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Editorials

The opinions and ideas expressed in papers and editorials are those of the respective authors. The expressions of the Association are completely recorded in its transactions.

Managed Milking

IT is not often that programs designed to speed up dairy farm operations carry great possibilities for improving sanitation at the same time. However, the so-called Managed Milking Program carries with it such dual benefits and for this reason should be supported enthusiastically by milk sanitarians. The program for managed milking or as it sometimes is called "fast milking" has as its basis the facts that the secretion of the hormone which causes the cow to release or let down her milk can be stimulated by hot applications to the cow's udder immediately before milking and also that once the milk is let down cows can readily be habituated to complete milking in three or four minutes. This interval allows sufficient time for preparing the next cow for milking so that a single milker may milk 15 or more cows per hour.

Although the use of electric warming pads on the udder has been suggested, the simple and natural way to apply heat to the cow's udder is by washing it with warm water. This is the method commonly used for this purpose. For many years sanitarians have been advocating the washing of cow's udders and teats with chlorine solutions just prior to milking. There is no reason why the chlorine solution cannot be used warm to serve the purpose of stimulating the let down of milk and at the same time the chlorine would serve to prevent the growth in the water and spread from one cow to another of bacteria in such water. It is granted that these bacteria may be harmless and because they are applied to the outside of the udder and teats may not serve to transmit mastitis but they may remain on the teats and thus enter the milk. Of course they are otherwise undesirable.

In the managed milking program the use of the strip cup for examining and discarding the first streams of milk also is advocated. This is another thing that sanitarians have been suggesting not only as an adjunct to detecting abnormal milk resulting from mastitis but for the purpose of eliminating the contamination that frequently is present in the first streams of milk from the cow's udder. Here again the technics of the economic and health programs coincide.

Furthermore, in the managed milking program a dairyman is urged not to leave the milking machine on the cow for more than three or four minutes and

to machine strip the cow. In doing this he prevents the milking machine cups from crawling up on the deflated udder and damaging the delicate tissue at the entrance of the teat canal. Petersen has demonstrated this means of irritation very graphically in his moving picture in which he shows this action of the milking machine cup by means of an interior view of a detached udder. For years health departments have been having cows examined and condemned on account of mastitis but very little has been done in the control of the disease. Dairymen who have practiced managed milking for some time believe that they have much less mastitis in their herds than formerly. It seems quite likely that this will be confirmed.

The economic arguments in favor of managed milking are sufficient to sell the program to milk producers and there appears to be no need for talking improved sanitation. However, sanitarians not only should endorse but should support the program providing heat is applied by washing the udder with a warm chlorine solution.

W. D. T.

"Milking Parlor Practice"

CONSIDERABLE interest is being evinced by milk sanitarians, agricultural engineers, and others, in signs of the beginnings of a trend, in some sections of the country in which dairy cows have to be housed in the barn through the winter months, toward "milking parlor practice". This term—"milking parlor practice"—is probably misleading, in that it does not imply the construction and use of elaborately fitted and furbished milking space essentially for show purposes. In essence, the practice consists of a limitation of the number of stanchions, in which milking only takes place, and the cows are housed elsewhere in the barn during the remainder of the day and night, in a space known as the "resting barn", "loafing barn", "tramp shed", etc.

This system has certain undeniable advantages, among which is a lower first cost in barn equipment. Some advocates claim greater comfort for the cows, if that is determinable and to be considered a factor. Conversely, the milking operation requires more time because of the necessary movement of the cows into and out of the milking stanchions. The smaller area of milking floor to be cleaned is probably balanced by the necessary removal of droppings from the "tramp shed".

In those sections of the country in which milking herds are rarely stabled overnight, the use of the stanchions only at milking time is the normal practice, whether or not the milking barn houses the entire herd at once. There is no point in a discussion of a departure from that practice. But, in areas in which the cleanliness of the continuously stabled cows' flanks and tails, and of the gutters (particularly at the time of the morning milking), and the maintenance of the structural repair and physical state of the space in which cows are milked, are factors in the sanitation of milk production, the pros and cons of "milking parlor practice" would appear to constitute a pertinent subject for discussion in the pages of the JOURNAL. Proponents and opponents of this system are invited to present their views, preferably supported by pertinent data.

C. A. A.

We Note—

FOR years we have urged the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS to recognize the outstanding, meritorious work of our professional brethren in the advancement of milk sanitation, technology, quality control, research, or education. Well, our good friend, the United States Army, recognizes the importance of milk sanitation. It takes this work seriously. It has cited one of our members, Colonel Babcock, for the excellence of his work in milk sanitation (see page 116, this issue). As an Association, we have not awakened to either the human interest or the spiritual stimulation of honoring such men; anyhow, other organizations do. We applaud this action of the Army, and we take pride in the recognition accorded our fellow milk technologist.

Then again, we note that the American Dairy Science Association Committee on Post-War Dairy Manufacture has recommended that the dairy industry needs "extensive continued research in the utilization of milk. Along with the development of new products and uses for milk in its various forms, there should be developed a very aggressive advertising and merchandising program of education as to the real value of the milk products." There it is again: more research, and more effective merchandising.

In this connection we note the immense amount of new work reported in the recent literature (see pages 67–100, this issue). We recognize indeed that scientific and technological progress is made by taking one step at a time; so by keeping at it, we gradually move along into new fields of knowledge and application. The recent work seems to lie in this field, namely, the publication of many pieces of research each of which is independently conceived and executed. These are desirable; we could not get along without such work. But there is another kind of research that we see only in relatively small amount. This is the kind that consists of long-time research programs. These should dig beneath the surface of things for years without fanfare of trumpets or display—the kind where the investigators are not pushed to publish something quickly, and where immediate (or even early) commercial returns are not expected. Other industries have undertaken such research programs. They started them because they believed that such work would be profitable, they continued and expanded them because they actually paid dividends, and they are expanding them on even greater scale because this is necessary for survival. Milk industry, when are you going to get into "big time"?

Finally, we note the relatively large number of our "old guard" who have retired during the past year. These men have been among those who fought the early battles for milk quality and who blazed trails for the advance of the increasing number of persons who now are concerned with the problem of securing safe and excellent-tasting milk. These men cannot be replaced; their experience and character have grown during thirty years or more of development in this field. Such strength does not come from just reading what the book says: it comes from effective living. The younger men must take an increasing share of developmental, investigative, and organizational responsibilities. Just as living conditions are steadily changing, so must production and distribution in the dairy industry change also. We need new insight, new perspective, new techniques. Younger men, take hold.

J. H. S.

Sanitation Halves Curing Time of Cheese

THERE has been a growing tendency in America to market a curdy and rubbery cheese devoid of odor and having very little flavor. This tendency increased during the war years because of the supply and demand for cheese. If the marketing of this type of cheese had prevailed for a few more years, a generation of Americans would have developed who would have considered this kind of cheese typical Cheddar cheese. However, to the cheese-lover and connoisseur of cheese an improperly aged cheese is an abomination. They desire a well-aged cheese, with a firm body and a clean, well developed flavor. Cheese like wine requires aging to develop the finest and best flavors and aromas. Due to research work by the Bureau of Dairy Industry, United States Department of Agriculture, it now looks as though the American people are not going to be robbed of their rightful heritage—a firm bodied, finely flavored, well-aged Cheddar cheese—because of the economics of the ripening or aging period. They have found three factors essential to halve the aging period, viz., good, clean milk, pasteurization and good starters. Under these conditions the cheese can be ripened at 60° F. instead of 50° F. and is fully ripened in three to four months instead of six to eight months. Furthermore, the cheese held at the higher temperature developed more and a better flavor than that held at the lower temperature. The reduction of time is made possible by the higher aging temperature. This higher temperature can be used because of the clean milk, pasteurization and good starters.

Earlier work by the Bureau had demonstrated that pasteurized milk was an important requisite in the production of cheese of uniformly high quality. Due to this work pasteurization was adopted by many cheese makers during the war years. Pasteurization, as every health worker knows, eliminates not only most of the bacteria causing undesirable biochemical changes in cheese such as off-flavors and odors, and gas, but also the disease-producing bacteria as well. Either one of these reasons is sufficient to require that all milk for cheese be pasteurized.

In the light of these facts it is strange why many cheese makers have held the mistaken notion that cheese made from pasteurized milk cannot be ripened fast enough and does not have the characteristic flavor.

Possibly with the kind of milk they were using for cheese and with poor starters, pasteurization didn't show up so well, or was it just prejudice? Pasteurization has always had a hard row to hoe from the very beginning, starting with milk, butter and ice cream and now cheese.

At any rate states and cities now have a scientific argument in addition to a health reason to require that all milk used in the manufacture of cheese shall be pasteurized.

F. W. F.

Scientific Advances in the Dairy Industry

A Review of Much Literature of the Year 1945

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Wollaston, Massachusetts

THE following summary of literature in the field of the dairy industry is largely based on the abstracts as published in several journals during the year 1945. Therefore many of the papers reported herein appeared in print during the year 1944. No attempt is made to restrict the summary to either of these calendar years. Restrictions of allotted space precluded the inclusion of all articles that contain material worthy of this study. We estimate that we have covered possibly at least four-fifths of the available literature.

The following abbreviations have been used:

CA means *Chemical Abstracts*, vol. **39** (1945)
DSA means *Dairy Science Abstracts* (1945), volumes **6** or **7**
JDS means *Journal of Dairy Science*, vol. **28** (1945)

In a few cases, the volume and year of a reference is different from those of the year 1945; specific publication data are fully given.

ANALYSES

Olsson reported that the determination of moisture in whey samples by heating for 22 hours in an oven at 87°–90° agreed within a few tenths of 1 percent with heating on a hot plate for 3–4 minutes (1).

Citric acid in dried skim milk was shown by Heinemann to run a maximum of 2.09 percent in March and April, with a minimum of 1.88 in November. A further 11 samples taken in July ran 1.83–2.08 percent. These values are useful for determining the milk solids in bread (2).

Coulter discussed new procedures concerning the titratable acidity of cream, the accurate determination of acidity to be neutralized, and use of suitable neutralizer (3).

The detection and determination of water in milk samples is critically and illuminatingly discussed by Lythgoe, showing by examples that cryoscopic determinations may need supporting analytical evidence to stand court review (4).

Fluorine in milk was reported to run: dried whole milk 0.48–0.83 p.p.m., evaporated milk 0.2–0.15 p.p.m., and milk 0.17 p.p.m., determined by a titration depending on the bleaching action of the fluoride-distillate on a thorium alizarin S lake (5).

Small centrifuges should be avoided, Herrington writes, because the forces at the bottle necks are insufficient to remove all adherent water (6).

Discrepancies between reports of analysts at receiving stations and creamery could be reduced, Herreid *et al.* reports, if operators were properly trained and if the Babcock bottles were calibrated in smaller units (7).

Vuillaume gives a formula for directly calculating the degree of dilution of a sample of milk from constants of its constituents (8).

Solids and ash in milk and evaporated milk for the new revision are reported by Frary (9).

Determination of total solids in fluid whole milk, skim milk, cream, condensed milk, condensed skim milk, and evaporated was shown by Livak and Doan to be possible in one hour as compared with 3–4 hours by the official method. They used the "Diet-

ert Moisture Teller" which employed forced air at 120° for 20–25 minutes giving check results with the Mojonnier tester. The "Official Method" requires 3–4 hours (10).

Full details are given for determining the total solids in milk according to the Analytical Methods Committee (British) (11).

Solids-not-fat values as calculated from formula and determined chemically are shown by Rowlson and Mickle to agree within a satisfactory working range (12).

Increasing the concentration of phenolphthalein was found by Barkworth to decrease the pH of the end point and therefore increases the titration figure in the acidity determination in milk (13).

The estimation of the end point in the titration of milk with phenolphthalein was shown by Barkworth and Evans to give the most reliable checks when the color is matched with milk to which 2 ml. of 0.001 percent rosaniline hydrochloride had been added (14).

Increase in alkalinity of ash as a measure of the use of neutralizers was reported by Kunkel and Combs (15).

A method is devised by Lyubin and Lebedeva for determining the amount of milk in a milk soup measuring the lactose content iodometrically (16).

Small additions of milk powder to flour were determined by Dawson, using a differential fermentation with *Saccharomyces cerevisiae*, and also *S. cerevisiae* with *S. fragilis* (17).

The detection of reconstituted milk in normal milk, described by King and Schouest, is based on comparing the intensity of yellow color imparted to the solution of washed curd of sample in 5 percent NaOH. The presence of 20–50 percent of reconstituted milks and 5 percent of canned condensed whole milk could be detected (18).

Needham discusses the importance and various methods of sampling milk for chemical and bacterial analysis (19).

Frary reports changes that should be made in the 1945 edition of *Methods of Analysis, A.O.A.C.* (20).

By determining the total amount of heat (H) per gram of fat necessary to raise the temperature from $T_1°$ to $T_2°$, Jack and Brunner report that the percentage of solid fat (P) in a cream sample at $T_1°$ can be calculated from the formula: (21)

$$P = \frac{[H - 0.5\ (T_2 - T_1)]}{19.5} \times 100$$

The original freezing point of sour milk was shown by Macdonald to be possible of calculation because about 77.5 percent of the total freezing-point depression is caused by the lactose and soluble ash (22).

Although milk from some herds failed to reach the minimum requirements in solids-not-fat, the value of the freezing point method for the recognition of genuine milk was confirmed by O'Loughlin and Ryan (23).

Ligthelm reports that the freezing point of 183 samples (— 0.524° to — 0.555° average — 0.541°) was not related to wide ranges in proximate analyses (24).

Freezing point depressions of cows' milk was found by Tankard and Bagnall to vary from — 0.541° to — 0.559° C. for herd samples and — 0.536° to — 0.564° C. for individual samples (25).

A method is worked out by Ryan for determining the molecular constant or the calculated freezing point of very old samples of milk whereby the amount of added water can be determined with an accuracy of about 3 percent (26).

The use of the cryoscopic method for the detection of added water to milk is critically discussed by Nussbaum (27).

Formaldehyde in milk was studied by Horn in respect to the limits of sensitivity of, and interference of nitrites to, the following tests: sulfuric acid-ferric sulfate, sulfuric acid-bromine, hydrochloric acid-ferric chloride, decolorized fuchsin, and phenyl

hydrazine hydrochloride-sodium nitroprusside (28).

Hood shows that $HgCl_2$-milk preservative tablets in Canada are often designated by trade numbers but contain a wide scatter of preservative content. He urges that labels specify the amount of ingredient (29).

The detection of borates in milk is readily accomplished, Bonoldi reports, by using the sensitive carmine-sulfuric acid reagent (0.05 percent carmine in H_2SO_4, density 1.825) (30).

Iron in food was determined by Thompson using a modified thiocyanate procedure whereby the colored compound of the acid-digested food is read in a spectrophotometer or photoelectric colorimeter. Dried skim milk carried 4.2–6.8 p.p.m.; dried whole milk 1.8–7.6 p.p.m.; and evaporated milk 4.0 p.p.m. (31).

The Karl Fischer reagent, using a quantitative reaction between water and a solution of iodine, pyridine, and sulfur dioxide in methanol, was reported by Heinemann to be satisfactory for the determination of moisture in butter oil, butter, dry milk solids, and sweetened condensed milk but was not satisfactory for those containing more than 20 percent moisture. Direct electrometric titration was possible with this reagent using the glass-platinum electrode assembly with a Beckmann pH meter (31a).

The Dietert Moisture Teller employing forced heated air was found by Doan and Livak to be applicable for determining total solids in ice-cream mix, sweetened-condensed whole milk, and sweetened-condensed skim milk (31b).

BACTERIOLOGY

Brucella abortus was reported by Fulton to have been found in 4.34 percent of 12,351 samples of human blood in Canada (submitted for Wassermanns). It died in 3–5 days in milk inoculated with *Strep. lactis*. Some strains survived for 13 months in unsalted butter, for 6 months in butter containing 2.1 percent of salt, and for 7 months in creamery butter "supposed to contain 1.7 percent of salt" (32).

Van Bever discusses the literature concerning influence of temperature and pasteurization time on the behavior of tubercle bacilli, phosphatase, soluble milk proteins, peroxidase, and agglutinin. He explains the phenomena as complying with first-order reaction velocities and also the Arrhenius law. He describes a simple cremometric apparatus for the determination of a series of small milk samples. He studied in detail the Kay-Graham phosphatase test B, and applied Eyring's ideas of protein denaturation as causing the parallelism between the behavior of bacteria, enzymes, and proteins by heat treatment (33).

Molds and yeasts in cultured dairy products (buttermilk, cream cottage cheese, butter, and sour cream) were found by Gershenfeld and Ruthenburg to be revealed most suitably on potato dextrose agar (34).

G.W.S. and M.L.A. Petazze report that pasteurized milk in Buenos Aires, kept at 23° for 12 hours, showed bacterial deterioration by diminution of proteins and increase in non-protein and amino nitrogen and ammonia (35).

Seelemann describes udder pathogenic streptococci and their important biological characteristics (36).

A pH and Eh indicator, claimed by Ulrich to be an improvement over litmus in milk medium, is made of 1 gram of chlorophenol red in 100 ml. of absolute alcohol and 0.25 gram of methylene blue in 100 ml. of water (37).

Plate counts of raw whole milk, and of the cream and skimmed milk fractions were shown by Ulvin and Cree to average 100, 66 and 126 respectively (38).

An improved darkfield colony counter (Quebec) is described by Richards and Heijn (39).

Coliform organisms in cream grow so much faster than in milk that Robinton and Genung maintain that their presence in cream must be interpreted in the light of cream as being a separate product from milk, just as butter is (40).

Milks with high bacterial counts were found by White and Sherman to carry such large numbers but smaller percentage of interococci, with large variations in both numbers and percentages that it is inadvisable to use the interococcus content of milk samples as a criterion of quality (41).

Hauser and King reported that a hypochlorite solution has a preservative effect to reduce the bacterial count of milk whether or not there is subsequent pasteurization. The Rupp test for free or semicombined chlorine is reliable for quantities of chlorine over 10 p.p.m. (42).

The determination of the reductase activity of milk is modified by Skar by completely filling to exclude air, or removing the dissolved air by vacuum. To effect better mixing, beads are added to the tubes which are shaken every ½ hour (43).

Thomé studied the methylene blue reduction test at 38°–40° on four milks from different sources, inoculated with streptococci, micrococci, and coliforms, all having practically the same reduction times when the same cultures were compared (44).

Reproducibility of bacterial counts by the direct microscopic method are discussed by Levowitz, who gives detailed instructions (45).

For direct microscopic counts, Olson and Warren describe a device which marks a circle 1 sq. cm. on glass slides, and another which modifies the mechanical stage of a microscope so that equally spaced fields across two diameters of this circle may be counted (46).

Penicillin was found by Seeley, Anderson, and Plastridge to be effective against *Str. agalactiae, Str. uberis, S. aureus, Str. viridans, Str. dysgalactiae,* and *C. pyogenes,* together with the hemolytic group C streptococcus, but a strain of *E. coli* was refractory (46a).

