentucky American Dairy Association and Dairy Council. He is president of the Falls City Milk Producers Association as well as board member or advisor to a number of other groups. "In fact, said Mr. Carpenter, "anything John is asked to do he does, not well, but outstandingly".

Ronald Ryan, immediate past president for the Dairy Club presented, from the Club, a picture of Mr. Moser, to Frank J. Welch, Dean of the College of Agriculture and Home Economics. Dean Welch, after adding to the account presented by Mr. Carpenter, accepted the picture to be hung in the hall of the Dairy Building.

Also guests at the banquet were nearly 70 high school seniors and their sponsors who attended the Second Annual Dairy Career Day. Winners in the student judging contest were also named and awarded prizes.

Nearly 70 high school seniors from all areas of Kentucky attended Dairy Career Day at the University of Kentucky, Friday, April 27. The boys were accom-

panied by 24 representatives of Kentucky dairy firms.

The "Day" started with a tour of the dairy manufacturing plant and experimental laboratories. This inspection was followed by a tour of the University campus.

The group assembled in the Student Union for lunch. Members of the Dairy Section staff and the U. of K. Dairy Club acted as hosts and guides for the boys and their sponsors.

After a wagon tour of the experimental farm the visitors were taken to the Dairy Center to survey the dairy production teaching and research facilities. Members of the Dairy Section staff discussed the need for trained men in dairying, (and facilities at U. K. for such training). Announcement was also made of undergraduate scholarships in dairying, provided by Kentucky dairy industry, which will be available for the first time in September, 1956.

The seniors and their sponsors were guests of the University of Kentucky Dairy Club at the annual Honors Banquet.

Sponsoring companies were Armour and Company., Atkins Dairy, Borden Co., Carnation Milk Co., Christian County Milk Producers Association, Clover Leaf Dairy Cudahy Packing Co., Falls City Milk Producers Assocaition, Ideal Pure Milk Co., Kentucky Cardinal Dairy, Kraft Foods Company, Model Pure Milk Co., Stanford Creamery Co., and Sugar Creek Creaming Co.

3-A SYMBOL COUNCIL NOW READY TO AUTHORIZE 3-A USE ON MOST MACHINERY COVERED BY STANDARDS

Manufacturers of nearly all dairy equipment for which 3-A Sanitary Standards now exist may now apply for permission to use the 3-A symbol on their equipment, a spokesman for the 3-A Sanitary Standards Symbol Administrative Council announces. Until this announcement, the 3-A Symbol Council was processing only applications pertaining to storage tanks, weigh cans and receiving tanks.

The types of equipment on which a 3-A Symbol may be used, provided they meet with established standards, are as follows (dates given are those of publication of the applicable 3-A Sanitary Standard in The Journal of Milk and Food Technology):

Type of Equipment	*Month and Year*
Homogenizers	Jan.-Feb., 1949
Electric Motors	Jan.-Feb., 1950
Tin-Coated Can-Type Strainers	Jan.-Feb., 1950
Piping and Equipment Fittings	March, 1950*
Thermometer Fittings	March, 1950*
Filters having disposable media	Sept.-Oct., 1950
Fittings, Supplement, No. 2	Jul.-Aug., 1952
Plate-Type Heat Exchangers	Jan.-Feb., 1952
Centrifugal and Positive Rotary Pumps (Amended)	May-June, 1952
Return Tubular Heat Exchangers	Nov.-Dec., 1952
Farm Tanks	Jul.-Aug., 1953
Transportation and Pick-Up Tanks	Sept., 1954
Leak-Protector Inlet and Outlet Valves	Jan., 1954
Thermometer Fittings, Supplement No. 1	Sept., 1954

*These sanitary standards were not published in the Journal of Milk and Food Technology, but were sent as a supplement with one of the 1954 numbers.

The Symbol Council spokesman emphasized that only on the above equipment may the use of the 3-A Symbol be authorized. He pointed out, however, that supplements 3, 4, 5, and 6 to the 3-A Sanitary Standards for Piping Fittings were published in the September, 1955 number of the Journal. Consequently, applications pertaining to fittings covered by these supplements may not be received prior to August 1, 1956, and the effective date of authorizations issued will coincide with the anniversary of the date of publication. The same post-publication time lag for applications to use the symbol on bulk milk dispensers, standards for which were also published in September, 1955, is to be observed.

Application forms, a description of the 3-A symbol, and a copy of the sanitary standard relevant to any application, may be obtained by writing Mr. C. A. Abele, Secretary-Treasurer of the 3-A Symbol Council at 2617 Hartzell Street, Evanston, Illinois.

The 3-A Sanitary Standards Symbol Administrative Council is composed of the following, in addition to Mr. Abele: Mark D. Howlett, Jr., Paul Corash and K. G. Weckel, who with Mr. Abele, represent International Association of Milk and Food Sanitarians on the Council; William A. Dean and A. E. Nessler, representing the Sanitary Standards Subcommittee of Dairy Industry Committee; and Paul K. Girton and George W. Putnam, representing the Technical Committee of Dairy Industries Supply Association.

PURE-PAK TO LAUNCH "WILD BILL HICKOK" MERCHANDISING CAMPAIGN

The Ex-Cell-O Corporation has announced the signing of a licensee agreement with the Wild Bill Hickok Merchandising Division of the Delira Corporation, whereby Pure-Pak will offer the Wild Bill Hickok merchandising program to individual dairies throughout the United States and Canada. Although Pure-Pak salesmen will sell the personality merchandising campaign to the individual dairies, each dairy will sign an independent contract with Delira.

In making the announcement, Ex-Cell-O also made

it known that it plans to announce the merchandising campaign through advertisements in the trade press and in Pure-Pak News, which is distributed to the dairies.

Each participating dairy will receive a promotional kit consisting of display materials and ideas to aid them in promoting the Wild Bill Hickok campaign. The kit will contain point-of-sale banners, showing Will Bill & Jingles drinking and pouring milk and motion displays showing milk pouring from the carton.

The kit also contains truck posters, talking half gallon cartons for retail routes; slides for TV spots, giveaways, such as fan photos, badges, buttons and Deputy Marshall certificates; and self-liquidating premiums for guns, holsters and badges (for retail and wholesale routes).

Delira will also make available additional promotion material such as billboards, car cards and additional point-of-purchase displays. Other promotional plans for the campaign will be announced at a later date.

George Scott, Vice President of Ex-Cell-O stated that "A personality merchandising campaign such as the Wild Bill Hickok program offers a tremendous plus sales potential at both the retail and wholesale level. There is no doubt that the children of this country represent influential buyer power at the point-of-sale. The appearance of Wild Bill Hickok and his friend, Jingles, on the cartons of dairy products packaged in Pure-Pak containers, will have a strong sales impetus."

