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AND FOOD TECHNOLOGY

Volume 10 March–April, 1947 Number 2

# JOURNAL of MILK AND FOOD TECHNOLOGY

## 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 the transactions.*

## Licensure, Registration, Certification

WE seem to be in an era of organization. We observe that relatively small groups, if controlled by an aggressive leadership, can impose their will on the great body of the inarticulate public. We saw this in the politics of Germany and Italy; we see it in Russia today; we live with it here in America in the labor groups; we see it increasing among the professional people. Are milk and food sanitarians immune or susceptible?

The question as to what the milk and food sanitarians think about all this will soon face us squarely. We might as well begin to think about it now. Already, there is a bill before the Ohio legislature for the registration of chemists (and also others before other legislatures) who are in responsible charge of operation affecting the public health, safety, and welfare. Milk inspectors are mentioned as being included in this category. Each such person would be required to establish his competence.

This subject is a live issue in chemistry circles. There is the usual argument about the need for protecting the public against incompetency, the desirability of receiving legal recognition of professional status, and the improvement of the economic position of the registrants. The advantages that have accrued to the medical, legal, and nursing professions are cited.

On the other hand, we hear that "grandfather" clauses and other loopholes leave the back door open, that such registration has not raised the professional or economic status of plumbers, embalmers, barbers, beauticians, etc. They say that it is the old story of the ins versus the outs—the competent and recognized personnel do not need official stamp while the new-comers seek an easy, stream-lined, accelerated path to approval.

As we see the matter in this relatively early stage of our consideration of the problem, there are certain facts that seem to stand out. The following may or may not be listed in their order of importance.

First, we see that the field in question becomes defined. This may be a good thing. It certainly would help the professional organizations to establish requirements for membership. Then the educational institution could (and probably would) set up curriculum requirements for the training of students in that particular field. Then restrictions to licensure or registration are imposed by the controlling organization or department or governing body. This operates to limit the supply of available workers, creating an employment demand that is forced to raise the economic status of the individuals who qualify. Illustration: physicians, veterinarians, engineers, nurses, pharmacists, registered plumbers, certified public accountants.

In this connection we see this tightening of fields produces the stimulus for creating new fields in order to circumvent the hardship imposed on the public by such restrictions on service. For example, there is chiropraxy, the cults, and "practical" nursing. The efforts of the medical profession to close the door to un-orthodox practise merely created new doors which are being legalized right and left by the formation (through politics) of other boards of registration and license. And the public are being humbugged just the same, this time by an"-oxy" or "-ism" instead of by the itinerant "doctor" with his patent medicine kit.

Again we note that the plea is made for the protection of the public. This sounds fine—and does indeed possess merit. It is one of those arguments that proves too much and so loses much of its force. In this connection we think of those barriers to the interstate shipment of milk and its products imposed at the instigation of milk sheds to restrict local markets to neighboring supplies—in the name of public health. On the other hand, licensure is overwhelmingly responsible for the present high standard of milk technology, safety measures, and building operations.

In general, it seems to us (at this time) that where a person actively engaged in the practise of his profession, as when in business for himself, licensure might be a useful control. But when he is employed by a firm or organization which itself is under license (e.g. a milk plant) or by a health organization (e.g. a health department) the licensing would be a needless form. If professional approval is desired, this could be secured by certification or registration with a national organization of professional colleagues which would issue certificates to those persons who meet the requirements set up by the respective board.

Registration may be considered to be an act of simply being listed on some publicized roster having no legal significance. Certification can be accorded by a national body of professionally competent colleagues or experts. Licensure indicates recognition by some legal body that is authorized to enforce its standards. In the first two cases, the control of standards is in the hands of the professional groups themselves, whereas the third case is in the hands of official bureaus. Legislative enactments are notorious in their character of almost never being rescinded. It is smart to make haste slowly in this matter.

J. H. S.

# Food Sanitation

"LINE upon line; precept upon precept. Here a little, there a little"—and so, at long last, the public are beginning to bestir themselves concerning the need for food sanitation. The excellent work of the Public Health Service in publishing its yearly reports on disease outbreaks conveyed through foods is building up a mass of information which is beginning to receive attention—and to stimulate action. Recently one of the great national monthlies [1] published a strong article entitled "Disease a la Carte". This pointed out the responsibility of the restaurant eater to demand food that will not produce disease. The publication then backed up the article with a full-page advertisement in a nation-wide string of daily newspapers in order to bring this article to the attention of many readers. It pointed out that 25 percent of all food produced in this country is eaten in restaurants and that 65 million Americans eat at least one meal a day in public places. It called for the adoption of adequate restaurant codes, training courses for food handlers, staffs of trained inspectors, and newspaper reports of bacteria counts in restaurants. It held that the consumer should be made to feel safe in eating out.

Hussemann and Tanner have just published a study of the food-borne reports of the U. S. Public Health Service.[2] They did not include outbreaks caused by chemicals and shellfish, and otherwise limited their tabulation to outbreaks that were definitely traced to foods. During the past five years, the number of outbreaks traced to bacteria have more than doubled. The five organisms most frequently incriminated (arranged in decreasing order) were *Staphylococcus,, Streptococcus, Salmonella,* the *Shigella,* and *Eberthella typhosa.* The first of these is the great threat, and outbreaks from *Salmonella* organisms are increasing.

It is to the credit of many restaurateurs that they are keenly aware of their responsibilities. Health departments are organizing to help train food handlers as to sanitary practises. Jamieson, Chen, and Willigan have published a suggestive article [3] entitled "Seeing Is Believing in Sanitary Control". They describe a portable kit that can be taken to a restaurant for examining eating utensils, *in situ,* and a display culture rack which is left in each establishment showing bottles of culture media which have been streaked by swabs from the utensils. The employees are reported to be impressed by what they see. This is an additional step in education. Rockford, Illinois is reported to be using it effectively. This epidemiological problem is important, is increasing, and needs drastic measures.

J. H. S.

1. *Woman's Home Companion,* December, 1946, (Reprints of the follow-up advertisement are available from the above magazine).
2. *J. Amer. Dietet. Assoc.,* 23, 16–21 (1947).
3. *Canadian J. Pub. Health,* 37, 90–96 (1946).

# A Need—An Opportunity

THE immense amount of investigation, study, and research that has been devoted to milk and its products almost staggers the imagination. Literally hundreds of titles appear in the literature each year, coming from research organizations all over the world. What is becoming of this work? It is certain that no one person can hope to cover all this information—and yet much of it should be utilized. Most emphatically, we do *not* call for a moratorium on new work in this field. What then? Publish it in a form that can be made available to every one who is interested. How? By whom?

Let us digress a minute. In the several great disciplines of science, we see compilations of technical information that are price-less. Each exerts an influence in its respective field that is analogous of that of the Bible to religion. Actually, chemists call the set of Beilstein's Organische Chemie, the chemist's bible. The physicists have their International Critical Tables.

The milk industry has nothing that even approaches such undertakings. Is this omission due to a lack of interest or a lack of financial resources or a lack of facilities.

Lack of interest? No. The great volume of annual publications attest the degree of interest.

Financial resources? The milk industry compares favorably with the steel industry in financial strength.

Facilities? The great libraries and research institutions of Washington house books, journals, reports, reviews, dissertations.

Where do these considerations lead us? Right up to the Milk Foundation. This is the regime of the reorganized association of milk dealers and its headquarters is now in Washington, D. C. Its secretary is acquainted with the technical language and the specialized outlook of scientific workers. He has shown ability and industry in following through in numerous technical projects. The Foundation would make a great contribution to its own industrial field if it would undertake to do a first class job in making available the milk literature of the world. First, we need a monumental treatise on the known facts about milk and its products. This should be kept up to date by frequent supplements, as now done in various other fields. In addition, it could do well by publishing an annual review of the world's literature.

The need, the organization, the place!

J. H. S.

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The Executive Board has selected Milwaukee, Wisconsin, as the place of meeting for the **thirty-fourth** annual meeting of this Association, October 16–18, 1947. The meetings and headquarters will be located at the Hotel Schroeder. Members are advised to write now for reservations for rooms, as a large attendance is expected.

J. H. Shrader, *Secretary-Treasurer*

# Abstracts of the Literature of Milk and Its Products During 1946

R. H. MAYBURY AND J. H. SHRADER
*Wollaston, Massachusetts*

**(Abstracts of the literature of food sanitation will appear in our May–June issue.)**

ABSTRACTS as published in several journals during the year 1946 are the basis for the following summary of literature in the field of the dairy industry. Consequently many of these papers were printed in 1945. However, the summary is not restricted to either of these calendar years. Limited space made it impossible for us to include all articles that are worthy of mention, but we estimate that about four-fifths of the available literature has been covered.

The following abbreviations have been used:

CA means *Chemical Abstracts,* vol. 40 (1946)

DSA means *Dairy Science Abstracts* (1946), volumes 7 or 8

JDS means *Journal of Dairy Science,* vol. 29 (1946)

JMT means *Journal of Milk Technology,* vol. 9 (1946).

In a few cases, the volume and year of a reference is different from those of the year 1946; specific publication data are fully given.

## ANALYSIS

A trustworthy method for the determination of the amount of crystallized fat in cream reported by Adriani and Tamsma is based on colorimetric measurement of the latent heat of crystallization of the fat (1).

A colorimetric procedure for determination in milk of total protein, or of casein alone is reported by Alvarez and Medin R. to replace advantageously the Kjeldahl and Deniges methods (2).

Milk treated with 60 mg/liter of trichloramitromethane can be kept without refrigeration for three days, report Bertrand and Lemoigue and still have no objectionable odor, color, nor bacterial survival (3).

Browne estimates sucrose and lactose content of mixtures, particularly sweetened condensed milk, by a method based on the fact that $NaHSO^3$ decreases the optical rotation of aldose sugars (4).

Erroneously high total solids values by the Richmond formula occur since a milk adulterated by skimming along with watering can have the same sp. gr. as genuine milk according to Desai and Patel (5).

Antergan (N-dimethyaminoethyl-N-benzylaniline HCl) is colorimetrically determined in milk by Dubost (6).

Boric acid as a preservative in milk can be detected by a flame test reported by Goding and Cason (7).

The accuracy of the Hillig method for determination of lactic acid in milk is found by Gould not to be affected by heating prior to analysis (8).

Determination of citric acid in milk and cheese by Gunner and Emilsson involves bromination of the milk and cheese filtrates followed by liberation and measurement of the bromine (9).

Preparation of a very pure whey protein by treatment of milk with NaCl and HCl is reported by Harland and Ashworth, who also found that 95 percent of the whey proteins are denatured by 45 minutes of heating at 80 degrees (10).

Heinemann states that a dairy product containing more than 20 percent moisture cannot be satisfactorily analized using the Karl Fischer reagent (11).

That fat acids in glycerides of milk are distributed in a pattern of widest possible distribution is the postulate of Jack, Henderson, and Hinshaw derived from low temperature milk fat precipitation data (12).

Kreveld describes an improved technique for counting fat globules in milk which makes use of a slide and cover glass etched with lines (13).

The phosphatase test can be adapted to the detection in cheeses of raw or improperly pasteurized milk, reports Lampert (14).

Heat-labile sulfur can be detected and roughly determined in milk by a method reported by Lea, in which nitrogen gas carries sulfur from the milk solution to a zinc acetate solution through which it is bubbled (15).

Unsatisfactory determination of milk solids content of bread by methods employing solvent extraction (which fails to recover all the fat) and of butterfat content by steam distillation methods are reported by Munsey (16).

The fat content of milk chocolate was determined by Offutt who compared a modified technique of Hillig's unified method with a modified Roese-Gottlieb method, the latter yielding results about 1 percent lower (17).

More accurate values for the phosphatase content of milk and cheese are obtained according to Horwitz by modifying the Sharer laboratory phosphatase test to give a two-fold increase in the amount of phenol produced over the present Sharer test (18).

Traces of Cu in milk are determined by Cranston and Thompson using an ion-exchange resin in conjunction with a polarographic measurement (19).

Nicloux's method for determination of alcohol is modified and adapted to fermented milk by Teixeira e Silva by use of $K_2Cr_2O_7$ with $H_2SO_4$ to produce a bluish green to yellow green color (20).

Using as a standard the very accurate Mojonnier Method of testing 80 percent cream, Heinemann approves the results with 80 percent cream obtained by use of the Kohman Calculated Method, a rapid control test suitable for billing purposes (21).

A colorimetric method for $NH_3$ in fluid and dry milk capable of satisfactory reproducibility is based upon retion of $NH_3$ with alkaline phenol and sodium hypochlorite, reports Choi, *et al.* (22).

Homogenized and unhomogenized milks with 3.2 and 4.4 percent fat content was analyzed by the Mojonnier and Babcock tests by Harland and Davis who found an average discrepancy between the two tests with homogenized milk of 0.102 percent (23).

The Sharp and Hart equation for calculation of total solids in milk is in error and is corrected by Herrington to yield values about ¾ percent higher. The corrected equation:

$$\text{Total solids} = 1.2537\ \text{Fat} + \frac{268.0\,(Q + 3)}{Qt\ 1000}$$

where $Q$ = Quevenne readings (24).

Milk heated for one hour at 116° C was found by Gould and Frantz after correction for retention to contain 9.9mg of formic acid per 100 ml which represented 49 percent of the total titrable acidity increase (25).

The determination of salt in butter and new cheese is reported by Arbuckle as more accurate using a mercurimetric titration method with S-diphenylcarbazone indicator. The method is not adaptable to Cl determination in milk or in sterilizers or where digestion of the sample is required (26).

In performing the resazurin and methylene blue tests with raw milk, Davis, Jones, Newland, and Wilby report that allowing the temperature to fall below 37.5° will favor very good or very bad milks whereas milk of fair to good bacteriological quality will be given lower scores (27).

Microbiological assay of dry skim and whole milk, evaporated milk, fresh milk, and casein for amino acids gives values not markedly different from chemical analytical methods according to Hodson and Krueger (28).

A satisfactory apparatus for the preparation of butter samples for analysis described by Meuron features a rotating, specially shaped blade in a cylindrical jar (29).

Titratable acidity in fresh milk is caused by inorganic phosphates according to Robinson and Samson (30).

Modified Babcock tests with homogenized milk were studied by Trout and Lucas in an effort to perfect a procedure that would eliminate the formation of curdy or charred material in the fat column. Use of a water-alcohol mixture in place of the final addition of water prevented the charring effect (31).

The specific gravity of many pasteurized milk samples tested by Walker is not in agreement with values by Richmond's calculation because milk has not stood long enough to allow maximum contraction which results upon the solidification of the fat globules (32).

Added water in milk is conclusively detected by observing the freezing point depression of milk (Hortvet test). The minimum value of this most constant physical property of genuine milk is 0.530 degrees. (Anonymous) (33).

The Mean value of the pantothemic acid content in dried skim milk is given by Loy as 32.5 yg. per g. of sample (368).

## BACTERIOLOGY

A strange reaction in sterile milk (colored with methylene blue) is reported by Cross who warns of need of care in sterilizing milk lest a reaction occur not of bacterial origin (34).

Of 2 anaerobic and 15 aerobic species of bacterial spores, *Bacillus cereus, B. mycoides, B. albolactics, and B. metiens* were relatively resistant to penicillin used by Curran and Evans to determine its preserving action in milk (35).

An outbreak of malty taint in milk, caused by *Streptococcus lactis,* was controlled by rigorous sanitation at the farm as reported by Davis, Jones, Wilby and Granfield (36).

The presence of two phosphatases in butter and buttermilk was concluded by Guittoneau, Chevalier, and Jerrouse who observed maximum activity at a pH of 4.2 and at 7.6–7.8, the former still active after heating to 73° for 50 minutes, the latter destroyed at 63° for 20 minutes (37).

Acidogenic and ammoniacal fermentation in the artificial broad bean milk is prevented by boiling the milk, Labarre and Poupart record (38).

A gram-positive diplococcus believed by Virtanen and Nikkila to cause malty flavor in butter by splitting pyruvic acid forming acetic acid resembles aroma bacteria in their behavior (39).

Aromatic substances in milk such as biacetyl from oxidation of acetoin, are produced by *Streptococcus diacetiloctis* according to Carlinfanti (40).

Infantile cholera may result, warns Guyot by feeding condensed milk that has been contaminated, after opening of the can, by a lower yeast, a torula, carried by gnats (41).

Hussman states that *B. putrificus,* one of the most dangerous spore-forming contaminants of milk, can only be effectively controlled in cheese making by controlling the pH, maintaining, for Emmenthal, a pH of 5.18–5.50, for Edam a pH of 4.8 (42).

The action of phosphatase on casein which has been dissolved in KOH, buffered, and treated with pancreatin, is very slow and not unimolecular, reports Lofgren (43).

The phosphatase of milk is a metalloprotein reports Massart and Vandendriessche, with zinc as the metal. The phosphatase is inhibited by KCN and cysteine, not inhibited by NaF, and is activated by Zn and Mg ions (44).

The effects of the fatty acids of butterfat and corn oil upon growth of micro-organisms depend upon the vitamin and amino acid content and fatty acid concentration of the butterfat and oil, report Spector (45).

Caseolytic and lipolytic cultures that would thrive in butter at 8 degrees C were identified by Jezeski and Macy as of the genus *Pseudomonas, Flavobacterium, Alcaligenes,* and *Achromobacter* (46).

Dahlberg interprets the more rapid growth in pasteurized milk of coliform bacteria over all other kinds by pointing out that the coliform bacteria are almost entirely recontaminants in pasteurized milk and hence unlike other bacteria present, have not been made dormant by heating or refrigeration (47).

That acid alone in milk is not sufficient to cause death of the tubercle bacilli is proven by Mattick and Hirsch, who show that milk containing lactic acid producing bacteria but not a antibiotic diplococcin is infective (48a).

Organisms in cheese responsible for epidemics of disease include E. typhosa, the Salmonella group, Clostridum botulinum, and steptococci, reports Fabian, in suggesting a combination of pasteurization and a 90-day holding period to combat spread of viable bacteria by cheese (48b).

Microscopic examination of producer samples of milk from cows for the presence of long chain streptococci is reported to be reliable by Johnson and Bryan (299).

High coliform counts in milk before pasteurization call for increased attention to the pasteurization process and subsequent handling of the milk points out Craige (300).

Origin and control of thermoduric and thermophilic bacteria found in milk are reported by Fabian (332).

An ingeniously devised set of equipment for determining the thermal death range of bacteria in milk is described by Gilcreas and O'Brien (333).

Acidified milk samples exhibited increased bacterial counts after incubation, reports Waisman and DeSoriano (339).

The standard plate counts of the cream and skim milk separated from raw whole milk were 65.6 and 125.5 respectively, report Ulvin, and Cree (340).

The origin of lactic acid bacteria important to cheesemaking is the subject of a controversy between Thöni and Mosimann (349).

Bacterial counts of milk obtained using the standard agar and the modified medium of Barkworth and Davis were not different, report Lax and Sesha (350).

A milk culture medium containing papain is described by Buittonneau and Chevalier (351).

Control of dust contamination in agar plates was effected by Gambrell and Ostrolenk by attention to details of laboratory construction and equipment (352).

In an improved Quebec colony counter described by Richards and Heijn the colonies are seen against a dark field (353).

Resazurin disk values compare favorably with mean colony counts, report Golding & Jorgensen (354).

The resazurin and methylene-blue tests compared somewhat similarly as measures of the keeping quality of milk, report Anderson and Wilson (355).

Staining with acridine orange is reported by Strugger as eminently suited to the examination of milk (356).