BUTTER

Brown and Bloor fed rats the fat acids of butter as substitutes for the milk fat in a normal diet. Liquid acid diets were as good as butter. The solid acid diets were inferior to butter and the volatile acids the poorest. The storage of vitamin A in the livers of the rats fed the liquid acid diets was greater than that from the solid acid diets. The liquid acids were absorbed well but the average absorption of the low solid acids was 71.3 and of the high solid acids 42.2 percent (47).

Acidity increase in cream for buttermaking from 0.11 to 0.20 or 0.31 percent was reported by White to give pH values of the butter serum from 6.76 to 6.1 and 5.51 respectively. Loss in butter scores ran 2–3 points between the low- and high-acid butters. In medium- and high-acid butters, the principal flavor defects were metallic, sour, or acid, and one fishy. Best flavor scores come from sour cream of 0.15 percent or lower to give a pH in the butter serum of 6.7–7.2 (48).

Bleaching and tallowness in butter was traced by Hussong and Hammer to the presence of copper, two such samples running 1.26 and 9.9 p.p.m. A third sample, showing bluish areas which gradually bleached, carried 14.4 p.p.m. of copper against 0.5 p.p.m. for the rest (49).

Fishiness in butter was reported by Hussong, Quam, and Hammer, as coming from plants producing cream of lower pH values than from nonfishy butter; but also when the butter was fishy with high pH values, the copper content was high. One source of copper mentioned is introduced from the fat phase of cream coming from cheese plants (50).

Fishy taste in butter is found by van der Waarden to be due to some other cause than the decomposition of

lecithin as maintained by Supplee and Sommer and Smith. The fat phase invariably contained the off-flavor substance. The apparatus and procedure is described for the molecular distillation of butter fractions (51).

Elliker, using a modification of the Pien, Baisse, Martin method for the determination of biacetyl in butter, reports that many bacterial cultures proved capable of destroying biacetyl added to sterile skim milk. *Str. lactis* in good butter starters inhibits the harmful *Pseudomonas*. The inhibiting factor presumably is the acid formed (52).

Flavor development in butter cultures was reported by Hoecker and Hammer. Lactic acid formation (at 21° C.) reached a maximum after 62 hours, but acetylmethyl carbinol after 38 hours decreasing thereafter, and diacetyl production was greatest in 22 hours, decreasing one-third in the 62 hours. Citric acid increased both flavors. *Strep. lactis* produced the same amount of lactic acid as the mixed culture but only a little of the flavor components. *Strep. citrovorus* and *paracitrovorus* produced no lactic acid and little flavor, but when lactic acid was first added, then both flavors were produced rapidly with no loss (53).

This article is an extensive discussion by Beijnum and Pette on the conditions that affect the development of acid and aroma in commercial starters in buttermaking (54).

Torsten and Virtanen state that the typical C_4 aroma compounds are not formed directly or solely from the citric acid of milk. Lack of calcium prevents formation of AcCMOHMe. The following reaction is given: citric acid $\rightarrow$ AcOH + oxal-acetic acid $\rightarrow$ CO_2 + 2 AcCOOH $\rightarrow$ CO_2 + AcCHOHMe $\rightarrow$ Ac_2 (55).

Polyethenoid acids in the C_{18} series in milk were studied by Hilditch and Jasperson, using a modified method of Mitchell, Kraybill, and Zscheili, based on the absorption when the acids are alkali-isomerized in glycol at 170° for 5 minutes (56).

The equilibrium butylene glycol $\rightleftarrows$ acetoin $\rightleftarrows$ biacetyl was studied by Petersen in relation to butter flavor and aroma. A short incubation period (24 hours) results in maximum acetoin plus biacetyl and minimum butylene glycol content (57).

Molds in storage butter was reported by Munin to be lowest in churns that were effectively disinfected, chlorine giving poor results because improperly used (58).

Butter made from normal untainted cream was found by Munin to score better when the cream was pasteurized in a system that was closed (59).

Butter in tins may be kept better if 2.5 percent salt plus 0.25 percent boric acid are added, but this treatment emphasizes any tallowy or oxidized flavors (60).

Butter quality or keeping time cannot be determined by any of the various chemical methods studied by Kiermeier (61).

Water, acceptable from a public health standpoint, was reported by Corley, Long, and Hammer to introduce spoilage organisms into butter: *P. fragi, P. graveoleus, P. mephitica,* and *E. coli* (62).

All azo dyes for coloring butter and cheese were found by Ritter to be reduced by the lactic acid bacteria. Non-reducible dyes were the triphenylmethane and phthalein dyes (63).

Fresh butter for tropical use is made by Wiley by adding a little salt, dried skim milk, biacetyl flavoring, and 19 percent of hydrogenated butterfat to dry butterfat, imparting a melting point of 105° F. (64).

Butter oil of superior keeping quality is claimed by El-Rafey, Richardson, and Henderson to be made by heating butter to 110°. This treatment drives off moisture, transfers much phospho-lipid material from the non-oil to the oil phase, and increases the concentration of reducing substances (65).

This article by Deribéré carries a review of the fluorescence of butter (66).

The water content of butter and its regulation is discussed by Underrain in relation to room-temperature, speed of churning, acidity of the cream, fat content of the cream, size of butter granules, hardness of the fat, salts, and working (67).

Mold in butter is reported in mm. per mg. of butter according to a procedure by Elliker, in substitution for Wildman's method which gives a comparative value (68).

The keeping quality of tinned butter was reported by Pont controlled bacterially by 0.12–0.25 percent boric acid or by vacuum, combined in each case with 2.5–3.5 percent NaCl, but tallowy flavors due to fat oxidation were still serious (69).

Bhat and Sidhwa found that five rancid butter samples contained on the average 61.94 percent less moisture, 2.21 percent less fat, 13.13 percent less lactose, and 1,815.54 percent more total acids than five fresh butter samples (70).

The wrapping of butter in dry parchment treated with 5 percent calcium propionate solution acidified to pH 5.5 with lactic acid was found by Olson and Macy to show marked superiority in surface flavor over controls (71).

The moisture, salt, and curd in creamery butter was reported by O'Shea and Lyons. A quick method of sampling half-worked butter by taking three ¼-inch-thick slices from left, middle, and right of churn gave as good results as the A.O.A.C. composite sample (72).

Knudsen summarizes the results of various investigations which showed that the quality of butter has gradually deteriorated during 1938–42, attributed to the unsatisfactory fodder situation. Steensberg traces the poor consistency of butter to lack of oil cake, recommending silage, grain, and yeast with skim milk and bone meal (73).

The addition of alkali to buttermilk sufficient to reduce the titratable acidity as little as 0.01 percent was reported by Kunkel and Combs to increase the ash alkalinity, and this is revealed in the buttermilk just as readily when the neutralizer is added directly to the cream. The ash alkalinity of 16 samples of unneutralized dry sweet cream buttermilk ran 55.0–112.0, averaging 78.0 ml. 0.1 NHCl to titrate the ash of 100 grams of sample. The ash alkalinity of 90 commercial samples of dry buttermilk ran 110–673, averaging 238. Reduction of acidity 0.03 percent did not impart abnormally high ash alkalinity (73a).

The mold mycelia counts in butter were observed by Elliker and Horrall not to correlate with organoleptic grades over the seasons. By mold mycelia standards, over 50 percent of all cooking grade butter, almost 75 percent of 89 score, about 90 of 90 score, and all of 92 score butter would be considered legal (73b).

BUTTERFAT

Using the Mojonnier fat test as a standard, a committee headed by H. C. Hausen, recommended the following methods: American Association for buttermilk, skim milk, and whey from Cheddar, Blue, Edam, and Swiss cheeses; Minnesota (original reagent) for whey from Cheddar, Swiss, Edam, and cottage cheeses; Pennsylvania for whey from Cheddar, Blue, and Edam cheeses. Centrifugation tended to give high results. Amyl alcohol or fusel oil were too variable to use (74).

Fat in milk is determined by Ram and Kothavalla by mixing a special reagent. It is shaken after 3 and 6 minutes, and gently inverted after 16 minutes, whereupon the fat content is read. Although no centrifugation is used, the results agree well with the Gerber method (75).

The Pennsylvania and Minnesota methods gave results to Brown and co-workers, agreeing closely with the

Mojonnier method for fat in sweetened condensed and evaporated milk (76).

The Paley bottle is described by Masurovsky as offering a more convenient as well as more accurate instrument in the determination of butterfat than the ordinary Babcock test bottle [cf. this JOURNAL 6, 299 (1943)] (77).

Melting points and refractive indices of fats should be determined under the microscope, according to Kaufmann and Lund, because of differences in melting points of two fractions observed, and because of the possibility of determining refractive indices by measuring Beck's lines in connection with mixing powdered glass with sample, heating, and using Lund's formula to check with Abbé readings (78).

Mulder devised the following formula, accompanied by a nomograph, for determining the fat loss in cream: $X = (100 - 7/6\ V_2) - V_k/V_2$, where V_k is the fat content of buttermilk; V_2, the fat content of cream; and X, the fat loss (79).

Butterfat recovered from butter which had been heated for 10 minutes at 250°–400° F. was shown by Josephson and Dahle to be stabilized during storage (80).

Jack and Henderson separated milk fat into five fractions by precipitation from pentane. The analysis of the filtrates by the ester-fractionation method confirmed the fatty acid composition as reported by other investigators (81).

Butterfat was fractionated by gradual solidification in tubes which were cut into 2-cm. segments. Hamdi and Zollikofer report that liquid fat near the surface gave high Reichert-Meissl, iodine, and saponification numbers. Slow cooling over two weeks caused pronounced fractionization and wide variation in constants (82).

Butterfat contains no special nutritive factors according to B. von Euler, H. von Euler, and Säberg who compared the nutritive values of margarine, butter, and the fat acids of each (83).

Forty percent raw cream was found by Bell and Sanders to oil off, after freezing, less than the pasteurized cream. Differences in size and number of fat globules and temperature changes greatly affected the cream emulsion. Quick frozen cream was less stable than cooling in 10–30 minutes (84).

The Reichert values for milk fat are pointed out by Hawley to be low due to the fact that the samples of milk are taken from cows near the ends of their lactation periods (85).

Babcock fat-column readings should be run at 53.5° to meet the density requirement of 0.9, Jenness and Herreid report. This temperature is approximated in tests read after holding in a warm bath at 60° C. as well as in those read directly from the heated centrifuge (86).

The official determination of fat in milk is reported by Steagall to have been rewritten to provide for the use of Mojonnier flasks with centrifuging for 15 minutes at 600 r.p.m. (87).

Mosimann points out that milk in Switzerland may vary 2 percent in fat within a few days in the mixed milk of about 10 percent of the cows in a herd. Statistical data shows that lack of feed reduced the milk quantity but not the fat (88).

The feeding to cows of cod-liver oil in one daily dose of 5–8 ounces was found by Moore, Hoffman, and Berry to lower the test and increase the iodine number, whereas this does not occur when twelve feedings are made daily (89).

Fat determinations in buttermilk by the Gerber method were found by Mulder to be lowered as much as 0.15 percent if formalin is added as suggested to prevent clogging of the butyrometer (90).

The "membrane" of fat globules was reported by Jenness and Palmer to carry protein 0.46–0.86 gram per 100 grams of fat, and lipide phosphorus

8.9–16.3 mg. in 19 samples of cream washed six times. The protein to phospholipide ratio varied from 1.8–2.4, running independent of variations in fat composition. The protein and lipide phosphorus ran 34.0–49.0 and 0.57–0.86 gamma per 100 sq. cm. of fat surface. Butters from washed cream had protein to phospholipide ratios of 1.0–2.0, the contents of "membrane" constituents were correlated with the specific fat surface (91).

"Membrane" material from butterfat, buttermilk, and butter-serum extracts was crystalized by Jenness and Palmer from ethanol, giving iodine numbers of 5.0–7.1, saponification numbers of 198.8–204.0, and melting points of 52–53°. The yield of these triglyceride fractions was greatest from butter serum extracts (92).

Herreid and Harmon found that samples of milk for determination of fat by the Mojonnier method should be weighed directly into the tared extraction flask. It may be pipetted in if the pipet is correctly calibrated to deliver and the milk is warmed above 35°–37° (93).

The fat content of milk was found by Reece to increase from feeding 10 grams of a thyroprotein, protomone, daily for three weeks, rising from 3.62 percent to 4.11 percent, with attendant average milk production increase from 23.3 pounds to 25 pounds per day (94).

The amount of ether-soluble material found in the Babcock fat column varied from 98.4–96.8 percent, depending on the method of removal of fat column from bottle and the volume of sulfuric acid used (95).

The commercial production of dry butterfat is described in detail, including drawings and photographs, by McDowall, Dolby, Beatson, and O'Dea. The cream is centrifugally separated, then dried in a hot vacuum pan, and filled into 4-gallon tins (96).

The carotene content of cow and buffalo butterfat was determined by Bal and Shrivastava using a Lovibond tintometer at fortnightly intervals for a year. For cows, the carotene content of butterfat ran 200–570 gamma per 100 grams of fat, varying with the carotene intake. For buffalo, the fat contained only 20–30 gamma independent of carotene intake (97).

The fat in homogenized milk can be reliably determined by the ordinary Babcock procedure provided that formaldehyde is not used as a preservative (98).

Air in butterfat was determined by Mohr and Eysank by melting the fat under glycerine and collecting the air in the graduated stem of a funnel inverted over the sample (99).

Herrington recommends that the Mojonnier machine be water-cooled through an air-cooled radiator to reduce errors in fat test from variation in room temperature (100).

Androde compared several methods for the determination of fat in powdered milk, condensed milk, cheeses, and ice cream. He states that the method of Weibull is applicable in all cases (101).

In studying twelve modifications of the Babcock test for homogenized milk, Trout and Lucas found that no one test consistently eliminated completely the foreign material at the base of the fat column but that in general the acid used should approximate regular Babcock acid strength, should be added in three portions, and remixing the acid-serum-water mixture after centrifuging and following the addition of water. A water-alcohol mixture (1.4 to 1) instead of final water gave clear fat column (101a).

Pitocin, the hormone, was found by Kelly to activate the tributyrase content of milk lipase, indicating that conditions may cause lipase or possibly other factors to attack individual substrates instead of all the fat present. When diacetin instead of tributyrin were used as substrates, the attacking enzymes are different. The author developed a method of using tributyrin

as a measure of lipase activity (101b).

The high-melting triglyceride fraction from "membrane" preparations was reported by Jenness and Palmer to be present in much greater concentration in butter serum than in buttermilk, due to a selective "clinging" of the phospholipide to the higher-melting molecules of the butterfat (101c).

CASEIN

Casein fibers were acetylated by Brown *et al.* with decrease in ability of fiber to take up water, increased resistance to hot water, decreased affinity for dyes, and with aluminum took up more dye (102).

Casein was reported by Roche and Mourgue to contain 16.2 percent of leucine and 4.5 percent of valine (103).

Leucine in casein was found to run 9.6 percent and valine was 6.2 percent, as reported by Schweigert and co-workers (104).

Tyrosine in casein was found by Thomas to run 6.03 percent (105).

Tryptophane was reported by Sullivan and Hess to run 1.17 percent (106).

Alpha- and beta-casein has been reported separated by Warner, by approaching the isoelectric point of alpha-casein from the acid side, precipitating it, and leaving the beta-casein in solution (107).

Phenylalanine in casein in alaline hydrolysate was reported by Brown to run 3.99 percent, and in lactalbumin 3.63 percent (108).

Phenylalanine values in casein hydrolysate, corrected for moisture and ash, varied according to time of hydrolysis and nature of hydrolyzing agent: 5N NaOH gave 5.5–5.7 percent after an hydrolysis of 6 hours or more; 7N H_2SO_4 gave same values with a 4–8 hour hydrolysis; and 20 percent HCl gave values nearer to 5.0 percent (109).

The methionine contents of casein and lactalbumin hydrolyzed by HCl were found by Albanese, Frankstone and Irby to run 2.85 and 2.32 percent; those of H_2SO_4-hydrolyzed casein, deaminized casein and oxycasein were 2.76, 3.12, and 0.21 percent (110).

Histidine nitrogen was determined from casein hydrolysates by Vickery and Winternitz to constitute 4.35 percent in a sample of casein which had a nitrogen content of 15.75 percent on a dry, ash-free basis (111).

Glutamic acid in hydrolyzed casein was determined by Dunn and collaborators, using *Lactobacillus arabinosus* 17–5 as the test organism. The amounts of glutamic acid of 5 samples ran 20.4 to 21.4, giving 22.5 percent on a dry, ash-free basis, as compared with a previously published figure of 22.0 (112).

Tryptophane in casein, moisture-free, was found by Horn and Jones to run 1.20 percent, and in lactalbumin 1.79 percent. Values given after alkaline hydrolysis were lower and did not agree with the microbiological assays (113).

Glutamic acid in casein was found by Lyman *et al.* to run 21.5 percent when assayed by hydrolysis (114).

Using *Lactobacillus arabinosis* 17–5 for assay of glutamic acid, casein was found by Lewis and Olcott to contain 19.7 percent, and beta-lactoglubulin contained 18.7 percent (115).

Lysin in casein, assayed by *Leuconostoc mesenterioides* by Dunn and co-workers gave 7.72 percent, or 8.3 percent on a moisture- and ash-free basis (116).

Lysine in casein was reported by Zittle and Eldred to run 8.1 percent after H_2SO_4 hydrolysis, 7.5 percent after HCl hydrolysis, and 7.0 percent after drying followed by HCl hydrolysis (117).

Amino acids from casein hydrolysate were reported by Shohl *et al.* to give a nitrogen metabolism essentially the same as with ordinary milk (118).

The ten essential amino-acids plus glycine were found by Madden *et al.* to give good nitrogen balance and re-

stored plasma protein to hypoproteinaemic dogs (119).

Crude or partly purified casein contains the extrinsic factor in pernicious anemia; however, extraction of such casein with alcohol removed the activity, shown by Castle *et al.* It is concluded that the extrinsic factor is a thermostable component of the vitamin B complex as yet unidentified (120).

A reduction in stability of colloidal casein systems was attributed by Hankinson and Palmer to a true hydration of calcium and sodium caseinate sols. (121).

This author, Thomé, compared McDowall's modification of the Walker method for casein with the Schlossmann method (6.45 X Kjeldahl N of alum ppt.) on numerous milk samples. He gives several conversion factors for formol titrations (122).

A purified casein, characterized by the special transparency and viscosity of its solution, is patented by Schibler. He removes albumin from technical acid-precipitated casein by fractional emulsification in a protein-hydrotropic substance like thiourea, sodium benzoate, urea, and others listed (123).

Casein is precipitated by Wendt by continuously mixing skimmed milk at 32°–60° with a solution of 2.5–10 percent HCl, H_2SO_4, or lactic acid, at a pH 4.1–5.1. The mixing is completed in a gear pump and separated by settling or centrifugation. The ash is 20 percent lower than that obtained on a riffle board, the viscosity is higher, the free acid is lower, and the particles smaller and more tender (124).