FARM BULK MILK TANKS' USE INCREASED 127% IN 18 MONTHS, NADEM — DISA SURVEY REVEALS

As of January 1, 1956, there were 30,330 bulk milk tanks on farms of American milk producers in all 48 states, according to a survey recently completed jointly by National Association of Dairy Equipment Manufactures and Dairy Industries Supply Association's Market Data Development Sub-committee.

This compares with 13,358 farm tanks which were estimated by NADEM to have been in operation on July 1, 1954. The new figures, just released, indicate a probability that a 127% increase occurred in farm bulk milk tanks in use in the 18-month period, 7/1/54 to 1/1/56.

Wisconsin, which had 1500 farm tanks installed on 7/1/54 as compared with 3,464 at the first of this year, and Minnesota, which had 600 tanks installed on the earlier date and 2,500 on the later date, led all other states in *volume* of increase. So far as *rate* of increase goes, Kentucky, which had one farm tank in operation on the earlier date, and 200 on the later, led all other states with a rate of increase figured at 20,000%!

If it were possible to figure rates of increase on the basis of some data collected, North Carolina's rate would even exceed Kentucky's; for on January 1, 1956, there were 250 tanks in operation in North Carolina, whereas there had been none, apparently, in operation 18 months earlier.

Complete state-by-state figures, released by DISA and NADEM to their respective memberships in May, are as follows:

FARM MILK TANK INSTALLATIONS BY STATES: AS OF JULY 1, 1954 AND JANUARY 1, 1956

	7/1/54	1/1/56	Increase
Alabama	3	60	57
Arizona	400	425	25
Arkansas	0	35	35
California	3,250	4,139	889
Colorado	75	185	110
Connecticut	144	642	498
Delaware	30	35	5
Florida	210	650	440
Georgia	65	396	331
Idaho	86	225	139
Illinois	600	1,500	900
Indiana	250	700	450
Iowa	375	1,010	635
Kansas	100	400	300
Kentucky	1	200	199
Louisiana	1	45	44
Maine	101	600	499
Maryland	320	723	403
Massachusetts	150	469	319
Michigan	250	1,000	750
Minnesota	600	2,500	1,900
Mississippi	16	27	11
Missouri	17	48	31
Montana	65	80	15
Nebraska	2	140	138
Nevada	84	106	22
New Hampshire	43	161	118
New Jersey	205	588	383
New Mexico	10	45	35
New York	495	850	355
North Carolina	0	250	250
North Dakota	0	95	95
Ohio	252	787	535
Oklahoma	16	175	159
Oregon	480	655	175
Pennsylvania	420	1,200	780
Rhode Island	0	92	92
South Carolina	99	184	85
South Dakota	20	500	480
Tennessee	110	150	40

Texas	84	451	367
Utah	145	228	83
Vermont	78	418	340
Virginia	200	750	550
Washington	2,000	2,900	900
West Virginia	2	11	9
Wisconsin	1,500	3,464	1,964
Wyoming	4	36	32
U. S. Total	13,358	30,330	16,972
Percentage of Increase		127%	

The cooperation of state agricultural and educational officials was particularly commended by the NADEM – DISA staffs for aid in collecting the above data.

PIPELINE CHATTER

Editorial Note: Here is an interesting letter received from Dr. Henry Morrison on leave of absence from the Dairy Department, University of Kentucky, for service with the dairy industry in Boliva.

Mr. H. L. Thomasson, Exec. Sec.
International Association of Milk and Food Sanitarians, Inc.,
Box 437
Shelbyville, Indiana
Dear Red:

I am "poco tarde" in sending in my 1956 dues; nevertheless, I want to continue my membership and keep getting the Journal even though it takes about two months to get here by slow freight.

Evidently the veterinarians read the Journal because the picked up the story about my coming here and ran it in some army veterinary paper and an army veterinarian, Major Castleberry, who just arrived knew I was here and the purpose.

The plant I am supposed to help with is still "abuilding" and will not be completed for several months yet. However, when it is finished, it will be a fine modern plant for the production of powdered milk, pasteurized fluid milk and butter. It was engineered by Mr. Layton Allen of United Nations, formerly with Carnation Co., and will be up to date in every way. Meanwhile, I am riding herd on the cows and chickens at the Experiment Station here and also doing a little Extension work.

With very best personal regards, I am,
Sincerely yours,
Hank

GOING TO THE DAIRY INDUSTRIES EXPOSITION? HERE'S HOW TO RESERVE YOUR HOTEL ROOMS!

Planning to attend the 20th Dairy Industries Exposition during the week of October 29—November 3 in Atlantic City, N. J.? Then the following information on how to make adequate hotel reservations now may be of value, according to the Exposition's sponsor, Dairy Industries Supply Association.

All hotels in Atlantic City have pooled their rooms for the week of the Exposition through an Atlantic City Housing Bureau, 16 Central Pier, Atlantic City, N. J. To reserve a room one must apply to this central office.

Members of International Association of Ice Cream Manufacturers, Milk Industry Foundation, National Association of Retail Ice Cream Manufacturers and DISA have received from their respective associations printed forms to be used in communicating with the Housing Bureau. Evaporated Milk Association has worked out for its members arrangements for reserving rooms in the Sea View Country Club, on the outskirts of Atlantic City.

Dairy people not members of any of the associations named, DISA points out, should write directly to Atlantic City Housing Bureau, giving the following information: hotels preferred (naming at least three choices), rates desired, approximate arrival and departure dates, and the names of the persons to be housed. Company letterheads should be used in writing. The Housing Bureau will make the room reservations, subject to the potential visitors' final approval.

DISA, on written request, will send from its headquarters at 1145 19th Street, N.W., Washington 6, D.C., to dairy people who do not belong to any of the named associations, printed hotel reservation application forms which list the available hotels and indicate their locations and their ranges of rates. Potential visitors can then determine which hotels they will prefer, and can use the printed forms in dealing with the Housing Bureau.

These restrictions, by agreement among the associations concerned, affect an otherwise generally free use of hotels:

1. Suppliers-equippers will not occupy the Dennis or the Shelburne, which will be used by IAICM and NARICM; nor will they occupy Chalfonte-Haddon Hall, which will be used by MIF.

2. MIF members will have priority claim on the Colton Manor, Lafayette and Seaside Hotels (except for parlor suites) and members of IAICM and NARICM will have priority claim on the Marlborough-Blenheim and Madison Hotels (except for parlor suites).