Estimation of bacteria and of the nitrogen distribution in cheese is facilitated by use of sodium citrate solution, report Knudsen, Sorensen and Overby. (357).

Plate counts are given by Hiscox for milk powders reconstituted with warm, cold, and sterile water (358).

Plate counts of dried milks reconstituted in different ways and at different temperatures are reported by Higginbottom (359).

Aneurin in cow and goat milk is determined by using the thiochrome and manometric analytical methods, according to DeJong (367).

Milk is reported to contain the enzyme fibrinogenase by Buruiana (370).

## BUTTER

The flavor of butter is determined to a large extent by the flavor of the cream from which it is made according to Babel (49).

Summer butter contains a fat soluble substance, not a known vitamin, distilling in the higher fraction containing acids of 14 and more carbon atoms, which Boer, Jonsen and Kentie describe as growth promoting (50).

Two methods of continuous buttermaking are described by Gemmill, each characterized by removal of all liquid as skimmilk rather than buttermilk (51).

In a study of causes of gumminess and off-flavor in southern butters, comparative values for percentage fat in cream, acidity of cream, pH of butter serum, hardness, and melting point of butter, etc., for Texas butters and several northern state butters are tabulated by Hanson, Arbuckle, and Shepardson (52).

The determination of gas content of butter in a modified procedure of Hills and Conochie makes provision for free and dissolved gas (53).

Uneven salt distribution in butter correlated generally with maximum bacterial activity, mottling of color, according to Hoecker and Hammer, whereas abnormal flavor was found in butter lacking uniform moisture distribution (54).

Reid discusses the prevention of various odors in butter (55).

Moisture and light are responsible for increases in acidity and rancidity respectively in both cocoa and cow butter as found by Sjostedt and Schetty (56).

Analytical constants for ewe butter listed by de Mingo and Calles include Polenske value (5.45), Grossfeld short acid number, (44.14) and Grossfeld butyric acid number minus short acid number (24.34) all of which are key criteria in differentiating between ewe and cow butters, the ewe butter values being higher (57).

Analysis of samples of Indiana butter over a nine year period by Gregory and Horrall revealed a general trend toward more samples having 80.00 to 80.99 per cent butterfat, a similar trend toward a lower salt content and revealed little correlation between mold mycelium count and organoleptic quality (58).

Peroxide number and aldehyde number, varying from 0.0 to .6 for the former, 0.01 to 1.61 for the latter, for Norwegian butter tested by Storen and Dovle showed 88 percent correlation. The values 0.16 and 0.15 respectively are normal values for Norwegian creamery butter, little correlation existing between the values (59).

The fishy and oily taste of Finnish butter, attributed to the Fe (12.32 y/g) and Cu (0.81 y/g) content can be remedied, as reported by Storgards, by addition of buffer salts which raise the pH from 4.5 to 6.0 (60).

In preparing butter samples for analysis one must avoid cooling after the sample has been softened, warns Vorhes, lest segregation take place (61).

Undissociated propionic acid very definitely inhibits the growth of molus, reports Olson and Tracy, in recommending the use of the acid in treating butter paper wrapping (62).

Metallic flavour developed as the main defect of butter kept in rusty containers, reports Hamilton (273).

Use of carotene for coloring butter is found satisfactory by Swartling who urges means of reducing the cost of carotene (274).

Dunkley and Wood discuss standardizing the pH of butter with carbonate neutralizers (275).

The Calcium balance in rats was found negative when butter or margarine were included in the diet, reports Westerhind (313).

Continuous buttermaking processes are presented by discussion of the operation of various pieces of equipment (325).

### BUTTERFAT

The properties and preparation of a satisfactory New Zealand dry butterfat similar to the ghee of India are reported by Barnicoat (63).

A dry butterfat product, liquid at icebox temperatures, and maintaining most of the original butter values is described in a patent granted to Buxton (64).

Hydrogenation of butter fat as reported by Kentie and Nanta is accomplished in alcohol solution at 40° in 2 hours time under 1 atmosphere with 15 per cent Raney nickel. No reduction of the carboxyl group occurred (65).

Repulsive forces between milk-fat globules are demonstrated by Kreveld by comparing the actual count of globules in a unit sized cell with the count assuming random distribution (66).

Butterfat losses to the buttermilk in the churning of cream are placed by Mortensen at the average value of 1.35 per cent and are greater with 26 per cent cream than with 33 per cent cream (67).

The fat globules in cream are in the majority composed of crystallized fat and are large in size in contrast with fat globules of skim milk which are liquid fat and small sized as reported by Mulder (68).

Rats fed butterfat rations showed greater average consumption of the ration and thus greater average gains in weight than those fed corn oil rations, report Parrish, Shimer, and Hughes (69).

The known constants for butterfat are tabulated by Petersen, with data indicating seasonal variations in refractive index and Reichert-Meissel number (70).

A dry butterfat product described by Wiley and Coombs has good keeping quality even in the tropics without refrigeration (71).

Physical stability of frozen cream is helped by use of freshly drawn milk, proper maintenance of the milk, quick freezing, and low temperature storage all these factors related to the preservation of small unclumped fat globules, report Bell and Sanders (72).

Feeding cows cottonseed oil increases the fat content of the milk only for a short period after which time, as Davis and Harland observed, the fat content returns or drops below normal (73).

A satisfactory hardened butter substitute described by the Australian government is composed of 94 per cent butterfat, 3 per cent peanut oil, and 2 per cent dried skim milk and 1 per cent salt (277).

### CASEIN

Iodinated casein fed to cows produced increases in milk production by 16–33 percent with minimum body weight loss. Certain more active samples of iodinated ardein (from ground nuts) produced similar weight loss, while other samples of iodinated ardein and samples of iodinated ox blood plasma were ineffective in producing milk gains (74).

Blaxter describes the results of an extensive experiment in which cows were fed iodinated casein in 30 g. daily doses. The mean increase in daily milk yield was 5.44. The diet caused loss in weight but had no effect on the incidence of mastitis, lameness, or abortion (75).

Casein utilization in mice was enhanced reports Bosshardt, Ayres, Ydse, and Barnes, by factors contained in two liver fractions (76).

The thyroxine content of iodinated casein is determined by Reinecke *et al.* by first hydrolizing the casein with 40 per cent barium hydroxide, extracting with butanol, and then determining the iodine content of the extract. Iodinated casein preparations can be made that contain 3 to 4 per cent thyroxine, 20 to 30 times the content in U.S.P. thyroid material (77).

Methionine supplied by casein is suggested by Mason, Theophilus and Noller to explain the excellent growth characteristics of a rice diet plus butter with casein for superior to either butter or casein alone with the rice. Rice plus butter alone has adverse growth effects (78).

Tough casein curds are precipitated from a mixture of dried and fluid skim milk in a patented process described by Oatman (79).

The nitrogen of acid hydrolyzates of casein was largely retained and utilized when injected into hypoproteinemic dogs, stated Frost, Heinsen, and Olsen (80).

*L. casei* factor (folic acid) combined with 18 per cent casein-containing diet was reported by Kornberg, Daft, and Sebrell to be effective in correcting granulocytopenia, a casein deficiency disease, in rats (81).

An aqueous dispersion of casein prepared according to a patent of Smith, can be utilized in food preparations (82).

Heat coagulation of milk was shown by Torboli to be due to a conversion of caseinogen to a dephosphorated material precipitated by the calcium salts (83).

Skim milk curd, which is 75–80 per cent water, 10–15 per cent protein, 0.3–3 per cent lactose and other organic and mineral matter owes its food value to its casein content, the most important protein present, and its flavor to the lactic acid as reported by Vidal (84).

The dialyzate of an enzymically hydrolyzed casein reported by Wretland containing 80–85 per cent free amino acids and 15–20 per cent low-molecular weight peptides was sufficient to maintain the nitrogen retention in rats tested (85).

The manufacture of rennet and acid casein is discussed and tests are summarized (291).

Casein is dried by infra-red lamps with half the energy expenditure required using coal as a source of heat (292).

## CHEESE

Advantages of low temperature curing (below 40 degrees F) of cheese as against high temperature (60 degrees F) are discussed by Erecson (86).

Mysost cheese from goat or goat and cow milk is described by Fischer (87).

Supplementary surface salting of cheese, necessary to develop the desired flavor, tends to increase $H_2O$ content of the cheese, reports Hostettler *et al.*, who overcome the latter effect by increased heating and stirring of the curd (88).

Minas cheese was studied by Rogick with attention to maturation changes which revealed decomposition of the lactose after the 10th day (89).

Factors considered by Hanson *et al.* that affect the quality of short-cure cheddar cheese include amount of rennet used in coagulation, salt used, methods of manufacture, temperature and duration of ripening process, and washing pH values (90).

The matting of cheese is related by Harrison and Robert to the acidity addition of fat, rennin, steapsin, lipase, protease, and amylose (91).

Hathaway and Davis, in testing 27 cheeses for the riboflavin contest varies from 13.5 to 1.2 y per g. found goat, Velveeta, Mel-o-Pure and Liederkranz highest in content, cream cheese lowest (92).

Cheddar cheese retains about 61 per cent of the original Ca, 53 per cent of the P, and 23 per cent of the riboflavin of the milk used in its preparation. These retention values were almost the same using pasteurized milk. Irvine Bryant *et al.* report retention values for cream, cottage, brick, and blue cheeses as well (93).

Retention values: Cream—84.4 mg per cent Ca., 86 mg per cent P., 280 y per 100g Riboflavin; Cottage—85 mg per cent Ca., 146 mg per cent P., 288 y per 100g Riboflavin; Brick—57.7 mg per cent Ca, 58.7 mg per cent P., 27.4 y per 100g Riboflavin; Blue—46.2 mg per cent Ca., 43.3 mg per cent P., 30.1 y per 100g Riboflin.

Keilling found that rennet plays a definite part in the ripening of cheese from experiments in which diluted rennet and curds were first heated together (94).

Control of the flavor of brick and related smear-ripened cheese can be effected by regulation of the surface smear caused by various micro-organisms, *Langhus Price et al.* suggest (95).

Proteins are responsible for the binding of water in cheese curds finds Mocquot from studies with curds in sugar solutions (96).

Excellent quality cheese can be made from milk pasteurized by heating to 160° F. by direct steam, reported Marquardt and Yale (97).

Ca and P values, considerably higher in Swiss and Edam and cheddar cheeses than in cream cheese and miscellaneous types tested by Zahrudt, Lane, *et al.* bear no relationship to the state of origin or the flavor of the cheeses (98).

Babel reports that slow acid production and in some instances almost complete cessation of and production in cheddaring of cheese result in the presence of bacteriophage (99).

A cooking temperature of 104° F. for cheddar cheese results in retardation of acid development but Babel advises that this heating does not explain large decreases in or actual stopping of the acid production (100).

The volatile fatty acids in cheese can readily be determined by the method of Kosikowsky and Dahlberg, a direct distillation method (101).

A minimum of 60 days of ageing for commercial cheeses such as cheddar was reported by Gilman *et al.* at sufficient assurance against finding viable *Brucella abortus* organisms (102).

The volatile fatty acids of cheese are determined by a method reported by Smiley *et al.,* which is based upon an ether extraction followed by distillation of the extract and of the residue (103).

Maximum vitamin A potency of Wisconsin cheddar cheese was found to occur in samples made in September and October whereas minimum values were found in the March–April period, report Higuchi and Peterson (104).

Factors affecting the development of acid in cheese-making are discussed by Platon (271).

Cottage cheese curds made from pasteurized milk were washed, salted packed and frozen for storage, reports Marquardt (278).

Preparation of Serac cheese, a whey cheese of 80 per cent moisture, 3–9 per cent fat and 14 per cent to 20 per cent protein content is described by Hondiniere (279).

Propionate brushed on the surface of cheese was reported by Dorsey to prevent mold formation for at least a year (304).

Cheese and curds in general evoked greater volumes of gastric juices than did milk, found Poliskov, in experiments with dogs (315).

Preparing cheddar cheese from pasteurized milk is discussed in a preliminary report which includes suggestions for speeding up the ripening time (336).

The effects on starters after heating, cooling, salting and acidifying were studied by Sjöström by measurements of Eh, bacterial numbers, and diacetyl formation (343).

Theories and methods of bacteriophage infection in cheese making are presented by Whitehead and Hunter (344).

Nichols and Wolf report widespread occurrence of phage attack in cheese starters. Heating of the bulk starter milk to 90° C for one hour allows a large safety margin (345).

Variable results obtained in attempts to control the flavor of cheddar cheese by inoculation with *L. Casei* and *S. cremoris* are reported by McDonald (346).

A *Sporotrichum* is reported by Guittonneau and Haas to be a normal ripening agent for certain cheeses (347).

*Thermobacterium joghart* as an acidifying agent in coagulated and subsequently sterilized milk proved a suitable culture medium for Roquefort cheese mould (348).

### EVAPORATED MILK

Evaporated milk allowed to remain in opened cans produces a discoloration with coffee found by Gould to be attributable to the rusting of the can and in no wise to the amount of lactic acid (105).

Condensed and evaporated milk processing is described by Ray who tabulates for French condensed and English evaporated milk (106):

| | | |
|---|---|---|
| $H_2O$ | 25.5 | 67.47% |
| fat | 10.0 | 9.10% |
| protein | 9.0 | 8.75% |
| lactose | 12.6 | 12.74% |
| ash | 1.9 | 1.94% |
| sucrose | 41.0 | .0 % |

Finding that human milk is low in vitamin C the first eight months of the year, Bogdanova recommends a 100 mg. daily supplement of ascorbic acid to lactating women (107).

The fat acids of human milk analyzed by Brown and Orians consisted largely of those acids of 18–20 carbon atoms (108).

Garry and Wood review dietary requirements in human pregnancy and lactation. Over 400 references given (109).

Evaporated milk stored at 100°F. for seven months showed insignificant lactic acid increase but did show a marked titrable acidity increase 71.3 per cent attributable to formic acid, reports Gould, Weaver, and Frantz (109B).

### HEALTH AND DISEASE

A milkborne outbreak of infectious hepatitis is reported by Murphy, Petrie and Work (310).

Whereas milk consumption in Massachusetts has increased, milk-borne diseases have decreased, reports Feemster (311)

Migraine headache was caused by milk in a patient with a 30-year history of the affliction, report Wolf and Unger (314).

Underpasteurization of milk in South Africa leads Pullinger to suggest putting the process into the hands of the government. a co-operative society or a public utility corporation (320).

The bacterial count in milk kept in home refrigerators did not rise significantly until the eighth or tenth day, a survey by Supplee-Wills-Jones Milk Co. revealed (338).

Thermophillic counts in commercially pasteurized milk in São Paulo were between 600 and 55,000 per ml, states Rubens (342).

High incidence of tubercle bacilli in the milk of Cape Town leads Horwitz to urge compulsory pasteurization (361).

Brucella melitensis, found in cheese, caused twenty cases of brucellosis according to Sofia (362).

An epidemic of septic sore throat at Salmon Arm, B.C., was milk borne as traced by Bowering, *et al.* (363).

Raw milk was a source of a widespread scarlet fever epidemic in Copenhagen, reports Jepsen and Hansen (364).

### Human Milk

Fifty percent of human milk samples showed inhibition phenomena explained by Ballestero to be attributable to bacteria developed during lactation (110).

One of the bacterial flora of human milk reported by Ballestero is found strongly acidogenic, others are weakly so, the former showing inhibitory behavior towards growth of fecal spore-bearing amerobic bacteria (111).

The vitamin content of human milk of mothers fed controlled and self-chosen diets is extensively studied in a series of experiments at Research Lab, Children's Fund of Michigan. (Macy *et al.*) Vitamin content of cow milk is compared with that of human milk (112).

Neuweiler reports the absence of ascorbic acid oxidase in human milk (113).

The vitamin D levels in the milks of pregnant women reached a maximum of only 62 I.U. per quart when given fish-liver oil (at most 480,000 I.U. of supplement) report Polskin, Kramer, and Sobel (114).

Dilution of human milk with as little as 10 per cent of cow milk (pasteurized but not boiled) can be detected as reported by Rodkey and Ball by testing for the cow milk enzyme xanthine oxidase (115).

A valuable milk mixture substitute for human milk is reported by Escudero (316).

### Ice Cream

The total solids content of ice cream mix and of sweetened condensed milk are determined by Doan and Livak using the Dietert Moisture Teller, (which makes use of forced heated air) more accurately than by the Mojonnier techniques of the "Official Method" (116).

Ice cream is a much richer source of carotene than whole milk, a good source of riboflavin but is lacking in ascorbic acid in tests by Holmes, Kuzmeski *et al.* (117).

Light colored honeys are reported by Lucas to be suitable for use in ice cream (118).

Ice cream stabilized by use of the fat fraction after Musher's patent is described as superior in quality (119).

Milk sherbets stabilized by addition of a high protein, low-starch oat fraction after Patent 2,395,060 (Musher) are of excellent quality (120).

Five new ice cream formulas necessitated by recent sugar and dried milk shortages in Great Britain are given by Pompa (121).

The sugar content of ice cream can be reduced 10 per cent to conserve sugar report Pyenson and Tracy if milk-solids-not-fat or other solids are raised to improve texture (122).

Ice cream overrun is greatly increased by an egg product patented by Scott and Parsons (123).

Dried ice cream mixes made from skimmilk which had been fore-warmed at 180° F. for 5 minutes before condensing, Pyenson and Tracy report, did not develop oxidized flavor and were very palatable after a year's storage (124).

Oral administration of penicillin using an ice cream base is reported to effect satisfactory relief of the patient (283).

Palatable ice cream is possible with sugar content as low as 11 per cent reports Josephson (284).

Commercial ice cream formulas are supplied by Leighton (285).

The Post-war trend in the frozen dessert industry is toward increased quality, confirms the committee report (334).

Bacteriological control of ice cream is covered by El-Gheriany and Kiani (360).

### Lactose

Crude and technical lactose suitable for food products is manufactured from cheese whey by Webb and Ramsdell by clarification, concentration, crystallization, and contrifuging of the whey (125).

The effect of the rate constant of the equation for the first order reaction represented by the dehydration of lactose upon the distilling time required in the totual method for determining moisture of dry milk products is discussed by Choi *et al.* (126).

## MARGARINE

Vitamin A in margarine can be satisfactorily determined by an improved type photo-electric photometer described by Bowen, Gridgemand, and Ongmann, who measure the absorption of the $SbCl_3$-vitamin A complex at 620 *my* (127).

Margarine fat composed of hydrogenated vegetable oils is digested to an identical extent (97 per cent) as butterfat, Deuel reports (128).

Fortified with vitamin A as reported by Feigenbaum, margarine maintains the full vitamin content six weeks (129).

Addition of small amounts of an aqueous mixture of lecithin, glyceryl monostearate, and cottonseed oil to margarine reduces spattering and leaking and improves texture, reports Stanley (130).

Margarine manufacture is discussed by Feron who covers methods starting materials, quality, and economics (131).

An efficient margarine factory layout described by Petrov includes a Gerstenbert emulsifier, evaporation cooling drum, and a vacuum mixer (132).

## MILK

Average indican contents of human milk, cow milk, and goat milk are reported by Aceto and Spinelli to be 30 y per cent, 124 y per cent and 192 y per cent respectively (133).

Curds from fresh whole milk which had been boiled, cooled, and inoculated with a small quantity of preformed curds were found by Chitre and Patwardhan to contain more riboflavin, less nicotinic acid, and more thiamine than the original milk (134).

In studies on the heat coagulation of milk, Cole and Tarassuk found not only a characteristic difference between goats and cows milk but also marked differences in the nature of the coagulum produced (135).