Casein, ash-free, and paracasein were prepared by Sandelin by addition of potassium oxalate to their solutions, precipitation by acidifying, and washing. Their physical and chemical properties are described at length (125).

The addition of 70 ml. per liter of lemon juice or 4 ml. of lactic acid (d. 1–21) precipitated the casein of milk without preserving it, according to de Soriano, whereas 5–6 ml. of lactic acid protects it for 24 hours, with precipitation of casein (126).

CHEESE

A bacteriophage infection of a cheese starter, manifested by slowness, was overcome by a procedure described in detail by Mattick, Nichols, and Wolf (127).

Bacterium linens, described by Albert, Long, and Hammer, is associated with protein breakdown in the ripening of certain soft cheeses, has great salt tolerance, and is commonly found in cattle feeds, in milk, and in dairy air (128).

Tocopherol was found by Emmerie and Engel to run in cheese (20 percent fat) 0.6 mg. per 100 g.; cheese of 10 percent fat, 0.3; milk (2.5 percent fat) 0.02; dried milk 0.5; and dried skim milk 0.05 (129).

Extraneous matter in cheese was determined by Price and Miersch by filtering a 50-gram sample onto a poplin filter pad using a phosphoric acid or sodium citrate solvent (130).

A total of 252 vat samples of curd in western Ontario, 1943, were reported by Sproule to run: none "clean"; 35.7 percent, "slightly dirty"; 46.4 percent "dirty"; and 17.8 percent "very dirty." Vegetable matter, the most frequent cause of contamination, was in 93 percent of the samples; coal dust and cinders were found in 58 percent; metal in 30 percent; and cloth fibers in 24 percent (131).

Extraneous matter in Cheddar cheese was studied by Miersch and Price by filtering a suspension of the cheese in a sodium citrate solution onto a sediment disk and also by filtering a suspension in phosphoric acid onto a poplin disk, both about equal in effectiveness but the latter quicker (132).

Analyses of some Rumanian cheeses are reported by Angelescu. They run 3,000 Cal. fresh, 5,000 Cal. dry, and the ammoniacal nitrogen coefficient (100 N as NH_3/total N) was 0 for Branza de vaci and Urda; 0.8–1.4

for Braïla, Petri, and Cascaval; 2.5–2.9 for Greek Cascaval (133).

Olsson compared the hot-plate drying of cheese for 3–4 minutes with the drying-oven method of heating 2–3 hours at 110°–120° or 5–7 hours at 105°–106°. The average differences were 0.2 percent, with 0.3 percent as the greatest variation (134).

Cheese, fortified with fish liver oils to increase the vitamin A content, was reported to lose less than 10 percent during processing and storage, and to develop no fishy flavor (135).

Whey cream added to milk for cheese manufacture was reported by Whitehead to yield a slightly weaker body but no oiling off, and gave an increased yield of 1.2 times the weight of fat added (136).

Shortening the cure for Cheddar cheese was found by Hauson, Arbuckle, and Shepardson to give the best product when the curd was ripened at 60° F. for 8 weeks and then at 45° F. for 8 weeks, using 4 oz. of rennet per 1,000 pounds of curd (137).

Scharer gives complete details of the application of the phosphatase test to cheese (138).

Sanders and Sager report that the phosphatase test can be applied to cheese. Tests on 340 samples of cheese of known history revealed that all samples made with raw or underpasteurized milk gave positive tests. None made with properly pasteurized milk gave values greater than 5 units regardless of age of cheese. The test detected the addition of 0.1 percent raw milk or a decrease of 2° in pasteurizing temperature (139).

Caulfield and Martin found that the use of the New York City field phosphatase test to detect improper pasteurization of milk for making Cheddar cheese revealed that the addition of only 0.25 percent raw milk gave a positive reading. No negative initial reaction became positive on six months ripening. No interfering materials gave false positive tests (140).

A phosphatase test for Cheddar cheese, issued by the United States Department of Agriculture describes the detailed procedure for making the test (141).

Cheese made from pasteurized milk is more uniform and milder than cheese made from raw milk, as reported by Price, and so meets the requirements of the majority of consumers (142).

Cheddar cheese manufacture is reported by Wilson, Hall, and Rogers to be benefited by pasteurization of the milk, provided there were no bad effects before pasteurization (143).

Babel and Hammer report improvement in flavor of Cheddar cheese made from pasteurized milk but treated with added lipase (144).

Blue veined cheese is manufactured from milk which has been subjected to a sudden action of steam in an evacuated chamber at 165°–75° F. and then cooled rapidly to avoid destruction of the lipases. Patent by Fabricius and Nielsen (145).

Gnagy reports that the control of the pH to about 9 has been adopted for the determination of gums in soft-curd cheese (146).

To check the claim that rancidity in Cheddar cheese is decreased by the presence of rennin or pepsin, Gould added rennin extract to homogenized mixtures of whey and cream. Lipolysis was only slightly retarded (147).

Cheese made from agitated milk was reported by Hlynka, Hood, and Gibson to possess objectionable flavors due to increased lipase action, attributed to increase in fat-aqueous interface (148).

Extensive studies by Koestler on the effects of soil, crop, and feeding practices in the production of milk for the manufacture of Emmentaler cheese showed no correlation (149).

Cottage cheese curd is preserved by freezing and storage at 0 to — 20° F. Marquardt states that slow thawing is important (150).

Mattick and Shattock examined thirty cheeses from stock (Cheddar, Cheshire, Leicester) and examined

for Group D streptococci on yeast dextrose agar at 30°. Counts ran from 10^4 to not less than 10^7 per gram (151).

Dichloroethyl ether was found by Muggeridge and Dolby to be effective in sanitizing wood in cheese plants that had become infested with the cheese mite, without showing any foreign flavor in the interior and only a slight off-flavor in the rind (152).

A study of several phosphates, tartrate, and citrate for the emulsification of hydrated casein showed Palmer and Sly that sodium citrate was superior in flavor and stability (153).

Cheddar cheese curing was reported by Marquardt to be hastened when it is held at 40° F. for two weeks, then at 55° F. for another two weeks under 70–85 percent relative humidity, turning frequently, and then held at 40° F. for one month, extending the storage at 60° F. for an additional two weeks if more flavor is needed (154).

A rennet substitute for Cheddar cheese, in the shape of a bacterial proteinase, was patented by Evans and Rais. It is particularly valuable in the manufacture of kosher cheese (155).

Cheese melting salts for manufacture of process cheese were found by Palmer and Sly to give best results when 9 parts of sodium citrate were used to 1 part of disodium phosphate (156).

Mold growth on cheese during storage was reported by Platon, Emgard, and Olsson to be prevented by paraffining if the surface were already free from mold, otherwise dipping, preferably in an alcoholic solution of methyl p-oxybenzoate (157).

Cheese-rind loss is prevented by enclosing the rindless cheese in a limp oil-resistant wrapper, then put into container, and pressed to remove all air (158).

Cheese leaks fat during transportation. Organic stabilizers such as pectin and agar had little effect and caused flavor deterioration. Homogenization improves fat stability (159).

Fat determinations in cheese were shown by Babel and Nelson to tend to run low by reason of loss of volatile acids, the official method giving the best result, then the Babcock, and lastly the Mojonnier (160).

Fat degradation in Cheddar cheese made from pasteurized milk was reported by Babel and Hammer was about the same whether or not lipase was separately added, whereas purified pasteurized butterfat held at the cheese-ripening temperature (50° F.) did not increase significantly in acidity. Rennet paste and mulberry juice imparted an increased rancidity but the latter was objectionable whereas the early unpleasant taste from the rennet paste addition gave a better flavored product than that from the control (160a).

In the manufacture of Cheddar cheese from pasteurized milk, Wilson, Hall, and Rogers write that the milk must be of good quality to avoid carry-over of the ill effects of bacterial action in the raw milk. The rate of acid development must be kept from utilizing all the lactose too soon—not sooner than 4½ hours after setting, the pH of the curd should preferably run 5.40–5.50. Some milk sugar should still remain when the cheese is removed from the press, about 24 hours after setting. It should be ripened at 50° F. or above (160b).

Lactic starters were found by Dahlberg and Ferris to give equally good appearance, flavor, and acid development when inoculated daily or every third day into milk. But when the latter starters were used in cheese-making, the acid development was retarded. Also, the latter gave poorer flavor (160c).

"Smear" on brick cheese was reported by Langhns *et al.* to come from the growth of several types of micro-organisms, appearing first as yeast-like forms, succeeded by micrococci and rod-shaped organisms of the *Bact. linens* type (160d).

Using a modification of the Scharer

laboratory test, Lambert reports that the phosphatase test is applicable to Cheddar, Monterey, Teleme, Feta, Romano, and cottage cheese. No cheese made from pasteurized milk yielded as much as 35 micrograms of phenol, and cheese containing 0.5 percent of raw milk could be detected (160e).

Cheddar cheese from pasteurized milk was shown by Walter and Lochry to be in production in about 150 factories. Increase in the proportion of No. 1 cheese was obtained by using a suitably controlled amount of an active starter and the use of a definite time schedule, showing a definite relationship between the rate of development of acidity and the quality of the cheese made from pasteurized milk (160f).

EVAPORATED

Evaporated milk, sealed under vacuum, was found by Doan and Josephson to decrease in its ascorbic content only from 50 mg. per liter on reconstituted basis to 47 mg. (161).

Toxic concentrations of lead were found by Lea and Fluck in four can-making plants, exceeding the safe limit of 1.5 mg. of lead per 10 cu. m. of air (162).

Webb and Bell report that high-temperature short-time heating of concentrated milk (1:2.29) gave an optimum heat stability by forewarming at 120° for 4 minutes and heating after concentration at 150° without holding (163).

McCollum and Grubb describe an evaporated milk which is fortified by the adding of vitamins A, D, C, B_1, and B_2, wheat germ oil, Fe, Cu, and Mn, furnishing 570 calories per can of 400 ml. (410 grams), stable for 6 months. It completely nourishes an infant in early life, and is commercially practical (164).

Evaporated milk was found by Cole and Tarassuk to contain enough iron to impart a greenish-black discoloration with the tannin-like substances in coffee, the shade depending on the pH value (165).

McManus and Cooke made silver-lined containers for milk and other liquid foods by depositing a protective layer of silver of 0.000002–0.00001 inch thickness over a base coating of varnish or rubber composition on black iron or steel cans (166).

The iron content of canned evaporated milk, increased by letting the milk remain in an opened can, when over 3–5 p.p.m. was formed by Cole and Tarassuk to give a noticeable color by the reaction with tannins (167).

Evaporated milk was further studied by Bell, Curran, and Evans, with respect to effects of temperature and time of sterilization upon its properties. The data is too extensive to summarize briefly (168).

Evaporated milk, inoculated with a test organism whose thermal death time was 115° C. for 14 minutes, was found by Curran, Bell, and Evans to become sterile after the following heat treatments: 128° C. for 55 seconds, 130° C. for 31 seconds, 135° C. for 15 seconds, and 148° C. for zero holding time (169).

Evaporated, mineralized milk with succinylsulfathiazole reduced the coliform count but not the total bacterial count in the caecum of rats, and depressed their rate of growth, as Day *et al.* showed (170).

Sweetened condensed milks, tested during the hostilities in Spain, were examined by Cecilia as follows: Cans incubated for 48 hrs. A sample running over 1 percent acidity was regarded with suspicion. Plate bacteria count was 10,000; not to exceed 50,000 by Breed. Centrifuged for leucocytes and streptococci. The condensed-milk products of most countries were of such poor hygienic quality that standard methods for international control were recommended (171).

Sweetened condensed milk is analyzed by Stanworth for its fat content by a rapid control method which involves mixing 50 grams of condensed

milk with 75 grams of hot distilled water. Directions and diagrams are given for the standardization of sweetened condensed milk before condensing (172).

Condensed milk, kept in aluminum cans for ten months, was found by Krylova to contain no aluminum, and after fifteen months only traces (173).

The estimation of sucrose and lactose in sweetened evaporated milk has been worked out by Browne who utilizes the fact that sodium bisulfite decreases the optical rotation of aldose sugars (174).

HEALTH AND DISEASE

Phemerol was reported by Bryan and co-workers as being effective in the treatment of cows with chronic streptococcic mastitis. A 0.1 percent solution killed the organisms after 10 minutes in the presence of 10 percent of skim milk (175).

Diets containing 30–35 percent of galactose were reported by Lecoq to produce cataract in white rats, but 25 percent of galactose did not give consistent results. Addition of 26–41 percent of wheat germ to the cataractogenic diets delayed, and in some cases prevented, the development of cataract (176).

Irradiated milk is reported by Scheer to be the best means of preventing and curing rickets. Treating 500 liters of milk requires 0.7 kwhr. of energy (177).

Gastroenteritis from homemade ice cream was reported to have caused the illness of over one hundred students from *Staphylococcus aureus,* isolated from the ice cream in large numbers. Apparently it became contaminated prior to freezing when the mix was allowed to cool at room temperature for 10 to 12 hours (178).

The A.B.R. (Abortus Bang Ring-probe) test for brucellosis, compared with the slow agglutination and Schönberg-Imig tests, was reported by Norell and Olsson to be a valuable indicator of the spread of brucellosis and as a means of control in districts where the disease has not spread, but it is not as reliable as the blood test (179).

A more sensitive ring test for *Brucella abortus* is described by Fleischhauer whereby the sample is centrifuged with haematoxylin reagent for 8 minutes at 2,500 r.p.m. (180).

A comparison of the four tests for the serological diagnosis of bovine brucellosis was shown by Scelemann and Langeloh—generally, the Sachwek flocculation test, the slow agglutination test, and the A.B.R. test. The latter was worth while as a preliminary quick test (181).

The claim that a bacterial suspension of Bang's bacillus and tubercle bacilli for injection into guinea-pigs was refuted by Rasch who showed that the number of positives was not appreciably influenced by the presence of alcohol in comparison with the current procedure (182).

Typhoid fever from cheese was reported by Halverson to have been traced to unpasteurized Romano Dolce, Teleme, and high moisture Jack cheeses (183).

Cheddar cheese was shown by Menzies to have been the vehicle in a typhoid fever outbreak (184).

Typhoid fever, type C, was traced to an unripened, unpasteurized, soft Roman type of cheese, involving 76 cases of which 90 percent had eaten the cheese. No cheese may be sold in California unless it has been pasteurized or made of pasteurized milk, or ripened or cured for at least 60 days (185).

Milk from healthy cows was reported by Schönberg to show normal riboflavin fluorescence whereas 42 of 43 samples of milk containing mastitis streptococci showed little or none of the characteristic riboflavin color (186).

Penicillin is reported by Foley, Lee, and Epstein to offer promise in the treatment of bovine mastitis caused by staphylococci and Group B and C streptococci (187).

Mastitis was favorably treated by Kakavas using penicillin in staphylococcic and streptococcic infections (188).

A satisfactory field test for the diagnosis of chronic contagious mastitis was stated by Roach to be still lacking. Using Edwards' agar as a criterion of validity, the strip cup identified only 10 percent of the infections, and either the manual or bromocresol purple tests gave 20 percent (189).

Bovine tuberculosis in four herds was reported by Tice to have been traced to a farmer whose sputum contained a bovine type bacillus (190).

Udder tuberculosis was traced by McFarlane, Garside, Watts, and Stamp to irrigation of mastitic animals with infected apparatus. Its presence was not detected clinically so that the delayed diagnosis led to the infection of the whole herd in six months (191).

At least two-thirds of 1,450 infections of human brucellosis in California during 1938–1943 are claimed to be traceable to raw milk (192).

Sonne dysentery from unpasteurized milk was reported by O'Keefe and Cooper in an outbreak of 57 cases from which *Shigella sonnei* was isolated from 29 of the cases (193).

Foot and mouth disease was reported by Lo Russo to be diagnosed by a formula listing differential leucocyte counts from the post-vesicular stage (194).

Pasteurized milk in the New York metropolitan area in February and October was found by Dahlberg to maintain its organoleptic quality excellent when stored at room temperature for 6 hours, and the bacteria count rose from 12,000 to 15,000 when stored at 35°–40° F., the count went a little lower, and after 7 days the flavor was "good" with no pronounced off-flavors. At 45°–50° F. the flavor was still "good" after 7 days and the count went to 180,000 after 4 days. At 55°–60° F., the milk became unsaleable after 4 days (194a).

HUMAN MILK

Forty-two pregnant women were given vitamin A in doses of 50,000–200,000 I.U. per day, reported by Hrubetz, Deuel, Hanley, and Fairclough. The vitamin A content of their milk increased in the same way as in the cow, the highest level of intake causing three times the level of the unsupplemented group. Neither protein, fat, ash, or total solids underwent any change, and no deleterious effects on the women were observed (195).

Human milk fat was analyzed by Hilditch and Meara who report that it contains fully saturated glycerides 9.1 percent, one unsaturated fat acid radicle 39.6 percent, two 42.7 percent, and three 8.6 percent, each of which they break down into component fractions (196).

The amino acid composition of human and cow milk proteins are listed by Williamson in comprehensive tables gathering the results of all workers. Human milk contained more cystine and less methionine, more tryptophane, less valine, threonine, and histidine (197).

Human milk, a few days after parturition, was reported by Blazso and Dubrausky to contain 35–125 micrograms of vitamin B_2 per day or an average of 17.3 per 100 grams (198).

Milk supplied to a human milk center in Helsinki was reported by Salmi to average in 1939 4.1 percent of fat; in 1941–42 and 1943, 3.1 percent. In January 1943, samples from 14 women averaged 3.48 percent fat, 0.85 percent protein, 6.22 percent lactose, and 0.13 percent of ash. Wartime diets of nursing mothers in 1943 ran 2,400 calories, and contained 0.4 liter of milk daily, and 0.5 kg. butter, 1 kg. of eggs, and 0.75 kg. of cheese or meat monthly (199).

Brougher reports that giving capsules of 500 U.S.P. XI units of vitamin B complex and 500 U.S.P. XI units of vitamin C to nursing mothers,

53 percent of those in the test group were still breast-feeding and 21 percent were breast- and bottle-feeding whereas in the control group these were 49 percent and 22½ percent respectively. At the time of leaving the hospital the figures were 80 and 10, for the vitamin-fed group, and 50 and 15 percent for the control before the vitamin supplements were given (200).

Cases of infantile heriberi were traced to milk of mothers suffering from B avitaminosis. These milks contained toxic products such as methylglyoxal from the faulty intermediary metabolism of the mothers (201).

An enzyme-resistant phosphopeptone was prepared by Mellander from human milk casein, yield a barium salt containing 4.28 percent phosphorus and 6.57 percent nitrogen. The electrophoretic pattern of human milk casein simulates that of cow milk (202).

Mother's milk in supply stations can be identified and examined for adulteration with cow or goat milk by means of a precipitin test with cow-milk antiserum, as reported by Urbach. Holding human milk at — 5° for 14 days does not reduce the bacterial content (203).