3. Dairy processors may not occupy the Traymore or the Claridge, which will be exclusively used by suppliers-equippers.

All other hotels in Atlantic City may be occupied either by processors or suppliers-equippers, depending on the wishes of the individual visitors and the availability of rooms, and regardless of individuals' or com-

panies' affiliation or non-affiliation with associations. Among hotels thus to be shared are such Boardwalk houses as the President, the Ambassador, the Ritz-Carlton, the Chelsea, the Abbey, the Mayflower and the New Belmont.

Off-Broadwalk hotels which are available for general occupancy include the Carolina Crest, the Clarendon, the Colton Manor, the Columbus, the Crillon, the Eastbourne, the Flanders, the Holmhurst, the Jefferson, the Kentucky, the Lafayette, the Lexington, the Mark, the Monticello, the Morton, the Penn-Atlantic, the Richfield-Boscobel, the Runnymede, the Senator and the Sterling.

SEVENTH INTERSTATE MILK SHIPPERS CONFERENCE SCHEDULED APRIL 23-25 AT PEABODY HOTEL, MEMPHIS, TENN.

The Seventh National Conference of Interstate Milk Shipments will be held at the Peabody Hotel in Memphis, Tennessee, April 23-25, 1957, according to an announcement by H. L. Hortman, Louisiana State Health Department, Chairman of the Executive Board of the National Conference.

Representatives from 33 states and the District of Columbia—representing almost 500 shippers of milk in interstate commerce—are expected to attend this first meeting since March 1955. Earlier Conferences were held in 1950, 1951, 1952 and 1953.

Serving on the program committee for the 1957 meeting are Dr. K. G. Weckel, University of Wisconsin; H. J. Barnum, Denver (Colo.) City Health Department; and Harold B. Robinson, Senior Scientist, U. S. Public Health Service.

BAKERY SANITARIANS TO STUDY SAFETY, BULK HANDLING, PERSONNEL SELECTION AT SEPTEMBER MEETING

Safety, bulk handling of ingredients, and personnel selection for the sanitation department will be among the topics on the program of the National Association of Bakery Sanitarians' sixth annual meeting, September 17-19 at the Hotel Morrison, Chicago. Program details were announced by Julian L. Cagle, program chairman and President-Elect of the Association. Mr. Cagle is Sanitarian for Helms Bakeries, Los Angeles.

A highlight of the meeting will be an all-day study of bulk flour handling being arranged by the current Association President, Louis A. King, Jr., Sanitation Director for the American Institute of Baking. According to Mr. King, the group will start at a near-Chicago mill and follow the actual handling of flour through milling, truck and rail transportation, and receipt in a bakery for storage in bulk tanks.

Discussions on the Monday, September 17 program will include:

Work Scheduling and Rescheduling—George Bassett, Chas. Freihofer Baking Co., Albany, N. Y.

Developing a Sanitation Program—Roy Sutor, Van De Kamp's, Inc., Los Angeles, Calif.

Selling Sanitation To Your Co-Workers—Dr. Edward L. Holmes, Executive Director, American Sanitation Institute, St. Louis, Mo.

Introduction To Some Brushes—Julian L. Cagle, Helms Bakeries, Los Angeles, Calif.

The group's annual luncheon will be held on September 17, with George Tompkins, Ward Baking Co., New York, as the featured speaker. Mr. Tompkins will discuss "NABS—Past, Present and Future."

Chairman for this day's meetings will be Mark Azzara, Kenwood Cake Co., Los Angeles, and Lois Cole, Quality Bakers of America, New York, N. Y. Other discussions will be:

Foreign Material Control—John Herr.

Personnel Selection for the Sanitation Department—a panel discussion headed by Miss Cole, and including Joseph I. Hackett, Drake Bakeries, Brooklyn, N. Y., who will talk on "Requirements of the Sanitarian;" W. W. Priestley, Director, Hecht's Bakery, Inc., Bristol, Tenn., on "Problems of the Personnel Department," and Mr. Azzara, on "Keeping Men on the Job."

Program chairmen for Tuesday will be Ellsworth Foran, Continental Baking Co., Chicago, Ill., and Robert C. Haven, Langendorf-United Bakeries, San Francisco, Calif. The program is as follows:

Safety and the Sanitation Program—Tyler Stevens.

Vacuum Cleaning—the Only Way—speaker to be announced.

How Floor Maintenance Contributes to Better Sanitation—speaker to be announced.

Cleaning Schedules and Work Load Studies—a panel discussion, led by Mr. Robert C. Haven.

Cost Control Projects and Report on the Baking Industry Sanitation Standards Committee—J. Lloyd Barron, Manager, Sanitation Dept., National Biscuit Co., New York, N. Y., and Chairman of BISSC.

The third day of the meeting will be devoted to the bulk flour handling project.

HEALTH CAREER HORIZONS PROJECT

Distribution of New Health Career Publications
Local Action on Health Careers

New Health Career Tools—To help promote local action on Health Careers and to supplement the HEALTH CAREERS GUIDEBOOK and PARTNERS FOR HEALTH, the Health Career Horizons Project now has a wide range of supplementary materials for

both school and community use. In producing these new pamphlets and visual aids during the 1955-56 school year, the Project is carrying out the further steps outlined in its original plan. In addition, we also have in production a motion picture for advance release this spring, and nationwide distribution by the beginning of the fall school term. Like the Health Career books, all these new materials are produced and distributed by the National Health Council with the public interest support of The Equitable Life Assurance Society.

Distribution to Schools and Counseling Agencies—Following the pattern developed last year for the Guidebook, the current school distribution covers state and local school administrators and professional guidance counselors, as well as all public and private secondary schools and junior colleges throughout the country. Major national educational and counseling organizations are again cooperating in this second round of distribution. The timing of this school distribution has had to take into account the fact that some 36,000 individual mailings are involved—and also the wisdom of allowing the post office, as well as the schools, to recover from holiday complications before our shipments started.

The individual high schools and junior colleges are, of course, the primary centers for school utilization of Health Career materials. The mailing being sent to them now is, in effect, a sample; it offers them substantial supplies of the Health Careers flier and posters, and includes a reply-card to facilitate their requests. Judging by the enthusiastic interest in Health Careers information and materials on the part of educators and counselors, we are expecting a large response. We are prepared for it—the printing of the flier, for example, runs to *a million copies.*

Again following last year's pattern, school distribution will be supplemented by similar mailings to libraries, public employment offices and other community sources of career development information and vocational guidance.