Milk, raw or pasteurized, whole or skimmed was found by Cooperman-Ruegamer *et al.* to be a good source of the monkey-antianemia factor (136).

Soybean milk, nearly as good as cows milk, was prepared by De and Subrahmanyan (137).

The proteins: lipoids ratio in milk is reported by Garino-Canina and Cassella-Jandolo as 0.97–1.02 (138).

Skimmed milk powder which had been extracted with ether when mixed with butter, margarine, corn oil, cottonseed oil, peanut, or soybean oil produces with all the same growth effects in rats, reports Deuel, *et al.* (139).

Citrates are present in skim milk as tricalcium citrate reports Eilers and Jense. A method for quantitative determination of citric acid in the presence of excess lactose is given (140).

Existence of a calcium caseinate-calcium phosphate double compound in milk is shown by Eilers *et al.*, from consideration of titration data, of ultramicroscopic observations, and of flocculation data (141).

Skim milk, Headley found, produces faster and more economical gains in pigs when incorporated into the dry lot diet than did a protein mixture composed of 40 per cent meat scrap, 30 per cent linseed meal, and 30 per cent alfalfa meal (142).

Goats milk contains the same amount of fat and ascorbic acid as cows milk but less riboflavin, report Holmes, Lindquist, and Greenwood (143).

Surplus albumen in cows diet did not affect the quantity of milk or its milk fat content, report Inchausti, Tagle *et al.* (144).

Cow, sheep, and human milk averaged 222 mg/liter of total choline, 129 mg/liter of nonhydrosol choline, and 15–35 mg/liter of free plus combined hydrosol choline, the choline substances being found mostly in the aqueous phase of milk, in studies by Kahane and Levy (145).

The action of milk lipase on tributyrin is suggested by Kelly as an indicator of rancidity in milk (146).

Pitocin activates of the tributyrinase in both normal and rancid milk is reported by Kelly (147).

Significant gains in quantity and fat content of milk resulting from feeding cows concentrate mixtures containing 5.3 per cent fat leads Loosli, Maynar, and Lucas to conclude that 1 lb. fat intake per day increases the production of fat-corrected milk (4 per cent) 2.6 lbs. per day (148).

Lipase breaks down into compounds that off-flavor milk, according to Roberts and Wylie, who give treatments for the control of lipase in fresh milk (149).

Shimwell and Evans use as a clotting agent for milk a bacterial proteinase, produced by growing bacteria in a nutrient medium (150).

The fluorine content of milk from cows given water containing 500 ppm of F did not exceed 0.5 ppm in test conducted by H. V. Smith, M. C. Smith, and Vavich (151).

Soates reports that persistent low acidity in grade "A" pasteurized milk is a result of the loss of $CO_2$ in slow pasteurization (152).

The electric conductivity of milk increases on standing due to the lactic acid that forms. Tapernaux, Desrante, and Bequet suggest deacidification by an electrolytic process (153).

Incidence of milk fever in dairy cows was not reduced by administration of 1 million units of vitamin D daily for 5 weeks, reports Hibbs *et al.* (154).

A satisfactory sterilized caramel milk made by mixing a caramel base with plain and concentrated milk is reported by Webb and Hufnagel (155).

And as yet unidentified substance of low molecular weight responsible in part for the cooked flavoring in heated milk is indicated by dialysis experiments on raw milk conducted by Hankinson, *et al.* (156).

Homogenized milk, when frozen and stored at a constant low temperature remained normal for very long periods, reports Babcock *et al.*, but when exposed to room temperature for ½ hour and then stored at a higher temperature than originally flat or oxidized flavor appeared on subsequent thawings (157).

"Excellent" flavor milk took a longer time to judge than did off-flavor milks as reported by Trout in studies that led to the average judging time of 7.2 seconds (158).

Since sterilization of food products containing milk results in rapid coagulation of the milk protein, Webb and Hufnagel recommend use of binders to take up moisture, homogenization, use of whey protein, and sterilization with a minimum of stirring to a smooth, heavy-bodied product (159).

$H_2O_2$ in small amounts in milk as a preservative destroys the ascorbic acid, reports Bisogni and Calendoli (160).

Rotary beating improved the texture of the white sauces made from homogenized milk which tended to show separation of fat in the preparation of the sauces, report Tomson and Trout (295).

Alpine milk is higher in lactose, calcium and chloride and lower in phosphate and casein than other French milk, reports Mathieu (365).

## MISCELLANEOUS

Sorghum roots and chaff are reported by Barbera to be suitable for dairy cattle feeding since analysis reveals the HCN content below the toxic limit (161).

From a consideration of the comparative values obtained in feeding cows tuberin and linseed oil cakes, Bonnet, Gasnier, and Leroy propose the feeding of tuberin as a remedy for the scarcity of digestible albuminoids which is responsible to a large degree for low milk production (162).

Galactose utilization in rats fed skim milk is greatly increased by the presence of fat as found by Bontwell Elvehjem and Hart (163).

Injection of 174 y of labeled Cobalt into the blood stream of a rumen fistula cow resulted in only very small amounts being found in the milk and when injected directly in the rumen none was found in the milk, as reported by Comar *et al.*(164).

No significant differences between the quantity, fat content, or mineral content of the milk of a group of pastured cows fed a diet including mineral salts ($CaCo_3$, $Ca_3$, $PO_{4\ 2}$, $Fe_2O_3$, NaCl, $MaCo_3$) and of a group not fed the salts were observed at the end of 15 weeks by de Man, Sjollema, and Groshue (165).

Potato leaf silage fed to cows in tests by Dijkstra resulted in satisfactory milk production (166).

The protein requirements of cows on Oahu, Hawaii, where considerable proteine supplement was necessary was reported by Henke to be supplied by air dried garbage, soybean oil meals, and sesame-oil meal (167).

Refection in rats is not effected by an addition of a small amount of milk to a vitamin free diet. Hopkins and Leader indicate that refection never occurs in the presence of starch or adequate vitamins (168).

AIV fodder was proven by Hvidsten to be the best source of carotene in winter feeding of cattle, producing an increase of vitamin A in winter milk from 900 IU/liter of 4 per cent milk to 1200 IU/liter. Summer milk from pasture fed cattle averaged 1900 IU/liter of 4 per cent milk (169).

A milk beverage prepared after a patent of Jackson from cocoa, malt and whole milk retains original food value and flavor and keeps well (170).

Cobalt sulfate is recommended by Keener, Percival, and Morrow to cure a mineral deficiency disease in cattle exhibiting certain described symptoms (171).

Coagulation of milk by rennin is not affected following addition of 75 mg per cent of Na dibutylnaphthalenesulfonate, probably, say Laporta and Mossini, because of removal of Ca ion as a complex (172).

A homogenized cream substitute is described by Mason and Justensen who emulsified vegetable or animal oils with aqueous vegetable flour suspensions (173).

Moore reports that the disturbance in the ascorbic acid synthesis in the vitamin A deficient calf does not effect the spinal fluid pressure (174).

Vaccenic acid, an oleic acid iosmer present in butterfat in considerate amounts was shown by Brouwer and Jonker-Scheffener to be present in greater amounts when the cows were fed summer rations than when fed winter rations (175).

Mare milk, Fredenberg reports analysis reveals, is low in protein fat but rich in lactose, and thus cannot be used for infant feeding without addition of 1 to 1.5 per cent cow milk fat (176).

In buffalo milk Ghoneim reports: protein percent$=3.43+0.116\times$ fat percent heat value (cal. per kg milk)$=110.33$ fat (percent)$+278.63$ (177).

Goat milk as analyzed by Holmes *et al.*, contains 137mg, percent Ca, 17mg percent Mg 170mg percent K, 112mg percent P, 4.4 percent fat and 3.4 percent protein (178).

Dairy cows consumed less silage and

produced less milk when fed a phosphoric acid treated alfalfa silage than when fed corn silage, reports Monroe *et al.*(179).

Milk production was similar from cows fed simple and complex grain rations containing about the same protein content in tests by Monroe and Krauss (180).

Rennet hysteresis in milk is explained by Pyne by assuming a Ca caseinate-phosphate compound to act as protective colloid (181).

Diets containing an abundance of milk, liver, riboflavin, and xanthine show little inhibitory behavior towards methylcholanthrenecarcinogenesis in mice, whereas the same diets show remarkable inhibitory behavior towards dimethyl-aminoazobenzene carcinogenesis, report Strong and Figge (182).

Addition of 3 to 3.5 g per liter of lactic acid to Escudero milk precipitates the casein, sterilizes the milk for 24–48 hours, and prevents bacterial growth if later contaminated, according to Waisman (183).

Rat milk quantity and quality is studied by Mueller and Cox as related to mineral and yeast intake with certain significant results (184).

Norton finds that feeding cows fresh bakers' yeast in amounts as great as 80g produced no changes in fat content of the milk and caused no increase in the cows' appetites (185).

Extension of colostrum-feeding of cows produces weight gains and increases in the blood plasma vitamin A, as reported by Sutton and Kaeser (186).

A low-calcium, acid whey results when the casein is put with $H_3DO_4$ at a certain pH in a patent granted Windfeld-Hansen (187).

Prolonged experiments with cows conducted by Ritzman and Colovos revealed that differences in diet had no effect on growth on milk yield and that light affects the metabolism only temporarily (188).

In an experiment reported by Shepherd, Woodward *et al.,* cows fed rations partly or wholly composed of various potato ensilages or rations of chopped raw potatoes showed good gains in live weight and kept up their milk production (189).

Studies with Ca-deficient New Zealand cattle showed doses of 80g Cu $SO_4$ non-poisonous, but 200-400g lethal (190).

An excellent artificial buttermilk powder is made from dried whole and skim milk, malted flour and cane sugar, reports Pikler (288).

Milk sera, including whey, are discussed by Pien from the standpoint of their utilization (289).

Australian commercial lactic acid production from whey is reported (290).

## NUTRITION

The entire milk supply from birth to five years of age of four groups of children was: for the first (control) group, irradiated evaporated milk; for the second, plain evaporated milk and cod liver oil (one lb. daily contg. 1500 units vitamin D and 15,000 USP units vitamin A; for the third group, irradiated evaporated milk and carotene (ten drops daily equivalent to 2250 USP units vitamin A; for the fourth group, irradiated evaporated milk and 10 drops carotene and brewers yeast (½ tblspn. equiv. to 0.5 mg vitamin $B_1$ and 0.2 mg riboflavin). Rhoades *et al.* found no significant differences in the groups at the end of four years as concerns growth, dentition, and intelligence, and dental caries in all groups were comparatively low (191).

The nutritional quality of the proteins in bread evaluated biologically are reported by Carlson, Hefner, and Hayward who found 6 percent white milk bread and 5 percent white soy bread equal to each other and superior to all whole wheat bread (192).

Use of casein in place of corn meal in the diet of rats administered carotene resulted in increased digestion of carotene and increased storage of vitamin A in the liver according to Fraps (193).

Twenty percent milk fat and twenty percent triolein diets both produced more rapid growth of rats than did 20 percent trilaurein or fat free diets, in experiments conducted by Henderson, Jack, *et al.* (194).

That less than one quart of milk daily will supply the calcium requirement of a pre-school boy was the conclusion of the Mmes. McLean, Jensen *et al.* (195).

The average content in milk products of the San Francisco area of numerous nutritive constituents is tabulated by Sharp, Shields, and Stewart in relation to the effects of manufacture and storage (196).

The utilization by the body of the calcium in milk was found by Steggerda and Mitchell to be the same whether the milk were pasteurized, homogenized, modified, or whether citrates were added (197).

In 72 matched pair experiments by Wolman with children no measurable differences were observed in certain intragastric responses to "soft curd," homogenized, and "hard curd" plain pasteurized milk (198).

Pasteurized or boiled milk fed white mice was found by Forti adequate for all normal life functions (199).

Addition of 6 percent nonfat dry milk solids was found by Riggs, Beaty and Johnson to improve the nutritional value of water bread, enriched water bread and whole wheat bread (200).

Mueller reports that cocoa in milk is thought to destroy certain vitamins (287).

## POWDERED MILK

Milk powders with fat contents of 1, 26, 28, 30 percent, moisture contents 2, 3, and 5 percent were stored for periods up to 16 weeks at temperatures of 40–140° F. in experiments reported by Bryce and Pearce. All showed deterioration when stored above 60° F. A moisture content of 3 per cent was found preferable for storage of all powders. Bryce reported maximum photolysis of riboflavin in skim milk powder at 4450 ang. (201).

Whole milk powder is stabilized in storage by wheat germ oil antioxidants or by antioxidants that develop in the milk powder on storage in moist atmospheres or at high temperatures report Chapman and McFarlane (121).

Cereal-bean-silkworm pupa powder and whole milk powder have the same digestibility, growth, and bone-building properties when fed to rats according to tests by Choo Yu Chen (203).

That increases in oxygen content in the headspace of packaged dried whole milk result from diffusion of oxygen from entrapped air cells within the powder particles is substantiated by Coulter and Jenness. The oxygen level can be reduced effectively by means of inert gas packing or by holding under a vacuum (204).

Problems involved in gas-packing dry whole milk as discussed by Coulter and Jenness include factors that determine the amount of air entrapped in the milk-powder and means of removing the oxygen from the powder (205).

Milk is vacuum dried by means of radiant heat according to a patent of Gentele (206).

Dehydrated mixtures of egg and milk decrease in palatibility under storage conditions much more rapidly than milk powders of similar protein and fat content according to Pearce, Whittaker, *et al.* (207).

The rate and extent of sorption of $CO_2$ by dried milk powders are related by Pearce to fat content and to $CO_2$-$N_2$ mixture ratio. These authors further report milk powders are more rapidly deteriorated by sunlight than by ultraviolet light alone (208).

0.8 percent oxygen in milk fat, corresponding to 0.2 percent oxygen in the atmosphere of dried milk, is the maximum value allowable without experiencing off-flavoring autoxidation, but Schaffer, Greenbank *et al.* reported limited but good keeping qualities by maintaining oxygen concns. below 5 percent in the atmosphere of dried milk (209).

Compression of spray dried whole-milk powder to a density of 1.15–1.20 is as effective as gas packing in reducing the interstitial oxygen, as reported by Thiel who also found cellophane and waxed paper ineffective in preventing oxygen reabsorption (210).

The relative keeping qualities of Australian dried whole-milk and skim milk powders were studied by Thiel and Pont who found the flavor of reconstituted gas-packed whole-milk powder just as good as that of skim-milk powder reconstituted with fresh butterfat, both powders stored under the same condition (211).

Organoleptic tests were shown by Pyenson and Tracy to be the only accurate way of measuring the keeping quality of powdered whole milk, the peroxide test not satisfactory correlated with flavor scores (212A).

With dried milks, a final oxygen content in the container of 1 percent can be obtained, report Schaffer and Holm by two evacuation stages each at 3 mm pressure, with a 3 to 4 day intervening holding period (212B).

Studies on the compression of dried milk powders by Miller reveal that the maximum pressure desirable is 5,000 lb. per sq. in., since among other things, greater pressure resulted in a plastic-like product (282).

Gas-packed dried whole milk was found to keep better than dried skim-milk (286).

A dry milk that is adaptable for manufacture of ice cream of excellent quality is the subject of U. S. Patent 2,383,070 to Mook (309).

Improvements in white bread by incorporation of dried milk as reported by Wilder and Williams include better shape, colour of crust, and better taste (324).

## QUALITY

The yellow color and milk fat content, not necessarily dependent upon each other, increase and flavor is better in milk from cows fed alfalfa diets in contrast with milk from corn fed cows, as reported by Garrett and Bosshardt. These also verified that cows can select B-carotene from plant carotenoids and concentrate it in the milk fat. A-carotene in milk fat was found less stable than B-carotene (213).

S. J. Rowland appeals for increased attention to the non-fat solids of milk in their relation to cattle feeds, breeding and to the pricing of milk (214).

Tallowy flavor in milk believed to result from oxidation of the lipid fraction of the milk is shown by Krukovsky and Guthrie not to develop in the presence of $H_2O_2$ but instead to develop only when a catalyst such as Cu and an excess of $H_2O_2$ are present (215).

The relationship of sediment to milk flavors is studied by Marquardt who proposes a definite dirt in milk control program (216).

## REGULATION

Bacterial population and keeping quality of milk generally poorly correlated and often not congruent are used together in judging milk by two tests described by Davis (217).

Milk from udders positive towards the bromthymol blue test for mastitis had a higher pH, less non-fat solids, less casein, more total nitrogenous matter, a softer curd and 28 percent lower yield than that from negative udders in tests by McDowall, who found that milk from udders testing negative but with high leucocyte count had the same change in composition as that from positive test udders (218).

A better basis than the specific gravity for detecting watering of milk is the C.S.D. (Sero-densimetric constant) value, report Perri and Klantschnigg in tabulating C.S.D. values for milks in Macerata Province (219).

The testing program in Britain and suggestions for improvements in the handling of milk and milk equipment are discussed by Phillips after considering the results of routine reazurin and other tests (220).

Pasteurization recording charts are interpreted by Gotta with respect to regulatory requirements (221).

Sanitary standards for milk storage tanks as set forth by the I.A.M.S., the U.S.P.H.S. and the Dairy Industry Committee cover the size, material, construction, openings, agitators, tilt, motors and top access of the tank (222).

As little as 0.05 percent of raw milk contaminant in pasteurized milk and non-ripened cheese can be detected by a modified phosphatase test reported by Sanders and Sager (223A).

Fischer and Staub report occurrence of 30 percent watered milk that exhibited unique behavior when overfrozen, the dispersing agent freezing first into an ice layer 90 percent water, the milk freezing last (223B).

From studies on the absorption and deterioration of synthetic rubber milker inflations, Jensen and Bortree report boiling inflations in strong lye solution to effect satisfactory sterilization (224A).

Watering of buttermilk is best detected gravimetrically, declares Kveton, by determining the dry substance content which should lie between 8 and 11.6 percent (224B).

The dairy plant operator's control system is reviewed by Levowitz from the standpoint of a state-supervised, industry maintained system of control of the milk-sheds (298).

The Wisconsin Dairy enterprise is increasingly being influenced by out of state standards and ordinances (301).

Improvements in the control program of the U.S.P.H.S. and the Connecticut State Department are discussed by Robertson in the interest of achieving conformance to the standards (312).

Missouri cities adopting the State Standard Milk Ordinance are responsible for their own milk control with state assistance available for enforcement, reports Young (317).

A vigorous score card system for milk products plants in California is reported by Ghiggoile (318).

Rockford milk, not improved by introduction of the Standard Ordinance, was produced in equal quality and at one third the cost of supervision under the Gunderson plan (319).

Pasteurization of milk is on the increase in Vermont following passing of a State law for milk control, reports Bremer (321).

The milk quality control program in Sheboygan, Wisconsin, includes use of the Myers-Pence technique, reports Widder (322).

Excessive water in butter is discussed by Hoton in its legal implications (323).

Field use of the cyroscope in the control of milk watering is urged by Corash (328).

Platform tests for quality of incoming milk recommended by Trout include the dipper-strainer and odor test as most useful (329).

Licensing of butter and cheese makers in Oregon aims to maintain high standards in production, reports Wilster (330).

Suggestions to the milk inspector by one having the dairy plant operator's viewpoint are given by Lucas (331).

Laboratory tests concerned with vigilance over the safety, the sanitation, and the nutritional value of milk are criticized by Geiger, Engle & Marshall (335).