Human milk was found by Escudero and Herraiz to contain 4 mg. percent of ascorbic acid, varying with the dietary intake and paralleling the urinary excretion. Pasteurization destroyed about 9.5 percent of the vitamin C content (204).

Human milk used by the National Institute of Nutrition (Buenos Aires) was reported by Escudero and Repetto to run: total solids 117.6, ash 1.88; carbohydrates 66.6, proteins 9.6, fats 35.4 grams, and calories 588.5 per liter.

Escudero and Lopez report that milk from mothers with helatic diseases, fed low-fat diets during pregnancy, ran low in fat and calories but was acceptable in caloric and biological value for infant feeding.

Escudero and Herraiz titrated ascorbic acid in the filtrate from milk which had been treated with sodium metaphosphate and HCl to remove the protein.

Escudero and Herrero found human milk on the average to contain: vitamin A 300 I.U., B_1 57 gamma, B_2 below 25 gamma, and nicotinic acid below 100 gamma per 100 grams.

Escudero and Herraiz report that human milk contained 1–3 I.U. of vitamin D per 100 ml. The daily administration of 1,000 I.U. of vitamin D_2 raised the level in milk to 6.4 in 30 days, to 9.1 and 18.8 in 45 days.

Escudero and Waisman S. compared the digestibility and metabolism of human milk with Escudero's milk mixture of cow milk 50 grams, barley extract 50 grams, sucrose 4 grams, and fresh butter 2 grams, prepared fresh daily and heated to 37° and acidified to 0.5 percent before use.

Escudero reports at length on the relative composition of the milk of the rabbit, sheep, cow, horse, and man in relation to growth of young. He suggests a new milk mixture (205).

Human milk at the Buenos Aires milk center is reported by Pierangeli and Escudero to be collected under hygienic conditions by an electric machine which extracts from eight women at a time. The milk center serves also as a welfare center where mother and child must pass a medical examination, chemical analyses made of the milk, and additional food and vitamins provided for the mother (206).

Escudero and Pierangeli report the composition of human milk from the beginning of lactation to 16 months later. In 1939 and 1940 when the food intake was supervised, carbohydrate varied 5.9–8.1, 0.9–1.2 for protein, 3.3–5.1 for fat, and 650–821 for calories (206a).

ICE CREAM

Mitchell, Shaw, and Frary determined gelatin in ice cream by first

separating the nitrogenous constituents of the milk products at regulated pH values, then precipitation of gelatin with silicotungstic acid at pH 3.0, and finally determination of the nitrogen in the precipitated gelatin silicotungstate (207).

Ice cream flavors were found by Bliss, Anderson, and Maryland to be most popular, in chocolate flavor, for American process chocolate and, in vanilla flavor, for an equal mixture of natural and synthetic vanilla. At 14 percent fat, 10.2 percent solids-not-fat was most favored, and at 11 percent s.n.f., 13.5 percent fat was preferred (208).

The bacteriological evaluation of ice cream was studied by Nelson who compared the resazurin and methylene blue reduction tests with plate and microscopic counts. The time taken to reach the pink stage in the resazurin test correlated with the results of the plate colony count at 37° C. The methylene blue test correlated generally with the plate colony count at 37° C. (209).

Ice cream overrun was determined by Lucas and Stout who related weight of frozen product to its volume and to the volume of the original mix. The air cells were broken by the amyl alcohol so that the true volume of the mix could be determined from that of the ice cream (210).

Attention is called by Pompa to the use of sodium carboxymethyl cellulose as a stabilizer in ice cream, giving formulas for 3 and 8 percent butterfat (211).

The weight and volume of ice cream bricks was determined by measuring the amount of overflow of water displaced by a known weight of the frozen product (212).

Tracy and Pyenson report that viscosity of ice cream mixes was increased and the body of ice cream improved by reason of the high starch content of flours used to build body. The flour added should be limited to 1–3 percent. It slowed whipping when gelatin was added (213).

Factors involved in the production of high-quality sherberts and ices are described by Caulfield and Martin. High sugar content and high overrun produce a soft product. The proper use of stabilizers is emphasized as more important than for ice cream and a tabulation gives desired proportions of gelatin against bloom strength. Each 5 percent of sugar increase calls for a 0.04 percent increase in citric acid content (214).

Invert syrup, containing about 70 percent of invert sugar and 30 percent of water has a sweetening power similar to that of sucrose. Fouts, Mull, and Freeman state that it can be used in times of sugar shortage to replace 50 percent of the latter, but sufficient dried skim milk should be added to increase the serum solids by about 1 percent (215).

LACTOSE

The acid hydrolysis of lactose was studied by Ramsdell and Webb, showing that hydrochloric acid gave good results, with progressive destruction of lactose and the newly formed hexoses during hydrolysis. A yield of 93 percent of hexose sugars was obtained, but the lactose in skim milk, whey, or crude lactose gave undesirable protein decomposition products (216).

Hydrolyzed lactose syrups were analyzed by Ramsdell by determining the sum of the two hexoses by a modified Barfoed solution, and the glucose and lactose by the method of Shaffer and Somogyi before and after fermentation with bakers' yeast (217).

Whittier gives a report of the literature of 327 references on chemistry, physical properties, and manufacture of lactose (218).

About 55–65 percent of the total lactose content is crystallized from skim milk by adding sucrose to the original batch, concentrating in *vacuo*, adding more sugar, and centrifugalizing, described by Thorneloe (219).

MARGARINE

Schmalfuss and Stadie studied the influence of benzoic acid, biacetyl, and the fat mixture on the spoilage of margarine. Biacetyl was superior to benzoic acid for preserving the flavor and reducing the development of acidity. The chemical effects are described at length (220).

Vitamin A in colored, vitaminized margarine was determined by Heimann by extraction in a column of Al_2O_3, extraction with benzene and light petroleum, evaporated to remove solvent, taken up in chloroform, and determined in the step photometer (221).

MILK

Iron in market milk was shown by Johnston to run 0.114–0.650 mg. per kg., mean 0.316, using Stugart's thiocyanate method with a Coleman universal spectrophotometer (222).

Pyridoxine was found by Hodson to run 0.48–0.95 mg. per liter for fresh milk, and averaged 0.67 for fresh, pasteurized, irradiated, evaporated, dried skim, and dried whole milks (223).

The estimation of lactic acid in milk was reported by Gould and Jensen to be reliable by Hillig's colorimetric method, that souring, detected organoleptically, occurred when there was less than 10 mg. per 100 grams, and that methylene blue was reduced quickly when 4 mg. of lactic acid had developed (224).

The composition of milk sold in Jerusalem was reported by Kovacs, Guggenheim, and Kligler to run: sp. gr. 1.0282–1.0371, total solids 11.01–13.69 percent, fat 2.39–4.48 percent, lactose 3.51–4.77 percent, protein 2.80–4.47 percent, ash 0.64–0.88 percent, calcium 0.11–0.16, phosphorus 0.06–0.10 percent, and chlorine 0.10–0.18 percent. Vitamins A and C ran similar to the values reported from other countries for stabled cows; aneurin ran 0.016–0.03 mg. per 100 grams, and riboflavin 0.08–0.13 (225).

Platon and Sjöström analyzed samples of milk of Swedish Friesian, Swedish Red and White, and Swedish Polled Cattle, from 59 dairies, and goat milk from one breeding station in Sweden. The analytical data are too extensive to report in this abstract (226).

Mácola and Fazio report that cow milk in Argentina contained 1.55–1.71 g. Ca and 0.07–0.12 g. Mg. per liter. The calcium was fairly constant over the season but magnesium ran lower in winter (227).

Addition of 8–10 percent of dry powdered silver chloride to milk was found by Schern and Schröder to delay souring one to two days in hot summer weather (228).

Analyses of 18 samples of goats' milk by Holmes and co-workers gave the following results: fat 4.0 percent; bacteria, 1,300 per ml.; pH, 6.37; ascorbic acid 6.5; niacin 2.96, pantothenic acid 3.38, riboflavin 1.25, and thiamine 0.47 mg. per liter (229).

When roughage of feed was reduced below 5 pounds per day, Loosli, Lucas, and Maynard report that the fat content and total milk yield decreased as compared with those from cows fed 12 pounds of hay, 30 pounds of corn silage and a little grain (230).

Escudero, Herraiz, and Herrero report results from balance studies, weight gains, and fixed nitrogen, show that cooking exerts no deleterious effect upon the biological value of milk proteins. Other papers in succeeding work showed that cooking exerted no adverse effect upon the weight gains, the calcium fixation, retention of vitamins A, B, and D, and phosphorus "absorption." Vitamin C ran 12.81 percent lower in the cooked milk (231).

The reducing substances liberated by heated milk were quantitatively determined by Harland and Ashworth, using thiamine disulfide (232).

The constituents of milk-nut-chocolate are determined by Issoglio. The calculation of the nut content is described from the analytical data (233).

Iron in milk was determined by Ruegamer, Michard, and Elvehjem, using a modification of the bipyridine method of Kitzeo *et al.* Iron values ran 0.490–0.570 mg. per kilogram of milk (234).

After comparing five known methods for determining the protein content of milk, Rehnfeldt concludes that the colorimetric method (xanthoproteic reaction) of Burniana is as accurate as any, is most convenient, and requires only 15 minutes (235).

Milk was reported by Nerenberg to be condensed to one-third of its original volume, and frozen into brick form for storage. The rate of protein denaturation is affected by the method of freezing and storing. Copper imparts an off-flavor (236).

Under intensive green feeding, it is reported by Sarkar and Sen that Hariana cows did not change the fat, total solids, protein, or ash of their milk but the Polenske value and iodine number rose. A maximum vitamin A potency of 10,000–11,000 I.U. per pound of fat can be produced by feeding 35–45 pounds of green fodder daily (237).

Samples of milk from cows, sheep, goats, buffalo, and humans were analyzed by Basu and Mukherjee for phosphorus partition. The ester phosphorus appeared to be mainly creative phosphate. Human milk contained the unusually high proportion of 53 percent of the total phosphorus as ester phosphorus (238).

Overman determined the monthly variations in the composition of the milk of the six leading breeds, on a total of 2,426 samples (239).

The correlation between refractive index and iodine values of milk in Sweden was used by Platon and Olsson to devise the formula $I = 3.40\ R - 109.83$ where R = refractivity and I the iodine value. Variations among individual samples were considerable. High-yielding cows gave milk with lower iodine values than low-yielders. No consistent correlation was found between the influence of feeding and the iodine value (240).

Townley and Gould report the volatile sulfides in milk, 0.240; skim milk 0.158; cream 0.480; buttermilk 0.512; skim milk whey 0.205; and buttermilk whey 0.575 mg. per liter respectively (241).

Milk fat acids of the goat, ewe, and mare were examined by Hilditch and Jasperson, separation being effected by fractionation of their methyl esters. This confirms the great similarity between goat and ewe milk, and gives details for the first time of the composition of mare milk, characterized by butyric acid only 1.1 percent, hexanoic acid only 1.9 percent, whilst linolenic acid ran 14.0 percent (242).

The nicotinamide content of cow's milk was reported by Morel to be 0.20–0.23 mg. per 100 ml., determined on the milk of a herd of 25 cows on pasteur. This figure was not increased by feeding the vitamins in the diet (243).

The use of Neurospora in the biological assay for choline in milk has been simplified by omitting permutit and utilizing only the steep portion of the assay curve, by Hodson (244).

Milk was reported by Barton-Wright to contain 0.8–1.0 microgram of nicotinic acid per ml., and dried milk, 9.2 microgram per gram, using *Lactobacillus arabinosus* for the microbiological assay (245).

Nelson reports that the addition of 1 gram of pancreatic enzyme to 10 gal. of milk just before pasteurization delayed the development of oxidized flavor (246).

Ferrous salts exerted a greater oxidizing effect than ions of nickel, ferric iron, vanadium, aluminum, manganese, chromium, and tin. Copper increased the potential, proportionate to concentration. A comparable reverse effect was caused by ascorbic acid (247).

Corbett and Tracy reported that milk stored for one and three days developed off-flavor in 1.5 and 10.0

percent of the samples, respectively. Copper increased this to 78.5 and 91.7 percent. Heifer milk was more susceptible than older-cow milk, and the milk of both groups was more susceptible in the early months than the later months (248).

The freshness of milk is indicated by the blue-grey color imparted to fresh milk by nitrazine yellow inaqueous solution of 1 in 10,000, increasing yellowness indicating increasing acidity. Schönberg points out that alkaline milk from diseased udders gives a strong blue color (249).

The presence of ammonia in milk is attributed largely to lack of cleanliness. In normal cow's milk the content runs between 8 and 10 mg. per liter. The value varied more widely in human milk (250).

The oxidation of ascorbic acid to dehydroascorbic acid is reported by Krukovsky and Guthrie to be a key factor in the inhibition of the tallowy flavor in milk (251).

Peters and Trout found a strong attraction between milk fat globules and leucocytes, affecting the cream layer. This is based, in part at least, upon the opposite electric charges of fat globules and leucocytes (252).

Milk changes the color of bromothymol blue determined electrometrically and colorimetrically to the extent of pH 0.2, as reported by Foschini, and in the presence of NaOH, at pH 8.4, the color was equivalent to a pH of only 7.4 (253).

Ash alkalinity from different breeds of cows was reported by Kunkel and Combs to differ considerably. The addition of alkaline compounds to skim milk to reduce the titratable acidity as little as 0.01 percent measurably increased the ash alkalinity but the latter was not increased enough even when the acidity was reduced 0.03 percent to make the alkalinity of the ash exceed that of some samples of unneutralized skim milk (253a).

Homogenization of milk at 2,500 pounds pressure was found by Peters and Trout to reduce the leucocyte count 41.28 percent. Rehomogenizing five times at 5,000 pounds reduced it 92.4 percent, with little effect on the intensity of the sediment. When homogenized at 5,000 pounds pressure for 10 minutes the leucocyte count was reduced 99.1 percent. The sediment was not affected by any of the treatments (253b).

Thiamin disulfide was found by Harland and Ashworth to be an excellent reagent for the quantitative determination for certain reducing substances, by reason of its reduction to thiamin by sulfhydryl groups (— SH). Unheated milk does not reduce thiamin disulfide but heating skim milk at 90°–95° C. for 5 minutes does produce reducing substances, as does also spray process skim powder (but there is no relation of this to baking quality). These reducing substances are lost by heating or standing at 20° C. (253c).

When milk is heated, Gould found that the lactic acid content increases 3–7 mg. per 100 grams of milk, constituting about 5 percent of the titrable acid. Stabilizing salts increased this acidity by 2–3 mg. per 100 grams. Lactose was destroyed to the extent of 25–30 percent of the original content, increased when citrate or phosphate was added. In whey under similar treatment, the acidity increased only 11 percent of the increase in skim milk (253d).

Whole homogenized milk or skim milk heated at 100° C. for 8 hours was found by Gould and Frantz to be reduced when the milk was treated with oxalate prior to titration, except that the addition of phosphate resulted in higher titers. The formol titration slightly increased, but reduced on addition of oxalate and obliterated by phosphate. pH changes correlated with the majority of the titrations. Whey differed by greater increases in formol titration than in the original skim milk (253e).

The volatile acid content of milk

was increased when skim milk was heated at 116° C. for 1–2 hours. Formic acid constituted 80–85 percent of these acids (253f).

Goat milk from stall-fed goats, was assayed by Holmes *et al.* and found to contain 4.2 percent of fat, 15.1 mg. of ascorbic acid, and 1.24 mg. of riboflavin per liter. Other samples ran 4.5 percent, 20 mg., and 1.02 mg. respectively (253g).

MISCELLANEOUS

Chocolate milk prepared with American-process and Dutch-process cocoa were reported by Holmes, Jones, Wertz, and Mueller to contain respectively 15.4 and 11.5 mg. ascorbic acid, 1.50 and 1.37 mg. riboflavin, 0.31 and 0.25 mg. thiamine per liter (254).

Thomé found that whey contains less phosphatase than the milk from which it is derived. But this difference is not believed by the author to preclude the application of the phosphatase test (Scharer's Rapid and Stein's) to whey. In acid whey the enzyme activity decreased with time, so it is recommended that tests should be restricted to fresh whey with pH above 4.5 and preserved whey with pH of over 5.3 (255).

Cream curd and cheese are "improved" by Friedel by adding the dried and powdered press juice from fresh cereals, legumes, or leafy vegetables to milk or cream before curdling (256).

Albuminous products are separated from milk whey by raising the pH above 7 without beating to form a precipitate, then concentrating to 6–12 percent by a separator, and finally spray drying. Patent by Kremers (257).

Milk is separated into whey and casein by the addition of methyl cellulose to skim milk (258).

Foodstuffs are prepared by Smets by adding sweetening or flavoring products with milk serum (259).

Acidification of milk is accelerated by adding 0.0000—0.00000001 (gram?) of p-aminobenzoic acid or its salt or derivative to milk (260).

Kirchoffer treated milk waste by reinculating the stored waste repeatedly over a rock filter. The sludge is settled and digested (261).

Young rats were reported by Newell and Elvehjem to grow equally well on whole milk, whole milk plus chocolate syrup, partially skimmed milk containing 1.5 percent of fat, and partially skimmed milk plus chocolate syrup. Those on the chocolate milk diet had some difficulty in rearing their young (262).

The training and employment of milk sanitarians was the subject of a committee report under the chairmanship of H. F. Judkins (263).

Dietary cirrhosis was found by Blumberg and McCollum to be gross when glycinin was the protein for young rats, but not cirrhotic when arachin was fed, and normal with casein (264).

Fresh liquid buttermilk containing 0.20 percent acid was reported by Brown to be as good as the same quantity of skim or whole milk in breadmaking (265).

Waste whey paste from lactose manufacture is diluted with water, treated with a soluble salt of pectic acid at a suitable pH, clarified, and concentrated below 140° F. to solids content of 75–85 percent. The resultant product will form a persistent foam, and this may be set by heat (266).

Whey proteins were precipitated undenatured by Harland and Ashworth, using NaCl and HCl (266a).

NUTRITION

The useability of milk for foods and other products is claimed by Baumann to be enhanced by first sterilizing it under heat-pressure, then making it alkaline (pH 9–11.5), then acid (pH 6.5–8.5) (267).

Bread was found by Harris, Clark, and Lockhart to give better growth

to rats when the bread contained 3 percent milk solids plus 3 percent soya flour than when either ingredient was used singly in 6 percent and 5 percent strength respectively (268).

Rowland and Soulides showed that milk curd increased in firmness with increases in Ca or casein content or decreases in soluble protein content or pH. Maximum firmness occurred at pH 6.2 (269).

Turner reports on the relative digestibility of milk by using both acid and alkaline digestion periods in the presence of enzymes from the hog stomach, duodenum, and pancreas, using the digestion rate of the acid-insoluble proteins as the index of digestibility. Pasteurization, homogenization, desiccation, zeolite treatment, and skimming did not alter the digestibility of cow milk. Enzyme-treated and hyper-heated whole milk digested faster than pasteurized milk. In decreasing order were human milk, mare milk, and goat milk (270).