Distribution to Health Agencies—Everything available to the schools—the flier, the posters and, when released, the motion picture—is also available to national, state, and local health agencies. In addition, the following are designed expressly for their use as tools in developing community Health Career activities—the *Fact-sheet,* the *Notes* pamphlet, the *Flip-chart,* and the *Projection Slides.*

As you probably know, these new materials constituted the Health Careers Exhibit at the Annual Meeting of the American Public Health Association. The APHA Committee on Scientific Exhibits awarded the Health Careers Exhibit and Consultation Area a special citation "as a cooperative service exhibit"—with the honors going to the many national, state and local programs which made its "cooperative service" possible, as well as to the publications and visual materials which made up the exhibit itself.

Looking toward coverage of the health field, the current mailing—of which this communication is a part—is going to National Health Agencies, and to state and local Health Officers, Health Councils, and Health Career Committees. (As explained in the covering letter transmitting this report and other enclosures, the preliminary distribution data-sheet provides more information on health-agency distribution, including details on requesting supplies.)

An important new element affecting distribution throughout the health field is *local action.* The community Health Career Committees and other organized local programs now getting under way have an important bearing on the utilization of all the Health Career publications. This new element makes it particularly necessary to develop well thought out distribution plans.

Meantime, however, there is no reason to put the materials in cold storage. We are prepared to make the flier, posters, flipchart materials, and projection-slides immediately available. This applies not only to additional copies of the publications for staff use, but also to supplies for conferences, whether national or local, and for other special needs.

Local Action on Health Careers—Beyond its relationship to the distribution of the Guidebook and other materials, the nationwide response to the Health Careers idea has some very broad implications.

Demand for the Guidebook, for example, provides substantial evidence of widespread interest: Requests have so far exceeded expectations that, in the first ten months after publication, 70 per cent of what was expected to be a two-year supply had already been sent out—75,000 out of a total of 107,000 copies.

Even more important, states and communities from coast to coast are going out on their own to organize for Health Careers, and this local action continues to pick up headway. Far from being imposed from above, all this community interest is self-generated, since staff limitations have compelled the Project to leave Local Action for Health Careers to its own devices. Though this by necessity rather than choice, it leaves no doubt that community action is spontaneous. All this state and local initiative looks tremendously encouraging—but we see the other side of the picture too. From the perspective of the country at large, what has happened so far is scattered, not to say haphazard. It is, in effect, a starter demonstrating what can be done—and has yet to be done—on a nationwide base. On balance, however, all of us who are

concerned in the nationwide Health Careers endeavor are entitled to feel that *together the national Project and its state and local counterparts are moving into 1956 full steam ahead.*

OREGON 1955 BANG'S TEST SHOW 0.55% REACTORS

Slightly more than one-half of one percent of the 296,852 cattle tested for brucellosis (Bang's disease) in Oregon in 1955 were reactors. Last year 1635 cattle or 0.55 percent reacted to this test.

These figures are from the annual report of the federal-state testing program and were released by M. E. Knickerbocker, chief of the state department of agriculture's animal division.

The 1955 figure on brucellosis incidence represents a slight upturn (0.002 per cent) from testing in 1954 when 1620 reactors were found in 295,107 cattle tested.

In another phase of the eradication program, 84,839 calves were vacinated last year as compared with 74,868 in 1954. Calfhood vaccinations in Oregon were at an all time high last year; vaccinations were made in 5554 herds.

Three Oregon counties—Wasco, Gilliam and Benton —were entirely free from this disease last year on the basis of testing done. Eleven counties had less than one-fourth of one percent; eight counties had between one-fourth and one-half of one percent; and five had between one-half of one percent and one percent.

Testing in Harney and Jefferson counties showed between three and four percent in each county; in Malheur and Wheeler, between two and three percent; and in Lake, Umatilla, Union and Wallowa between one and two percent.

The highest percentage of reactors in any county in the state was in Crook county where 7.21 percent of the 3090 cattle tested reacted.

More calves were vaccinated in Baker county than in any other county with Malheur second and Umatilla third in this phase of the program. At the present time nine western Oregon counties and one eastern Oregon county hold modified-certified brucellosis free area ratings and a number of other counties are working toward this goal.

CHOCOLATE MILK RESEARCH FOUNDATION

Teen-agers are becoming one of the biggest market potentials for chocolate milk and chocolate dairy drink, the Chocolate Milk Research Foundation revealed, as it urged dairies and retail outlets to take advantage of this growing opportunity for new profits.

As a gesture of goodwill to teen-agers, the Foundation operated a free chocolate milk bar at the Chicago Junior Achievement Trade Fair, which climaxed national Junior Achievement Week. While the boys and girls, from 15 to 21, were setting up exhibits of their miniature business operations, two pretty Junior Achievers handed out free half-pint cartons and bottles to the workers. In three hours, some 600 youngsters downed 1,500 drinks.

School age youngsters, from 6 to 19, this year will pass the 40,000,000 mark. Population charts indicate that by 1960 the total will pass 45 million. The 1955 birth rate set a new mark with 4,045,000 babies born.

Taste preference tests have proved that — given the opportunity of choice — youngsters will choose chocolate milk over white milk at least two to one, and often as high as 6 to 1.

Recognizing this taste trend and the growing number of young potential customers, the Foundation has urged all dairies and retailers to aim their sales toward these customers. Major problem of reaching this market is making the chocolate milk and chocolate dairy drink easily available. Vending machines in spots where youth groups congregate, cartoned dairy chocolate easily accessible and featured in corner drugstores, school supply stores; and attractive displays in retail grocery stores and supermarkets are all sales stimulators for this new buying group, the Foundation pointed out.

Congress is now considering legislation to expand the Special School Milk Program from $50 million to $60 million this year. Federal government and U. S. Department of Agriculture give full acceptance to chocolate milk on this School Milk program as long as it is made with whole milk meeting the minimum butterfat regulations. However, certain states and certain local communities have ruled against permitting chocolate milk in their schools, despite the fact that it cuts down their federal subsidy.

Special efforts are being made this year to have chocolate milk accepted equally with white milk in the entire School Milk program.

SEES 'TIN' CAN BEING OBSOLETE IN NEAR FUTURE

Stolk, American Can President, .. Says Can Factories Also to Change

Familiar metal cans so widely used for food and other products in this country will be "unrecognizable" by present standards within a relatively few years, William C. Stolk, president of the American Can Company, said recently.

Even the factories in which the containers are

manufactured—currently at a rate of about 38 billion a year—may eventually undergo similar striking changes, the Canco executive said.