## TECHNOLOGY

The thermostability of malted milk, less stable than milk due to its lower buffer capacity and high pH level, is reported by Bezsonov and Mazokhina to be improved by adding stabilizers (225).

Objective farm odors can be removed from dairy products by addition of 50–200 ppm biacetyl, and onion and garlic odors can be removed by treatment with chloramine-T or chloramine-B, reports Christensen and Sturhahn (226).

Though low temperature pasteurization of condensed sweetened milk as a measure to prevent gelation is advised by Eilers and Korff from studies on the viscosity and of the voluminosity of the solids, yet high temperature sterilization of the product can be accomplished if the proteins are stabilized by small amounts of added potassium citrate (227).

Studies of the viscosity of skimmilk by Eilers and Korff indicate decrease in viscosity on heating to 40 or 45 degrees, increase on heating above 65, because of denaturing of the protein, and decreases in the temperature range 0–40 degrees because of a reversible change in the caseinate fraction. A linear relationship is found to exist between change in voluminosity of milk and the rheological concentration (228).

Butter or a dehydrated butter oil are produced from cream by heating to 170–190° F, centrifuging, homogenizing, and stratifying to remove the concentrated fat (229).

Not one of the four wrappers tried by Saitner and Friebe for Tilsit cheese, parchment impregnated on one or both sides and lacquered on one or both sides, proved satisfactory, for they all adhered to the cheese and all passed exudations from the cheese on long storage (230).

A synthetic butter was produced by esterifying with glycerol the $C_{11}$ and $C_{12}$ fractions of oxidized wax paraffins. Anonymous (231).

Use of 0.3 percent $H_2O_2$ for keeping milk 30 to 40 days is reported by Romani (240).

Steam sterilization is reported by Bowyer, Fisher *et al.* superior to hot-hypochlorite which is better than cold-hypochlorite, whereas detergent alone is ineffectual (232).

In a patent granted to Chapin a siftable, water dispersable shortening is prepared from pasteurized 1:1 concentrated skimmilk (233).

Pasteurization of milk by sweeping through with warm oxygen as reported by Guittonneau, Bejambes *et al.* causes deacidification by removing the $CO_2$, inhibits the growth of heat-resistant or aerobic lactic acid bacteria but stimulates certain aerobic forms which may cause curdling (234).

Continuous manufacture of amino acids from protein material is accomplished by bubbling acid vapors into a suspension of casein, wheat gluten or gelatin and collecting the hydrolyzate as formed through a filter (235).

Plain tin plate induces deterioration in stored butterfat more rapidly than does lacquered or washed tin plate or glass as reported by Lea who suggests use of a lacquer coating which contains an autioxidant (236).

Preparation of lactic acid from a solution containing lactose with lactic acid bacteria feeding on wheat germ or whey is patented by Myers and Weisberg (237).

By homogenizing 2000 lb. 15 percent condensed natural buttermilk, 600 lb. fat and 4 lb. $NH_4$ alginate at 150–60° F. followed by spray drying, a non-greasy powdered shortening, improving baked goods by its utilization, is prepared by North, Alton, and Little (238).

A granular, non-greasy shortening with high free available fat is prepared in a patent granted North, Alton, and Little from 30 percent condensed skimmilk (239).

Detergency of the highest order was obtained by using 0.10–0.15 percent wetting agent-metaphosphate detergents, Jensen reports, measuring with the spectrophotolometer the light transmission of the washings of milk films on glass (241).

Botwright recommends the quaternary ammonium salts as safe and effective germicides for the food industries (242).

Milk plant wastes such as spilled milk, leaks in valves and pipes, etc., are discussed by Hahn in an effort to effect their elimination (243).

Quaternary ammonium and phosphonium compounds were reported by Mueller, Bennett, and Fuller as the only satisfactory dairy sterilizing agents of 42 surface-active agents tested (244).

Butter quality was markedly affected as a result of use of the detergent $P_8Z$ with wooden churns, reports Hedemann (272).

Causes for milk rejection listed by Furnia, Manson, and McHale include poor cooling, dirty utensils, and mastitis (276).

Cheese moulds made of alloys, stainless steel and a plastic that are corrosion resistant are reported by Schwarz and Hagemann (280).

Fourteen methods of packaging cheese are summarized, these including fast freezing, waxing, canning, bottling, etc. (281).

Temperature control in the H.T.S.T. pasturization process discussed by Hall involves due attention to measuring and recording instruments (293).

Functional requirements in designing dairy barns include those of stall and milking room (294).

Wilster describes many technological developments that have brought the butter industry to its present sound status (296).

Water and sewage problems in milk sanitation discussed by Warrick and Wisniewski cover well construction, plumbing, and milk waste treatment (297).

Sterilization of milk by compression to 2,500 lb./sq. in. followed by spray injection into a heated zone, is the subject of U. S. Patent 2,401,077 to Johnston (302).

The details of lactic acid production from whey with *L. bulgaricus* are given by Swaby (303).

Since scale formation in bottles increases cleaning costs, Piper reports on scale removal and prevention (305).

Use of an ice bank designed by Minster is said to insure against breakdown and power failure (306).

Pasteurization and irradiation are accomplished by use of ultra-violet light in German equipment described by Langton (307).

Pasteurization effected in 20 seconds is described in U. S. Patent 2,390,872, issued to Dahlberg and Holland (308).

The fiber milk container, rectangular in shape, is predicted to be produced to the tune of 10 billion in 1947 according to Baselt of American Can Company (326).

Square milk bottles are recommended by Hall as helpful in reducing the cost of milk distribution (327).

At concentrations of 1:500 to 1:2500, alkyl dimethyl benzyl ammonium chloride has no germicidal action in milk reports DuBois and Dibblee (337).

Thomé and Nilsson warn that a separator is a source of infection when used as a means of clarifying pasteurized milk (341).

## VITAMINS

The weighed mean vitamin A potency of creamery butter in the state of Washington is reported by Ashworth, McGregor, *et al.* to be 17,900 IU per lb. No correlation was found between vitamin A activity and acidity or type of flavoring, coloring, neutralizing, and pasteurization of the butter (245).

Vitamin A but not carotene possesses a strong positive correlation to the butterfat content of cows' milk as reported by Citeaux *et al.* from extensive studies that indicate the need of adding vitamin A to winter rations for cows (246).

The results of feeding rats milk diets containing succinylsulfathiazole are interpreted by Day, Wakim, *et al.* as evidence of a low concentration of "folic acid" and vitamin K in evaporated and dried cow milk (247).

The vitamin A content of Arizona butter averaged 17,457 IU per pound as reported by Farrankop (248).

Relation of the vitamin A levels in milk to that in the feeds is studied by Farrankop, Smith *et al.* as a function of different feeding methods (249).

Hepatic reserves of vitamin A in cattle were lost proportionally to the decrease in carotene intake as found by Frey and Jensen (250).

Vitamin D deficiency may result in calves kept in the barn all winter without feeding sun-cured hay report Hibbs, Krauss *et al.* from considering case histories of calves (251).

Holmes reports that the riboflavin content of mares' milk increased from 0.13 mg./liter to about 4 times this value upon administering 350 mg. of riboflavin daily for 4 days (252).

That the etiology of deficiency diseases is influenced by the metabolic route and by intestinal resorption as well as by mineral and vitamin content of food is shown by Krupski (253).

The nicotinic acid, biotin, and pantothenic acid content of milk was assayed by Lawrence, Herrington, *et al.* by a modified procedure. Pantothenic acid and biotin contents were correlated but nicotinic acid was not related to either. All three were stable during pasteurization and exposure to sunlight (254).

The vitamin A content of butter from Ayrshire cows is reported by Lord to be 31 IU with pasture feeding and 15 IU per g. fat with stall feeding (255).

Milk and milk products in 1941 furnished the people of the U. S. 1,600 I.U. of vitamin A per person per day or nearly ⅓ of the allowance as revealed in a survey made by Maynard *et al.* Further results of the survey indicate 36 percent of all creamery butter is winter butter with an average vitamin A potency of 11,200 units, the balance is summer butter with 18,000 I.U. (Survey conducted by Bur. Dairy Ind. and Office of Expt. Stations.) (256).

Vitamin A deficiency in cows results in degeneration of basal metabolism indicated by diarrhea, blindness, etc.; increased food intake with 50 percent loss in weight, 25 percent decrease in protein utilization, digestion depression, and lesions of tissues, according to results of tests by Ritzman, Colovos *et al.*(257).

Raw milk entering the manufacturing plants averaged 17.1 mg. reduced ascorbic acid per liter; pasteurized milk, 5.8 mg. per liter total vitamin C; reconstituted evaporated milk and powdered whole milk, 2.0 mg. and 12.5 mg. per liter respectively, in a survey by Stewart and Sharp (258).

Chocolate milk loses riboflavin photochemically only 12 percent in 4 hrs. A rapid fluorometric method for determining riboflavin in chocolate milk is reported by M. R. and C. R. Shetlar and J. F. Lyman to compare well with other methods (259).

Carotene is reported by van Zeben to be a poor source of vitamin A since carotene is only incompletely transformed into the vitamin after absorption (260).

Vitamin A requirements in calves are reported by Lewis and Wilson to be 250 U.S.P. units per kg of body weight, somewhat similar to that of young rats and infants (261).

Vitamin A potency of Ohio butters tested by Krauss *et al.* showed little decrease on storage for 12 months at 0° F.(262).

Vitamin A potency of Idaho butters tested by Theophilus *et al.* showed less seasonal variation than the carotene content, the former being 12,499 I.U.

in February and 19,281 I.U. in October (263).

Evaporated milk, reported by Doan and Josephson to be a highly suitable medium for vitamin C fortification, is most satisfactorily fortified by use of the sodium salt of ascorbic acid (264).

Neither thiamine hydrochloride nor methionine were found by Shaw effective in treating ketosis in dairy cattle. Cases of spontaneous recovery from ketosis indicate the need of caution in seeking treatment (265).

Pantothenic acid, niacin and biotin contents of milk were reported for one year by Stefaniak and Peterson who observed seasonal variations as a result of feeding changes only in the biotin content (266).

Values for vitamin A and carotene contents of Kansas butter given by Parrish *et al.* were higher when good pasture conditions prevailed than when little or no pasture existed (267).

Because milk undergoes rapid loss of ascorbic acid and significant loss of riboflavin on exposure to sunlight, Josephson *et al.* urge consumer education in the care of milk (268).

Deaeration of milk is recommended by Guthrie since this prevents development of oxidized flavors and is of importance in vitamin C preservation (269).

The milk of cows fed cod liver oil, developed either an oil flavor or an oxidized flavor, reports Guthrie. The reduced ascorbic acid content increased only when the cow received the oil by drenching, not by mixing with the feed (270).

The carotene-vitamin A ratio in butterfat is 1:3 before pasture and 1:1.5 during pasturing as colorimetrically determined by Ronnenberg (366).

Nicotinic acid content in milk is reported by Morel and Baratte (369).

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# Milk Transportation Tank Cleaning and Sanitization*

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Many in this audience are readily able to recall the time when much of the milk distributed in the larger communities was transported from the country loading platforms, in cans, on "milk trains." There was a short era during which considerable milk was pasteurized and bottled at country receiving station-milk plants, and transported to the city in bottles. But the cost of returning the empty bottles influenced a trend to pasteurization in the city. It was then that the advantages of transporting raw milk in insulated tanks became apparent. That the development of this means of milk transportation is comparatively recent is evident from the fact that in a report to this Association at the 1922 Annual Meeting, Smith (1) stated that in February of that year there were in use 13 milk transportation tanks mounted in railroad cars, and 68 mounted on motor trucks or trailers—a total of 81 tanks!

The more complete transition since 1922, from the transportation of milk in cans to the movement of bulk milk from receiving stations in the country to milk plants in the city in larger—but fewer—receptacles, has generally been regarded as an unqualified benefit to milk sanitation. Shipment in cans possessed potentialities for contamination or spoilage of milk because of the poor state of repair or ineffective cleaning of the cans, or to delayed or inadequate cooling of the milk, whereas bulk shipment is in insulated tanks with the milk at low temperatures so that the contents do not significantly warm up during transit. On the contrary, those who have—in curiosity or by force of necessity—given close attention to the operation of milk transportation vehicles realize that the transition from cans to tanks, as containers for the transportation of bulk milk, was not a complete panacea for the sanitation problems inherent in the transportation of milk.

## Sanitization Difficulties

It is not necessary to describe milk transportation tanks to this audience; at least one such tank is on display at the Dairy Industries Exposition. Nor should it be necessary to enlarge upon the statement that all of the tanks currently in service are not as modern in design, nor as recent in construction, as that on display. Design which ignores principles of sanitation, and disrepair resulting from years of service, constitute serious handicaps to the effective cleaning which is a prerequisite to the complete sanitization of the tanks. This is essential to the preservation of milk quality during transit. The past six years have been a continuous nightmare to transportation tank operators. Marked increases in the volumes of milk to be transported daily, together with the inability to obtain additional tanks, a situation aggravated by the difficulties and delays attendant upon the procurement of motor and chassis parts, necessitated the retention in service of tanks which normally would have been replaced. Also it became necessary to operate transportation vehicles with fewer and shorter intervals for reconditioning and repairs.

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Because the design and state of repair of tank interiors, manholes, outlets, inlet pipes, valves, air-vents, and agitators vitally affect the feasibility and ease of effective cleaning, and the time required therefor, a resumé—not necessarily complete—of defects found in milk transportation tanks which have been in long and continuous service will serve to illustrate the nature and magnitude of the difficulties which must be overcome in the maintenance of good bacterial quality of milk in transit.

*Tank lining*

Metal—dents and scratches; crudely applied patches; opened seams or welds, which permit leakage.

Glass—erosion in spots, exposing the metal, which is also corroded; chipped areas, especially at the edges of openings.

*Manhole doors*

On top—rough finish on the inner surface; connection and air-vent openings threaded completely through the casting.

At the end, and on top—hinges worn, permitting play; gaskets permanently installed, sometimes with rivets.

*Outlet valves*

Deteriorated rubber gaskets; lead or tin gaskets pulled so tight that the metal is extruded as much as ¼ inch or more into the bore of the outlet, forming a pocket; deep shoulders in the valve construction, forming pockets; outlets located in the bottom of the tank, so that the outlet is in the form of a bend, and the valve is both inconvenient and difficult to remove.

*Inlets*—frequently of the goose-neck variety, difficult to clean and to inspect.

*Air-vents* — interiors unfinished; threaded shanks not extending through the manhole cover, thus leaving exposed threads in the threaded opening.

*Agitators* — blades rough; shaft packed, and not removable for cleaning.

*Manhole hoods and valve covers*—broken or lost hoods and covers virtually un-replaceable because of material and labor shortages.

*Insulation*—covering broken or torn, permitting the insulation to deteriorate.

The foregoing list of defects has not been included to create the impression that a majority of milk transportation tanks are in an extremely dilapidated and unsatisfactory condition. It is, however, a roster of the conditions, one or more to a tank, which are likely to be found wherever milk sanitarians are devoting little or no attention to this feature of the handling of raw milk for pasteurization. These defects play a prominent role in the deterioration in bacterial quality which sometimes takes place between receiving stations and pasteurizing plants.

Reference has been made to these several types of transportation tank defects and disrepair because, when existent, they are constantly a contributing cause to ineffective cleaning. In these days of 40-hour weeks and increased overtime pay, time consumed in cleaning difficult-to-reach recesses, and roughened or corroded areas is costly to the concern responsible for the condition of the tanks. Consequently the time allotted for the cleaning of each tank is limited, and some of the recesses and areas are not cleaned every time the tank is washed. However, important as the physical condition of tanks is with respect to effective cleaning, it is merely incidental when compared with the prevailing disorganization of milk transportation tank cleaning and sanitization as a factor in the increase in bacterial content of milk in transit.

Milk distributing concerns which operate the receiving stations from which their raw milk supplies are obtained, and which own and operate a fleet of truck and trailer tanks, or lease a number of railroad car tanks, are in position to maintain an organized tank cleaning and sanitization service, although break-downs in such services are not infrequent.

All of the milk transportation tanks in service do not routinely shuttle between the same receiving stations and milk plants, however. Many are operated by trucking concerns, some by individual owner-drivers, and provide a contract or single-trip merchant service. This morning a contract tank may pick up a load of whole milk at Receiving Station A and haul it to Milk Plant B; late this afternoon it may take on a merchant load of skim-milk at Receiving Station C to be delivered to a condensary or cheese plant, where it is unloaded after sunset. To-morrow morning it will return to Receiving Station A for the milk for Milk Plant B. Will the tank have been washed and sanitized after unloading the skim-milk after sunset? Will someone at Receiving Station A inspect the tank interior, and noting that it has not been cleaned, wash and sanitize it before loading the milk for Milk Plant B? The bacterial quality of the milk received at Milk Plant B to-morrow will surely reflect any omission of sanitization of that transportation tank since it was unloaded there this afternoon. I doubt that it would be possible, in fewer words, to present the nature of the problem encountered by milk sanitarians who deal with milk supplies transported in tanks.

## REGULATORY CONTROL

Paradoxically, however, relatively few milk ordinances prescribe, in detail, the control measures which are to be applied to transportation tanks. The enforcement authorities must arbitrarily, and on their own initiative, apply to these vehicular containers the provisions prescribed for milk cans and stationary receptacles, if they undertake their control. It is quite obvious, of course, that the circumstances and conditions under which transportation tanks have to be cleaned and sanitized, and the responsibilities for their sanitary condition, do not parallel those which pertain to milk cans and milk receptacles in receiving stations and milk plants. It, furthermore, is axiomatic that control measures should preferably be predicated upon legally adopted provisions which are relatively specific.

In Chicago, where approximately 340 truck and trailer tanks, and about 40 railroad car tanks are in constant service, studies were conducted and rules discussed with trucking concerns, receiving station and milk plant operators, and health authorities, over a period of approximately two years before regulations satisfactory to all concerned were drafted, and adopted by the Board of Health on July 19, 1945. They amplify Item 26r of the specifications for Grade A Raw Milk for Pasteurization. (A copy is appended.)

In essence this regulation

1. Applies to all milk transportation vehicles.

2. Prescribes substantial construction, good repair, tight closure, and cleanliness, and prohibits the transportation of contaminating substances or materials (Item 26r, U.S.P.H.S. Milk Ordinance); it also prescribes removable shelves, if milk cans are carried in tiers, and the separation of cans of Grade A and of ungraded milk.

3. Prescribes that tank construction, and the degree of cleanliness, shall comply with Items 12 (r) and 13 (r), and with 10 (p) and 12 (p), respectively, of the specifications for Grade A Raw Milk for Pasteurization, and for Grade A Pasteurized Milk.

4. Prescribes that tanks shall be cleaned *at the point of unloading*, and shall then be tagged, at the manhole or inlet, to indicate where, when, and by whom that operation was conducted.

5. Prescribes that tanks shall be bactericidally treated prior to loading, the nature of the bactericide, and where, when, and by whom treated, to

be recorded on the reverse of the tag on which the cleaning data were recorded. These tags must be kept on file for three months.

6. Prescribes that the manhole and outlet valve of loaded tanks—except those in railroad cars—shall be sealed, and that railroad car doors shall be sealed.

7. Prescribes that tanks shall be tagged to identify the source and nature of the contents and the date of their receipt from producers, and

8. Prescribes that every milk transportation vehicle display on each side the legend: *Chicago Board of Health Permit,* and immediately thereafter the number of the permit issued, and the number assigned to that vehicle.