A soft curd milk which will not flake or curdle on boiling, has no cooked flavor, and possesses a good cream line is made by Helmer and Farnham who treat milk with rennet just short of coagulation and then blend with raw hard-curd milk (271).

Spur and Wolman studied the influence of added rennin upon curd-forming properties and peptic digestion of milk. The measured curd size was appreciably smaller for the rennet custards than for the untreated controls. The rennet custards digested more rapidly, yielding more soluble nitrogen in the whey than did control milks (272).

Enzyme-treated milk was found by Steigmann and Blatt to be tolerated better by patients with peptic ulcer than ordinary milk (273).

The average daily requirement for essential amino acids is reported by Block and Bolling to be supplied by 3,600 cal. of bread prepared with 6 percent of milk solids and fortified with 2 grams of lysine per 100 grams of protein, or addition of 3 grams of lysine to milk-enriched bread would reduce the consumption to 2.5 pounds a day (274).

POWDER

The Minnesota dry milk industry is reported at length by Koller. The report carries production figures, together with costs, sales prices, and available markets (275).

Moisture in dried whole milk was reported by Sherman to be reduced, by dielectric heating, from over 3 percent to 1 percent in less than 1 hour, below 130° F. more cheaply than by ordinary heating (276).

Pearce studied many physical and chemical tests on dried milk powder to measure its quality. Palatability was the best indicator of quality. Optimum temperature of storage was 37.8° C. (277).

Webb and Hufnagel report that compression of dried skim milk under 3,200 pounds per sq. in. and of dried whole milk under 2,400 could be easily crushed to powder which could be as easily reconstituted with water as the original powder. Saving in shipping space was made by compression or jolting. Dried skim in 30-gal. paraffin-lined tight oak barrels, packed to a density of 0.75–0.80, remained uncaked, and took up only 1 percent moisture at 110° F. in 80 percent relative humidity after 4 months (278).

The nitrogen distribution in dried milk was found by Ashworth and Van Orden to run 90.75 percent in casein and 9.25 percent non-casein (279).

Dawson determined small amounts of milk powder in flour by a differential fermentation procedure (280).

The inositol content of dried whole milk after hydrolysis with HCl was found by Beadle to be 48 and 63 mg. per 100 grams in two determinations (281).

Dried milk is recommended as the starting mash for the first two or three weeks, after which the milk may be replaced with grass clippings silage,

as shown by Taylor, Russell, and Platt (282).

Dried skim milk in the diet of growing chickens was reported by Hammond and Titus to exert no beneficial effect over several different combinations of other protein feeds (283).

The addition of dried milk to rats fed on a diet of unpolished rice, carrot and yellow butter reduced the incidence of liver tumors, as shown by Sugiura (284).

Dried milk, enriched with vitamin D to the extent of 50 I.U. per gram, was fed to rachitic children at the rate of 20–40 grams per day for 4–6 weeks. Healing was satisfactory but slow (285).

Retardation of fat antoxidation in dried milks was reported by Williamson to be effective by the addition of rice bran concentrate, mixed tocopherols, hydroquinone monobenzyl ether 4,4′ dihydroxydiphenyl ether, all at 0.3 percent concentration, and thiourea at 0.1 percent (286).

Tryptophane in dried whole milk was found by Greene and Black to run 0.31 percent, in lactalbumin 1.59 percent, and in dry casein 1.08 percent, or 1.19 percent when calculated on a 16.0 percent total nitrogen basis (287).

Dry skim milk is shown by Hetrick and Tracy to keep better when gas-packed in nitrogen and/or carbon dioxide. Loss of palatability may be associated with oxygen absorption or reaction with some non-fat constituent (288).

Chapman and McFarlane used the colorimetric determination of $Fe_4[(CN)_6]_3$ to detect and determine certain reducing groups in milk powders. Higher values were found in fresh powders than revealed by titration with 2,6 dichlorophenol-indophenol or potassium iodate, both of which showed no difference between fresh and stale powders. Heating increases the reducing activity of lactalbumin and casein (289).

Hillig recommends for official adoption the colorimetric method for the determination of lactic acid in skim milk previously described (290).

Hillig reports that the Tillmans-Bohrmann method for the detection of neutralizers in dried skim milk is entirely satisfactory (291).

Pompa writes that spray-dried milk powder is better than the drum- or roller-dried powder for the manufacture of ice cream because it is more soluble and the fat is more uniformly distributed (292).

Copper in milk powder was determined by Boulet and McFarlane quantitatively by refluxing with KCNS in 95 percent acetone, and then determining the Cu colorimetrically with dihydroxyethyldithiocarbamic acid (293).

The determination of copper in whole-milk powder, reported by Menefee, utilized a modification of the sodium diethyldithiocarbamate method (294).

Copper in milk powder is determined by Hetrick and Tracy on ashed samples of the milk product by the carbamate method. The copper-carbamate in carbon tetrachloride is measured by a spectrophotometer determination and estimated from a standard reference curve (295).

Copper in whole milk powder was determined by Menefee based on the addition of citric acid and ammonia to the solution of the ashed sample containing ferric iron. The iron is determined by reading the color imparted by adding sodium diethyldithiocarbamate, taking the reading of the color in a photelometer and using a calibration curve of known standard strength copper (296).

Iron in powdered milk was determined by Pyenson and Tracy, using the 1,10-phenanthroline color reaction. Samples of a commercial run averaged 3.3–4.6 p.p.m. (296a).

Fluorescence of dried whole milk increased with storage, increasing at 118° F. over that at 75° F., reported by Pearce as being unsatisfactory as a quality test (297).

Full-cream milk powders were reported by Lea, Moran, and Smith to keep well when stored in with 0.01 cc. of oxygen per gram of powder (1 percent of oxygen in the free air space), packed to a bulk density of 0.55 gram per cc. Increasing oxygen content facilitated development of off-flavor (298).

Dried whole milk, packed in nitrogen, lost 5–10 percent of its vitamin A and carotene content when stored at 20° C. for 6 months, but loss of riboflavin was very slight (299).

No correlation could be demonstrated by Pearce between the palatability of stored dried milk and its oxygen absorption, caramelization, solubility index, titratable acidity, or fluorescence (300).

A panel of 42 tasters was asked to compare milk reconstituted from dried whole milk with the pasteurized milk delivered at home. Of the 21 members receiving reconstituted milk, 2 thought it better than, and 12 as good as, ordinary pasteurized milk (301).

QUALITY

Clean milk is defined by Doan as milk which is free from extraneous filth, free from objectionable odors, free from bacterial contamination, and free from pathogenic organisms (302).

The quality milk control of the Boston Health Department is described by Fay (303).

The flavors in dairy products were studied by Fabian with particular reference to saltiness, sourness, and sweetness, studying them from their combined effects (304).

Cotton discs used for determining extraneous material in milk were shown by Weckel to vary in weight, thickness, diameter, and roundness; in rates of wetting, and in sediment retention (305).

REGULATION

Bacterial plate counts are pointed out by Brew and Breed as being useful in determining sanitary quality of milk but this cannot properly be used to draw fine distinctions between different figures as representative of actual quality (306).

The microscopic examination of raw milk was shown by Mallmann, Bryan, and Baten to be as accurate when the smear is mounted from a 4 mm.-loop as when spread by the standard pipet technique (307).

Resazurin tablets are now standardized, and Johns reports that the degree of reduction is measured more easily by Munsell color standard papers in test tubes than by the use of the Lovibond comparator (308).

The methylene blue reduction test is reported by Johns to need a reevaluation in terms of the plate count as a measure of bacterial quality (309).

The methylene blue reductase test, as now specified in standard methods procedure, is shown by Abele to indicate a bacterial quality which differs from that indicated by plate counts (310).

The standard plate count of milk was found by Golding and Jorgensen to check well with the resazurin test as determined on milks of widely different sources (311).

Staphylococcal mastitis was shown by Seeley, Anderson, and Plastridge to constitute a possible difficulty in meeting bacterial standards for wholesome milk (312).

After October 1945, all laboratories in the State of Connecticut, engaged in work connected with dairy products, must be registered with the State Department of Health (313).

Milk inspection is urged by Adams to be integrated into a supervision of the wider field of food handling in general (314).

Basic control essentials in milk sanitation are pointed out in an editorial as consisting of clean milk that is pasteurized, then controlled by dependable laboratory examination, the formulation of which needs further collaborative study by administrators, engineers, and laboratorians (315).

The Army milk control program is described by Col. Raymond Randall, Veterinary Corps (316).

The advantages and disadvantages of state versus municipal milk inspection is discussed by nine experienced milk control officials (317).

Coliform organisms, determined by plate methods, should not exceed 10 per ml. This is held as a reasonable standard by Tiedeman and Smith (318).

Market milk in Funchal, Portugal, was reported by Jacob to run 21 percent with chemical defects, and 23 percent with over 15 million organisms (319).

Quality control in the dairy industry is the subject of a paper by Thompson, giving a bird's-eye picture of this aspect of the whole dairy industry (320).

The addition of vitamin D to milk is the only vitamin addition which the Council on Foods and Nutrition of the American Medical Association has approved. The others are considered to be unnecessary because they would not be utilized extensively by the people who need them the most (321).

The addition of vitamin D to milk is not sanctioned by the Argentine National Institute of Nutrition because the more pressing need is to obtain a sufficient supply of milk itself. Control would be difficult, commercial deception would be open, and the increased price would not be justified in view of cheaper sources of vitamin D (322).

TECHNOLOGY

The value of milk irradiation in Frankfurt am Main is reported by Scheer with the following data: 19,385 children under 3 years of age received 0.75 liter of milk each day. Rickets incidence in 1939 (before irradiation began) was 75 percent; 1941 (after irradiation began) 45 percent; 1942, 22.3 percent. In 1943, 23 percent, although the fat content of the milk for irradiation had been decreased to 2.5 percent (323).

Short-time high-temperature milk pasteurization was discussed in its technical aspects in papers by Olson, Palmer, Gillespie, and Moore (324).

Heat treatment in high-temperature, short-time pasteurization in Massachusetts is 161° F. for 15 sec., New York State 160° F. for 15 sec., and New York City 160.5° F. for 16 sec. (325).

The performance of high-temperature short-time pasteurization was studied in plant and laboratory by Hiscox. He maintains that various laboratory studies do not give concordant results because of the difficulty in controlling the heating through the "lethal range" from 140° F. to pasteurizing temperature. Pasteurization at 162.5° F. with 15.5 seconds holding gave bacterial counts as low as laboratory pasteurization at 145° F. for 30 minutes, but at 160° F. the thermoduric counts ran high and went still higher at 158° F. Thermophilic counts ran lower than with the long holder process. Holding for 15 seconds at 162° F. allowed a good margin of safety in the phosphatase test, but 160° F. was near the danger level and the rate of heating became as important as the holding time. At 162.5° the cream volume loss ran from 27 to 57.5 percent. The rate of flow through tubes is fastest at center as compared with that nearer the walls. He suggests an efficiency of 70 perment, e.g. fastest flow of 15 seconds and slowest 21.5. For safety the working temperature should be a little over 162° F. to allow for lag of control instruments (326).

The effect of high-temperature short-time pasteurization on the ascorbic acid, riboflavin, and thiamine content of milk was reported by Holmes and co-workers to be without measurable effect (327).

A small milk-in-bottle pasteurizer electrically heated is described by Blandy and Nixon as correcting some

of the earlier difficulties of uneven heating, poor circulation, stratification, and box insulation (328).

Home pasteurized milk in 1–2 quart quantities is described and the products studied, by Trout, Devereux, and Bryan. Creaming was practically destroyed at 77°, and cooked flavor developed at 81°.(329).

The riboflavin content of milk was reported by Holmes to run as follows: before pasteurization, an average of 146 micrograms; after pasteurization in spray vat, 143 micrograms. In a coil vat, 152 before pasteurization and 149 after. By flash treatment, 141 before and 142 after (330).

New developments in dairy technology were described by Fritz, as follows: An ultra-violet milk-sterilizing machine is cheaper to operate than a pasteurizer and giving equal bactericidal action. A continuous buttermaker produces 1,800 kg. of butter per hour from a 45–50 percent cream, already in operation in several large dairies. For cheese curd-cutting and stirrer operate in a jacketed vessel from which the prepared cheese may be forced into molds (331).

Developments in some branches of the dairy industry during 1944 were presented under the headings of laboratory, frozen desserts, dairy-farms, equipment and platform tests, public health, education, dairy engineering, mastitis, and cheese (332).

Attempts to use a modified Trommsdorff method for the purpose of selecting milks for homogenization led Peters and Trout to conclude that so many undetermined factors affect the sedimentation in homogenized milk that this method is not applicable (333).

The deposition of milkstone in the heater is reported by Bell and Sandus to be retarded by preheating in direct proportion to time and temperature. Preheating causes partial precipitation of salts and proteins (334).

A new "swab-slant" test is proposed by Jamieson and Chen for determining the bacterial condition of surfaces of dairy equipment (335).

Weckel maintains that the best method for fortifying evaporated milk with vitamin D is to homogenize a vitamin D concentrate into a small batch of the evaporated milk and then add measured amounts of the latter to the tanks of standardized evaporated milk (336).

Jansen gives detailed instructions for treating the surfaces of tanks for protective painting. New tanks are cleaned best by sand blast or emery grinding and immediately painted with an anticorrosive, heat-stable special paint, at least in three coats. On bad spots, old paint is removed to the iron base with a sand blast, burning, or alkali (337).

To locate leaks in plate-heater milk pasteurizers, Pullinger spreads neutral starch paste with added phenolphthalein over the side of the heat exchange plates traversed by the milk. When the equipment is assembled, alkaline water is passed along the opposite side of the plates under pressure (338).

Loss of riboflavin in milk was traced by Ziegler and Keevil as follows: bottling 3–5 percent, and irradiation 5.1–8.3 percent (339).

VITAMINS

Vitamins from the milk of a herd of seventy Ayrshire, Guernsey, Holstein, Jersey, and Shorthorn cows on late summer pasture, reported by Holmes and co-workers was: ascorbic acid, 1.84 ± 0.069 mg. per 100 ml.; nicotinic acid ± 0.01 mg.; pantothenic acid 0.366 ± 0.031 mg.; riboflavin 0.137 ± 0.008 mg.; and aneurin 0.044 ± 0.004 mg. (340).

Fifteen samples of late summer milk were found by Holmes and co-workers to contain the following vitamins per liter:

ascorbic acid..	18.4 ± 0.69 mg.
nicotinic acid.	1.1 ± 0.10 mg.
pantothenic ..	3.66 ± 0.31 mg.
riboflavin	1.37 ± 0.08 mg.
thiamine	0.44 ± 0.04 mg.

Relative to thiamine content as 1, the ascorbic acid is 41.6, nicotinic acid 2.5, and riboflavin 3.3 times as much. Inasmuch as recommended vitamin allowances for infants are in the ratio of ascorbic acid 75 times, nicotinic acid 10 times, and riboflavin 1.5 times, it follows that such milk should be fortified with ascorbic and nicotinic acids (341).

Butter, cheese, and dried milk from South Africa were analyzed by Highman for their vitamin A content (342).

Carotene and vitamin A in butter from Sweden were assayed by Platon and Swartling and discussed at length (343).

Vitamin A in milk in England was reported by Kon to run 30–40 I.U. per gram of fat in summer and fell to 10–20 I.U. in early spring. Riboflavin ran 150 micrograms per 100 ml. of mixed milk. Mastitis decreased the content of water-soluble vitamins as much as 25 percent. Cheese contained more riboflavin and considerably more vitamin B_1 than would be expected from the partition of water, indicating combination with coagulable solids (344).

Experiments by Sen and Sarkar showed that an increase of daily carotene intake by Hariana cows (from 12,530 to 218,060 gamma) caused a 50 percent increase in the carotene and vitamin A content of the butterfat, and that a decrease in the daily carotene content caused a reduction in both carotene and vitamin A (345).

More vitamin A and carotene in milk fat and better flavor scores were found by Krukovsky, Ellis, and Percy in normal milk than in lipolyzed milk (3.3 degree acid) when protected from light but exposed to air. Irradiation for 2 hours entailed no carotene loss but the vitamin A content fell from 30 to 4 I.U. per gram fat. Increased irradiation caused a 50 percent loss in air-exposed samples, but no loss in vacuum-sealed ones (346).

The vitamin A content of creamery butter produced in Minnesota in 1943 and 1944 were reported by Jenness and Palmer to show marked seasonal fluctuations ranging 9,000–10,000 I.U. per pound January–April, increasing during pasteuring to 16,500–18,500 I.U. during May–October, and then declining back to winter level. In winter, carotene furnished 11–15 percent of the potency while in summer, it ran 21–25 percent of it (347).

The carotenoid content of milk was assayed by Trout, Moore, and Scheid. Pasteurization, homogenization, added copper, and added sucrose exerted no effect on the carotenoid content of frozen cream. No correlation was seen between induced oxidized flavor and carotenoid content (348).

Berl and Peterson determined the distribution of carotene and vitamin A in the products obtained in the manufacture of butter, as follows: (349)

	Carotene	Vitamin A
In skim milk....	10–14%	2–4%
In butter	89–94%	93–100%
In buttermilk	0.8–2%	0.4–1%

The assay of vitamin A by studying the changes in the cellular content of the vagina of rats was claimed by Pugsley, Wills, and Crandall to be more precise, quicker, and cheaper than the growth method (350).

Preliminary experiments showed Wilkie and DeWitt that neither the $SbCl_3$ method nor the indirect spectrophotometric procedure was universally applicable to the estimation of vitamin A. A direct spectrophotometric procedure was developed, involving chromatographic fractionation of the unsaponifiable extracts (351).

Vitamin A in ewe's milk was reported by Underwood and Curnow to run 1,287 I.U. per 100 ml., taken within 12 hours of parturition, and 102, 76, 31, and 20 for subsequent samples. Merinos averaged 272 I.U. within 12 hours, and that of crossbreeds 402 I.U., in 2 days falling to 58 I.U., and 50 I.U., and in 9 days a trace and 18 I.U. respectively (352).

Vitamin B_1 is reported by Ritter to occur mostly in the buttermilk or whey of whole milk, skim milk, butter, cheese, powdered milk, powdered whey, and milk-sugar molasses (353).

Boiling of milk decreases the thiamine by 4.5 percent, riboflavin 21.6 percent, and makes no change in the nicotinic acid content, as reported by Escudero, Herraiz, and Herrero (354).

Determination of thiamine in milk by a modification of the fluorometric method is based by Hodson on the use of taka-diastase to liberate thiamine from cocarboxylase (355).

Zollikofer and Richard report that milk from cows fed on hay and on silage respectively showed no difference in acid production by lactic acid bacteria. The lactoflavin (riboflavin) ranged in y per 100 ml.; hay, 130–183, 155.6; Amasil silage, 121–176, 147.1; AIV silage, 132–180, 161.4; Herba silage, 141–176, 155.0 (356).

Riboflavin in processed milk was shown by Holmes to run at 1.41–1.52 mg. per liter when determined by the fluorescence method, and that recent pasteurization exerted no deleterious effect to reduce it (357).