Mr. Stolk made these predictions in a talk on "planned obsolescence" at the annual dinner of the Purchasing Agents Association of New York and the Sales Executives Club of New York, at the Commodore Hotel on February 14. He defined planned obsolescence as the process of "improving our business by deliberately making obsolete the things we make or use, our processes and techniques and our industrial know-how."

He said planned obsolescence is "one of the most powerful driving forces in modern business" and "the prime ingredient in our growth and development."

Using the metal can as a case study of how planned obsolescence works, Mr. Stolk explained that the container industry some time ago decided to obsolete the tin can "before any one of several factors might combine to obsolete it for us." He referred specifically to the strategic nature of the world's tin supplies.

Research is turning up new materials and production methods that are making possible cans for many products never before packaged in metal containers, he added.

"We have gained so much momentum that I don't hesitate to predict that the metal cans of five years from now will be unrecognizable by today's standards," he said. "More than that, the cans of tomorrow will be better and more economical, and far more products will be packed in them than ever before."

Mr. Stolk also foresaw the possibility that entirely different production methods, such as welding and the use of plastic cements and synthetic resin coatings, eventually may reduce the amount of machinery and the size of can factories as much as one half. The smaller plants, he added, will be more productive than the present ones.

The process of striving to develop more and better products through planned obsolescense is going on in industry everywhere in the country and is one of the motivating forces that make America strong and constantly raise the standard of living, he continued.

"Industry will spend this year more than $33 billion for new plants and equipment," Mr. Stolk said. "Almost all of this money will be spent for facilities that will help us get more out of our available resources and provide new and better products to keep our economy expanding. This mushrooming of America's industrial plant is the direct profit from the research that makes planned obsolescence possible."

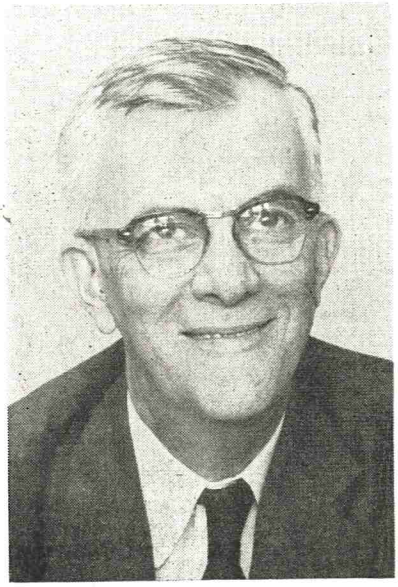
The $5 billion currently being invested in research by government and industry is providing the groundwork for well over $30 billion a year in industrial expansion, Mr. Stolk added.

CARL B. DEDERICH, JOINS PAUL-LEWIS LABORATORIES

Carl B. Dederich has recently joined Paul-Lewis Laboratories, The House of Enzymes, Milwaukee, Wisconsin, as assistant to Norman Gross, Sales Manager of the Dairy and Meat Division. Mr. Dederich has been very active in the Dairy Industry for the past two and one-half years in a sales capacity throughout the Midwest. In his present position, he will give assistance to the many Paul-Lewis representatives throughout the United States.

CALIFORNIA ASSOCIATION EXTENDS INVITATION

On behalf of the Executive Board of the California Association of Dairy and Milk Sanitarians, I wish to extend our welcome to all participants at the Seattle Convention of the International Association of Milk and Food Sanitarians to visit with us at our Annual Meeting which will take place September 11 and 12, 1956 at the Lafayette Hotel, Long Beach, California, (a city close to Los Angeles). Our Sight-Seeing Committee will be at your service.



WILLIAM A. HADFIELD, PENNSALT SANITATION EXPERT, RETIRES

William A. Hadfield of the Pennsalt Chemicals technical staff, will retire on July 31 from a 41-year career as one of the country's leading sanitarians. Widely known throughout the milk and food industries, Mr. Hadfield pioneered in the field of chlorine sanitation on the farm and in dairy plants through his early association with General Laboratories of Madison, Wisconsin, originators of the first chlorine sanitizer, B-K Liquid. When that company was acquired by Pennsalt he became technical advisor to its B-K Sanitation Chemicals staff, and was instrumental in the development of Pennsalt's system of chlorine sanitation which has gained wide acceptance throughout the U. S. and in foreign countries.

A native of Madison, Wisconsin, he received his early education in the public schools there and later earned both Bachelor and Master's degrees at the University of Wisconsin where he majored in chemistry and bacteriology.

Mr. Hadfield, who is a widely known lecturer and author of papers and technical articles in the field of farm and dairy sanitation, is a member of numerous

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scientific organizations including the American Public Health Association and International Association of Milk and Food Sanitarians. He has been prominent for many years in the activities of the Chemical Specialties Manufacturers Association and is a member and former chairman of the Scientific Committee of the Disinfectants and Sanitizers Division.

CHARLES EDWIN COTTON

Charles Edwin Cotton, 40, of 2415 Ellis avenue, Idaho state milk and food sanitarian, died in his home after a long illness.

Mr. Cotton started his work with the Department of Public Health in 1941 as milk sanitarian. After two years of service with the Army during World War II, he returned to the health department and was appointed senior sanitarian in 1947. He was assigned as sanitarian in and for the city of Twin Falls from Feb. 1, 1948, to May 29, 1950, when he was appointed state milk and food sanitarian.

He was born April 8, 1916, in St. Anthony and attended elementary and high schools in Birdsboro, Pa. He attended Albright college at Reading, Pa., and Pennsylvania State college and was graduated from the University of Idaho in 1941 with a bachelor of science degree in zoology. He took graduate work at the University of Minnesota during the school year of 1950-51 and received a master of science degree in public health. He was married April 18, 1941, in Moscow to Lois O'Meara McIntyre. He served as a staff sergeant in the European war theater with the 47th infantry regiment of the ninth division.

Mr. Cotton was a member of St. Michael's Episcopal cathedral parish, Boise lodge No. 310 BPOE, the American and Idaho Public Health associations and held a reserve commission in the U. S. Public Health Service as a Senior Assistant Sanitarian.

Surviving, in addition to Mrs. Cotton, are three children, Patrick, John Charles and Kelley Ann, all at home; two brothers, Tom of Homedale and David of Fort Bliss, Texas; a sister, Mrs. Martha Wilson of Seattle, and his step-mother, Mrs. Florence Cotton of Seattle.

CLASSIFIED ADS

FOR SALE: Single service milk sampling tubes. For further information, please, write: Bacti-Kit Co. 2945 Hilyard Street, Eugene, Oregon .

"TYPES OF DAIRYMEN

"Procrastinator — He knows the length of your rope.