A brief discussion of the application of the permit system to milk transportation vehicles may be of general interest. The U.S.P.H.S. Milk Ordinance prescribes that milk distribution vehicles display the number of the permit issued to the distributor whose products they transport. This provision set the precedent, in the Chicago Milk Ordinance, that milk haulers, whether of cans or of tanks, be required to obtain and hold permits. But many haulers, both milk concerns and merchant haulers, operate more than one vehicle. Therefore, a permit is now issued for each vehicle, but the basic number of all the permits issued to any hauler or concern is the same, the vehicles being numbered serially. The permit number of a vehicle may thus be: 1285–6. In this manner every vehicle is positively identified, and inspection findings may be filed against that particular unit. This also facilitates control activities, because a permit must be obtained for each new vehicle added to the fleet, and when a truck or tank is damaged or becomes unfit for use, the permit for its operation may be revoked.

This discussion of permits is somewhat of a digression from the main subject of this paper; nevertheless, reference has been made to it, because it is the mechanism by which control over the sanitization of milk transportation vehicles is exercised.

This is an appropriate point to philosophize that the adoption of control regulations does not, per se, bring about complete control; it is merely the initial step.

### CLEANING FACILITIES

It was soon discovered after enforcement activities were inaugurated that numbers of the milk plants at which bulk milk was received in transportation tanks were not adequately equipped to wash them. Unloading areas (where tanks usually are also washed) were not impervious, or were not properly drained; hose connections were inconveniently located, lighting facilities were inadequate; and, one of the most serious obstacles to effective cleaning, the personnel assigned to this operation was frequently the last addition to the plant staff, and was untrained.

Parallel conditions existed at country receiving stations at which the tanks are loaded, particularly with respect to lighting. Washing facilities must also be provided at these stations, for tanks sometimes arrive in a condition unsuitable for loading and must be washed or re-washed.

Favorable progress is being made in the installation of adequate overhead lighting (much loading of tanks occurs after sunset, especially during winter) and extension lights and connections. The installation of transformers to reduce the voltage and the use of sealed beam light globes is recommended, because the effective washing and inspection of tank interiors are dependent upon adequate lighting of all parts.

### BACTERICIDAL TREATMENT

Effective bactericidal treatment of the tanks prior to loading is somewhat more difficult of attainment than was anticipated. The entire inner surface area of a tank cannot effectively be sprayed by leaning into the manhole and pointing the spray-nozzle first toward one end and then toward the other end. Some nozzles project a fine stream, instead of a misty spray. It would require far more time than is usually devoted to this operation to wet the entire inner surface with such a nozzle. Spray equipment, of the cheaper type, corrodes and deteriorates rapidly when chlorine compounds are used as the bactericide. It has been observed, when the spray is out of order, that a few pailfuls of chlorine solution are poured into the tank, and the man detailed to treat it gets into the tank, and, with a brush attempts to sweep the solution around the periphery, and against the ends, hoping to contact all surfaces, including the top, without completely soaking himself and his clothes. This is, of course, preferable to omission of treatment until the spray is repaired; but its effectiveness is, to say the least, questionable. We are recommending that sprays which produce a fog be suspended through the manhole, the manhole closed and the outlet valve opened, and permitted to function until the fog issues from the outlet.

One inspector is detailed to transportation tank inspection. He is provided with suitable outer garments and overshoes, and a powerful flash light and a sealed beam extension connection. (He uses the latter where there is a transformer on the line.) He removes the outlet valve and all other removable parts when making an inspection, and gets into the tanks.

Much progress has been made in fifteen months of intensive application to this undertaking. We feel assured that this activity must necessarily be reflected in improved bacterial quality of bulk milk when it reaches city milk plants. Our experience has convinced us that milk transportation tanks constitute a segment of milk handling equipment which has not been sufficiently emphasized in milk ordinances and regulations—particularly since so many communities now obtain milk from distant sources.

REFERENCE

1. Smith, R. S.—Transporting Milk in Tanks. *Annual Report of International Ass'n. of Dairy and Milk Inspectors,* 1922.

RESOLUTION

WHEREAS, Provisions pertaining to vehicles used to transport milk and milk products for consumption in Chicago are included in a number of separate Board of Health rules and regulations; and

WHEREAS, These provisions should be integrated into one section of regulations; and

WHEREAS, Certain of these provisions should be amplified, clarified, and made more specific;

THEREFORE, BE IT RESOLVED

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

5. That Item 26r of the regulations pertaining to Section 154–14 of the Municipal Code be and it is hereby amended by striking out the present wording, which is as follows:

"All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect the milk or milk products from the sun and from freezing, and from contamination. Such vehicles shall be kept clean and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination." "Milk haulers shall furnish to the board of health at least once each month a list showing the name and address of each producer whose milk has been hauled during that period, the amount of milk hauled daily, and the name and address of the milk plant supplied with such milk," and by inserting in lieu thereof the following:

"All vehicles used for the transportation of milk or milk products, in cans between farms and receiving stations and milk plants, shall be of substantial construction; shall be provided with means for tight closure; shall be in a state of good repair; shall be clean; and shall, when milk cans are carried in tiers, be provided with removable racks or shelves, so that the bottoms of upper tiers of cans do not come into contact with the lids of lower tiers of cans. No substance which may contaminate milk shall be transported with milk or milk products in such manner as to result in potential contamination thereof. Tanks used for the transport of fluid food products other than milk, or of milk or milk products from sources which do not hold Board of Health permits, prior to their use for the transport of milk or milk products, shall be given special treatment approved by the Board of Health, to remove all traces of the said products before being used for the transport of milk or milk products. In the event that milk from sources which do not hold Board of Health permits are transported in cans in the same vehicle with milk or milk products from sources holding permits, contained in cans, the cans containing the two kinds or types of milk shall be kept separate.

"Milk tanks mounted on trucks or trailer chassis, railroad cars, or other conveyances, and used for the transportation of milk and milk products shall conform in construction and state of repair to the requirements of Items 12 (r) and 10 (p); the outlet valves of all tanks so used, except those on such tanks as are completely enclosed in the transportation conveyance, shall be provided with tightly fitting hoods or dust covers.

"Tanks used for the transportation of milk or milk products, and all piping, connections, and pumps used in withdrawing milk therefrom, shall be cleaned, as prescribed in Items 13 (r) and 12 (p), as promptly as possible after the removal of the contents. Tanks shall be cleaned at the point of complete unloading, unless otherwise directed by the Board of Health. After cleaning, a tag shall be attached to the manhole or inlet closure, on one face of which is inscribed the following information: (a) the word "CLEANED;" (b) the permit number of the tank or trailer unit; (c) the date and time at which the tank was cleaned; (d) the place at which the tank was cleaned; and (e) the name of the person who cleaned the tank.

"If a tank, cleaned and tagged as herein prescribed, is used for the transportation of milk or a milk product from a source to which a Board of Health permit has not been issued, the holder of the tank truck permit, or his agent, shall remove and destroy the tag bearing the legend "CLEANED," before the tank is filled at such source.

"Tanks which, upon arrival at milk receiving stations, bear tags indicating that they have been cleaned, shall, prior to the placing of milk or a milk product therein, have their milk bearing surfaces and outlet valves adequately treated with a bactericide, as prescribed in Items 14 (r) and 12 (p). When such bactericidal treatment of a tank has been completed, the tag indicating the cleaning thereof shall be removed, and on the reverse side thereof shall be inscribed the following information: (a) the words "BACTERICIDALLY TREATED"; (b) the nature of the bactericide used; (c) the date and time of bactericidal treatment; (d) the place at which such treatment was administered; and (e) the name of the person who administered the treatment.

"Whenever the milk or milk product content of a tank is divided among more than one consignee, the piping and fittings used in removing the tank contents shall be cleaned and given bactericidal treatment after each successive usage.

"The tags reporting the cleaning and bactericidal treatment of every tank in which milk or a milk product has been transported shall be kept on file at the milk receiving stations at which the tanks were loaded, for a period of at least 90 days, and shall be available for inspection by representatives of the Board of Health.

"Whenever a tank is known to have been last used to transport milk or a milk product from a source to which a Board of Health permit has not been issued, or arrives at a milk receiving station without a tag indicating when, where, and by whom it was cleaned, or is found to be unclean, it shall be cleaned before it is given bactericidal treatment, as hereinbefore prescribed. A tag recording both such cleaning and bactericidal treatment shall be prepared and kept on file, as hereinbefore prescribed.

"Tanks used to transport successive loads of milk or a milk product from a railroad tank car to a pasteurizing plant, without an interval of delay between loads, shall not be required to be cleaned and bactericidally treated, and tagged, after the removal of each successive load, provided such tanks comply with the said requirements before the first of the said successive loads is placed therein.

"The top manhole, the inlet port, and the outlet valve cover of every tank used for the transportation of milk or a milk product, except those housed in closed railroad cars, shall be sealed, immediately after the completion of the loading operation, by a means approved by the Board of Health. Railroad car doors shall be sealed promptly after the loading of the tanks, with regulation railroad car seals, or each tank in the car shall be sealed in the manner prescribed for tanks on automobile trucks. Such seals shall remain unbroken until the tank contents are transferred into the custody of the consignee. In cases of multiple deliveries from the same load, the foregoing requirement shall apply only to transport between the loading point and the first consignee.

"The contents of every tank of milk product in transport shall be identified by a tag attached to the outlet. Such tags shall bear the following information: (a) a designation of the contents of the tank, as defined in Section 154–1 of the Municipal Code; (b) the name, the permit number, and the post office address of the milk receiving station at which the contents were collected or processed; (c) the date of receipt thereof from the producers; and (d) the name and address of the consignee.

"In the event that the contents of a tank consist of portions from two or more receiving stations, such tank shall be tagged so as to indicate the source and amount of each such portion.

"The bodies of all vehicles regularly used for the transportation of milk and milk products, in cans or in bulk, shall display, on the front and on the rear, in plain view, the word "MILK," in letters not less than six inches high, and shall display on both lateral sides, in plain view and in letters at least three inches high and one and one-half inches wide, the name and address of the person holding the permit to operate the said vehicle, and the legend "CHICAGO BOARD OF HEALTH PERMIT," and immediately thereafter the permit number, together with the number assigned each vehicle by the Board of Health for the purpose of identification."

At the meeting of the Board of Health on July 19, 1945, the above resolution was adopted.

# The Minimum Sanitary Requirements of the National Cheese Institute and How They Work In Practice*

E. L. Reichart

*National Cheese Institute, Inc., Chicago, Illinois*

The National Cheese Institute has approached the problem of sanitary standards from the standpoint of raw material and physical facilities and methods.

Our Research Committee and our Quality Committee, in preparing recommended minimum standards, were fully aware of the necessity of establishing standards that were not only sound and dependable from a public health standpoint but were also practical and feasible from the operating man's viewpoint. Too many programs of quality improvement in the past have been predicated on a theoretical ideal and have, subsequently, failed of realization because the operating or manufacturing departments were unable to put the programs into effect.

That the present wave of enthusiasm for increased quality of raw material and sanitation of facilities and methods is the result of recent activities of the Federal Food and Drug Administration, as well as increased vigilance of various state dairy departments, is a pretty generally accepted fact. With the minimum acceptable criteria, established by these regulatory bodies as the immediate goals that must be achieved, our Research Committee and Quality Committee have established the following minimum standards for milk to be used in the manufacture of cheese:

1. Milk will not be accepted if it does not comply with local state laws.
2. Milk with objectionable flavor characteristics is not to be accepted.
3. Each patron's milk is to be tested for sediment by the "bottom of the can" method and all milk showing a sediment pad worse than No. 3 or evidence of mastitis or any objectionable extraneous matter will not be accepted. (A No. 3 pad is the equivalent of 2.5 milligrams of prepared standard dirt.)
   Patrons delivering milk showing a No. 3 sediment pad will be warned at the time of testing.
4. Cans used in transporting milk from farm to factory should be of such construction as to be easily cleaned, must be kept clean, and in good repair.
5. New patrons must meet the above requirements before being accepted.
6. It is further recommended that each producer's milk be subjected to the methylene blue reduction test at least semi-monthly.

We are fully aware that these minimum requirements do not represent an ideal milk supply, but they are the first step in the direction of improved quality and were considered possible of early attainment. In discussion with regulatory officials, it was agreed that compliance with these milk standards would eliminate present objections from a milk quality standpoint. As these milk sediment standards were jointly adopted by the National Cheese Institute, the Evaporated Milk Association, and the Dry Milk Institute, it seemed that non-conflicting and satisfactory operating conditions would be attained.

Our members adopted this program this spring and have found it practical and desirable, as well as conducive to better quality in the resultant finished cheese.

In the application of this program, a number of developments were encountered that may be of interest.

Extraneous matter found in milk is

* Annual Meeting, Wisconsin Milk Sanitarians Association, 9-12-46, Stevens Point, Wisc.

not always the producer's fault. It may be introduced into the milk from the can itself, from rinse water, or from environmental conditions occurring while the milk is in transit.

Much more frequently than is generally assumed, sediment is traceable to faulty can washing operations, cans in poor condition, or to steps being taken by the farmer, such as rinsing his cans previous to use that introduce extraneous material in objectionable quantities. Before unsatisfactory milk is called to the producer's attention, the plant management should make certain that it, itself, is free of blame.

If the cans are eliminated as a source of contamination and you are sure that dirt did not enter the milk after it left the producer, then and then only should he be contacted for necessary improvement in producing techniques. Intelligent field work is absolutely necessary at this stage.

It is the exceptional producer who deliberately sells poor milk, and most farmers are anxious and willing to show necessary improvement if shown how to effect such improvement. Too frequently the producer is sold additional equipment or encouraged to make costly improvement in his physical plan, when simply good housekeeping procedures would assure satisfactory results. Fundamentally, all efforts should be concentrated on keeping extraneous material from getting into the milk. Clean healthy cows, clean milkers, clean milking place, clean utensils, including clean cans, and protection of the milk after it is placed in the can will produce clean milk. Of course, proper straining is helpful in reducing sediment, but keeping sediment out first is far more important from a sanitation standpoint.

Milk is the raw material of the cheese factory. Cheese is the raw material of the processing plant or cheese assembler, and presents a problem as difficult, if purchased from factories located in distant sections, as does milk to the local cheese factory. The processor is responsible for the finished product and if he uses cheese that inadvertently contains extraneous material he will soon find himself in difficulties. All cheese should be periodically examined, as is the milk received at the factory, to assure a satisfactory raw material for processing. Our Research Committee and Quality Committee have established "Sediment Standards for Cheese" as well as a method for routine examination of cheese for extraneous material, that is being used with good results.

Minimum sanitary standards for the finished product depend, however, jointly on raw material and plant facilities and condition. The latter have received increased attention in recent months and need continued emphasis. Difficulties in obtaining materials have retarded this program considerably.

The National Cheese Institute's Research Committee and Quality Committee have prepared "Sanitary Standards for Cheese Factories" which are being rapidly adopted by factories and proving of considerable value in eliminating common causes of difficulties with the production of a quality product.

As one of the more difficult sanitation problems involves successful insect and rodent control, the National Cheese Institute, several years ago, sponsored a project at the University of Wisconsin, under the supervision of Dr. E. M. Searls, to study insect and rodent control in dairy plants. This spring a group of research and quality control men, from the food industry, formed a committee with representatives of major food processing groups, which meets periodically and discusses the developments in the field of insect and rodent control. It is hoped that, in this manner, successful methods and materials will more rapidly become known and all interested in this important phase of quality improvement will keep current of developments.

Summarizing our experiences with Standards for Sanitation, I would say that progress made has been proportional to the sincerity of effort put into the program. Greater availability of material and labor for repairs, as well as new machinery, will greatly aid the progress of this work.

# SANITARY STANDARDS FOR CHEESE FACTORIES

NATIONAL CHEESE INSTITUTE, INC.

110 North Franklin Street

Chicago 6, Illinois

I. Standards for Factory Premises.

1. Dust Control—Dust shall be adequately controlled to prevent contamination of milk, curd and cheese.

2. Drainage—Suitable drainage shall be provided to allow quick run-off of all surface water around factory and from factory buildings.

3. Odor control—All sources of objectionable odors shall be eliminated.

4. General appearance—Lawns, flowerbeds, and shrubs shall be well kept and the general surroundings shall be free of discarded equipment or other debris.

II. Standards for Plant and Equipment.

1. Exterior of plant. The exterior shall be in good repair and wood structures shall be painted.

2. Floors. The floors of all rooms in which milk and dairy products are handled shall be constructed of concrete or other equally impervious and easily-cleaned material and shall be smooth, properly drained, provided with trap drains, and kept clean.

Interpretation 1. For factories having wood floors the compliance will be deemed satisfactory if floors are constructed so that no cracks or crevices exist which would make them difficult to clean and if such floors are kept in sanitary condition.

3. Walls and ceilings—Walls and ceilings of rooms in which milk or dairy products are handled shall have a smooth washable light-colored surface and shall be kept clean.

4. Doors and Windows—Unless other effective means are provided to prevent the access of flies, rodents and vermin, all openings from rooms where milk is exposed shall be effectively screened, and doors shall be provided with self-closing devices.

5. Lighting and ventilation—All rooms in which milk is handled shall be well lighted and ventilated, in compliance with State Laws.

6. Miscellaneous protection from contamination—The various milk handling operations shall be so located and conducted as to prevent any contamination of the milk or of the cleaned equipment.

Interpretation 1. Weigh cans. Downspouts from weigh cans shall be constructed to prevent the entrance of flies, dust and contamination of the milk.

7. Protection from insect, rodent and pet contamination—Plant and surroundings shall be so constructed and maintained as to prevent the entrance of rodents or their harboring on the premises. Pets shall not be allowed in the manufacturing, cheese storage or supply rooms.

8. Toilet facilities—Toilet rooms shall not open directly into any room where milk or milk products are exposed. The doors of toilet rooms shall be self-closing. Toilet rooms shall be kept in a clean condition, in good repair, and well ventilated.

Interpretation 1. The toilet room. The toilet room shall be conveniently located. It must be adequately screened.

Interpretation 2. Toilet room equipment. Hand washing facilities must be provided in the toilet room. The room must be equipped with self-closing metal container for used towels.

Interpretation 3. Where outside toilets are permitted, they shall be constructed according to approved sanitary requirements and shall be maintained in a sanitary condition.

9. Water Supply—The water supply shall be easily accessible, adequate, and of a safe, sanitary quality.

Interpretation 1. Approval of supply. All supplies of water used for drinking, and washing equipment shall be tested by The Division of Sanitary Engineering or Department of Healtn of the state in which the plant is located at least twice each year, and shall meet its drinking water requirement. Provided, however, that after three years of satisfactory inspections, it shall be sufficient to make inspections once each year. Reports of the tests should be kept on file at the plant office for inspection.

Tests for the sanitary quality of water shall be made at (a) the water outlet used for washing equipment and (b) a drinking water outlet.

10. Hand washing facilities—Convenient hand washing facilities shall be provided, including running water, soap, and approved sanitary towels. The use of a common towel is prohibited.

Interpretation 1. Facilities for hand washing. Hand washing facilities shall be provided at a convenient location for employees of the receiving room and processing room.

Interpretation 2. Warm water shall be provided for hand washing in toilet rooms.

11. Intake—Shall be a separate room.

12. Curing room—Shall be a separate room of adequate size and equipped with facilities for reasonable temperature control. Shelving shall be of a type which can be readily taken down for cleaning.

Interpretation 1. Shelving shall be constructed so that it may be removed for cleaning.

Interpretation 2. Vegetables and canned goods shall be kept in closed cabinets or containers if it is necessary to store them in this room.