Riboflavin in Canadian dried buttermilk, according to Evans, Young, and Branion, ran 20–48 micrograms per gram. Skim milk (33 samples) had 13–23 micrograms per gram, and 9 samples of dried whey ran 14–27 (358).

Riboflavin was reported by Daniel and Norris to run 35 microgram per gram of dried, sweet-cream buttermilk, 1.77 in liquid whole milk, 1.58 in liquid skim milk, 4.71 in Cheddar cheese, and 0.367 microgram per gram of butter (359).

Nicotinic acid was reported to be isolated from cows' milk for the first time by Karabinos and Dicken (360).

Fresh milk was found by Hodson to contain 0.91 mg. nicotinic acid, 3.1 mg. pantothenic acid, 149 mg. choline, and 47.1 y of biotin, per liter respectively. The processing and irradiation of evaporated, dry skim, or dry whole milk caused a slight decrease in the biotin content of dry skim milk (361).

Holmes and Jones show that bottled milk allowed to stand for more than a short time exposed to sunshine lost a large part of its ascorbic acid and riboflavin (362).

The vitamin C content of cow and buffalo milk was found by Kothavalla and Gill to run 28–29 mg. per liter. Loss through pasteurization amounted to 24 percent by the holder method and 17.5 percent by the high-temperature short-time method, enhanced to almost 80 percent when the milk was exposed to copper and least destruction by nickel. Storage lost another 24–26 percent, with a total loss of 60 percent when delivered to customers (363).

Raw milk was found by Mawson and Kon to contain 1.84 mg. vitamin C per cc. (average of 71 samples) while pasteurized milk ran 0.69 mg. per 100 cc. This difference appeared to be due to methods of handling rather than to the effect of pasteurization which destroys only about 20 percent of the initial vitamin C content (364).

Ascorbic acid in the dairy milk of Cordoba, Argentina, was reported by Mácola and Fazio to run 12.4–14.6 mg. per liter, and was highest in the autumn season (365).

Vitamin C in milk products is determined by Stewart and Sharp by selective oxidation of ascorbic acid and interfering substances (by addition of concentrated cucumber juice), followed by reduction of dehydroascorbic acid to ascorbic acid by a suspension of *Esch. coli* or *Staph. albus*. The ascorbic acid is then determined by indophenol titration (366).

Cultured buttermilk, together with cacao products were reported by Mueller and Wertz to contain fair amounts of vitamin K (367).

Monthly determinations of blood plasma carotene were found by Sutton and Soldner to vary over wide ranges. In ability to convert carotene to vitamin A the breeds are listed in increas-

ing order: Guernsey, Jersey, Ayrshire, and Holstein. The blood plasma vitamin A ranged 18 micrograms per 100 ml. in June to a high of 24 in October. These tend to lag behind blood-plasma carotene (368).

Buttermaking distributed 10–14 percent carotene into the skim milk, 89–94 percent into the butter, and 0.8–2.0 percent into the buttermilk. Viamin A ran 2–4 percent in the skim milk, 93–100 percent in the butter, and 0.4–1.0 percent in the buttermilk, as reported by Berl and Peterson (369).

Vitamin K in cultured buttermilk was reported by Mueller and Wertz to be appreciable but not great enough to constitute a good source (370).

Riboflavin in milk was found by Stamberg and Theophilus to be decreased 40 percent when exposed for 2 hours to direct sunlight. Good shade, brown glass bottles, or paper containers give very good protection. There was no further loss in a dark refrigerator (371).

Fluorescence determinations of riboflavin in chocolate milk by Shetlar *et al.* showed that this vitamin decreases very slowly when exposed to sunlight, averaging about 12 percent after 4 hours, as compared with a loss of 80 percent for whole milk (372).

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A New Germicide for the Food Industries

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INTRODUCTION

THE food and beverage processing and dispensing industries are confronted daily with the problem of controlling bacteria, yeasts, and molds to prevent:

1. Spoilage of food.
2. Illness caused by the growth of organisms in food.
3. Diseases transmitted by utensils.

These effects are inter-related, and all can be minimized by the proper cleansing and disinfection of processing equipment and serving utensils. The U. S. Public Health Service Code,[1] which has been used by a number of cities as a basis for ordinances to control eating and drinking establishments, specifies that all multi-service utensils shall be adequately cleansed and then submitted to an "approved bactericidal process." There are two types of approved treatments—either exposure to some form of heat, such as water at 170° F., steam, or dry heat; or immersion in a solution of a chemical germicide.

The proper application of heat is a well-known method of destroying bacteria, yeasts, and molds. The use of dishwashing machines, good detergents, and hot water produces clean utensils, carrying a minimum of disease-producing microorganisms. These conditions usually prevail in the larger restaurants and hotels where sanitary standards are high. However, most taverns and soda fountains do not have equipment which is capable of supplying enough hot water or steam to do the job. As an alternative to heat sterilization, the Code specifies that utensils shall be immersed in a plain water rinse to remove the detergent and organic matter, and then immersed for two minutes in a solution containing 50–100 p.p.m. available chlorine—or its bactericidal equivalent.

In the food plants, such as dairies, it is either difficult or impossible to apply heat to many pieces of equipment. For that reason, a chemical germicide is generally used.

For a number of years, the only satisfactory chemical germicides for food establishments have been the chlorine liberating compounds. Other compounds have not been considered suitable for the disinfection of surfaces which contacted foods because they did not possess the following properties:

1. High germicidal activity.
2. Low toxicity.
3. Tastelessness and odorlessness.
4. Non-corrosiveness.
5. Physical and chemical stability.
6. Economy in use.
7. Property of simple chemical determination.

It is obvious that the aldehydes, the heavy metal salts (e.g. mercury), pine oil, cresylic compounds, and others are entirely unsuitable wherever they are liable to contaminate foods or beverages.

CHLORINE GERMICIDES

Several different types of chlorine compounds are used. They vary in the degree of availability of the chlorine, that is, the proportion actually available at any time to oxidize the bacterial cell. Free gaseous chlorine is the most active form, in fact so active

that it presents a number of problems in use. In the form of sodium hypochlorite, it is sold as solutions containing from 5–15 percent available chlorine. The calcium salt is also on the market. On dissolving in water it is entirely converted to the sodium salt. This form is more stable and convenient to handle as it is a powder, but has the disadvantage of introducing calcium salts which may be deposited on the surfaces of utensils and equipment. There are also several nitrogenous organic compounds containing available chlorine, such as chloramine T, succinchlorimide, and azochloramide. They are less reactive with organic matter, but higher concentrations are required to provide the same speed of disinfection.

Chlorine is a very effective germicide. Less than 1.0 p.p.m. is necessary to kill large numbers of coliform type bacteria in water, providing that it is relatively free of organic matter. However, the addition of small amounts of organic matter will greatly decrease the germicidal activity. The U. S. Public Health Service Code takes this factor of inactivation by organic matter into consideration when it recommends the use of sanitizing rinses containing 50–100 p.p.m. chlorine for restaurants and taverns and 200 p.p.m. for dairies.

Several theories have been proposed to explain the nature of the germicidal action of chlorine, but they all agree that it is an oxidizing reaction.[2] In the presence of organic matter, such as food proteins, part or all of the germicide may be consumed and the destruction of bacteria and other microorganisms is incomplete.[3] The fundamental principle seems to be that in order to disinfect with a chlorine liberating compound, a sufficient amount must be present to raise the oxidation potential to a germicidal level, and sufficient reserve must be present to maintain this potential until the germicidal action is complete.

Surveys conducted by the U. S. Public Health Service have shown that less than 5 percent of the food and beverage establishments which are not equipped for heat sterilization use chlorine in the proper manner. Though very effective when properly used, the chlorine germicides receive poor acceptance for several reasons. First, there is little or no demand by the restaurant patron that he be protected from the diseases transmitted by food utensils which are not properly sanitized. Second, the patron objects to the odor and taste imparted to foods and beverages when chlorine is not removed after sanitization. Third, chlorine irritates the hands and corrodes equipment.

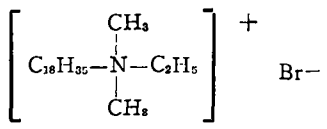
QUATERNARY AMMONIUM GERMICIDES

During the last decade a new group of chemical compounds has been developed and applied to the food fields as germicides. These are the quaternary ammonium salts. Several German workers published information on them in 1928[4] and again in 1935,[5] but it was not until 1938 that they were introduced to this country. During the war the quaternary ammonium germicides were used extensively by the Armed Forces.

These compounds are homologous to ammonium chloride. If carbon-containing groups are substituted for all four of the hydrogen atoms of ammonium chloride, the resulting compound is a quaternary ammonium salt. These are not all germicidal. Hundreds of them have been prepared, but only a few are sold for disinfectant purposes in this country at the present time.

An extensive investigation led to the development of a new quaternary ammonium salt, 9-octadecenyl dimethyl ethyl ammonium bromide. Designated by the trade name, AMERSE, this compound satisfactorily meets the requirements for a practical food-

utensil germicide. Its structure may be represented as:



The term, "cationic germicide," may also be applied to this compound. In aqueous solutions, it dissociates into two ions. One of these is the simple bromide ion; the other is the complex carbon-nitrogen structure called a cation. The cation is the portion of the quaternary ammonium compound which is responsible for germicidal activity, hence the name, "cationic germicide."

Several workers have discussed the antimicrobial mechanism of the cationic germicides. Baker, Harrison, and Miller demonstrated the inhibition of bacterial respiration and glycolysis, and the ability of phospholipids to prevent this inhibition. The bacteriostatic and bactericidal properties of the cationic compounds were believed due to a disorganization of the cell membrane by virtue of the surface activity, and also the denaturation of certain proteins essential to metabolism and growth.[6, 7, 8] Valko and DuBois[9] demonstrated the ability of anionic wetting agents to "revive" organisms which had apparently been killed by cationic compounds. This detoxication was attributed to the action of bacteria as cation exchangers.

As these compounds are powerful wetting agents, their water solutions possess low surface tensions and will contact and kill organisms not accessible to non-wetting germicides. The wetting characteristics of the quaternaries are a distinct advantage. For example, an AMERSE solution will spread evenly over the surfaces of a milk cooler without brushing. Dishes, glasses, and utensils rinsed in these low surface tension solutions drain more rapidly and dry without water marks.

These compounds also possess detergent properties. One report states that they are superior to soap and the alkaline phosphates.[10] The writer uses them routinely in the laboratory to clean and disinfect his hands after handling pathogenic microorganisms, and it is understood that several hospitals follow this practice in the surgery.[11]

Physical and chemical stability are very important factors. The quaternary ammonium salts are not volatile; most of them are crystalline solids. Chlorine is, of course, a gas and the degree of volatilization varies with the concentration, temperature, and alkalinity of the solution. In acid solutions, gaseous chlorine is liberated with a rapid decrease in strength. Solutions deteriorate on exposure to light.

Chlorine is corrosive to some metals and it blackens silverware. The quaternary germicides are not harmful to metals, rubber, or plastics in the proper dilutions. They are odorless, colorless, and virtually tasteless in use solutions.

GERMICIDAL EFFECTIVENESS

The quaternary compounds have extremely high germicidal activities. They are 200 to 700 times more powerful than phenol, depending upon the individual compound, the test organism, and the test conditions.[12] For example, under standard phenol coefficient conditions, which are more severe than those met in the food establishments, AMERSE kills *Streptococcus pyogenes* in 10 minutes at a concentration of 10 p.p.m.

Since the quaternary ammonium salts are not oxidizing agents, they are not as greatly affected by oxidizable organic matter as are the chlorine compounds. Their activity is reduced, but to a much less degree. They pass several Government specifications which require germicidal activity in the presence of 10 percent horse serum.[13] Chlorine compounds are unable to meet this requirement.

The pH of the sanitizing solution is another factor influencing its activity as a germicide. Dr. Mallmann, of Michigan State College, found that 0.5 p.p.m. chlorine would not completely destroy *Staphylococcus aureus* in 30 minutes when the test solution was alkalinized to pH 9.[14] On the other hand, at pH 5 and pH 7, sterilization was complete in 5 minutes or less. Although the germicidal velocity of chlorine is lower in alkaline solutions, most commercial chlorine preparations contain some form of alkaline stabilizer. Exactly the reverse is true of the quaternaries. For example, in a neutral medium one compound kills *Eberthella typhosa* in 10 minutes at a concentration of 50 p.p.m. In the presence of 1 percent trisodium phosphate, a concentration of 12.5 p.p.m. is effective.[15] When it is considered that sanitizing rinses follow the cleaning process in which alkaline detergents are often used, the effect of pH on germicidal activity becomes an important factor. Considering these various factors, these germicides are, weight for weight, among the most powerful known today.[16]

No germicide may be used in food processing that is in any manner capable of rendering the food toxic. Although free chlorine is very irritating, it is readily reduced to harmless salts. The quaternary salts possess the lowest toxicity indices of the known chemical germicides, that is, when compared with other compounds, solutions of the same germicidal strength are much less poisonous to the cells of the body. For example, in a test in which a toxicity index of less than one indicates a desirable compound, several quaternaries show indices of 0.3 to 0.5 while tincture of iodine shows an index of 0.8, phenol 4.0, chloramine T 1.16, and alcohol 7.5.[17, 18] One-1,000 solutions are harmless to the eyes of a rabbit.[19] This concentration is 10 to 100 times stronger than that required to kill most bacteria. Rats were given food containing up to 3 percent of one of these compounds, and even after several months they were normal in every respect.[20] Calculating on the basis of the oral toxicity to rats, the fatal dose for a man would be about 35 gallons of 1–5,000 solution, the strength used to rinse food utensils. When solutions containing 1 percent of the active ingredient of AMERSE were applied to the forearms of 18 people for 24 hours, two showed a slight reaction. At 0.1 percent, no reaction was observed with 25 subjects.

USE IN SANITIZATION

Several studies have been made of these compounds as sanitizing agents for food establishments. In 1940, Krog, Health Officer of Plainfield, N. J., and Marshall of New York City, tested alkyl dimethyl benzyl ammonium chloride in the laboratory.[21] Drinking glasses contaminated with heavy cream, lipstick, and bacteria were exposed to the germicide for 1, 2, or 3 minutes. In other tests the glasses were washed in soap or alkaline detergent solution before the sanitizing rinse. They concluded that a concentration of 200 p.p.m. of quaternary ammonium compound was satisfactory as a germicide. Lipstick interfered in some cases, but generally a one minute exposure was sufficient. Results in several taverns and restaurants were also satisfactory. Walter and Hucker, of the New York Agricultural Experiment Station, conducted tests at six taverns and concluded "that the substitution of a quaternary ammonium compound for plain water or chlorine generally resulted in a marked decrease in the number of organisms."[22] MacPherson, Health Inspector of Peterborough, Ontario, came to the same conclusion. He also found that if ice cream scoops were kept in a 200 p.p.m. quaternary solution instead of in plain water, the bacterial count was less than 10 per cc. Plain water rinses had counts as high as several millions per cc.[23]

Recently our laboratory conducted some studies in a number of restaurants

and taverns in and about the city of St. Louis. Over 50,000 organisms were frequently found on a single drinking glass when it had not been exposed to a sanitizing agent. The effect of rinsing glasses and dishes in three different quaternaries and in chlorine solutions was compared. The U. S. Public Health Service Code specifies that utensils shall be immersed in the sanitizing rinse for 2 minutes. However, it was observed that most operators exposed beverage glasses for a much shorter time, generally less than 15 seconds. Therefore, similar exposure times were used in order to approximate the least favorable conditions of use. Under these conditions, two of the quaternaries were generally superior to chlorine.

In conjunction with a local health department, our laboratory compared the germicidal activity of AMERSE with that of chlorine. Our procedures were briefly as follows: Glasses were washed in a detergent solution, immersed in the sanitizing rinse for 10–15 seconds and swabbed according to the procedure used by the U. S. Public Health Service. The buffered dilution water from these swabs was then plated in agar and bacterial counts made.[24] We found that with an intermediate rinse, the chlorine residual dropped from 100 p.p.m. to the minimum of 50 p.p.m. after 230 glasses were processed. We then substituted a rinse containing AMERSE and, without an intermediate rinse, processed the same number of glasses. Samples of glasses taken at intervals in each series showed a logarithmic average germ count of 2,610 in the chlorine series and 85 in the AMERSE series.[25] Several other series showed the same picture. Under actual use conditions the quaternaries were superior. It was noticed that bartenders showed less tendency to towel glasses rinsed in the quaternaries, as they rinse and dry clear. Comments were frequently heard on the advantage of an odorless rinse. It is well known that bartenders avoid the use of chlorine rinses because of the disagreeable taste and odor imparted to beverages.

After an independent investigation, another worker came to the following conclusions: AMERSE is as effective as chlorine in recommended concentrations, odorless and tasteless, more stable than chlorine, and its solutions feel pleasant to the hands. Because of the above, it is more nearly foolproof, as the average dishwasher is more likely to use AMERSE properly with less supervision. As utensils rinsed in AMERSE have a clearer, more sparkling surface, there is less tendency for toweling. It can be used effectively in a two-compartment wash and rinse vat.[26]

Although the quaternary germicides tend to decrease the foam stability of beer, it has been found that rinsing the glasses with cool running water before use nullifies this effect. This practice is recommended by most breweries.

As the quaternaries retain a large proportion of their activity in the presence of organic matter, it is possible to clean and disinfect in one operation in some applications. For example, alkaline detergent powders containing quaternary ammonium salts are being used in some taverns.

Most health departments require a simple field test method for determining the strength of germicidal rinse solutions. Several test kits have been developed for this purpose.[27, 28] The AMERSE Test Kit enables quantitative determination of AMERSE solutions in about 30 seconds, and is no larger than a cigarette package.

These compounds have also been used in the dairy field. Studies with one of them were made in a milk plant having a daily capacity of 25,000 quarts. Various sections of the milk handling and processing system from the weigh tank to the bottle filler were examined bacteriologically. Swab tests were made according to standard methods, and it was generally found that between 90 and 100 percent of the organisms were killed.[29]

tion to encourage hospital administrators, institutional managers, state health departments, and purchasing agents of states and municipalities to consider the possible acquisition of surplus property for replacements in operational equipment. This appears to be an excellent opportunity to assist institutions which have been operating under restricted budgets and those unable to buy food equipment during the war years to purchase a considerable amount of good usable equipment from surplus.

The actual transaction involved in the acquisition of surplus property is being handled through the several regional offices of the Reconstruction Finance Corporation, Consumer Goods Division. Reconstruction Finance Corporation offices are located strategically throughout the United States, and specific inquiries concerning surplus supplies desired should be addressed to the nearest office of this agency in the territory where the claimant resides. Similarly, applications for surplus property by public health institutions may be filed at the nearest regional office of the Reconstruction Finance Corporation. Public Health Service representatives will be assigned to expedite filling of orders and other surplus property activities in each of the R.F.C. regional offices. Of special interest is a provision of Surplus Property Administration Regulation No. 14 which allows a 40 percent discount from "fair value" on all equipment and material which is to be used for or by eligible public health claimants. Applications from health agencies for acquiring surplus property at a discount will be reviewed by the Public Health Service representative in the nearest regional office of R.F.C. His duties will be largely promotional and consultative.