Timid — Do not be unduly forceful. Careful, this type often has a mean wife.

Cooperative — Requests may be all that are necessary.

Conscientious — Do not overinspect and spoil him.

There are too many tax burner type — Be brief and seem efficient.

Observing — Be safe and use Bacti-Kit single service sample tubes, Box 101, Eugene, Oregon.

Box 101, Eugene, Oregon.

HIDE YOUR AX AND EDUCATE HIM!"

FOR SALE: New fiberglass insulated sample case with individual compartment for each bottle and a convenient carrying bail. Bacti-Kit Company, Box 101, Eugene, Oregon.

PIPELINE CHATTER

June 1, 1956

H. L. Thomasson
Box 437
Shelbyville, Indiana
Dear Red:

Enclosed is a print of Joplin's approved signs for our milk supply and eating and drinking establishment sanitation programs. Due to the fine cooperation of our dairies and eating and drinking establishments, we were fortunate last year in attaining the highest milk rating in the State and the eating and drinking establishments raised their sanitary rating from 43 percent to 88 percent, to attain one of the higher restaurant ratings in Missouri.

Due to the above facts we thought it might be a good idea to show our appreciation for this excellent cooperation and we investigated the possibility of installing signs (such as our approved water supply signs) to advise the public as to our State approved ratings. After consultation with Missouri health officials and state highway representatives, the signs as shown on the print, were devised. The signs are two feet by three feet, six inches and have been installed on the eight main highway arteries leading into the City of Joplin. All signs were placed within the immediate City limits as requested by highway officials, and worded to the satisfaction of State health officials. Certain other stipulations were necessary in order to meet the approval of the Missouri Division of Health. The signs were sponsored and paid for by the Joplin Sertoma Club.

The caption, *Look for the Grade* "A", was chosen because we have the grading type ordinance for both the eating and drinking establishments and our milk supply. Both programs were enforced through the latest *Ordinance and Code* as recommended by the U. S. Public Health Service.

Since we are receiving favorable comment from the public and the tourists visiting in Joplin, we thought it might be a good plan to pass this idea on to other health departments throughout the United States. We believe that these signs have led to an improvement in our public relations with the dairies and eating and drinking establishment operators. I am sure that other cities with approved ratings will be interested in giving deserved credit and publicity to the business concerns under their supervision.

Installation of these signs in Missouri established a new policy in reference to such public health programs and I trust the above information may prove to be of interest to you. In case further information is desired I will be happy to acknowledge all communications.

Yours very truly,
Webster Scott
Director, Department of Health & Welfare,
City of Joplin, Missouri

Mr. H. L. Thomasson,
Box 437,
Shelbyville, Indiana, U. S. A.
Dear Red:

As you may perhaps have heard by this time, John D. Faulkner and I were the two North American representatives at a Joint FAO/WHO Expert Committee Meeting on Milk Hygiene in Geneva, Switzerland, June 25-30th. Since this meeting may have some news interest for our members I have prepared a short account of it which I am enclosing (See NEWS and EVENTS). Also, under separate cover I am sending a photograph of John and me taken immediately before the sessions started.

It was really a most interesting and valuable experience to attend these meetings and to learn first hand of the conditions and problems existing in other countries. It certainly was a real education to me. A number of the committee members are people whose names I have known for many years and it was both a pleasure and a privilege to get to know them and have the opportunity of working closely with them during the week of the meetings.

Geneva is a lovely city and the WHO Headquarters furnished splendid facilities for the meetings.

After the meetings I had an opportunity of going through the large milk plant in Geneva and also of visiting some of the farms and village collecting stations where the milk is handled before being sent in to the city plant.

I am sorry I shall not be able to attend the meetings in Seattle in September as it is my good fortune to be attending the International Dairy Congress in Rome later that month. Following the Congress Mrs. Johns and I hope to visit a number of dairy research centers in Western Europe and Britain before returning home.

With kind regards and best wishes, I am,

Yours sincerely,
C. K. Johns,
Officer-in-Charge,
Dairy Technology, Dept. of Agriculture
Ottawa, Canada

FAULKNER AND JOHNS REPRESENT NORTH AMERICA ON JOINT FAO/WHO EXPERT COMMITTEE ON MILK HYGIENE

Largely with a view to providing some guidance to those countries where milk technology is in its infancy meetings of an Expert Committee on Milk Hygiene were convened at Geneva, Switzerland, June 25-30th under the joint auspices of the World Health Organization and the Food and Agricultural Organization of the United Nations. At the opening session Dr. C.

John D. Faulkner and C. K. Johns chat with other representatives of FAO/WHO Committee.

K. Johns was elected Chairman and Dr. P. Kastli Vice-Chairman, with Mr. John D. Faulkner as rapporteur.

In opening the meetings, Dr. Dorole, Director of WHO, outlined briefly what the sponsoring bodies had in mind. More detailed comments were then furnished by representatives of the two sponsoring organizations following which the committee attached the agenda.

Because of its extensiveness and the wide variety of conditions existing in the different countries, the committee found themselves under heavy pressure in order to bring in the final report by the last day of the conference. However, largely because of the cooperative spirit shown by the members it was found possible to reconcile the divergent opinions and to arrive at a final report, which was accepted unanimously. After editing by the Joint Secretaries of the Committee, the Report will be submitted to the two sponsoring organizations and if accepted by both will subsequently be published.

A great deal of thought and effort went into the preparation of this Report and it was hoped that it will be a valuable guide to those countries where a program of milk hygiene is in its early stages.

Attached is a list of those participating in the meetings of the Joint Expert Committee at Geneva.

PROVISIONAL AGENDA

1. The work of FAO and WHO in milk hygiene
2. Hygiene in milk production (the farm)
   a. Environmental conditions
      (1) Dairy farm buildings and installations
      (2) Insect control
      (3) Water supply
   b. Health of dairy cattle
      (1) Feeding difficulties
      (2) Mastitis, treatment with antibiotics
      (3) Zoonoses (tuberculosis, brucellosis, anthrax, etc.)
   c. Milking
      (1) Health and cleanliness of milking staff
      (2) Milking methods, their influence on udder health
      (3) Cleaning and sterilization of milking utensils, especially milking machines
   d. Farm handling of milk
      (1) Cooling and filtration on the farm
      (2) Milk collection in cans
      (3) Bulk collection
3. Collection and transport of milk
   a. Cleaning and sterilization of transport cans and tankers
   b. Handling of milk in collecting centres
   c. Refrigeration during transport
4. Handling and processing of milk in dairies
   a. Medical hygienic control of dairy staff
   b. Milk control on reception — bacteriological and other tests
   c. Payment according to hygienic quality
   d. Cooling, clarifying and storing
   e. Pasteurization, sterilization, "toning" and drying in relation to hygienic control
   f. Hygienic control of dairy equipment
5. Hygienic methods in the distribution of milk
   a. Prevention of contamination (bottling, milk tank)
   b. Cooling in distribution
   c. Hygiene in retailing (house-delivery, shops, etc.)
   d. Milk hygiene in the home
6. Official supervision
   a. Principles of milk control legislation
   b. Organization of control
      (1) Official
      (2) Non-official
7. Recommendations for future co-ordinated research by FAO and WHO in milk hygiene.