13. Salting room—Shall be a separate room of adequate size and free from unnecessary supplies and equipment. Salting tables shall be in good repair and kept clean. Salt brine tanks shall be in good repair and clean.

14. Storage room—Shall be in good repair, orderly and free from unnecessary materials and equipment.

15. Boiler room—Shall be separated from make room and other rooms where dairy products or dairy supplies are handled or stored. It shall have tight partitions and self-closing doors. It shall be orderly, in good repair and free from useless material and equipment.

16. Milk Piping—Only sanitary milk piping of a type which can be easily cleaned with a brush shall be used.

Interpretation 1. The pipe line. The maximum length of any single piece of pipe shall be twelve feet. Pipe shall not be spliced.

Interpretation 2. Finish. Replacements and new purchases of stainless steel milk pipe shall have a minimum finish on the inside surface as that which is obtained with not less than 120 grit (polish) properly applied.

Interpretation 3. Fittings. All new fittings shall be of the recessless type. Recessless fittings shall be used on all new pipe or replaced pipe.

Interpretation 4. Valves. Replacements and new purchases of valves through which milk or edible milk products are handled must be of sanitary construction and made of white metal or stainless steel.

17. Construction and Repair of Containers and Equipment—All containers and equipment with which milk products come in contact shall be constructed in such manner as to be easily cleaned and shall be kept in good repair.

Interpretation 1. Whey Storage Tank. Tanks for milk or whey to be skimmed, when located in the make room, shall be easily accessible for cleaning. When located in separate room, the room shall be tightly sealed, properly lighted and ventilated and with an ample supply of hot water for washing and scalding. Floors of such room shall be of water-tight material.

Interpretation 2. Agitators. A drip pan shall be placed beneath all mechanical agitators, machinery or other equipment to prevent oil, grease, or other extraneous matter from dropping into the vats or onto the milk products.

Interpretation 3. Sanitary pumps. All pumps for handling milk or milk products shall be of sanitary construction, and constructed of non-corrodible material.

Interpretation 4. Starter equipment. In all factories where starter is used suitable equipment shall be provided. For detailed reference see Appendix "A".

Interpretation 5. Swiss cheese kettles. Inasmuch as Swiss kettles are constructed so that they are not self-draining, they shall be completely dried immediately after being used.

18. New Equipment. Throughout the plant when new equipment is installed, it must be of sanitary construction.

Interpretation 1. It is recommended that all new equipment used in the handling of milk and milk products be constructed of stainless steel. Foreign type cheese kettles may be an exception.

19. Locker Room. When locker space is provided it shall be kept in a clean and sanitary condition.

20. Placement of Equipment. Equipment shall be so placed as to be readily accessible for all manufacturing and cleaning operations.

III. Plant Operation.

1. Over-Flow Milk—Drip or over-flow milk shall not be used in the production of cheese.

Interpretation 1. Drip Milk. Drip Milk is that milk which is accumulated after the inverted can passes its normal dumping position and prior to the first washing operation.

2. Cleaning and Bactericidal Treatment of Milk Piping, Containers and Apparatus. All piping, containers and apparatus used in handling milk and milk products shall be kept clean. After cleaning, such equipment shall be subjected to an approved bactericidal process.

Interpretation 1. Cleaning of Pipe. Adequate facilities must be provided for the washing of pipe. All pipe lines through which milk is handled are to be taken down daily and washed with a brush. Demountable pipe fittings such as tees, elbows, etc., shall be cleaned in a vat using brush and washing powders.

3. Handling of Milk Piping, Containers and Apparatus—Between bactericidal treatment and usage, and during usage, piping, containers and apparatus shall not be handled or operated in such manner as to permit contamination of the milk.

Interpretation 1. Chlorine Strength. The amount of chlorine (inorganic) in chemical sterilizing solutions shall at no time be less than fifty parts per million of available chlorine.

Interpretation 2. Cloth Filter Bags. Cloth filter bags or cloths are to be used but once. The use of cloth filter bags tied to the ends of pipe should be discouraged and the filter bag when in use must not float in the filtered milk.

4. Cleaning Milk Cans—Before releasing milk cans to patrons, such cans must be cleaned, sterilized and dried.

Interpretation 1. Clean Cans. Producer's milk cans should be periodically inspected for cleanliness.

There shall be filed in the office of the plant superintendent a report of this inspection which shall include (a) the date of inspection, (b) number of cans examined, (c) number of cans found unclean, and (d) the probable cause for unclean cans.

The can washer shall be cleaned and inspected daily for proper operation.

5. Disposal of Wastes—All wastes shall be properly disposed of.

6. Miscellaneous—Special precautions shall be taken to avoid contamination of milk, curd and cheese with microorganisms and extraneous material.

Interpretation 1. Rubber Squeeges. Rubber squeeges shall be used instead of brooms in handling curd in the vat.

Interpretation 2. Metal Sponges. Metal sponges shall not be used.

Interpretation 3. Smoking. Smoking and tobacco chewing shall be prohibited in all rooms where milk and cheese are handled.

Interpretation 4. Wearing apparel. All persons coming in contact with milk and milk products, containers or equipment, shall wear clean garments having no pockets above the belt, and caps and shall keep the body clothed at all times.

IV. Plant Personnel.

1. Health—Every employee whose work brings him in contact with the production or handling of milk, milk products, containers, or equipment shall have an annual medical and physical examination. All new employees shall have a medical and physical examination before reporting to work.

This item shall be deemed to have been satisfied if there is presented the physician's certificate of health, indicating absence of contagious disease.

Interpretation 1. Medical Certificate File. Medical certificates of all employees shall be filed in the office of the plant superintendent.

2. Cleanliness. All employees coming in contact with milk, milk products, containers, or milk handling equipment shall wear clean garments and caps and shall keep their hands clean at all times while thus engaged.

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Copies of these standards, with statements concerning satisfactory compliance, can be obtained from the National Cheese Institute, Inc., 10 N. Franklin Street, Chicago 6, Illinois.

# Some Observations on the Use of Roccal

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## INTRODUCTION

ROCCAL, a quaternary ammonium compound, has been giving satisfactory service for several years as a chemical bactericide in eating establishments. The product is reported by Krog and Marshall (3) to have certain attributes which makes it very desirable for use in sterilizing dairy farm utensils and milk plant equipment. These workers found it to exert a definite bactericidal action on the flora normally associated with milk handling equipment, that it is no more corrosive to metal and rubber than water and that it does not impart taste or odor to milk products when used as a general sanitizing agent. Harshbarger (1) reported that it was non-toxic to growing white rats when included in the diet at the rate of 3 percent. Scales and Kemp (4) reported good results when using this substance for sterilizing cows' udders prior to milking. Jacobsen (2) reported that quaternary ammonium compounds are used extensively for farm dairy sanitation.

## PURPOSE OF EXPERIMENT

There has been considerable differences of opinion between various dairy and milk inspection agencies regarding the use of Roccal on dairy farms and in dairy plants. In general, it has not been accepted although in some instances certain inspection officials have given their permission for it to be used. Since the work reported by others tend to establish its efficiency as a germicidal agent and that it is non-toxic, the experiments reported herein are intended merely to shed more light on this chemical with the thought in mind of clarifying some of the unknown points which might influence its use on farm dairies and in milk plants. A frequently asked question by those who do not permit its use is, "If this substance does not impart a taste or odor to milk when used as a sanitizing agent, what effect might it have if added directly to milk on the bacteria count and flavor of the product?" Realizing that there might be some unscrupulous or uninformed dairymen or dairy plant workers who actually would attempt to reduce the bacteria count of milk by the direct addition of such a substance, experiments were conducted to provide this information. Experiments were also conducted to determine the extent to which Roccal could be added to milk without detection by tasting.

## EXPERIMENTAL

### *Effect on Bacteria in Milk*

For these experiments two lots of milk were selected, lot 1, fresh whole milk of high quality with a comparatively low bacteria count, and lot 2, fresh whole milk of a lower grade having a relatively high bacteria count. Both lots of milk were subjected to the same treatments throughout the course of the experiments.

Thirty-six 100 ml. portions of each lot of milk were placed into sterile flasks. Aqueous Roccal solutions containing 10,000 and 25,000 parts per million were prepared. Six series of samples, each series being comprised of six 100 ml. portions of milk containing 0, 10, 50, 100, 200, and 250 parts per million of Roccal were prepared by adding the necessary amounts of the appropriate Roccal solutions. Three of these series were pasteurized immediately at 143° F. for 30 minutes in laboratory pasteurizing apparatus and cooled to 50° F. The other three series were left unpasteurized. Up to this point there are six series of samples of each lot of milk containing from 0 to 250 parts per million of Roccal, three series of each lot being pasteurized and three series raw. Within an hour standard plant counts were made on one series of the raw and one series of the pasteurized milk samples. The remaining four series of samples were stored at 50° F. and at the end of 24 hours a raw and pasteurized series were removed from storage and bacteria counts were made. After 48 hours the remaining two series of samples were removed from storage and examined for bacteria counts. This procedure was used to determine the effect of Roccal on bacteria when added directly to milk in varying concentrations. The results of the trials are shown in Table 1.

tasted immediately to determine the concentration of Roccal necessary to produce a flavor that could be detected by experienced milk judges. The remainder of the samples were stored at 50° F. and taste tests were again made at 18, 42, and 76 hours. The results of these flavor studies are shown in Table 2.

## DISCUSSION OF RESULTS

The data shown in Table 1 indicate that the addition of Roccal did reduce the bacteria count of both lots of milk. The substance was definitely more effective in reducing the bacteria count of the lot 1 milk having a low bacteria count than it was in the lot 2 milk having a high bacteria count. It may be observed also that the substance

TABLE 1

EFFECT OF ROCCAL WHEN ADDED DIRECTLY TO MILK ON THE BACTERIA COUNT *

*Lot 1*

| *Roccal* | *0 Hours* | | *24 Hours* | | *48 Hours* | |
|---|---|---|---|---|---|---|
| *Ppm.* | *Raw* | *Past.* | *Raw* | *Past.* | *Raw* | *Past.* |
| 0 | 17,500 | 70 | 53,500 | 65 | 595,000 | 30 |
| 10 | 13,000 | 50 | 22,000 | 80 | 528,000 | 50 |
| 50 | 6,000 | 30 | 13,000 | 50 | 368,000 | 10 |
| 100 | 4,500 | 100 | 6,000 | 20 | 180,000 | 20 |
| 200 | 4,500 | 10 | 4,500 | 0 | 10,000 | 0 |
| 250 | 1,500 | 50 | 11,500 | 0 | 25,000 | 20 |

*Lot 2*

| *Roccal* | *0 Hours* | | *24 Hours* | | *48 Hours* | |
|---|---|---|---|---|---|---|
| *Ppm.* | *Raw* | *Past.* | *Raw* | *Past.* | *Raw* | *Past.* |
| 0 | 294,000 | 2,000 | 600,000 | 4,000 | 528,000 | 4,500 |
| 10 | 296,000 | 2,000 | 605,000 | 1,900 | 330,000 | 5,000 |
| 50 | 255,000 | 1,500 | 228,000 | 50 | 120,000 | 3,500 |
| 100 | 260,000 | 150 | 242,000 | 0 | 45,000 | 500 |
| 200 | 158,000 | 100 | 110,000 | 0 | 55,000 | 500 |
| 250 | 55,000 | 10 | 66,000 | 0 | 69,000 | 200 |

* Standard plate count—Figures represent average counts on duplicate plates

### *Effect on Flavor*

Roccal was added to two series of 500 ml. portions of milk in such amounts as were required to yield 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50 parts per million of Roccal. One series of samples was pasteurized immediately at 143° F. for 30 minutes and cooled to 50° F. Both the raw and pasteurized series of samples were

caused a lowering of the bacteria count in the pasteurized samples. This effect may be noticed in both lots of milk but more particularly in the lot 2 pasteurized milk.

The bacteria counts on both lots of milk were reduced but it may be noted that a considerable concentration of Roccal was required to reduce the bacteria count appreciably especially in

TABLE 2

EFFECT OF ROCCAL WHEN ADDED DIRECTLY TO MILK ON THE FLAVOR *

| *Roccal* | *0 Hours* | | *18 Hours* | | *42 Hours* | | *76 Hours* | |
|---|---|---|---|---|---|---|---|---|
| *Ppm.* | *Raw* | *Past.* | *Raw* | *Past.* | *Raw* | *Past.* | *Raw* | *Past.* |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 2 |
| 10 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 15 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| 20 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 25 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 30 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 35 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 45 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 50 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

* Notations indicate the composite judgment of several experienced milk judges
1 = No off-flavor
2 = Puckery flavor
3 = Bitter flavor
4 = Very bitter flavor

the case of the lower quality milk. This is considered especially significant because it appears that the producer or processor of milk who is capable of producing milk of high quality with a low bacteria count would have no incentive to be careless with the use of Roccal or purposely to add it to the milk to reduce the bacteria count. The producer of low quality milk would have to add such an excessive quantity of Roccal as shown by the figures in Table 1 to affect an appreciable reduction in the bacteria count that the chemical could be detected readily by the average consumer of milk.

It may be observed by examination of the data in Table 2 that Roccal added directly to milk produced a noticeable puckery flavor at 10 parts per million which increased in intensity, becoming slightly bitter at about 20 parts per million and very bitter at 40 parts per million. Since this flavor occurs at such low concentrations of Roccal in milk it would seem unlikely that a sufficient quantity of Roccal could be added to reduce the bacteria count appreciably without producing a very undesirable and easily detected flavor in the resulting milk.

## CONCLUSIONS

Roccal added directly to milk reduced the bacteria count. The effect was more noticeable on low count milk than on high count milk. The bactericidal property of Roccal in milk was not affected by pasteurization. Roccal would have to be added to milk of low quality to the extent of 200 to 250 parts per million to bring about significant decreases in the bacteria count of milk.

Roccal in milk was detected by taste when present to the extent of 10 parts per million. The milk at this point had a slight puckery flavor which increased in intensity to a slight bitterness at 20 parts per million and to a very bitter flavor at 40 parts per million.

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# The Utilization of Whey*

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WHEY is in many respects a unique dairy product. Of course each and every dairy product is unique but whey is somewhat in the position in which the Irishman placed the bullfrog when he said, "Every one of God's creatures is unique only the bullfrog is more so."

Whey is unique in several respects. In general, it results from the substantially complete removal from milk of milk fat and casein. The composition of whey is somewhat influenced by the technique of its preparation. Casein whey differs from cheese whey and whey from several types of cheese show distinct differences in composition. There is also a tendency for whey to exhibit in a rather exaggerated form several factors such as seasonal, regional and species variations which commonly influence the composition of milk.

We might be able to spend a profitable hour discussing the composition of whey and factors which influence it. We might even spend an hour on riboflavin alone, but this is not the occasion.

Every student knows that the average composition of whey is about as follows:

| | *Percent* |
|---|---|
| Water | 95.15 |
| Protein | 0.87 |
| Milk fat | 0.23 |
| Lactose | 4.78 |
| Ash | 0.49 |
| Lactic acid | 0.19 |

When commercially dried, the composition of cheddar cheese whey becomes approximately:

| | *Percent* |
|---|---|
| Water | 3.7 |
| Protein | 12.2 |
| Milk fat | 1.0 |
| Lactose | 70.5 |
| Ash | 8.8 |
| Lactic acid | 2.9 |

Any very wide deviation from these figures strongly indicates that the whey has received violet treatment at some time or other.

A glance at these tables of composition brings out some of the unique characteristics of whey. It is the most dilute of dairy products. And for this reason alone, it has frequently been despised.

Making some comparisons with other dehydrated or powdered milk products, we observe the following approximate values.

*Lactose Content*

| | *Percent* |
|---|---|
| Dried cheese whey | 70 |
| Dried casein whey | 65 |
| Dried skim milk | 50 |
| Dried buttermilk | 48 |

*Protein Content*

| | *Percent* |
|---|---|
| Dried cheese whey | 12 |
| Dried casein whey | 10 |
| Dried buttermilk | 30 |
| Dried skim milk | 32 |

*Milk Ash or Milk Minerals Content* *

| | *Percent* |
|---|---|
| Dried cheese whey | 8.5 |
| Dried casein whey | 8.5 |
| Dried buttermilk | 8.0 |
| Dried skim milk | 8.0 |

* The actual ash content of commercially dried whey is frequently found to be considerably in excess of 10 percent. Such high ash content generally indicates the extent to which neutralization has been practiced. Neutralization is further indicated by an abnormally high alkalinity of the ash.

Some mention has been made of factors which have been imposed by

* Address given at Dairy Manufacturers Conference, University of Illinois, Nov. 16, 1945.

nature upon the composition of whey. These are both interesting and important. They, however, pale into insignificance when compared with the violence which may be done to its composition by rough treatment or by neglect. Whey is an excellent medium for the development of a wide variety of microorganisms. Acid development with its consequent reduction of lactose, and putrefaction are examples of what may happen to neglected whey. Neutralization may in part cover up but cannot correct defects produced by careless handling.

Now if we look for a moment at some of the characteristic constituents of whey some interesting observations may be made.

In general, when we talk about protein, we are inclined to think in terms of nitrogen times 6.25 or some other factor and thus arrive not at a scientific fact but at a rather highly generalized superficial statement.

We who are interested in dairy products sometimes pride ourselves upon a superior knowledge of milk proteins, *i.e.,* when we think of what is known about cereal and other vegetable proteins. We do, however, know a little about the protein or proteins of whey. A small portion of the protein is apparently casein or at least closely related to it. Another portion shows the characteristics of albuminoses or peptones. Whey protein is largely heat coagulable and thus comes under the classification of albumin and/or globulin. The amino distribution of the minor protein fractions is so far as I know almost completely unknown.

From the standpoint of nutrition we also know something about the protein of whey. Following the technique of Mitchell, we have found casein to have a biological value of 85.5 percent and the protein of whey, so called lactalbumin, 96.4 percent.

It thus appears that in spite of the sketchy information that we have on the protein of whey, this protein is of outstandingly high biological value. Dr. Cannon of the University of Chicago, making use of his technique in which serum protein and weight loss is restored to animals depleted by protein starvation, has also shown the high biological value of lactalbumin—the protein of whey. These observations confirm many previous observations accumulated over a long time.

High quality protein is none too plentiful in the world. And while the amount of protein percentage-wise in whey is small, nevertheless in the aggregate, whey might supply for human food a vast amount of one of nature's very best protein foods.

Another way in which whey is a unique product is the large proportion of lactose which it contains.

The scientific literature dealing with the nutritive value of lactose is very large and very confusing. For example "it has been suggested that milk sugar (lactose) is worth no more than store sugar (sucrose), *i.e.,* 5 cents a pound".

Another view of the matter is: "Unlike sucrose, lactose passes the ileo-cecal valve and forms in the intestine an exceptionally favorable medium for the growth of *Bacillus acidophilus* and related acid producers, thereby inhibiting protein putrefaction. By thus maintaining an acid reaction in the intestine, lactose moreover favors maximum calcium and phosphorus utilization (at least in the rat). It is known that (in the rat) the rickets-producing properties of some diets are repressed by supplementing with lactose."

Whey powder has long been used as a constituent of poultry feeds. One of the large uses for poultry is in the preparation of the so-called "flushing mash" which usually contains 25 percent whey powder. Such a mash is very laxative for chickens and helps in the control of coccidiosis. The flushing or laxative action of whey powder is directly attributable to its high lactose content.