It should be emphasized, of course, that declarations of surplus property will extend over a considerable period of time, and the needed item might not appear for several weeks or months; in fact, might never be declared. Since the volume of goods and equipment involved is huge, it will require time to inventory and document it before it can be announced as available. This is an important consideration to bear in mind so that misunderstandings can be avoided.

The acquisition of surplus property at a discount by educational institutions is also included as a part of the surplus property plan. This program is being handled by the U. S. Office of Education. Since much property has both health and educational use, a close liaison has been established between these two agencies.

This announcement concerning surplus property activities and the part being played in it by the U. S. Public Health Service is intended primarily for the information of milk and food sanitarians to alert them to the fact that an active program has been set up to give public health claimants every consideration and that a real opportunity to advance public health services appears to be possible through the acquisition and use of property which is no longer needed in the prosecution of the war. The Office of Surplus Property Utilization will be glad to answer specific inquiries from food and milk men or others working in the field of public health. The program is new and there are still many problems to be reconciled, but it is hoped that nationwide good will accrue through this overall program.

CONVENTION NOTICE

The following organizations will meet in Atlantic City, New Jersey, October 20 to 26, 1946:

Dairy Industries Supply Association
International Association of Ice Cream Manufacturers
International Association of Milk Dealers
International Association of Milk Sanitarians
National Association of Retail Ice Cream Manufacturers

Due to the fact that several large Atlantic City hotels still are serving as Army Hospitals and the date of their availability for civilian guests is not yet determined, the selection of headquarters hotels by the above organizations has been delayed.

To be fair to everybody, the Atlantic City hotels will not, before May 31, accept any reservations for the period October 20–26, 1946, unless the Army-occupied hotels are released prior to that date so as to permit their consideration as headquarters by the above Associations for their members.

Whenever the Atlantic City hotel arrangements are completed, the above Associations will simultaneously notify all of their members regarding the Hotel Headquarters selected by each Association. Hotel Application Blanks necessary to secure reservations in Headquarters Hotels will accompany these announcements.

Arrangements are being made to send, at the same time, to non-affiliated individuals in the dairy industry, information on how to obtain accommodations in other than headquarters hotels.

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International Association of Milk Sanitarians

(Association Organized 1911)

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Membership and Dues: Active membership in the Association is $3.00 per year, and Associate membership is $2.00 per year, including respectively all issues of the JOURNAL OF MILK TECHNOLOGY. All correspondence concerning membership in the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, including applications for membership, remittances for dues, failure to receive copies of the JOURNAL OF MILK TECHNOLOGY, and other such matters should be addressed to the Secretary of the Association, C. SIDNEY LEETE, STATE DEPARTMENT OF HEALTH, ALBANY, N. Y.

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Association News

The Chicago Dairy Technology Society met in the Continental Hotel at 6:30 P.M. on January 8th, 1946. The first meeting of 1946 was handled by the new officers.

Attendance at our monthly sessions has increased steadily and the program committee promises some fine speakers. They have already made good on their first promise with a fine talk on Trends in the Development of the Dairy Industry, by Dr. P. H. Tracy.

The February speaker was E. H. Parfitt of the Evaporated Milk Association.

Ross Speicher, our Entertainment Committee Chairman, is planning on a Spring Party to be held the latter part of April or the first of May. The Dairy Tech parties in the past have been something to remember, so try to attend our next good time.

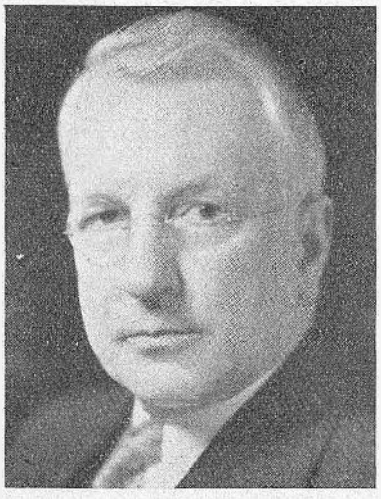
FRED E. SEYFRIED

The annual meeting of the Iowa Association of Milk Sanitarians was held February 27th and 28th at Iowa State College, Ames, Iowa. The following subjects were discussed:

1. Controlling insect pests in the dairy plants with DDT.
2. High temperature, short time pasteurization.
3. Dairy farm hygiene.
4. U.S. Food and Drug Administration policies.
5. Dairy cleaning agents.
6. Cleaning farm dairy equipment.
7. Milk and its relation to the spread of disease in Iowa.

During the business session it was decided to continue the policy of holding regional meetings in various parts of the state.

IRWIN'S WORK IN PENNSYLVANIA



Ralph E. Irwin retired July 31, 1945, as director of the Bureau of Milk Sanitation of the State of Pennsylvania. Starting as Assistant Sanitary Engineer, Bureau of Engineering in the Pennsylvania Department of Health in 1907, Mr. Irwin spent much time in the chemical treatment of raw water supplies, the operation of water filtration plants and investigation of public milk supplies suspected of having caused milk-borne disease. By 1917 this Section comprised eight engineers and an office personnel. All the engineers eligible entered the armed services in World War I and the duties of the Section were added to those of the Construction Section in the Bureau of Engineering.

December 15th, 1917, Mr. Irwin enlisted and was assigned to Edgewood Arsenal, Maryland, where he became Camp Sanitary Officer with the rank of Captain. Here he had an opportunity to select a milk supply and equipment for and supervise the installation and operation of a milk treatment plant for the Arsenal. Following his discharge from the Army in 1919, he returned to the Pennsylvania Department of Health and was assigned to full time work on public milk supplies.

During 1920 and 21 equipment for pasteurizing milk was installed in the three state insitutions for the treatment of tuberculosis.

While attending the Convention of the INTERNATIONAL ASSOCIATION OF DAIRY AND MILK INSPECTORS in Chicago in 1920, Mr. Irwin discussed the homogenization of milk with Dr. J. B. Hollingworth of Ottawa, Canada, where the use of homogenized milk increased the consumption of milk in the home as well as in restaurants and hotels. In 1922 Pasteurized Homogenized Milk was served in the Mont Alto Sanatorium for tuberculosis and the per capita consumption of milk increased from 1½ quarts to 2 quarts.

The use of Pasteurized Homogenized Milk was sufficiently successful to warrant its promotion throughout the State.

In 1923 the Advisory Health Board of the Department of Health adopted Rules and Regulations for a clean and safe public milk supply. These Rules and Regulations were included in Pennsylvania's first Milk Sanitation Law in 1929.

Mr. Irwin was the Department of Health representative to the World Dairy Congress in 1923. The same year he was in charge of the delegation from the League of Nations during its visit to dairy farms and milk treatment plants in Pennsylvania.

Those from Pennsylvania in attendance at the 1923 Convention of the INTERNATIONAL ASSOCIATION OF DAIRY AND MILK INSPECTORS in Washington, D. C., met in Harrisburg, Pennsylvania, in January 1924 and organized the Pennsylvania Association of Dairy and Milk Inspectors. Dr. George W. Grim was elected President, and W. W. White, Secretary-

Treasurer. This organization is now the Pennsylvania Association of Milk Sanitarians of which Mr. Irwin is Honorary President.

In 1925 the first motor laboratory was placed in service for the assistance of milk treatment plants. This laboratory was equipped for the determination of temperature, sediment, acidity, butterfat, methylene blue reduction, and direct microscopic examinations. A second motor laboratory similarly equipped was placed in service in 1926. The use of these two laboratories did much to promote cleanliness and safety in the preparation of pasteurized milk. In 1925, Dr. Charles H. Miner, Commissioner of Health of Pennsylvania, authorized a study of the Electropure Process for the pasteurization of milk. In 1930, Dr. Theodore B. Appel, Secretary of Health, authorized a study of the New York Plate Pasteurizer for the pasteurization of milk. Mr. Irwin was in charge of the engineering work in each of these studies and did much to place high-temperature short-time pasteurization in conformity with the health requirements of milk sanitarians.

In 1929, Mr. Irwin divided the state into seven districts with a representative from the Bureau of Milk Sanitation located in each district. This proved successful and, as qualified men became available, the districts were increased to sixteen.

In 1935 the supervision of the preparation of ice cream was added to the Milk Sanitation Law of 1929. This law requires that the milk and milk products used in the preparation of ice cream shall meet the requirements of Milk for Pasteurization. This law expanded the farm and plant inspection duties of the Bureau of Milk Sanitation and brought Mr. Irwin and the representatives of the Bureau of Milk Sanitation in contact with practically all state milk sanitarians in the Central West and Eastern States. Mr. Irwin used this opportunity to promote uniformity in state requirements for dairy farms and milk treatment plants.

Mr. Irwin followed the use of DDT preparations by the Army for the control of insects and had developed a sound program of fly protection for plants before his retirement.

He has been a member of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS for over 25 years. Following the death of our first Secretary-Treasurer, Mr. Ivan C. Weld, he was Acting Secretary-Treasurer until the election of Dr. Paul B. Brooks. He was President of our Association 1929–1930.

Mr. Irwin also held a Fellow Membership in the American Public Health Association and was a member of the Conference of State Sanitary Engineers, Honorary President of the Pennsylvania Association of Milk Sanitarians, and Honorary President of the Pennsylvania Association of Directors of Laboratories for the Bacteriological Examination of Milk.

In his home community, Mr. Irwin is a trustee and steward in the Methodist Church; Charter Member and Past Master of West Shore Lodge, F. & A. M.; Charter Member and Past Commander of American Legion Post No. 43; and Charter Member and director of Camp Hill National Bank.

ANNUAL MEETING, OCTOBER 24–26, 1946
ATLANTIC CITY, N. J.

ERNEST KELLY RETIRES AFTER 35 YEARS AS DAIRY SCIENTIST

Ernest Kelly, assistant to the chief of the Bureau of Dairy Industry of the U. S. Department of Agriculture, has retired after more than 35 years of Government service, most of which was devoted to scientific studies relating to milk sanitation and to the development of production practices and educational programs for improving the wholesomeness of the Nation's milk supply.

Mr. Kelly is well known to the dairy industry. He has served in an official capacity in various dairy associations, has written many popular and technical bulletins on dairy problems, and is the senior author of a standard textbook on the subject of market milk. He was instrumental in developing much of the research information that has since been applied to the sanitary production of milk on the farm and in the factory.

Mr. Kelly, who was born in Washington, D. C., in 1883, obtained his scientific training and education at Cornell University. Leaving the University in 1906, he first spent several years in commercial dairies and then in 1910 began his carreer in the U. S. Department of Agriculture, in the Section of Market Milk Investigation of the Bureau of Animal Industry. He was put in charge of the Section in 1912 and it later became the Division of Market Milk Investigations in the Bureau of Dairy Industry.

During the 30 years or more that Mr. Kelly was in charge of the Division of Market Milk Investigations, the Division worked out many of the basic essentials of dairy sanitation and helped establish the principles in general practice in the industry. Fundamental research relating to the cooling of milk, transportation, cleaning of milking machines, and other sanitary problems was involved. This Division conceived and carried out the first experiments which proved conclusively that feed flavors are carried through the blood stream in the body of the cow and into the milk, and that this is a more important cause of strong feed flavors in milk than their absorption from the air.

In the early years of the market-milk work, a score card system was developed for the inspection of dairy farms and city milk plants and became widely used in the industry. A system of scoring milk and cream was also developed, and competitive contests were introduced and widely used as a means of stimulating the production of high-quality milk and cream by individual farmers and dairy plants.

Considerable information was also amassed concerning the construction, arrangement, equipment and operation of milk plants. The results of these studies, which pointed the way for better arrangement of machinery, more efficient use of labor, and reduced breakage and loss of bottles, have become a handbook for many dairies, especially the smaller ones that needed

a standard for judging economy of operation.

Mr. Kelly initiated and directed the first comprehensive study of the basic requirements for milk production in terms of feed and hours of labor. The results of the study, which was made in seven states more than 25 years ago, can be used even today by applying present prices of feed and labor to the basic figures for the locality.

More recently the work of the market-milk division included basic studies on the homogenization of milk and cream, on the curd tension and digestibility of homogenized milk, and the relation of certain feeds to the development of oxidized flavor in milk.

LIEUTENANT COLONEL C. J. BABCOCK AWARDED LEGION OF MERIT FOR HIS WORK WITH ARMY MILK SUPPLIES

The citation accompanying the award reads as follows:

Lieutenant Colonel Clarence J. Babcock, 0506148, Sanitary Corps, Army of the United States, in important assignments in the Veterinary Division, Office of the Surgeon General, from December 1942 to October 1945, contributed importantly to the procurement of a safe wholesome and adequate milk supply for the Armed Forces and rendered invaluable service in protecting the health of military personnel against milk borne diseases.

Colonel Babcock has completed his services and returned to the Bureau of Dairy Industry, Agricultural Research Administration, U. S. Department of Agriculture, Washington, D. C.

Correspondence

THE DAIRY SITUATION ABROAD

A Letter from Colonel James A. Tobey

When my troopship arrived in New York last December, most of the soldiers on board rushed to the Red Cross workers on the pier and avidly asked for milk. It was the first time in two or three years that they had been able to enjoy pure, safe whole milk, one of the features of American life.

In Europe their rations had included ten ounces of milk and dairy products, but it was served as canned evaporated or powdered milk, and canned butter and cheese. These are, of course wholesome products, but they do not have quite the elan of the more natural ones.

The rich dairy regions of Europe are no longer as rich as they were. Milk is obtainable, but it is seldom pasteurized. In some areas butter and cheese are also available, but all these native dairy products were "off limits" for reasons of hygiene.

Ice cream was a rare treat in the early days of the war, but has been served more frequently since V-E Day. At the Red Cross in Algiers, ice cream was dispensed during the hot, sultry days of summer. The supply, made from prepared mixes sent from the U. S. was limited however, and many in the long lines of soldiers would be disappointed when the meagre supply was exhausted.

In Palermo in Sicily there was a reasonably modern pasteurizing plant, which had contributed a small fraction of the city's milk supply. Its equipment, brought from Naples, was good, but the methods employed would never have passed the rigid type of inspection in vogue in the United States.

In North Africa and Sicily the goat was a more prolific source of milk than the cow, and this was also true on the mainland of Italy. When we landed in Normandy in France, we were impressed by the fat, sleek, brown cattle in the rolling fields. The retreating Germans had taken many with them, but many still remained. In France milk sanitation is somewhat primitive in the rural regions, although Paris had a fairly good supply before the war. The favored beverage in France is, of course, wine rather than milk.

After the occupation of Germany, which began in April, 1945, the French sent many thousands of cattle back to the homeland. From my area in Wurttemburg they commandeered some 5,000, which they loaded into trucks and took on a precarious journey to different parts of France. They did this a few days before we took over in July, somewhat to the disgust of our military government. They also took a good many other things, including machinery, clothes, wine, and automobiles, which they claimed had been stolen from them by the Nazis. Perhaps they were justified.

In Germany and France food supplies are low, and very few milk and dairy products are available to the people. The basic ration in Germany was only about 1,200 calories a day during the first six months of the occupation, but at the end of 1945 it was raised to 1,500. Heavy workers and certain classes of persons get more, and there is some supplementation with vegetables and fruits during the summer. The diet is inadequate, but so far there has been very little gross malnutrition.

Belgium, Holland, and Greece are even worse off. Conditions are not too bad in Denmark, always noted as a flourishing dairy region. Austria is in about the same condition as Germany. In England, where a sensible system of food production and distribution has been in effect, conditions are much better, although the diet is monotonous.

Food may have helped to win the war, but it still has a job to do in helping to write the peace.

JAMES A. TOBEY
Colonel, Sn.C.

GENERAL INFORMATION ON DDT

The control of disease-carrying insects is of great importance to public health, and for that reason the Michigan Department of Health is interested in the use of the chemical DDT (dichloro-diphenyl-trichloroethane). DDT is a highly effective insecticide and can be used to control flies, mosquitoes, roaches, fleas, lice and bed bugs without endangering useful insects such as bees. Used on surfaces nonfrequented by useful insects, DDT will kill insect pests by gradual nerve paralysis. While the insects need only a brief exposure to DDT to be affected, they may live from twenty minutes to several hours.

CAUTIONS IN THE USE OF DDT

With ordinary precautions, there is no more danger in the use of DDT than with ordinary oil type insecticides. It must be remembered that DDT is a poison, and can be dangerous if used carelessly. The directions issued by the manufacturer should be followed. Various DDT products must be used only in proper solution and for intended purposes. For instance, oil solutions of DDT should never be applied to the skin, used on pets, or sprayed on foliage.

When applying DDT, an industrial protective cream should cover the face and other exposed portions of the body. The hands should be thoroughly washed after using DDT. The fine mist or vapors of sprayed DDT should not be inhaled. This can be avoided by using a fine droplet-type of spray and by keeping inside areas well ventilated.

METHOD OF APPLICATION

Liquid solutions of DDT should be applied to flat surfaces in a fine droplet spray in an amount sufficient to cover the surfaces without running. The oil solvent will evaporate and leave DDT crystals on the surfaces treated. When considerable areas are to be treated, a three-gallon garden sprayer is recommended. The ordinary nozzle furnished with the garden sprayer is not very satisfactory, since it produces a conical spray with very little material in the center. A flat fan-type spray has definite advantages, for it gives more uniform coverage and is more easily controlled. The Spraying Systems Company of Chicago furnishes a satisfactory nozzle for this type of work, designated as ¼ T 8002.

When extensive areas are to be covered, commercial paint-spraying equipment or power spray equipment should be used. Most orchard sprayers fill these requirements and when equipped with proper nozzles and trigger control valves, make suitable equipment for applying DDT solutions.

A 5 percent DDT solution should be used to treat wire cloth or screen-

ing. Application may be made with a wide paint brush, whitewash brush, paper hanger's paste brush, or a roller-type paint applicator. The surface of the roller should be felt or fiber, since a carpet covered roller has not proven satisfactory. Apply material liberally and secure door in either a closed or open position until dry.

Dusts may be applied to animals with a shaker-type applicator or a dust gun similar to that used by gardeners. Care must be taken to keep dust out of the eyes of animals. A dust gun may also be used to apply dust to surfaces such as floors, cracks, and crevices, floor openings, walls and ceilings, around pipes, heat ducts, conduits, etc.

GENERAL RECOMMENDATIONS

At a farm home the kitchen, porches, and screens of the house, the privy, barn, milk house, animal sheds, chicken coop or brooder house, and hog pen should be treated.

Dishes, utensils and work surfaces should be protected while spraying with DDT. Dishes and utensils may be removed or covered. However, dishes in closed cupboards need not be removed. Work surfaces may be covered. Should some material collect on such surfaces, a thorough scrubbing with soap and water is recommended before the material has dried.

Painted or papered walls may be treated without harm to surfaces, provided they are clean and a uniform coverage of material is applied. Applying material to blue wall paper should be avoided.