LIST OF PARTICIPANTS

WHO Members

Mr. John D. Faulkner,
Chief, Milk and Food Program,
US Public Health Service,
WASHINGTON 25, D C.
U. S. A.

Mr. Teodore R. Moreno,
Chief, National Service of Milk Hygiene,
Ministry of Public Health,
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Argentina

Dr. J. Babad,
Agricultural Research Station,
REHOVOT
Israel
Dr. M. S. El-Rafey,
Technical Director,
Societe Industrielle et Commerciale
Laitiere "Mandara" S. A. E. (SICLAM)
MANTAZA
Alexandria, Egypt

WHO Consultant

Prof. H. D. Kay,
Director, National Institute for Research in Dairying,
SHINFIELD, Nr. Reading,
United Kingdom

UNICEF Representative
Mr. R. L. Cooper,
Chief, Milk Conservation Project

FAO Members

Dr. C. K. Johns,
Bacteriology Division,
Canadian Department of Agriculture,
OTTAWA, Ontario
Canada
Prof. Dr. P. Kastli,
Commission Suisse du Lait,
LIBERFELD,
Berne
Switzerland
Dr. J. W. Pette,
Nederlands Instituut voor Zuivelonderzoek,
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EDE
Holland
M. Germain Mocquot,
Station Central de Microbiologie et Recherches Laitieres,
JOUY-EN-JOSAS (S. et O.)
France

FAO Secretariat

Dr. Hans Pedersen,
Dairy Specialist,
Animal Production Branch,
Agriculture Div.

Mr. H. J. Meharry,
Dairy Specialist,
Animal Production Branch,
Agriculture Div.

Mr. R. N. Clark, ES, WHO)
Dr. M. Kaplan, CDS, WHO) Joint Secretaries

CHOCOLATE MILK FOR SUMMER CAMPS

When city youngsters swarm into their summer camps they'll be taking their appetites for chocolate milk along with them, the Chocolate Milk Research Foundation pointed out, as it urged local dairy operators to take advantage of this big volume summer market for chocolate milk and chocolate dairy drink.

Anticipating a big demand by summer camps for chocolate milk, the Foundation played host at a chocolate milk bar during the annual Regional Camping Association exhibit, attended by more than 150 camp directors and buyers.

The Foundation participated in its first camping display in Chicago a year ago. This year, several camp directors reported that they had taken recommendations made last year and had ordered large quantities of chocolate milk from the local dairies nearest their camps. Amounts of daily orders ranged from five to twenty gallons. Principal use was the serving of the chocolate milk hot for breakfast. One camp director said:

"We always had our cook prepare breakfast cocoa with powders and sugar until we heard your suggestion of serving hot chocolate milk for breakfast. We tried it one day, and now we'd never go back to the old method."

A new suggestion was made this year to the camp directors by Miss Patricia Hanson, hostess for the Chocolate Milk Research Foundation.

She said:

"The twice-daily coffee break has become an accepted pattern for adults, so why not give the youngsters a twice-daily 'chocolate Milk break.' "

She recommended to camp directors that they inaugurate the serving of chocolate milk at mid-morning and mid-afternoon, since the "break" would give the campers a welcome variation in their heavy schedule of activities, and at the same time the chocolate milk would renew their energy. The Chocolate milk break could vary with the weather, served hot on rainy and cold days, and cold on normal hot summer days.

The Foundation recommended to local dairies that they contact camp directors and buyers early in the season to line up summer season orders for chocolate milk. Some of the larger camps purchase chocolate milk in bulk five gallon containers for use in dispensers, while others prefer it in individual half-pint glass or fibre containers.

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Add'l. 100's	1.60	1.60	3.00	4.20	7.00	3.37

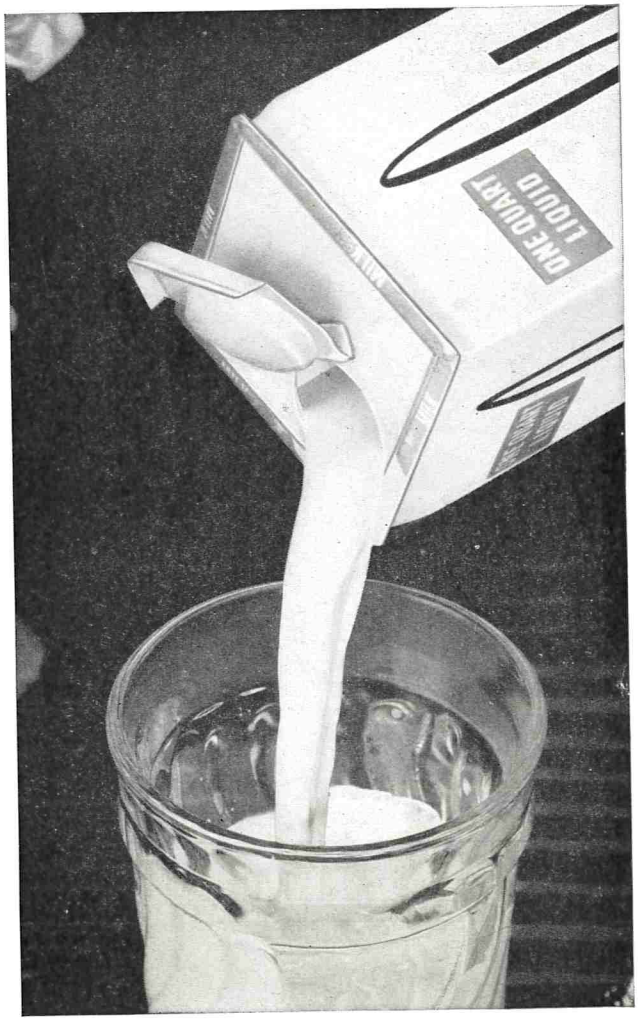
"Canco Snap Cap Carton
POURS BEST!"