Much recent work on the synthesis

of certain vitamins in the intestinal tracts of various animals including man, tends again to focus attention upon the possible role of lactose in such vitamin synthesis. The development of newer techniques provide tools for the re-evaluation of the dietary value of lactose. It is of course realized that the technical difficulties are great but we may confidently look to future research to clear up much of the confusion which exists in both scientific and clinical literature with regard to the value of milk in general and lactose in particular, especially as regards intestinal putrefaction and vitamin synthesis. It may even be found that Metchnikoff was correct in some of the conclusions at which he arrived, about the health value of milk products, especially acidophilus milk. Work of this sort may entirely modify or revise our concepts with regard to the vitamin requirements for man. Perhaps after all, we shall come to appreciate lactose. Incidentally vitamins while important, are far from being the whole story of nutrition, and vitamins certainly differ from high grade protein and essential minerals which are not synthesized in the alimentary tract—except of course for protein synthesis in ruminant animals.

The value of the ash or minerals of whey should certainly not be overlooked. Permit me to call attention to the experiments by Dr. Corry Mann on feeding milk to children. The following quotation is from the excellent book by Brody, *Bioenergetics and Growth,* page 795.

"His boys (Mann's) were receiving a diet rated as adequate, but Dr. Mann wanted to see what an extra glass of milk at meals (a pint per day) would do. Records were kept of half of the group on their usual diet, and of an equal number who received the milk supplement. The result was that while the 'control' boys gained 4 lbs. in weight and 1.8 inches in height, the milk-supplemented group gained 7 lbs. and 2.6 inches. 'The casual visitor would never fail to recognize the boys receiving the extra milk,' said Dr. Mann, 'they were obviously more fit.'

"The spectacular growth-accelerating effect of milk on weight and especially on height (skeleton growth) is perhaps due largely to the richness and availability of calcium in milk. In Mann's experiments, the addition of casein equivalent to that given in milk and margarine equivalent to the butterfat in the milk did not increase the height as did whole milk. Leighton and Clark found that skim milk increased growth in height as much as whole milk. These observations lead to the conclusion that the calcium in milk is a major factor in increased growth of the skeleton. Ordinary diets are more often deficient in calcium than in any other nutrient, and are thus made good by milk."

Riboflavin was first discovered as a constituent of milk and whey and called "lactoflavin". The fluorescent yellow color of whey is due very largely to its riboflavin content. The principal source of riboflavin in the American dietary is dairy products. Ordinary commercial dried whey contains from 20–30 gamma of riboflavin per gram. Thus whey is a vast and sofar as human food is concerned, almost an untapped source of this important dietary factor. Whey, like milk, also contains considerable amounts of other water soluble vitamins.

Now I have taken considerable time in talking about what whey is and what it contains. I have done this for the purpose of stimulating thought as to ways and means for utilizing this great store of valuable food elements.

Whey is probably the No. 1 neglected dairy product. The chief reasons that whey has been held in such general disregard is because it is such a dilute product and because it has very generally been mishandled. When whey is handled in the same manner in which fresh milk is or should be handled it is certainly not offensive to the senses of taste and smell. And when sound fresh pasteurized whey is handled only in stainless steel equipment and dried with all of the precautions which should be observed in the drying of fresh milk it is really a very fine product, both in flavor and odor.

The largest use of whey is in poultry

and animal feeding. In this field, dried whey has been used for some twenty years with outstandingly good results. In general, it seems that whey in poultry and animal feeding takes the place occupied by milk added to the already adequate diet of the boys in Dr. Corry Mann's experiments, to which reference has been made above. Whey, like skim milk and buttermilk is the plus factor in poultry and animal feeds which helps so much in the production of sound healthy stock.

For human food the coagulable protein of whey has long found some small use in whey cheese which on account of the unusually high value of the protein which it contains, should be appreciated for its food value.

Concentrated or dried whey has found its largest use as human food as a constituent of cheese foods, the nutritional value of which has been demonstrated over and over again.

Dried whey is an excellent ingredient for the baking of cakes and pastry. It is, however, little used. This is also the case with confections.

Whey has found some industrial uses in the production of lactic acid and its derivatives also in the production of alcohol and vinegar. Other industrial uses offer distinct possibilities. It is, however, as a food that whey should find its place.

In closing I would like to quote a paragraph from the report of the American Dairy Science Association Committee on "Post-war Utilization of Dairy Products", appearing in the October 1945 issue of the *Journal of Dairy Science.*

"In considering the utilization of whey it should be pointed out that the 90 pounds of liquid whey that is produced in the manufacture of 10 pounds of cheese is another source of human food that has heretofore not been utilized to any great extent. With the adoption by various states of regulations and laws requiring the pasteurization of milk for cheesemaking, which in turn is likely to tend toward the development of larger factories for the manufacture of cheese, it seems logical to conclude that larger amounts of good pasteurized whey will be available. This naturally suggests that various possible uses for whey will be given more serious consideration in the future. Whey solids have found use in cheese foods and cheese spreads, in baked goods, soups, and candies. Whey is used as a source of lactose and lactic acid. The use of lactose for the manufacture of penicillin has stimulated lactose production. The largest use of whey has been and still continues to be for animal feed. Whey has excellent food values and its further use in various food products offers distinct possibilities."

It is my plea to the dairy industry that consideration be given to the great values of whey as a food product and that ways and means for its further utilization be given serious consideration.

# Symposium on Milk Equipment

## Present and Future Status of Milk Plant Equipment and Materials *

R. D. Britton

*General Manager, Wisner Manufacturing Corp., New York City*

The subject of this symposium, as you know, is "Present and Future Status of Milk Plant Equipment and Materials", which subject can be interpreted in several ways. It would be fitting to assume that this group would be interested in this from the standpoint of sanitary improvements and technical developments, and yet there is another angle which might be brought to your attention and which I will touch upon later.

Generally speaking, an observation of the displays at the exhibition hall reveals no radical changes in the principles of major equipment, although some companies have endeavored to give you a preview of what might be expected in time to come.

There are, however, certain things of interest which are new and which I shall endeavor to mention briefly. For instance, there is a device for can washers which maintains a given range of solution strength in the solution tank, electronically operated and equipped with a warning signal at the front end of the machine which lights red when the solution strength drops below the minimum strength desired.

Also, there is a volumetric rinse at the front of the can washer to minimize plant waste and reduce the contamination of streams running by country receiving plants.

There is shown a packaging machine for filling paper containers which handles the package through the complete operation without the necessity of touching the container whatsoever.

There is a new type of apparatus for sterilizing milk which has apparently been perfected to a point satisfactory for commercial operation. There is equipment which might radically change the method of handling butter, which has long been discussed and referred to as the "Continuous Buttermaking Process".

There have been many improvements in the small accessory equipment in plants. These are small items which are necessary to the operation of plants but which have never before been given too much thought from a sanitary standpoint. The items to which I refer are sanitary pipe washing machines, sanitary pipe racks, sanitary fitting tables, etc.

There is a new capper made up of a very few parts and so constructed that it can be dissembled and reassembled very quickly. The milk bottle capper has always been rather an unsanitary item in a milk plant, but this new capper which is constructed of all stainless steel solves this problem. Another feature about this capper is the fact that when caps jam in the machine, the bottom cap slide can be removed quickly without dissembling the rest of the capper so as to take out jammed caps without the necessity of touching the caps with the hand or with an icepick a practice which is unsanitary.

Storage tanks have been greatly improved by incorporating spun heads with a large radius both on the inner shell as well as the outer shell. There

* Presented at the Thirty-third Annual Meeting of the International Association of Milk Sanitarians, Inc., Atlantic City, N. J., October 24–26, 1946.

has also been an improvement in the design of the front head accessories such as the inlet fitting, peep sights, manhole door frames, and in some cases the elimination of the thermometer fitting within the milk receptacle entirely. This is accomplished by welding a thermometer well on the outside of the inner shell into which the bulb of the dial thermometer is projected. According to the manufacturer who is incorporating this device in his tank, there is only a time lag of about 45 seconds to 1 minute before the thermometer reaches the milk temperature. As previously stated, this eliminates any thermometer fitting through the milk receptacle and also eliminates the necessity of the thermometer bulb being submerged in the milk itself.

These are just a few of the many things I might mention, but again referring to my earlier remarks, the other angle which might be brought to your attention is the physical ability of the manufacturer to accomplish what might be normally expected of him by your group.

Last night I attended the Service of Supply Dinner, better known as the S.O.S. Dinner, and for about two and one-half hours I heard the supplier expound to the industry the almost impossible task of trying with all their ingenuity and ability to come somewheres near to meeting the demands of the industry. Many obstacles with which you are all familiar were mentioned and the picture as a whole looked pessimistic to say the least. Deliveries of equipment were quoted at anywhere from 4 to 30 months, averaging approximately 18 months. These figures were the result of a personal canvass of executives of the displaying manufacturers.

I shall give you delivery dates as a result of this canvass as follows:

| | |
|---|---|
| Freezers | 12–20 months |
| Coolers | 4–12 months |
| Pumps | 4–12 months |
| Pasteurizers | 6–15 months |
| Plate Equipment | 10–18 months |
| Storage Tanks | 15–24 months |
| Weighing and Receiving Equipment | 6–30 months |
| Straight-line Can Washers | 9–32 months |
| Rotary Can Washers | 4–19 months |
| Homogenizers | 12–24 months |
| Separators and Clarifiers | 4–13 months |
| Refrigeration Compressors | 18–20 months |
| Can Conveyors | 10–16 months |

At this point you might be interested in the following statistics as given by the Bureau of Census in Washington in regard to the shipment of dairy equipment. During the month of June, 1946 in round figures approximately $2,800,000 worth of dairy machinery and equipment was shipped. At the end of the month of June the backlog of orders for dairy machinery and equipment totalled $45,000,000.

Almost all of the audience at last night's dinner were customers there to have one questioned answered, "When can I expect my equipment"?

Your group, however, is looking for two questions to be answered. "When can we expect equipment to replace the old unsanitary existing equipment?" and "When are the manufacturers going to develop something new?"

Gentlemen, the first question was answered last night in an exceedingly pessimistic way and yet the second question presents to the manufacturer a more herculean task than the first.

I am sure every single manufacturer in this industry would rejoice in its ability to be able to accomplish both of these things under present day conditions. This, however, is impossible, we cannot do both at this time.

Therefore, in behalf of all the dairy machinery and equipment manufacturers I am going to request that you gentlemen bear with us during these hectic times and take these remarks into consideration when making demands both upon the processor and the equipment manufacturer.

I am sure your kind indulgence will not only be appreciated but will materially help us all toward better conditions.

## Thermometers and Control

R. E. Olson
*Taylor Instrument Companies, Rochester, N. Y.*

### Delivery

*New Instruments—*

Perhaps of first importance is the matter of delivery of instruments. The instrument industry, in common with most others, assumed a very heavy burden during the war for the production of indicating, recording, and controlling devices which were found to be real essentials in war-time industries. This responsibility was discharged in creditable fashion, many companies producing several times their pre-war volume. The backlog in the instrument industry is still appreciable but I am happy to report to you that the delivery situation is well on the way toward improvement. In some cases new instruments can be had in from four to eight weeks depending upon the manufacturer. In general, where complete new installations are concerned, instruments can be made available for installation by the time the equipment is to be started up.

*Repairs:*

You may be even more interested in the service which can be expected when instruments are sent back to the manufacturer for repair. The time required for effecting repairs varies anywhere from two to eight weeks under present conditions, depending upon the type of instrument and form of bulb connection. Instruments which have been in service for many years may utilize a form of connection no longer in regular production, in which case a few weeks should be added for the special work involved. There are some dairy machinery manufacturers who have set up a system of repair by replacement in the case of special instruments which have been developed for a specific piece of equipment.

### New Developments

Under the heading of new developments which have made their appearance at the present show are a number of improvements and newly developed devices which are of interest to the sanitarian and milk enforcement officer. I shall attempt to briefly describe these, as follows:

*Indicating Thermometers:*

There is exhibited a complete line of mercury-in-glass indicating thermometers. Heretofore much thought has been given to the creation of fool-proof and sanitary methods of attaching thermometers to a given piece of apparatus but not much has been done towards improving the scale portion for dairy service. This new design represents an all-out effort towards obtaining maximum readability under all operating conditions and better sanitation. This is accomplished by hermetically sealing the scale and tube within a thick Pyrex glass tube. This makes it possible to submerge the entire thermometer in a washing solution so that it can be cleaned by the same methods used for fittings, pipe, etc.

*Improved Controller Design:*

Several companies are offering an improved model of temperature controller, such as used on continuous milk heaters. In these models a new attempt has been made still further to simplify construction and insure a more positive operation under tough field conditions. One manufacturer has introduced a new form of controller for high temperature short time pasteurizers which might be termed a packaged unit since it combines in a single case the temperature controller and safety thermal limit recorder. This construction makes possible the complete replacement of a control system as a unit. It is a step in the direction of simplification and is of public health significance in that it makes the individual plant more self-contained should trouble develop.

*Holding Period Timer:*

At least two types of a holding period timer for the high temperature short time pasteurizer have made their appearance this year. Both operate on the thermometric principle and have the advantage of making it possible to make a determination of the holding period quickly while the pasteurizer is operating in a normal manner on milk.

The principle of operation is very simple. Two thermal responsive elements are used. One is located at the entrance of the holding tube and the other at the outlet. A surplus amount of steam is admitted through the circulating water system for a brief interval causing a small quantity of slightly overheated milk to move through the holder tube. The time required for this "temperature wave" to pass from one thermal element to the other is a measure of the average velocity of the milk passing through the holder tube. One manufacturer's apparatus consists of thermo-couples and an electronically amplified potentiometer type of recorder in which there is a fast revolving chart. Another manufacturer secures a similar result by the use of two mercury-in-glass thermometers in the bores of which are inserted electrical contacts. Tests made to date with this thermometric method indicate holding time readings which are quite consistent although approximately 3 seconds longer than intervals obtained by the conventional salt injection method.

*Plastic Covered Flexible Connecting Tubing for Recording Thermometers:*

In their effort to provide a more durable instrument, manufacturers have resorted to an extremely strong interlocking type of non-corrosive flexible armor to protect the smaller inner capillary from damage. This form of design has been eminently satisfactory and has reduced failure due to capillary breakage to the very minimum. Some sanitarians, however, objected to the corrugations of the flexible armor. This objection has now been overcome by covering it with a corrosion-resistant plastic which completely eliminates crevices and presents a smooth water-tight washable surface.

*Differential Sanitary Pressure Switch:*

A switch of this type has now been developed for use in connection with certain hookups of high temperature short time pasteurizers where means are desired to prevent automatically raw milk from entering a milk-to-milk regenerator unless the pressure of the pasteurized milk is at least 1 lb./sq. in. higher.

References to the use of such a switch are contained in the *U. S. Public Health Service Code,* Sec. 7: Item 17p. It is completely sanitary and water-proof in its construction and its operating point is capable of being sealed. It operates at static pressure levels from 3 to 20 lbs./sq. in. and will open or close an electrical circuit whenever the pressure of the pasteurized milk falls to within 1 pound per square inch of the pressure of the raw milk. At any given setting it will operate within plus or minus one-quarter pound per square inch.

*New Flow Diversion Valve:*

A new model flow diversion valve is being exhibited which has been designed to insure greater trouble-free operation than has been achieved in the past. It is also simpler and of more rugged construction than earlier models. It is constructed so that the entire valve body assembly can easily be removed and it contains 13 fewer parts. It is more fool-proof than older models in that the forward flow port is automatically kept closed until the operator manually connects the valve stem to the operating mechanism. In other words, its position can only change to forward flow when the temperature reaches a plus legal value. Failure due to improper assembly or failure of the auxiliary circuits and contacts controlling the raw milk pump cannot cause a forward flow condition.

The entire valve assembly has been changed so that the forward flow port is at the highest point. In such a position it would be physically impossible to obtain a forward flow of sub-legal temperature milk were the hydraulics of the system such as would exist if the restriction now commonly used in the diverted flow line to assure equal holding periods in forward as well as diverted flow is eliminated. The valve, however, is designed so that it will perfectly seal the forward flow port in the event of a differential as high as 15 lbs./sq. in. between the milk in the body of the valve and that in the forward flow line. The entire valve body and all parts exposed to milk are constructed of 18–8 steel thereby insuring longer life by being resistant to various corrosive washing solutions.

*Service:*

One other item of interest that deserves mention is the broad subject of instrument service. One company has what is termed a protective service plan. This has been in operation for the past three years and has met with favor judging from the rate at which the demand for it is growing. It consists of contracting with the user for periodic service of instruments at specified intervals. It is interesting to note that there has been only one single instance of instrument trouble between visits out of over 400 inspections divided among 90 companies who have contracted for this service.

These service contracts have been welcomed by the sanitarians in the territories where they have been given. It has been devised especially for high temperature short time pasteurizers with the realization that trouble-free operation of the control system is necessary in the interest of overall efficiency of operation.

## Abstracts of Milk Literature

*(Continued from page 91)*


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# The Milk Bottle Supply Situation*

J. W. Saybolt

*Glass Container Manufacturers' Institute, New York, N. Y.*

Your secretary has suggested that I talk to you on a subject vital at this time to the whole dairy industry—the milk suppliers, distributors and customers, as well as yourselves. The subject is the present supply situation with regard to milk bottles.

Normally, such a subject would not have sufficient news interest to be worth while as a topic. Even during the tremendous supply dislocations of the war, it might have been taken for granted that the milk bottle supply would be adequate. In view of the difficulties and the unprecedented demands on the glass container industry in the last six years, I feel that the milk bottle manufacturers have every reason to be proud of their record of service to the dairy industry. No other industry has been as fully and as steadily supplied with glass containers as the dairy industry.

At the present time, with milk bottle manufacturers operating at full capacity, the supply may be described as "tight", and even critical. Only in one area is there a serious shortage of containers and there, it is generally admitted, other factors are at work beyond the responsibility of the milk bottle suppliers.

Before analyzing the present supply outlook for milk bottles in detail, let me review briefly the record since 1940. Some of our experiences in this period serve as an instructive background for the current situation. Bear in mind that the milk bottle industry must be prepared to deliver a considerable normal annual volume of containers for replacement, and that when an increase in milk consumption develops, approximately eight bottles are required initially to service each unit delivered. In periods of increasing milk consumption, in other words, milk bottle manufacturers must supply the normal grossage for replacements and in addition approximately eight times the unit value of the increase.

For the five years preceding 1941 the milk bottle industry shipped an annual average of slightly under 2½ million gross a year. In 1941, with the boom in war industries and the beginning of concentrations of men in training camps, shipments suddenly jumped 30 percent to 3¼ million gross. In the following year they increased further to 3⅓ million gross. After that they steadily declined for two years. This slackening in the requirement occurred mainly for these reasons. The "float" of bottles—that is, the eight required to service each unit delivered—had temporarily caught up with the increases in milk consumption wherever those increases had taken place. Men were moving rapidly overseas and others were being taken from cities and villages into training camps already well supplied with bottles. Moreover, in the fall of 1942 limitation orders were issued by WPB—Order No. 10 requiring a deposit on all bottles—and Order No. 79 restricting the distribution of cream and limiting the amount of fluid milk that could be sold in areas of 50,000 population or more. The deposit order stimulated the return of bottles with the result that dairies generally were securing greater trippage from their bottles.

Late in 1944 the demand for maximum milk bottle production reappeared and has remained ever since. During 1944 the dairy industry could have had a half million more gross if it had asked for them. While the glass industry foresaw the later demand and made timely preparations, it could not have laid by a stock of any considerable size because the clamor for other types of bottles was too great, if for no other reason. Since the late months of 1944, milk bottle manufacturers have operated their machines as fully as the supply of raw materials would let them.