Gold fish and canaries should be removed from the room before the spraying process. Store DDT material, especially the powder type, apart from kitchen supplies.

During the application on farms, caution should be exercised to protect feeds from contact with DDT. Stock drinking cups may either be covered or thoroughly flushed out after the spraying process. Milk cans, pails, strainers, stirrers, separator parts, strainer pads, etc., should be removed. No special precautions are necessary regarding the feed boxes or mangers, since the amount of material used is insufficient to be toxic to the animals.

Oil solutions of DDT cannot be applied to vegetation since it will burn foliage. Therefore only wettable powder is recommended for treatment of grass, shrubbery and trees. While spraying wettable powder, it is necessary to provide agitation to keep the powder in suspension.

Products which do not carry a label giving the name of the manufacturer or processor, active ingredients, amount of DDT in percent, instructions for use and necessary precautions should not be purchased. An oil solution containing 5 percent of DDT is probably the best suited for general home use. One application of DDT remains effective for a varying length of time. Repeat applications are advised after six or seven weeks.

TYPES OF PRODUCTS AVAILABLE

1. Oil solutions of DDT in concentrations varying from practically nothing to 5 percent.
2. DDT mixed with fine inert materials in dust form varying in concentration from 1 percent to 10 percent.
3. Emulsifiable oil solutions usually containing between 25 percent to 35 percent DDT. Water can be used to make desired dilutions.
4. Wettable powders containing as high as 50 percent DDT. Water may be used as the diluent agent but agitation is necessary to keep solids in suspension.

There are a number of distributors which merchandise DDT products, but the Michigan Chemical Corporation of St. Louis, Michigan, is the only manufacturer in this state. Detailed information concerning insect control may be obtained by writing to that company.

Industrial Notes

FEAGAN JOINS KLENZADE

The appointment of W. S. Feagan as Branch Manager of the Klenzade Kansas City office was announced recently by C. B. Shogren, Sales manager and Vice-President of Klenzade Products, Inc., Beloit, Wisconsin.

Mr. Feagan, a Public Health Engineer and a graduate of the University of Illinois, has been identified with the dairy sanitation field in the state of Missouri since 1936, with the exception of two years when he had charge of the milk sanitation program of the Michigan State Health Department from 1939 to 1941.

From 1936 to 1937, Mr. Feagan was engaged in farm inspection work for the Missouri Health Department and from 1937 to 1939 was Dairy Plant Engineer for the St. Louis Health Department. In this position he had charge of plant compliance during the inauguration of the United States Public Health Service milk program.

For several years following, Mr. Feagan had supervision of milk and ice cream inspection in Kansas City, and more recently was Dairy Superintendent of Bonne Terre Farming and Cattle Co.

"HOW TO GET LOWER BACTERIA COUNTS"

"How to Get Lower Bacteria Counts" is the title and subject of a 32-page booklet offered free to dairy executives, superintendents, foremen and others responsible for plant and equipment maintenance cleaning, by Oakite Products, Inc.

This booklet describes low-cost, modern procedures for simplifying and speeding up daily clean-up work through the use of specially designed cleaning, germicidal, conditioning and descaling materials. It tells how to do the following important jobs: removing milkstone deposits from coils, tubing and sides of pasteurizers, preheaters, regenerators, aging tanks, holding vats, coolers and similar equipment; germicidal treatment of processing and handling equipment; bottle and can washing, and can conditioning; descaling piping, spray jets, and other surfaces of can washing machines; descaling pasteurizers, ammonia condensers, etc.; steam detergent cleaning of equipment and parts; keeping walls, floors and other surfaces in clean, sanitary, safe condition.

New Members

ACTIVE

Anders, Nolan Oliver, Regional Milk Sanitarian, State Health Department, 701 Stubbs Ave., Monroe, La.

Andrews, Sam, Sanitarian, State Health Department, Box 602, Frederick, Okla.

Baldwin, Emil L., Sanitarian, State Health Department, 207 W. Bradford St., Britton, Okla.

Cleveland, David C., Sanitarian, Co-op. Health Unit, Tahlequah, Okla.

Dodd, Shelby, Dairy Inspector, City Health Department, R.F.D. 4, Box 347, Oklahoma City, Okla.

Dreisbach, LeRoy A., Senior Inspector, of Milk Plants, City Health Department, 705 Municipal Building, Akron 8, Ohio.

Gatewood, Ted, Sanitarian, Logan County Health Department, Guthrie, Okla.

Gelbar, Alvin, Milk Inspector, Cushing, Okla.

Green, Tim, Sanitarian, Oklahoma County Health Department, 206 New County Building, Oklahoma City, Okla.

Hicks, Troy J., Sanitarian, State Health Department, Box 478, Elk City, Okla.

Hill, Earl O., Milk Inspector, Board of Health, 133 E. 9th St., Anderson, Ind.

Howell, R. L., Food and Drug Inspector, Pittsburg County Department of Health, McAlester, Okla.

Jorgensen, Dwight L., Milk Inspector, City Health Department, 2828 N.W. 13th St., Oklahoma City, Okla.

Keith, J. F., Superintendent, Rose Lawn Dairy, Muskogee, Okla.

Kious, R. E., Acting Director, Sanitation Division, St. Louis County Health Department, P.O. Box 267, Clayton, Mo.

Lanphere, W. B., Sanitarian, Carter County Health Department, 8½ A St., N.W., Ardmore, Okla.

MacPherson, Ronald M., Chief Sanitary Inspector, Department of Health, Peterborough, Ontario, Canada.

Macy, Professor Harold, Professor of Dairy Bacteriology, University of Minnesota, University Farm, St. Paul 8, Minn.

Malone, Harold L., Assistant Engineer, State Department of Health, 1525 N.W. 47th St., Oklahoma City, Okla.

Matthews, R. Kay, Sanitarian, State Health Department, City Hall, Hugo, Okla.

McDermid, Capt. Arlye M., Captain Veterinary Corps, Station Hospital, Moody Field, Ga.

Murguia, Dr. Luis J., Chief of Milk Control Service, Health Department, Calle Duranzo 1395. Montevideo, Uruguay, S.A..

Needham, Ellsworth, Milk Inspector, Bureau of Dairy Control, 1124 N.W. 43rd St., Oklahoma City, Okla.

Nowlin, Aubrey C., Sanitarian, State Health Department, P.O. Box 458, Sapulpa, Okla.

Poe, Berl, Sanitarian, Pontotoc County Health Department, 706 E. 15th St., Ada, Okla.

Polson, Jim, County Sanitarian, 918 N. Seminole St., Okmulgee, Okla.

Pumnill, Loyd F., Assistant Engineer, U.S. P.H.S., 709 Columbia St., Lawton, Okla.

Reed, Ralph E., Sanitarian, Cleveland County Health Department, Norman, Okla.

Stiewig, O. P., Sanitarian, County Health Department, 413 Willow St., Duncan, Okla.

Warren, E. Myrl, Sanitarian, 22 E. Drumond St., Shawnee, Okla.

Warren, Ruel O., Sanitarian, State Health Department, 315 N. Cherokee St., Tahlequah, Okla.

Watson, Hardy, Sanitarian, County-City Health Department, Box 1358, Lawton, Okla.

Wyatt, Fran, Sanitarian, State Health Department, Box 379, Guymon, Okla.

ASSOCIATE

Angevine, N. C., Sales and Service, Verley Products Corp., 845½ Boonville, Springfield, Mo.

Anstrom, John A., Fieldman, Momence Co-op. Association, Momence, Ill.

Appleby, Mryl W., Laboratory Technician, Pioneer Ice Cream Division, 202 Rowley St., Gouverneur, N. Y.

Arseneau, Meddie F., Assistant Superintendent, Momence Milk Co-op. Association, 318 E. Illinois St., Momence, Ill.

Baker, Dennis, Owner, Sno-White Dairy, 421 East 7th St., Okmulgee, Okla.

Berard, Dr. Henri L., Professor of Dairy Industry, Provincial Dairy School, St. Hyacinthe, Quebec.

Beukey, A. H., Owner, Beukey's Creameries, 201 S. Central St., Cushing, Okla.

Boe, Robert H., 3406 Tom Green St., Austin 21, Texas.

Bolton, Warren J., Partner, Bolton Dairy, 518 S. 8 St., Chickasha, Okla.

Bratton, V. C., Manager, Gilt Edge Dairy, Box 128, Norman, Okla.
Burns, Charles F., Milk Sanitarian, Paris-Lamar County Health Unit, Paris, Texas.
Christiansen, C. V., Director of Laboratories, Bowman Dairy Co., 140 W. Ontario St., Chicago, 10, Ill.
Clemons, Charles H., Manager, Grays Harbor Dairymen's Association, P.O. Box 748, Montesano, Wash.
Cochran, Chesley W., Manager, Southwest Ice and Dairy Products Co., Box 747, Hobart, Okla.
Coffin, Maurice W., Manager, Fairmont Creamery Co., Guthrie, Okla.
Cohen, Harry, Dairy Inspector, Chicago Board of Health, 7517 Cornell Ave., Chicago, Ill.
Dargel, Edmund H., Fieldman, Kilbourn Co-op. Creamery, 717 Superior St., Wisconsin Dells, Wis.
Davis, Dwight W., Manager, Southwest Ice and Dairy Products Co., P.O. Box 7, Altus, Okla.
Donovan, Paul J., Attorney-at-law, 33 N. LaSalle St., Chicago, Ill.
Drake, P. K., Fieldman, Quality and Production, Wisconsin Creamery Co., Mazomanie, Wis.
Freedman, Mrs. Shirley, 3703 Springdale Ave., Baltimore 16, Md.
Galick, Jack Lester, Bacteriologist, Capitol Dairy 1817 S. Kedzie Ave., Chicago, Ill.
Gibson, G. G., Extension Dairyman, Extension Service, Texas A. & M. College, College Station, Texas.
Gile, James A., Cheesemaker, Shullsburg, Wis.
Gingrich, Wayne, 613 Perrin Ave., LaFayette, Ind.
Harris, Dr. T. W., Dairy Specialist, Hinman Milking Machine Co. Oneida, N. Y.
Hawkins, Ray F. Fieldman, Pet Milk Co., Footville, Wis.
Hill, Lee H., Charge of Sanitation, c/o Twin City Milk Product Association, 2402 University Ave., St. Paul 4, Minn.
Holzman, Otto, Fieldman, Carnation Co., 631 N. Cedar St., Richland Center, Wis.
Ivey, B. E., Sanitarian, Stephens County Health Department, Toccoa, Ga.
Johnson, H. E., Manager, Johnson's Milk and Ice Cream Co., 529-31 "C" St., Lawton, Okla.
Knott, Daniel S., Inspector, City Health Department, 717 Martin St., Peoria, Ill.
Kull, Arthur L., Manager, Mariondale Dairy, Mariondale Farms, Genoa City, Wis.
Larson, K. P., Owner, Larson's Dairy, 814 Elm St., Duncan, Okla.
Meany, James A., Dairy Inspector, Chicago Board of Health, 8948 S. Laflin St., Chicago 20, Ill.
Miller, John T. Jr., Sanitation Supervisor, Calhoun County Health Department, Calhoun City, Miss.
Pickard, Isadore, Dairy Inspector, Chicago Board of Health, 550 Roscoe St., Chicago, Ill.
Reedal, John R., Manager, Promotion Department, Perfection Manufacturing Co., 2125 E. Hennepin Ave., Minneapolis, Minn.
Russell, John P., District Manager, Detjen Corporation, 33 Vose St., Woonsocket, R. I.
Scherschel, Paul W., Supervisor Laboratory and Field Service, Pure Milk Co., 855 Elkhart St., Gary, Ind.
Shenk, Norman A., Manager-Owner Del Rico Creamery, Box 1498, Santa Fe, New Mexico.
Stees, Herney, Laboratory Directory, Momence Milk Co-op. Association, 136 W. Indiana St., Momence, Ill.
Stein, Roy W., Bacteriologist, Dairy Cooperative Association, 1313 S. E. 12th Ave., Portland 14, Oregon.
Strassenberg, Hilbert, Hauler, Momence Milk Co-op. Association, 517 W. 2nd St., Momence, Ill.
Wagner, W. R., Field Inspector, Dairy Dale Milk, Inc., Meyersdale, Penn.
Welk, Paul A., Manager, Columbus Milk Producers Co-op., Astico, Wis.
Wempe, Dr. A. F., City Dairy Inspector, 601 Elm St., Marysville, Kansas.
Williams, Donald H., Canton, Maine.

CHANGES IN ADDRESS

Adrounie, Capt. V.H. Sn.C. 0513157, Lincoln, Neb., to 76 Green St., Battle Creek, Mich.
Aulik, Bernard, Chemung, Ill., to Box 345, Harvard, Ill.
Beechwood, Dr. C. T., Salt Lake City, Utah, to 300 Essex Building, Bank and Plume Streets, Norfolk 10, Va.
Burke, Charles F., Lancaster, Wis., to 123 Bogert St., Beaver Dam, Wis.
Dubois, Charles, Albuquerque, N. M., to 8231 24th N. E., Seattle, Wash.
Engendorff, Sgt. O. H., Clovis N. M., to State Sanitarian and Dairy Inspector, Box 17, Worland, Wyoming.
Goforth, Howard I., St. Paul, Minn., to Coble Dairy Products, Lexington, N. C.
Goldschmidt, S. J., Janesville, Wis., to Beloit Health Department, Beloit, Wis.
Hawkins, James Vernon, Jr., Austin, Texas, 603 B.M.A. Bldg., Kansas City, Mo.
Hendrichs, S. L., Madison, Wis., to Foods Division, City Health Department, Milwaukee, Wis.
Honer, Clem, Madison, Wis., Waterloo, Wis.

Kehlet, Viggo V., Long Branch N. J., to 1503 Comstock St., Asbury Park, N. J.
Krefil, W. H., Jacksonville, Fla., to 420 N. W. 29th St., Miami 37, Fla. C/o Crowley's, Inc.
Kroger, Dr. H. J., St. Louis, Mo., to P.O. Box 54, Newfield, N. Y.
Mott, Mrs. Janet H., Ames, Iowa, to 3905 Clay St., San Francisco, Cal.
Newman, Dr. Alphonso, Middlebury, Vt., to Tahawus, N. Y.
Noth, Alvin, Norwalk, Wis., to 346 S. James Ave., Reedsburg, Wis.
Oldenburg, W. J., P.O. Box 3067, Seattle, Wash., to Universal Laboratories, 1239 Rainier Ave., Seattle 44, Wash.
Rink, Clare W., Glenolden, Pa., to Supervisor, Technical Training, The Diamond Alkali Co., 2400 Oliver Building, Pittsburgh 22, Penn.
Robinson, Harold B., Denver 2, Colo., to U.S.P.H. Service, District No. 1, Sub-Treasury Building, New York, N.Y.
Stroud, Howard J., Olympia, Wash., to Department of Environmental Health, School of Public Health, University of Michigan, Ann Arbor, Mich.
Templeton, Hugh L., 5011 Chicago St., Omaha 3, Neb., to 6125 Florence Blvd., Omaha 11, Neb.
Van Devender, V. C. Jr., Keesler Field, Miss., to 1528 W. Howard Ave., Biloxi, Miss.
Walts, Dr. Charles C., 301 S. Cameron St., Harrisburg, Penn., to Hershey Creamery Co., P.O. Box 121, Harrisburg, Penn.

DAIRY SCIENCE MEETING AT AMES, JUNE 18–20

Plans for the 3-day session of the American Dairy Science Association at Iowa State College, Ames, June 18–20, include a program of reports on dairy science experiments.

All three sections of the association — manufacturing, production and extension—will conduct their own programs. In addition, A. R. Porter, Iowa State College dairyman, says there will be general sessions of the entire group.

The 1944 meeting of the association was in Columbia, Mo. No meeting was held last year because of travel restrictions.

WISCONSIN DAIRY MANUFACTURERS' CONFERENCE

The annual Wisconsin Dairy Manufacturers' Conference will be held Thursday and Friday, April 18 and 19, 1946, at the Department of Dairy Industry, University of Wisconsin, Madison, Wisconsin. The program will be geared around an Operations Clinic. The subject material that will be covered in the program will include operation costs, detergents, plans, regulatory laws, powdered milk, homogenized milk and cream. Requests for copies of the program should be addressed to Professor H. C. Jackson, Department of Dairy Industry, University of Wisconsin, Madison 6.

H. C. JACKSON

ANNUAL MEETING, OCTOBER 24–26, 1946
ATLANTIC CITY, N. J.

"Dr. Jones" Says—*

Josh Billings said once: "It's better to know nothing than know what ain't so." Well, that's like a lot of these broad statements: it's only about 75 percent true. The fact is: the better informed you are, the more liable you are to know a few things that "ain't so."

We judge by what we can see in the light we've got to see by. It's like years ago: they had microscopes and they looked at specimens from sick people. They didn't see any disease germs, so they knew there weren't any. I remember reading an editorial in an old medical journal: some fellow'd suggested that, maybe, diphtheria was caused by living bodies too small to see. The editor was pointing out what a silly idea that was, when it was well established that diphtheria came from emanations from open drains and so on. Then they developed more powerful microscopes and a new kind of stain. They looked again and there they were—these diphtheria bacilli. The editor'd made himself look foolish—not by not knowing about the diphtheria bugs but by being too dogmatic about what he knew that wasn't so.

Sometimes, on the other side of it, we're too brash about junking old ideas. Like grandpa's old handmade armchair: we wish, now, we'd saved it. Back in the early days of antiseptic surgery, they were spraying the air in operating rooms, trying to prevent wound infections. Then the bacteriologists demonstrated that germs were on their hands and instruments and the patients' skin. When they took care of those they stopped getting infections. So the idea of air-borne infections went out the window and we've been wisecracking about bacteria not having wings and all that.

But here more recently, with their high-speed photographs and all, it's been demonstrated that people with respiratory infections and so on, coughing and sneezing—there may be a mist of infected discharges around 'em. So they're experimenting now with air disinfection in places like schoolrooms: ultra-violet rays and what not.

And that's the way it goes. So knowing a few things that ain't so—it's no disgrace, so long as we're willing to learn. The main thing is not being too dogmatic about things we think we know—and maybe don't.

PAUL B. BROOKS, M.D.

* *Health News*, New York State Department of Health, Albany, November 5, 1945.

WASHINGTON STATE RESUMES DAIRY INSTITUTE

The fifteenth annual State College of Washington Institute of Dairying, the first one held since 1942, was attended by an enthusiastic group of dairymen from all branches of the industry during the week of March 4–9, 1946. Over 180 visitors registered and there was keen competition in the traditional dairy products scoring and judging contests held in conjunction with the Institute, as reported by Dr. H. A. Bendixen, Acting Head of the Department.

Numerous speakers addressed the meetings on a wide variety of timely subjects. At the closing annual banquet a memorial ceremony in honor of the graduates of the department who gave their lives in World War II was led by Dr. Bendixen. This was followed by talks by many of the returned veterans on their most interesting experiences abroad.