That's the majority verdict of 328 housewives who chose Canco Snap Cap over carton "X" in a recent side-by-side comparison test right in their own homes!

HERE'S PROOF of the wide public acceptance our fibre milk container has earned. An independent research organization got the answer from the woman who buys. 328 housewives in New Orleans used the Canco Snap Cap carton side by side with carton "X". After using milk from both cartons for four days, the majority of the housewives stated they prefer Canco Snap Cap. 56% said it pours best. Canco's "controlled pouring" was their choice.

Then, too, 93% said it opens easiest! 69% said it closes better! 83% said it was easier for children to handle.

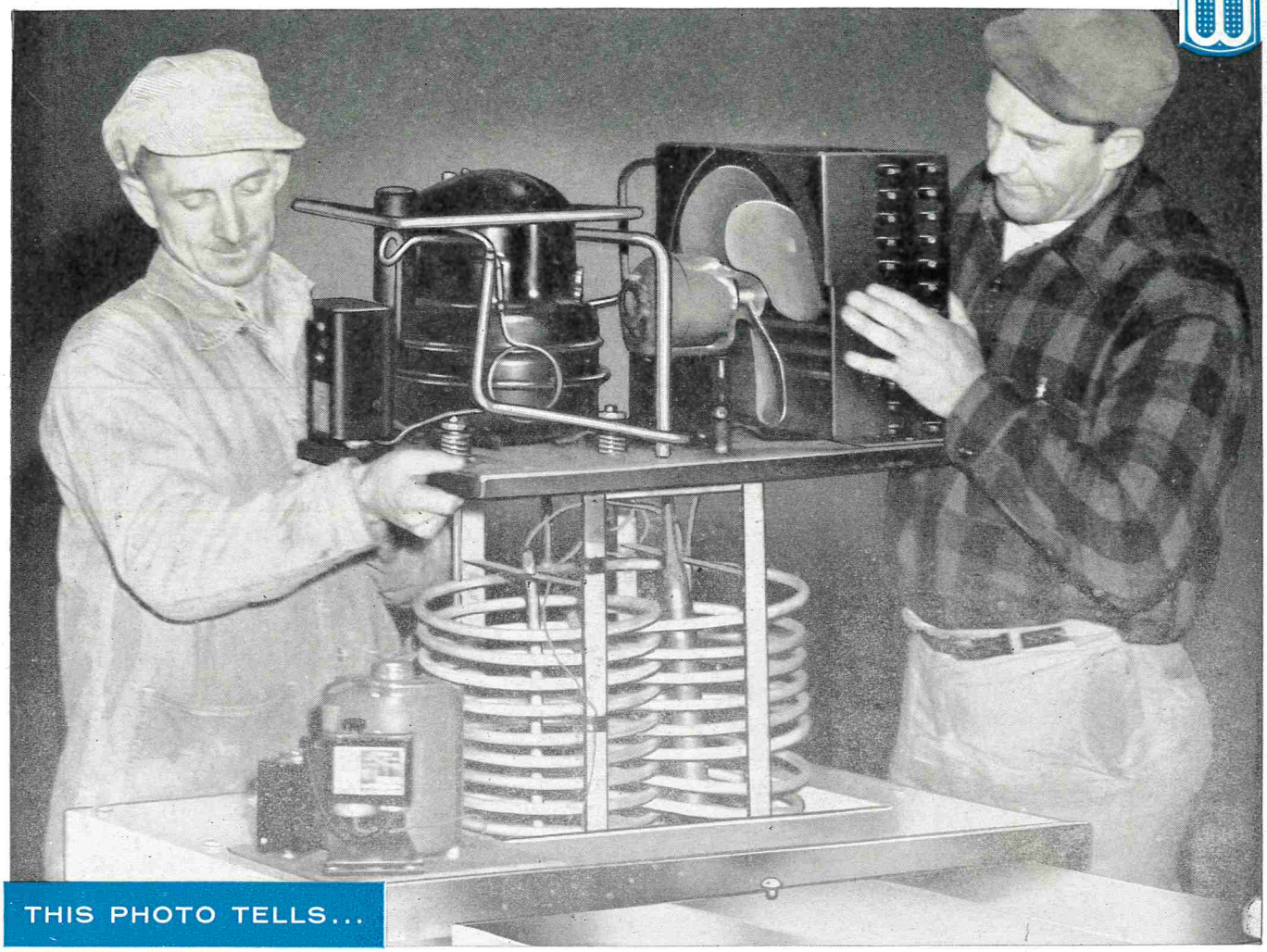
These popular easy-handling features of the Canco Snap Cap carton have made it the milk container women *really* prefer.



AMERICAN CAN COMPANY

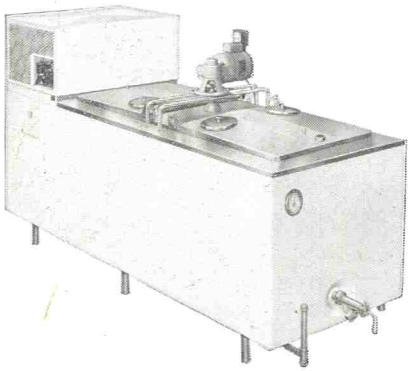
Fibre Container Department, 100 Park Avenue, New York 17, N. Y. CANCO

WILSON BULK MILK COOLERS LEAD THE WAY FOR EFFICIENCY, CONVENIENCE



THIS PHOTO TELLS...

What Makes a Good Bulk Cooler!



"If you can't lift out the cooling system, it's not a good cooler." That's what producers are saying. They got the idea from Wilson. Because you *can* lift out the cooling system of a Wilson bulk cooler. And as a result, producers get better cooling, safer cooling, and longer, more profitable operation.

Better cooling results from Wilson's drop-in refrigeration unit because it permits separated compartments. Ice and ice water are in one compartment; milk is in the other. Milk can never freeze because only ice water (never ice) touches milk tank walls. Cooling is fast and efficient.

Safer cooling because with the drop-in refrigeration unit in a Wilson bulk cooler, producers get power failure protection. If power fails, simply lift out the cooling unit and replace with block ice. Or use cold water from the well. This drop-in feature also simplifies maintenance—you can replace the complete unit fast.

Longer, more profitable operation is obvious when you examine the simplicity of a Wilson bulk cooler. It's simple, it's rugged, and it's built to last.

Producers can't go wrong by going bulk with Wilson. You'll want to have complete information on file to help give producers in your area the full story. Mail in the coupon today.

WILSON
BULK MILK COOLERS
WILSON REFRIGERATION, Inc.
Smyrna, Delaware
A Division of Tyler Refrigeration Corporation

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