As a result of their efforts, shipments of milk bottles for the first eight months of 1946 are 60.5 per cent greater than for the first eight months of 1940. They are nearly 9 percent ahead of even the similar period of 1945.

The continued rapid increase in milk consumption is one reason for the "tight" supply of milk bottles. The return of our military forces, the large number of new households, the shortages of other foods, and similar factors have combined to create a continuously rising demand for milk. The increase has been so rapid that the "float" of bottles has had no opportunity to quite catch up to milk distributors' requirements. Once the "float" is adequate, the situation is eased; the milk bottle, being a multiple-trip container, needs only to be replaced after its service life of thirty or forty trips or more.

But an increase in business volume is as much a goal of the dairy industry as of the glass industry. The dairyman wants to know why the glass bottle has trouble in keeping his pace.

If the supply of milk bottles is something less than could be desired, the causes lie beyond the power of the glass industry to correct. In the first place, there is a serious shortage of soda ash, one of the requisite raw materials for glass. Authorities estimate that soda ash production this year will be about 10 percent, or 500,000 tons, short of expected demand. There is no total, reasonable substitute for soda ash in making glass; and, unfortunately, there is no substitute for soda ash in making aluminum, soap, paper, cleansers, detergents, and hundreds of other products. We are all on a quota basis, so that each industry receives its share, but the supply is limited.

A further curtailment in soda ash supply has recently resulted from the opening of new aluminum manufacturing facilities, and it is probable that our industry will not be able to maintain its present rate of production. Since soda ash production requires elaborate and expensive processes, it is not likely that this situation will clear up for at least another year.

Further, the shortage of box cars has had the effect of holding down shipments. Earlier in the year, the coal and railroad strikes handicapped our performance. In view of these difficulties, our 60.5 percent increase in shipments as compared with 1940 is an achievement.

With these production problems making the supply of milk bottles critical throughout the country, in the New York City metropolitan area the situation is especially so, and there, as in other areas, the milk bottle manufacturers have been absolved. A recent survey of urban milk markets showed that elsewhere, while additional milk bottle supplies could be used to advantage, the continued rise in milk distribution was not being impaired to any great extent.

Another subject your Secretary expressed interest in is—future trends in the design of milk bottles. As to this matter, I can say emphatically that the square design, development of which started prior to the war, has proven to be the ideal dairy container. While improvement in glass manufacturing technic may result in still further improved designing, the square bottle is here to stay.

It should be pointed out here that the extent that this new bottle has been introduced into use, has been a factor in increasing the milk bottle supply. Since there is no individual blown lettering on these bottles, they can be turned out in long production runs; and the inventory problem, often a complex one with round, blownlettered bottles, is simplified. Still another advantage must thus be scored to the credit of the square type of bottle, which the glass industry, and that part of the dairy industry which has adopted it, are confident will be the milk bottle of the future.

Those dairies which have adopted the new bottle are obtaining the economies predicted for it. Indeed, wherever it has been possible to install the new design, the saving it has effected in greater utilization of equipment and storage and delivery space has been as important as the overall economy of approximately 1¢ per delivered unit resulting from its use. Since a case of round bottles takes up 47½ percent more area than a case of squares, a dairy can do almost half again as much business with the same storage and cooler space. Moreover, the space-saving feature is a tremendous advantage in the delivery operation, and becomes a very important factor in the loads carried on every-other-day deliveries. The carrying capacity of present-day trucks can be increased with very minor adjustments by as much as 50 percent. The storage advantage of square bottles is also of importance to the consumer, especially when she is served by every-other-day deliveries.

As milk sanitarians, you will be interested in a cleansing test on square bottles performed under average dairy conditions by Professors L. H. Burgwald and T. V. Armstrong of Ohio State University. Since the square design is new, some doubt arose in the minds of a few dairymen lest it would not wash as easily and thoroughly as the old round bottle. Actually, the inner corners of the square design have curving radii, so that it approximates the interior of the round bottle; moreover, it was anticipated by the designers of the square bottle that the flattened panels would act as a baffle in the washing process, breaking up the swirl, increasing the splashing action and therefore the effectiveness of the cleansing.

To resolve all doubt, Professors Burgwald and Armstrong took batches of a dozen square and a dozen round bottles at intervals from seven types of washers in use in an average size city. Following standard testing procedures, bacteria counts were made for each of nearly a thousand bottles, half of them square and half of them round, brought to the laboratory over a period of three months. Their conclusion was that "there is no difference in the commercial practicability of cleansing and sterilizing the returnable square milk bottle and the conventional round bottle in the typical dairy soaker equipment".

I have attempted in this short talk to acquaint you with the facts of the current milk bottle supply situation. In spite of shortages of soda ash and other materials and services, the glass container industry is now producing at a rate 60 percent greater than it was in 1940, but it is doubtful if this rate can be maintained under present conditions.

Where container shortages threaten to become more acute experience proves that dairymen have a means for helping themselves. In many such markets campaigns urging consumers to return their bottles promptly have been instituted with excellent results. To achieve the best results such campaigns should cover the entire market with all units cooperating. That real possibilities for greater utilization of the glass milk bottle exist in many markets is indicated by the contrast in trippage figures.

Glass milk bottle manufacturers have accepted as a responsibility the furnishing of these containers for the great mass of consumers, and will continue, as in the past, to give their best in design and production to this objective, but it should be realized that the present conditions, outlined above, are real handicaps and that every reasonable cooperation from the dairies and the public is needed.

# New Books and Other Publications

Guide to Safe Food Service, A Manual for Use in Organizing and Conducting Classes for Food Establishments Employees, by John Andrews and Frances T. Champion. Tentative Edition, 65 pages, February 1946. U. S. Public Health Service, Washington, D. C.

In the Foreword, Mr. A. W. Fuchs writes: "Courses in sanitation for restaurant workers have been conducted by many health departments and other agencies, each pioneering and contributing to the general fund of experience. To fill the need for a comprehensive manual, available materials were surveyed, studies were made of restaurant sanitation courses of different types, and this Guide to Safe Food Service prepared. It is issued as a tentative bulletin in order to secure try-outs and recommendations for revision. . . ."

It contains detailed plans for setting up and conducting courses for employees in restaurant sanitation, with quizzes, lists of visual aid material, and a right-wrong chart.

Condensed Milk and Milk Powder, by O. F. Hunziker. Sixth Edition. xv+502 pages, 128 illustrations. Published by the author, La Grange, Illinois, 1946. $6.50.

This book is re-organized and rewritten so that it now comprises forty-seven chapters, and is conveniently arranged for class-room use. Many of the references to the literature date as late as 1945. By setting the type smaller and closer, the publisher has produced a smaller book without appreciable decrease in content. As in previous editions, the author is clear, authoritative, complete, and practical. In this field, "Hunziker" is the one and only.

## Animal Foods Inspection Division Established*

Canned foods prepared for dogs, cats, and other meat-eating animals may now receive Federal inspection, when packers request and pay for this service. The inspection, being made available at the request of industry representatives, includes supervision over sanitary conditions in the plant, the ingredients that go into the cans, accurate labeling, and various other steps of preparation.

Authority for the service is the Research and Marketing Act of 1946, enacted by Congress in August. The available inspection applies to "canned wet food for dogs, cats, and other carnivora," as distinguished from dry foods such as dog biscuits. The canned product must be "a normal maintenance food," containing at least 10 per cent protein, 0.3 per cent of calcium and phosphorus, respectively, and 0.15 milligram of thiamin, an essential vitamin. At least 30 per cent of the product must be meat or meat byproduct. Vegetables, grains, or substances derived from them must be of good quality, sound and clean.

Besides containing the name and address of the packer, the label must give the ingredients in the product in the order of their predominance. The inspection number that the Department gives each plant must also appear on the label. Products that meet official requirements are to be marked with an inspection and certification stamp in the form of a keystone, a design prepared especially for the purpose.

The Bureau will administer this new inspection service through an Animal Foods Inspection Division, of which Dr. L. V. Hardy is head.

* Service and Regulatory Announcements. Bureau of Animal Industry, U. S. Dept. of Agriculture, November, 1946, p. 75.

# JOURNAL OF MILK AND FOOD TECHNOLOGY

*Official Publication of the*

## International Association of Milk Sanitarians

(Association Organized 1911)



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## Associated Illinois Milk Sanitarians

At the annual fall business meeting of this Association, held in Chicago on December 16, 1946, the following resolution was offered and adopted:

> "Be it resolved that it is the sense of this Association that annual meetings of the International Association of Milk Sanitarians should not be held simultaneously with such meetings as the American Public Health Association, the Milk Industry Foundation or the Dairy Industry Exposition."

A copy of this resolution was directed to be forwarded to the Executive Board of the International Association of Milk Sanitarians.

# Fellowships for Physicians and Engineers

ANNOUNCEMENT is made by Surgeon General Thomas Parran of the U. S. Public Health Service that applications for Fellowships in post-graduate public health training for physicians and engineers for the school year beginning in the fall of 1947 will be received at any time prior to May 1, 1947.

The Fellowships are made possible by a grant of $228,400 from the National Foundation for Infantile Paralysis through funds contributed to its March of Dimes. Fifty-three students were awarded Fellowships for the school year beginning in September, 1946.

The Fellowships provide an academic year's graduate training of approximately nine months in an accredited school of public health or an acceptable school of sanitary engineering followed by three months of field training, and are open to men and women, citizens of the United States, under 45 years of age. Physician applicants must have completed at least a year's interneship. Engineering graduates with a Bachelor's or higher degree in Sanitary, Civil or Chemical Engineering are eligible; and those with other engineering degrees who have had experience in the public health or sanitary engineering field may also submit applications. The Fellowships are administered by the Committee on Training of Public Health Personnel, which consists of representatives of schools of public health, the State and Territorial Health Officers, the American Public Health Association, and the U. S. Public Health Service.

The specific purpose of the Fellowships is to aid in the recruitment of trained health officers, directors of special services, and engineers to help fill hundreds of vacancies existing in State and local health departments throughout the country. The Fellowships are intended for newcomers to the public health field, and are not open to employees of State and local health departments, for whom Federal grant-in-aid funds are already available to the States.

Applicants for Fellowships may secure further details by writing to the Surgeon General, U. S. Public Health Service, 19th and Constitution Avenue, N.W., Washington 25, D. C., Attention Public Health Training.

**Make room reservations now for the thirty-fourth annual meeting.**
**Hotel Schroeder, Milwaukee, Wisconsin, October 16–18.**

# Thomas G. White—1867-1946

THE sudden death of Thomas G. White on November 30, 1946, was a distinct shock to his host of friends and acquaintances. Apparently in the best of spirits and health, he had gone to his old home on Seward Avenue in Detroit on Saturday morning, November 30th, to repair the garage roof. After assembling the necessary materials he had climbed up the ladder and on reaching the top, collapsed, but did not fall. Friends noticed that he was not moving, and rushed aid to him, but he never regained consciousness. Having lived to the ripe age of 79 years, he was truly active until the end, always alert, happy, and doing something constructive.

Mr. White—Tom, as he was affectionately known—was born in Dundee, Scotland, on November 25, 1867, and emigrated to this country by way of Windsor, Ontario, in 1892. He received his final naturalization papers in 1903, and became a respected, loyal American citizen.

His early days in Detroit were spent as a coachman for various families. Later, he became a conductor on the old D.S.R., spending many years with them. On July 1, 1911, he started to work with the Detroit Health Department as a milk inspector, which employment continued until June 30, 1940, when he retired.

Mr. White, as one of the early milk inspectors, started working in the field, traveling from farm to farm on foot, of course catching an occasional ride with some friendly farmer. A little later he obtained a horse and buggy; the horse, the well-known "Bonnie Doone", became a familiar sight, and is remembered by the older milk producers in the area. With the passing of horses as a means of transportation, Tom finally obtained an automobile, one of the early Brush cars. Later he had several others, and during his final years with the Department of Health his trips through the country in his old Model T Ford. that he always bragged "ran just like a clock", were regular events. His visits were looked forward to by producers, station managers, and his many friends.

His early work as an inspector in the field was during what might be called the 'rough and ready' days. At this time inspectors were not welcome, and a great deal of education was necessary. However, in his friendly manner he overcame objections, educated producers, and did a great deal to improve the milk producing conditions in the Detroit area. Kindly, yet firm in his dealings, he had consistently worked for better conditions, that it was his good fortune to live to enjoy. The 29 active years that he devoted to milk improvement and the good that he accomplished during these years provides a fitting monument to a life that was well spent.

Mr. White was very active in the local Burns Club, having been a long-time member, officer ,and president. He was also a member of the Michigan Milk Inspectors Association since its inception, and in 1940 was unanimously elected to the only life membership existing.

Mr. White is survived by his daughter, Margaret (Mrs. W. L. Davidson) with whom he made his home since the death of his wife, Ann, in 1942; her husband, W. L. Davidson, and their five children; his son-in-law, Stanley Creagh, and his son, of Chicago; his sister-in-law, Mrs. Andrew White, and her two children.

Burial was Tuesday, December 3rd, at Roseland Cemetery, Detroit.

R. R. P.

# New Members

## *ACTIVE*

Bowie, Dwain T., D.V.M., Box 555, County Health Dept., Gadsden, Ala.
Cook, Emory J., Lakemont Drive, Augusta, Georgia.
Gandier, Dr. J. C. C., 120 King St., Welland, Ontario, Canada.
Vernier, Mrs. Carolyn B., 301 Engineer Bldg., 940 Main St., Jacksonville, Fla.

## *ASSOCIATE*

Ackerman, F. W., Kusel Dairy Equipment Co., Watertown, Wis.
Amundson, Rayder, Jackson County Quality Milk Assoc., Northfield, Wis.
Anthes, Theodore W., Dairy Inspector, Milwaukee Health Dept., 218 North 70th St., Milwaukee 13, Wis.
Ausen, Ardell J., United Milk Products, Co., Osseo, Wis.
Bauer, Thomas F., Rochester Dairy, Arkansaw, Wis.
Becker, Ervine, 206 Second St., Jackson, Mich.
Belanger, J. Albert, 8366 Lajeunesse St., Montreal 10, Quebec, Canada.
Bingham, Floyd R., 733 Osage St., Normal, Ill.
Breedlove, Walter, P. O. Box 472, Brownfield, Texas.
Brignone, L. John, Manager, Tolibia Cheese Mfg. Corp., 612 South Main St., Fond du Lac, Wis.
Buhler, Robert W., Vice-president, Mari-Gold Dairy, 1009 Monroe Ave., Racine, Wis.
Clarke, Everard, P. O. Box 10, Vernon, B. C., Canada.
Cline, K., c/o Wyeth Incorporated, Mason, Mich.
Coddington, Philip, c/o The Carpenter Steel Co., Kenilworth, N. J.
Dilts, Charles A., Sidney Wanzer & Sons, Monterey, Indiana.
Dorocke, John E., 9335 Rhodes Ave., Chicago 19, Ill.
Fellenz, Carl J., Am. Dry Milk Inst., Inc., New London, Wis.
Guthrie, Richard A., DeLaval Separator Co., 812 N. Fourth St., DeKalb, Ill.
Hanson, Raymond L., Rochester Dairy Cooperative, Rochester, Minnesota.
Hogan, Wm., Chicago Board of Health, Box 353, Appleton, Wis.
Hopson, Robert S., 807 East 45th St., Richmond, Va.
Johnson, Vernie E., Fieldman, Abbotts Dairies, Inc., Cameron, Wis.
Kanten, Glen C., Cass-Clay Co-operative Creamery Assoc., Box 582, Moorhead, Maine.
Kihlstrum, Elmer E., 201 Bishop St., Peoria, Ill.
Kraska, E. J., Kraska Food Laboratory, 506 Jay St., Box 105, Manitowoc, Wis.
Larsen, Peter G., 1944 N. Richmond St., Chicago 47, Ill.
Lebeck, Ralph, Fountain City & Alma Creameries, Alma, Wis.
Levine, Joseph, 1111 East Central, Des Moines, Iowa.
Marquardt, Louis, Dairyland Co-op. Assoc., Cambria, Wis.
McGee, Wallace J., Station Veterinarian, U. S. Army, Office of the Station Veterinarian, Chanute Field, Ill.
McKim, Ernest F., 2909 E. Washington St., Indianapolis 1, Ind.
McLaughlin, Charles Jr., 5112 Edmondson Ave., Baltimore 29, Md.
Mecham, C. Marion, 2503 Taylor Ave., Baltimore 14, Md.
Montgomery, J. P., Dresden, Tenn.
Nolan, Robert J., Luick Dairy Co., 3512A No. 20th St., Milwaukee 6, Wis.
Pearson, Marion F., Lee County Health Dept., 123 E. First St., Dixon, Ill.
Pederson, E. L., Plant Supt., Abbotts Dairies, Inc., Cameron, Wis.
Perry, N. A., Dairy Dept., Pennsylvania State College, State College, Pa.
Rothe, Wm. G., Oak Park Health Dept., 841 S. Wenonah Ave., Oak Park, Ill.
Skarstad, J. C., Rochester Dairy, 267 E. King St., Winona, Minn.
Stiritz, Eugene E., Kankakee Pure Milk Co., 396 S. Schuyler, Kankakee, Ill.
Tardiff, Ray O., Breyer Ice Cream Co., 53rd St. below Woodland Ave., Philadelphia 4, Pa.
Vogt, Alvin R., Nelson Co-op Creamery, Nelson, Wis.
Vogt, Fred L., 1108 Second St. East, McCook, Nebraska.
Watkins, Raymond G., 20 A Dunkerron Ave., Epsom, New Zealand.
Wisniewski, Theo., 3120 W. Homer St., Chicago 37, Ill.

# "Doctor Jones" Says—*

Well, I see the State Department of Health—they've got out a new pamphlet on home pasteurization of milk. It gives all the particulars: a list of things you need and just how to do it. And, on the front of it, there's a picture of a nice-looking young lady giving a demonstration. I'd recommend her as a number one "pin-up girl"—her *and* the pamphlet. All you have to do is ask for 'em—the pamphlets, that is.

And, by the way, I heard the other day that one of the big mail-order houses is advertising a home pasteurizing outfit. All I know about it is that it costs somewhere around forty dollars.

The sale of raw milk, here in this State—judging from the figures, we're getting along toward what may be, more or less, an "irreducible minimum." There's still considerable being sold legitimately and, I suspect, some illegal sales they'll have to get after. But it's getting less all the time. Eventually it'll get down to isolated or sparsely settled sections where there's no commercially pasteurized milk available and to folks that have their own cows. Such situations: that's where the home pasteurization comes in.

People that buy their milk: if good pasteurized milk is available—of course it's a lot simpler and, usually, cheaper than buying raw milk and pasteurizing it at home. Doing the job at home: there's no doubt about it; it's considerable bother. The equipment's got to be kept clean and there's the fuel and your time—if that's worth anything. But, after all, the most valuable things—we don't usually get 'em without some bother. And most of us believe in insurance. It's the best insurance, pasteurization is, against diseases that can be milk-borne. Even carefully guarded dairies—you never can be quite sure some of these gangsters of the bacterial underworld won't break in.

Of course, I s'pose there'll always be some folks—well, I guess most of us are a little pigheaded if we get on the right subject. Like Grandpa Pepper and his well. "Yes," Grandpa says, "the village water—I don't question none but what it's safe and all. But that well water—I've drunk it upwards of fifty years. If there's any diseases in it," he says, "I've probably had 'em all."

*By Paul B. Brooks, M.D.*

* Health News, New York State Department of Health, Albany, N. Y., October 21, 1946.